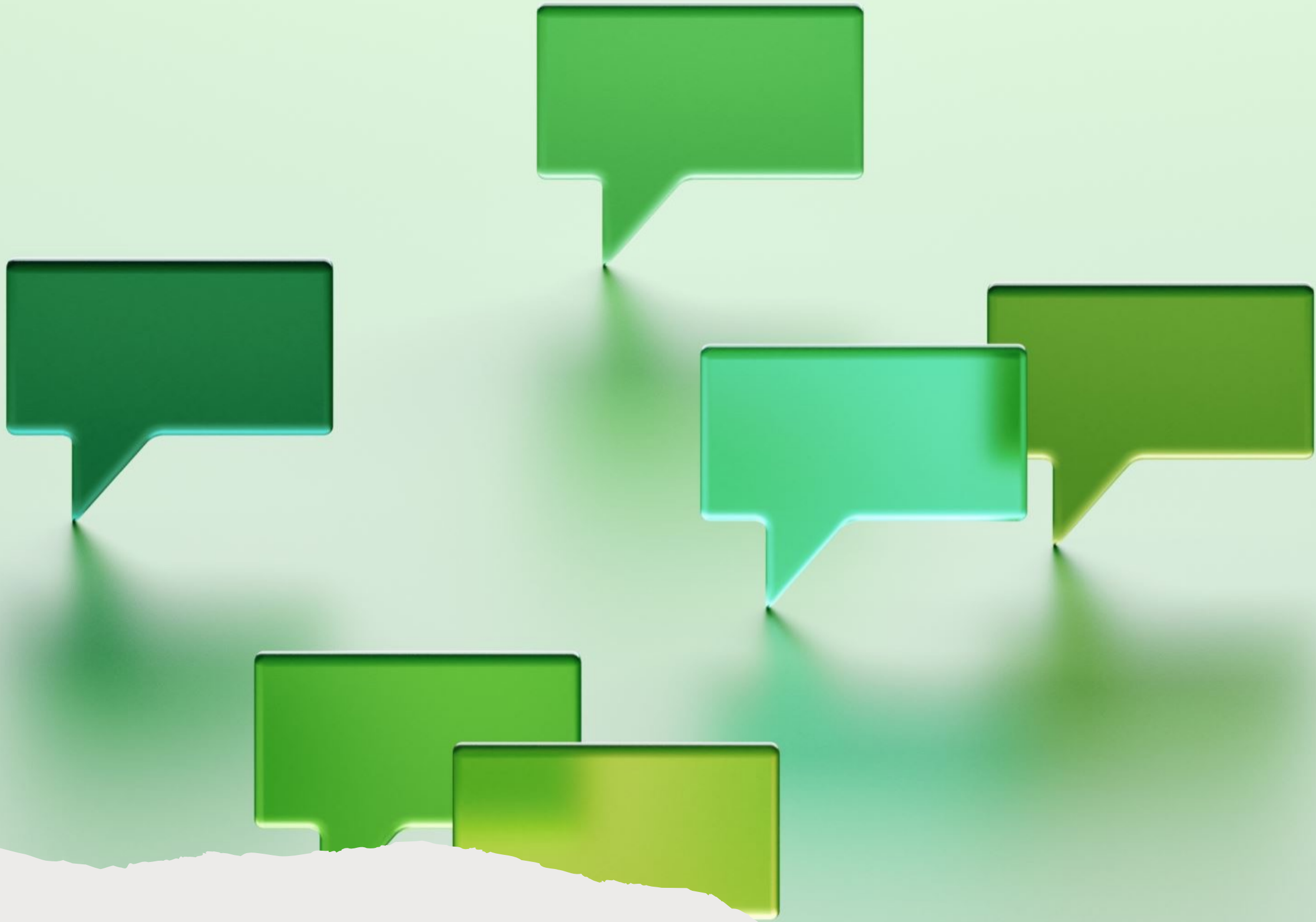


# ROBOTICS: TEACHING EQUIPMENT PROJECT

PHASE III

NOND PHOKASUB



Feedback



# FEEDBACK

After the activities were distributed for use in over 120 Thai schools, I received valuable feedback from teachers via Line Official Account that I can use to further improve the activities. I received positive comments on all activities, but it was mainly Flowchart Board Game that had many suggestions for improvements.



The Board Game finishes too early.

More example questions would be more effective.

