

Category 4
Resource Development

Group #4-013

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Abstract

The idea of “Learning through play” has existed for quite some time now and many have noted that learning through fun and play is a more effective way of absorbing information. Although Singapore has already started to implement learning through play, our resource aims to further encourage the implementation of learning through interactive play. Students are hence able to learn quicker and have a greater impression of the knowledge imparted to them through fun activities, having the ability to retain information better. Through our resource, we hope that students can develop life skills like critical thinking, application of knowledge to everyday situations, creativity and other imperative 21st century skills as well as develop financial literacy, which is an essential skill to have so that they can go about their daily lives.

1. Introduction

1.1 Rationale

We wanted to develop a resource which is versatile and can be used by preschool teachers for preschool students to learn the content being taught in class regardless of what subject it may be. We also wanted the resource to be interactive and fun so that students of young ages with shorter attention spans are immersed in the activity that can be carried out by the teachers as part of our resource package. The preschool students would hence be able to pick up new knowledge and skills through the activities.

1.2 Target audience

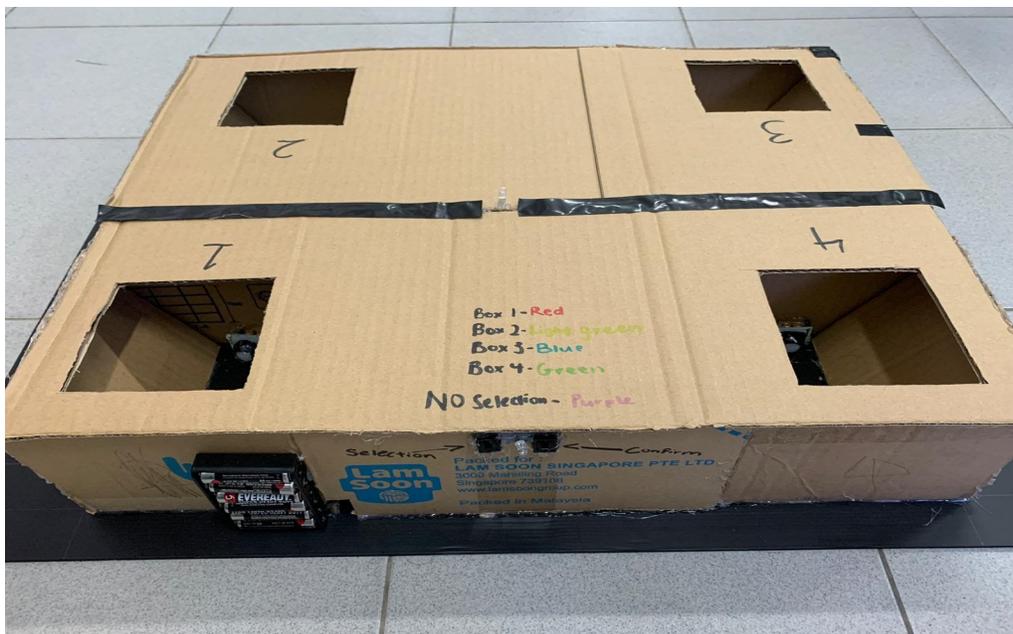
The target audience is mainly the preschool students as it serves as a learning aid for them, but the resource could also serve as a teaching aid for teachers since it facilitates the impartation of knowledge. The resource package is especially useful for preschool students since the activity is simple yet enjoyable and offers an alternative to the usual “listen and learn” learning style, which they may find mundane.

1.3 Objectives

We aim to help preschoolers from Learning Vision@Hwa Chong to learn through play and find the joy in learning from a young age. We also hope that our resource package can benefit both the teachers and students as it serves as both a teaching and a learning aid. Our resource package allows for growth and development of students by allowing them to get a good grasp of the concepts so that they are ready for primary school. Lastly, through our resource, we hope to help preschoolers develop life skills like communication, critical thinking and creativity from a young age during their developmental years where the things they learn can leave a lasting impression on them.