The Board Game should allow for more players to incorporate more students





Development

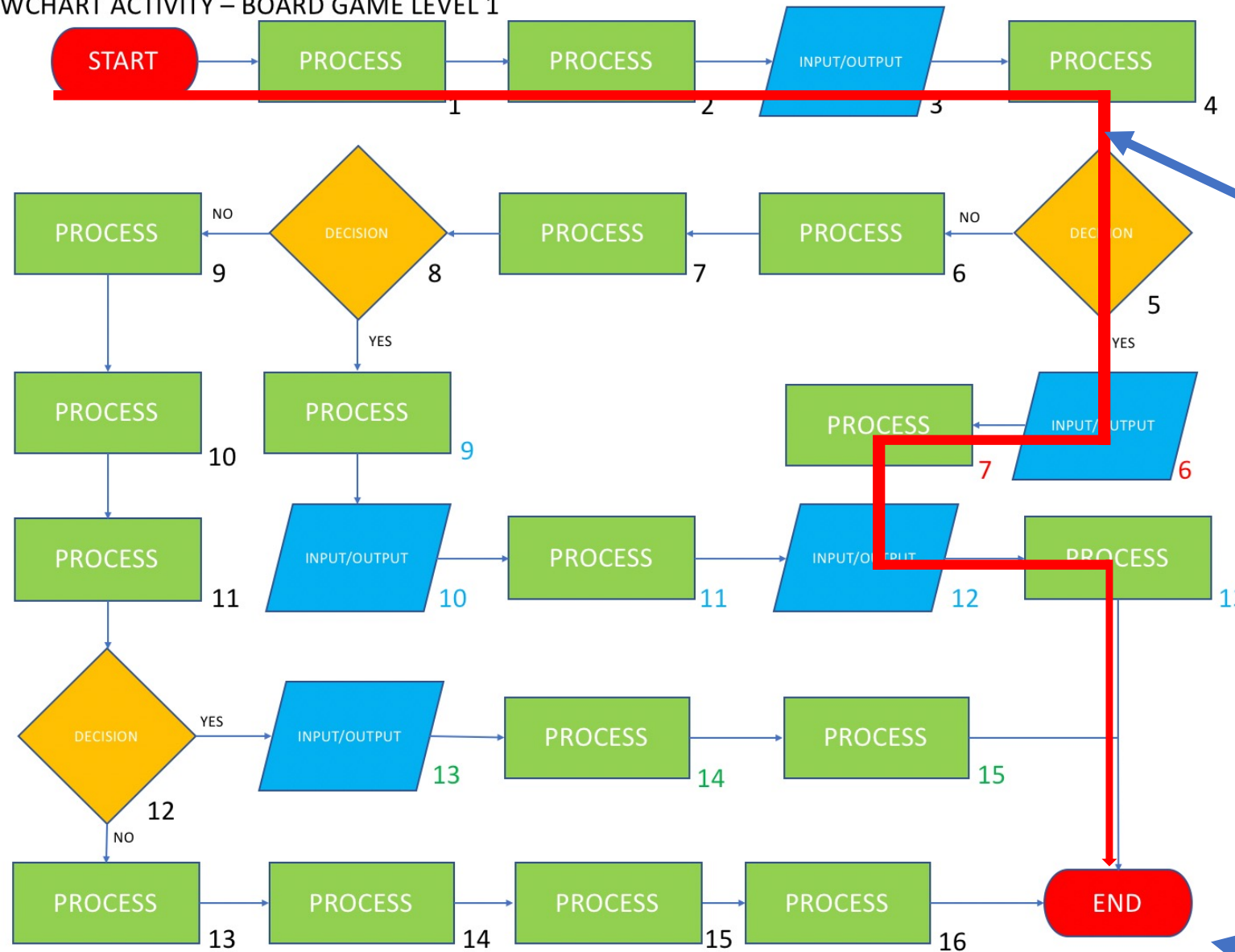




# RESPONDING TO FEEDBACK

- 🎯 Increase length and duration of the Board Game
- 🎯 Increase the number of questions
- 🎯 Increase the number of players

FLOWCHART ACTIVITY – BOARD GAME LEVEL 1



The design and layout of the board game can be improved as there is a path that leads to the endpoint in only 10 steps.

The number of tiles in the board game can be increased as the longest path is currently 17 steps.

However, there needs to be a balance between complexity and simplicity to allow young students to understand the game quickly and not feel that the game is not fun due to a lack of understanding.

A little more complexity can be added to the board game to allow a greater number of permutations and allow the game to run for a longer time.



# DESIGN IDEAS

 Increase length and duration of the Board Game

To increase the number of permutations, missions can be added to lead to a new aspect of the game. Missions would be in the form of simple cards that players would need to randomly select at the beginning. These cards will each contain an 'instruction' and a 'reward' for completing the mission. The mission is not compulsory but the 'reward' may be worth the player's time as the 'reward' can be in the form of a personal advantage or a punishment to another player in the duration of the game. Missions will have varying difficulties. The harder the mission, the better the reward. Students will need to keep track of their missions (e.g. on pen and paper) and other players can help check. Examples of missions are shown below:

## MISSION CARD

### MISSION

Collect 1 counter that is placed on the board by landing on the tile that the counter is placed. This mission can only be done once.

### REWARD

You have the ability to move one player back to the START.

## MISSION CARD

### MISSION

Land on 2 Decision Tiles.

### REWARD

Move to END.

## MISSION CARD

### MISSION

Land on 3 tiles that are prime numbers

### REWARD

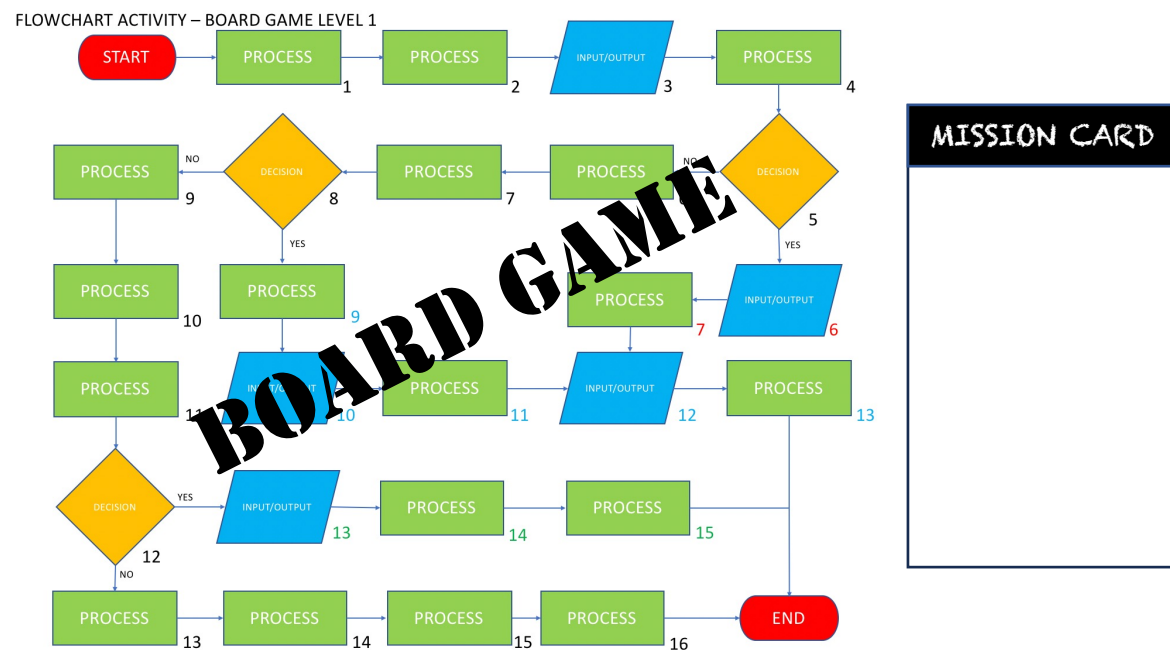
Move one player 5 tiles backwards.

# DESIGN IDEAS

🎯 Increase length and duration of the Board Game

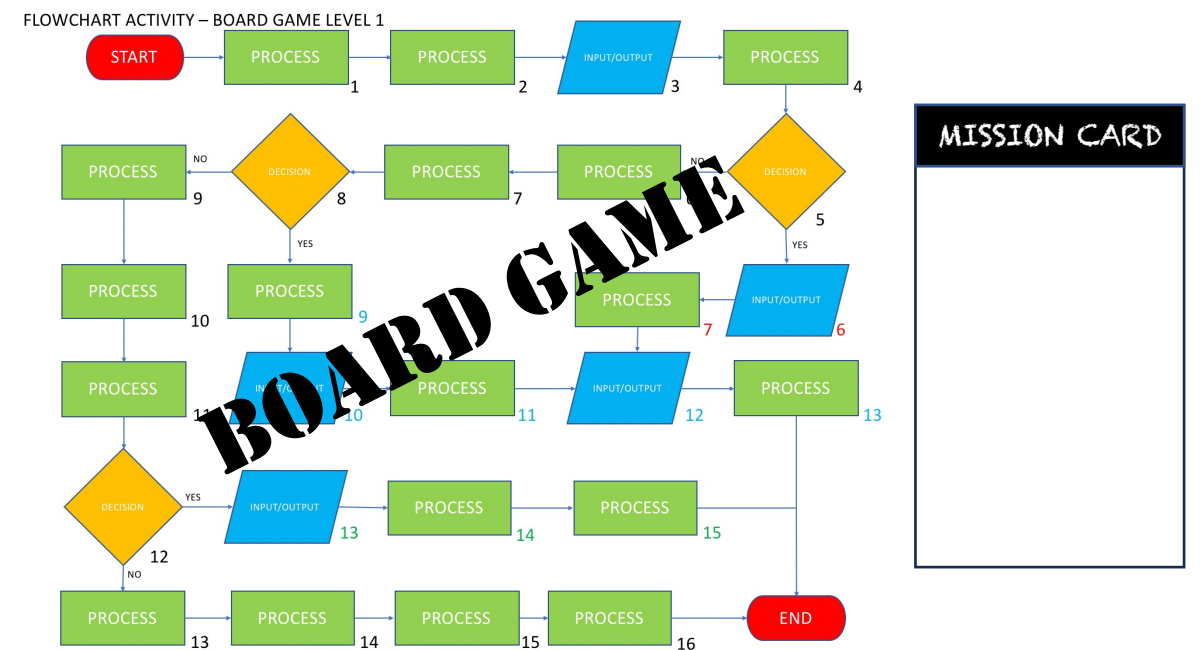
Two options were considered for the modifications in terms of the concept of the board game.