1.4 Resources

The resource package includes a game board and a form of currency which mimics the Singapore currency. For the game board, students throw balls into holes 1, 2, 3 or 4, which indicates their answer for any multiple-choice questions posed by the teachers. If the hole in which they throw the ball into is correct, the light bulb lights up. The teacher can select the hole they want through the “Selection” and “Confirm” buttons. For example, if the teacher wants the fourth box to be the correct answer, they have to click the selection button 4 times and confirm it. Afterwards, a blue light will blink, indicating that the fourth box is chosen.





Coding was required to make the circuit within the game board to work.

```
const int buttonPin = 2;
const int confirmPin = 3;
const int pirA = 13;
const int pirB = 12;
const int pirC = 11;
const int pirD = 10;
const int red = 9;
const int green = 8;
const int blue = 7;
const int ledRed = 6;
const int ledGreen = 5;
const int ledBlue = 4;

int buttonPushCounter = -1;
int buttonState = 0;
int lastButtonState = 0;
int confirmState = 0;

void setup() {
  pinMode(confirmPin, INPUT);
  pinMode(buttonPin, INPUT);
  pinMode(pirA, INPUT);
  pinMode(pirB, INPUT);
  pinMode(pirC, INPUT);
  pinMode(pirD, INPUT);
  pinMode(red, OUTPUT);
  pinMode(green, OUTPUT);
  pinMode(blue, OUTPUT);
  pinMode(ledRed, OUTPUT);
  pinMode(ledBlue, OUTPUT);
  pinMode(ledGreen, OUTPUT);

  Serial.begin(9600);
}
```

```
void setColor(int redV, int greenV, int blueV){ //change RGB LED color (confirmation lights)
  analogWrite(red, redV);
  analogWrite(green, greenV);
  analogWrite(blue, blueV);
}

void setColorAns(int redV, int greenV, int blueV){ //change RGB LED color (confirmation lights)
  analogWrite(ledRed, redV);
  analogWrite(ledGreen, greenV);
  analogWrite(ledBlue, blueV);
}

void buttonCnt(){ //note button count
  buttonState = digitalRead(buttonPin);

  if(buttonState != lastButtonState){
    if(buttonState == HIGH){
      if(buttonPushCounter == 4){
        buttonPushCounter = -1;
      }
      buttonPushCounter++;
      Serial.println(buttonPushCounter);
      if(buttonPushCounter == 0){
        setColor(255, 51, 153);
      }
      else if(buttonPushCounter == 1){
        setColor(255, 0, 0);
      }
      else if(buttonPushCounter == 2){
        setColor(255, 128, 0);
      }
      else if(buttonPushCounter == 3){
        setColor(0, 255, 0);
      }
    }
  }
}
```

```

}
else if(buttonPushCounter == 4){
  setColor(0, 255, 255);
}
}
delay(50);
}
lastButtonState = buttonState;
}

void detectMotion(int pirPin){          //turn on specified PIR sensor
int pirStat = 0;
while(true){
  pirStat = digitalRead(pirPin);
  if(pirStat == HIGH){
    setColorAns(255, 0, 0); // red
    delay(50);
    setColorAns(0, 255, 0); // green
    delay(200);

    setColorAns(0, 0, 255); // blue
    delay(200);

    setColorAns(255, 255, 0); // yellow
    delay(200);

    setColorAns(80, 0, 80); // purple
    delay(200);

    setColorAns(0, 255, 255); // aqua
    delay(200);

    Serial.println("Detected" + String(pirPin));
  }
  else{
    setColorAns(0, 0, 0);
  }
}