## 🕒 OPTION 1



Option 1 involves each player playing individually on the board and timing themselves to see how long it takes them to reach the 'END'. The reward for missions would be in the form of taking away a specific amount of time from the total time a player takes to reach 'END'. The player would also have an option to return to the 'START' again after reaching 'END' if they want to complete their mission, but they will have to reach 'END' again as well.

## ♟️ OPTION 2



Option 2 involves all players playing on the board at the same time, similar to the first version of the board game. Like a typical board game, the player who reaches 'END' first is the winner. The reward for missions would be in the form of personal advantages such as making another player move backwards or moving another player back to the 'START'.

# DESIGN COMPARISONS

 Increase length and duration of the Board Game



OPTION 1

## ADVANTAGES

- Time deductions for completing missions allow for a fair and straightforward way of rewarding players for completing missions
- Time allows for a clear indication of the winner

## DISADVANTAGES

- A game that is highly dependent on time may mean that students are less focused on the learning concepts of the game itself



OPTION 2

## ADVANTAGES

- Not relying on time as a method of determination may allow students to be more focused on the learning concepts
- All players playing at the same time may offer a more connected feeling with others and may be more exciting.
- Different types of rewards will add a greater number of permutations

## DISADVANTAGES

- Method of determining rewards for missions may be more difficult as different missions will have different rewards



# DESIGN SELECTION

 Increase length and duration of the Board Game

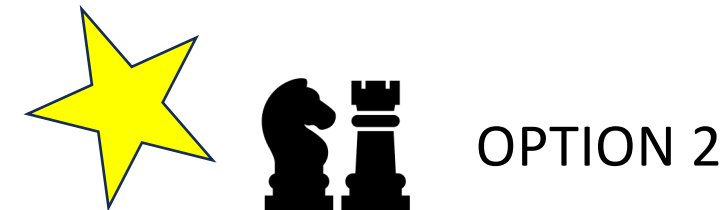


## ADVANTAGES

- Time deductions for completing missions allow for a fair and straightforward way of rewarding players for completing missions
- Time allows for a clear indication of the winner

## DISADVANTAGES

- A game that is highly dependent on time may mean that students are less focused on the learning concepts of the game itself



## ADVANTAGES

- Not relying on time as a method of determination may allow students to be more focused on the learning concepts
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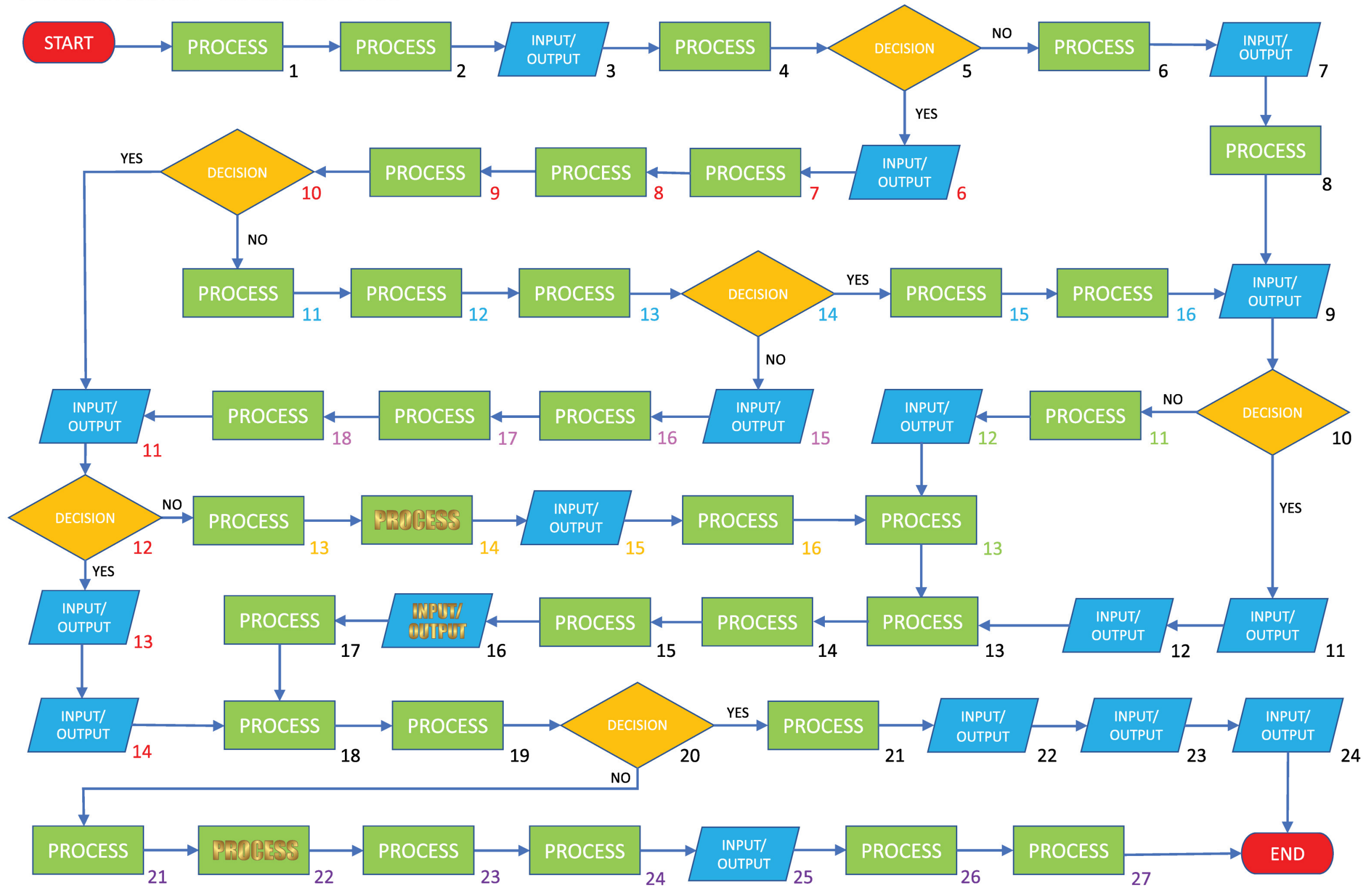
## DISADVANTAGES

- Method of determining rewards for missions may be more difficult as different missions will have different rewards

Option 2 was chosen because the disadvantage in Option 1 (less focus on learning concepts) could become a major problem with the board game and minimise the effectiveness of the "learning by playing" concept.

# DESIGNING THE BOARD

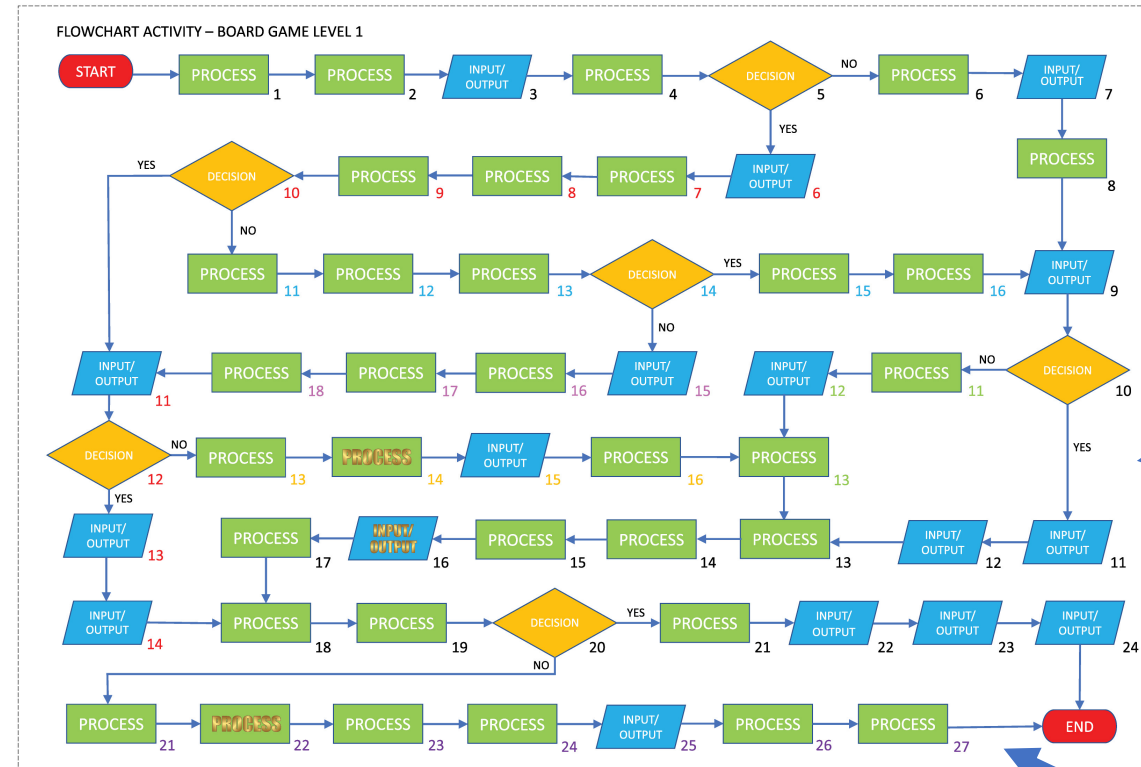
FLOWCHART ACTIVITY – BOARD GAME LEVEL 1





# EVALUATING THE DESIGN

Mission cards add another level of complexity to the game, increasing the number of permutations to the game.



The board no longer has one route that takes a player to the 'END' in a small number of steps.


The board now has 28 steps with 7 different pathways, increasing the complexity of the game.

- ✓ Increase length and duration of the Board Game
- ✓ Adding complexity whilst maintaining simplicity


# DESIGNING MISSION CARDS

**EASY** Missions – These missions should be easily completed within the round and will have the least effective rewards.

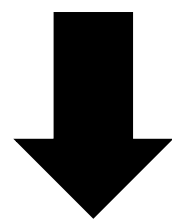
**MISSION CARD**

 **MISSION**

Land on 3 INPUT/OUTPUT tiles.


 **REWARD**

Play another go.




Adds an element of chance where the player may want to take their chances at INPUT/OUTPUT tiles (which can move the player forward OR backwards) to complete the mission.

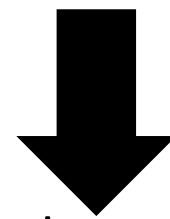
**MISSION CARD**

 **MISSION**

Land on 2 Decision tiles.

 **REWARD**

Move forward 3 tiles.




Requires the player to apply decision making on whether to follow a route with as many Decision tiles as possible to increase their chances of completing the mission or to follow the fastest route to the finish line.

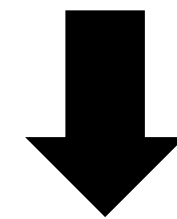
**MISSION CARD**

 **MISSION**

Land on 3 tiles that are prime numbers.

 **REWARD**

Move one player 3 tiles backwards.




Adds a learning opportunity in terms of numbers but also adds an element of chance.




# DESIGNING MISSION CARDS

**MEDIUM** Missions – These missions can be completed but require elements of luck and effective decision making.

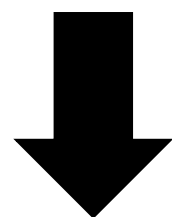
**MISSION CARD**

 **MISSION**

Follow the 'NO' path 2 times when on a Decision tile.


 **REWARD**

Move forward 5 tiles.




Adds a different aspect to the game where the student needs to consider the options of taking a risk with a route for the reward or reaching the finish line but sacrificing the reward.

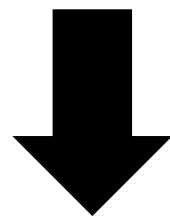
**MISSION CARD**

 **MISSION**

Draw a flowchart symbol and name the symbol for 5 consecutive go's without looking at the board or posters. A different symbol is required each time.


 **REWARD**

Double your next roll.




Allows for a learning opportunity in terms of flowchart symbols.

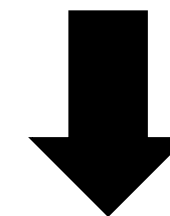
**MISSION CARD**

 **MISSION**

Draw an extra card when landing on an INPUT/OUTPUT tile. Complete this twice to complete the mission.

 **REWARD**

Move one player 5 tiles backwards.




Adds an element of chance to the game to increase the permutations.


# DESIGNING MISSION CARDS

**HARD** Missions – These missions are least likely to be completed so they require rigorous decision making (e.g. on routes taken on the board).

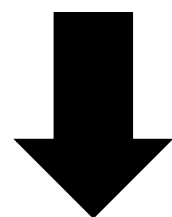
**MISSION CARD**

 **MISSION**

Land on a gold tile. This mission can only be done once.


 **REWARD**

You have the ability to move one player back to the START.




Adds a different aspect to the game where the student needs to consider the options of taking a longer route to collect counters for the reward or reaching the finish line but sacrificing the reward.

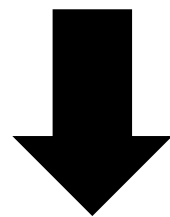
**MISSION CARD**

 **MISSION**

Answer a question from the question bank everytime you roll a 4,5 or 6. 2 correctly answered questions complete the mission.


 **REWARD**

Move to 21




Allows a learning opportunity for students.

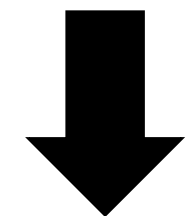
**MISSION CARD**

 **MISSION**

Draw a flowchart for a specific activity (e.g. going to school or making mama noodles) everytime you land on a DECISION symbol. 2 correct flowcharts complete the mission.

 **REWARD**

Move to END

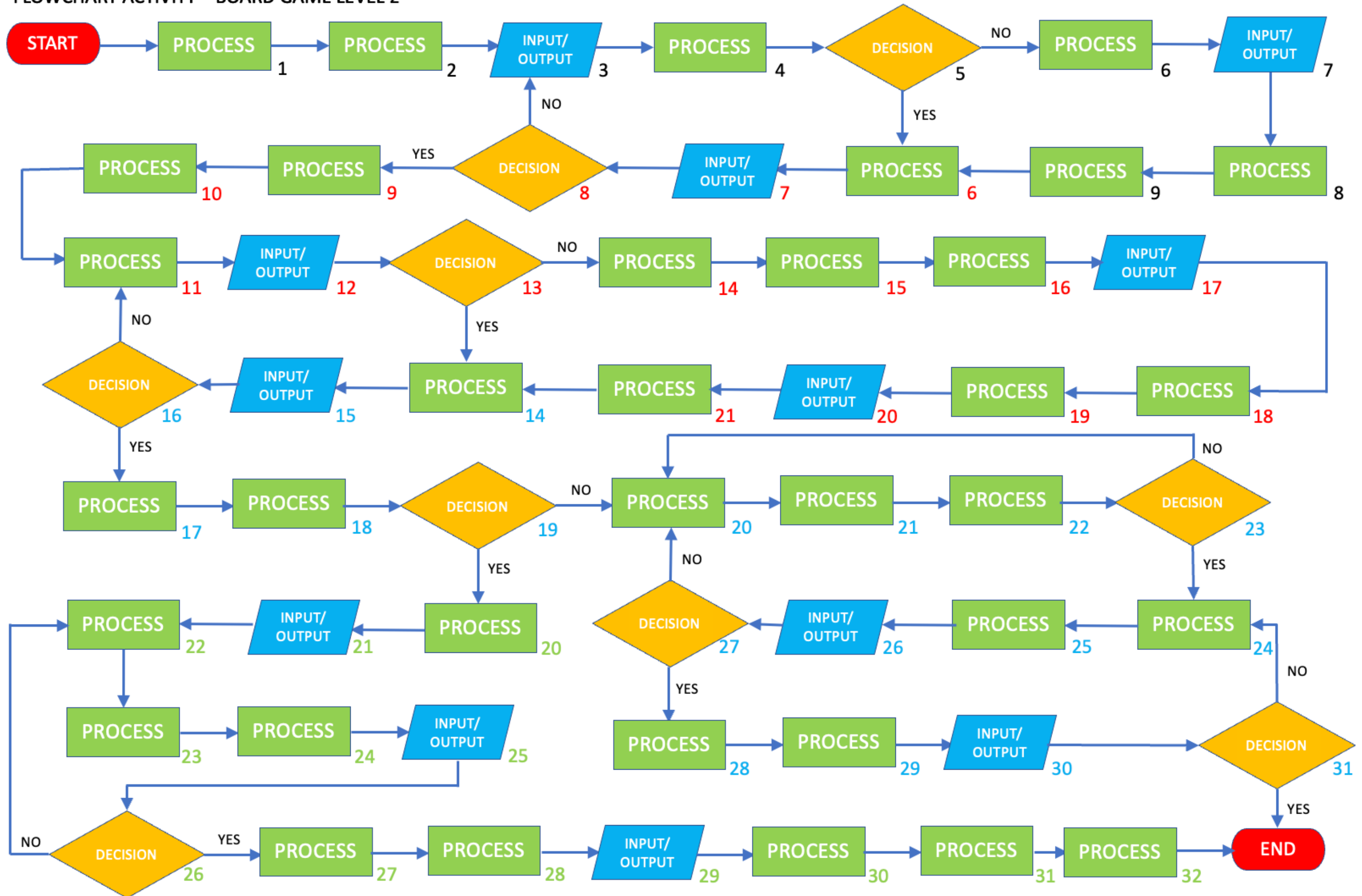


Allows a learning opportunity for students in terms of flowchart skills.



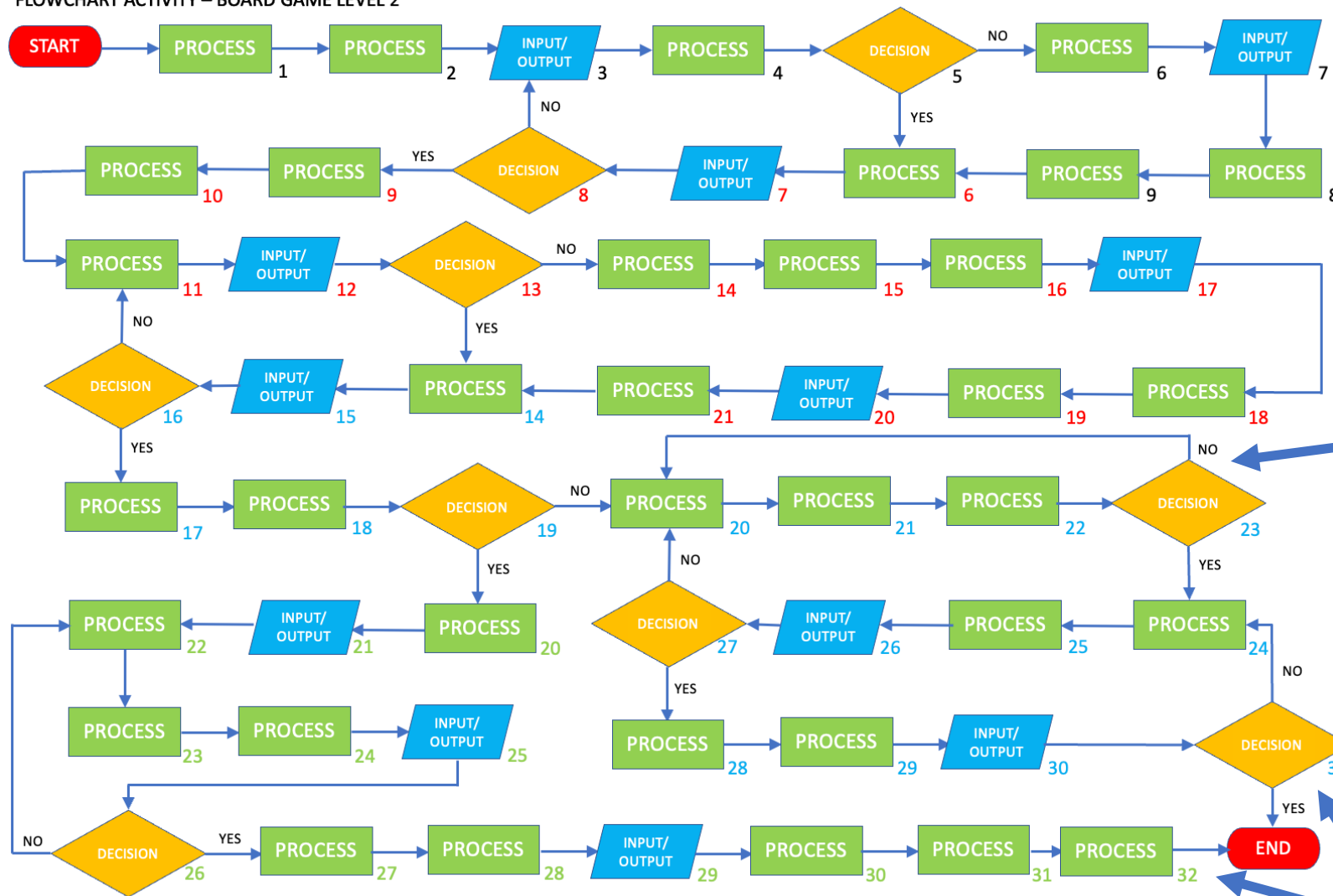
# DESIGNING THE BOARD

FLOWCHART ACTIVITY – BOARD GAME LEVEL 2



# EVALUATING THE DESIGN

FLOWCHART ACTIVITY – BOARD GAME LEVEL 2



Mission cards will not be used in this second level to ensure the game is not too complex as this game already has both input/output cards and a question deck.

The board has a greater number of tiles and still maintains the challenge with the Decision symbols that employ a similar mechanism to “snake and ladders” (if the student answers the question incorrectly they will move backwards).

The board now has over 30 steps with different routes to the END, adding complexity to the game.






- ✓ Increase length and duration of the Board Game
- ✓ Adding complexity whilst maintaining simplicity

# EVALUATING THE DESIGN

Robotics/ Computing Science – Board Game



Nond Phokasub

## Sample Questions for Decision Cards

1. Question: What is the diagram to show how a task should be carried out?  
Answer: Flowchart
2. Question: What symbol do we use to begin the flowchart?  
Answer: Start
3. Question: What symbol do we use to finish the flowchart?  
Answer: End
4. Question: What symbol represents a decision?  
Answer: rhombus 
5. Question: What is used to connect each symbol in a flowchart sequence?  
Answer: Arrow 
6. Question: Prepare a flowchart of going to school.  
Answer:
7. Question: Name 3 different flowchart symbols.  
Answer: Start, Process, Input/Output, Decision, End, Document etc.
8. Question:  $4 + (10/2) = ?$   
Answer: 9
9. Question: What is the most common input device you can think of?  
Answer: Keyboard
10. Question: What symbol represents a process?  
Answer: Rectangle 
11. Question: What symbol represents an output?  
Answer: parallelogram 
12. Question: Which is called the brain of a computer?  
Answer: CPU
13. Question: What symbol represents an input?  
Answer: parallelogram 

Robotics/ Computing Science – Board Game

Nond Phokasub

14. Question: What platform can we use for basic programming?  
Answer: Scratch
15. Question: Think of personal information that should always be kept to yourself and not to reveal to anyone.  
Answer: Password, ATM Password
16. Question: Name an Output Device  
Answer: Monitor, printer, speaker, headphone.
17. Question: Create a flowchart for turning on a computer including the following steps: turn on computer, enter password, password check, access.  
Answer:  

18. Question: What is the difference between a Process symbol function and a Decision symbol function?  
Answer: A Decision symbol requires a decision to be made with a 'yes' and 'no' arrow coming out of the Decision symbol.
19. Question: Start and End symbols both fall under one symbol. What is that symbol's name?  
Answer: Terminal / Terminator
20. Question: What is the symbol for document?  
Answer: 



Increase the number of questions





# Manufacturing





# PACKAGING DESIGN

Similar design to show that the Board Game follows the same design.

'New' in red to attract interest and emphasise this new developed version.

**NEW**

LEARNING BY PLAYING

FLOWCHART ACTIVITY - BOARD GAME LEVEL 1

**UNPLUGGED ROBOTICS**  
By Nond.

NEW FEATURE!  
INCLUDES NEW MISSION CARDS

**MORE PATHWAYS  
MORE PLAYERS  
MORE FUN!**

**FLOWCHART BOARD GAME  
VERSION 2**

Develop logical thinking    Learn Computing Science & Robotics  
Develop flowchart skills    Unplugged Activity

AGE  
10+  
2-8  
PLAYERS

Key components from previous design are maintained to show that the Board Game follows the same concept as before and is still as effective.

Use of key improvements/changes that were designed to address the suggestions from teachers. Using previous pain points as a point of advertisement.

More counters added to allow for more players.

✔ Increase the number of players

A column is used to separate the new version from previous version. Column highlights new features and attracts attention.

Use of triplet and repetition of 'MORE' to emphasise the 'more effective' concept embedded into the new design and create catchy phrase.

Use of triplet and repetition of 'MORE' to emphasise the 'more effective' concept embedded into the new design.