```

```

buttonCnt();
confirmState = digitalRead(confirmPin);
if(confirmState == HIGH){
  break;
}
delay(100);
}

void loop() {
  while(true){
    buttonCnt();
    confirmState = digitalRead(confirmPin);

    if(confirmState == HIGH){
      break;
    }

    if(confirmState == HIGH){
      for(int i=0; i<5; i++){
        setColor(0, 0, 255);
        delay(50);
        setColor(0, 0, 0);
        delay(50);
      }

      switch(buttonPushCounter){
        case 0:
          setColorAns(0, 0, 0);
          break;
        case 1:
          detectMotion(pirA);
          break;
        case 2:
          detectMotion(pirB);
          break;
        case 3:
          detectMotion(pirC);
          break;
        case 4:
          detectMotion(pirD);
          break;
      }
    }
  }
}

```

As for the currency, it is for preschoolers to use when they carry out simple monetary transactions in school to simulate them purchasing things. This allows them to be financially literate and have the ability to manage their money.



2. Review

The game board we created cannot be found anywhere else and the flexibility of it allows the game to be used for various subjects. It is specifically catered to preschool students so that they can learn through play. Currency we created mimics the Singapore currency used so that preschoolers can easily adapt to using the real Singapore currency. Although there are existing currencies like Monopoly money, the size, colour and value of the notes are vastly different. Hence, our currency is specifically created to mimic that of the Singapore currency.

3. Methodology

3.1 Needs Analysis

We have carried out research on the concept of learning through play and found out how it benefits students.

According to The Guardian, early years of education in Finland emphasises more on creative play rather than academic subjects. Play at this stage of child development can successfully engage students in the process of learning. Carefully organised play improves cognitive abilities of a child and they would hence have greater attention span, concentration and sharper problem-solving skills.

According to UNICEF, play is one of the most important ways in which young children gain essential knowledge and skills. Play allows children to practise skills, try out new possibilities and discover new challenges, leading to deeper learning. This helps children to communicate ideas and understand each other better through social interaction

According to The Straits Times, due to the cashless payment being more prevalent, virtual currency would inadvertently result in children not being able to see the importance of money. Children of the newer generations would not be able to be

financially literate and have financial management skills. This may make children think that money is available with a swipe of a card and take money for granted. The lack of handling of physical cash also eliminates any sense of saving money or rational decision making.

Play encourages learning in an effective and enjoyable way. This deviates from the norm of students merely listening to what the teacher says in class and exposes children to experiential learning, which is not common in Singapore. Also, our resource can help children to be financially literate and have simple financial management skills especially since such skills are largely threatened by e-payments.

3.2 Construction of resources

Materials used:

- Corrugated board
- Reused cardboard from packages
- Jumper wires
- Microcontroller
- 4x PIR sensors
- 2x Light bulbs
- 2x Buttons
- 6x Batteries

We used the corrugated board as the base of our game board, and attached 4 boxes made out of cardboard onto the corrugated board. Each of the 4 boxes included a PIR motion sensor that was connected to the microcontroller, which is in turn connected to the light bulbs and buttons at the front and on top of the game board. The battery is also connected to the circuit through the microcontroller. All of the connections between the different parts of the circuit are made using jumper wires.

3.3 Pilot test

Pilot testing was not feasible since we were not allowed to visit the preschool. We were also unable to collect their feedback or opinions through online platforms since they do not know how to respond to our online survey or form. However, we managed to test it out on a very small scale with children around the same age as those in the preschool.



I like the fact that every time you get an answer correct, it will sense it and the bulb will light up

I like the fact that I can get riddles correct and the light would flash

I like that I can choose the colour of the light

4. Outcome and Discussion

4.1 Final Outcome

Based on the small-scale pilot test, the feedback was positive and the children were engaged in the package as they found it rather fun and interesting. Our desired outcome of allowing children to learn through play is fulfilled.

4.2 Limitations and further works

Due to the sensitivity of the PIR motion sensors, the motion sensors may not be able to reliably detect the ball when it is thrown into the hole, and thus may not give an output through the light bulb. This problem can be minimised by adding small ramps in each of the holes, such that the ball will automatically be directed in front of the motion sensors, making it significantly easier for it to be detected.

The package was also made out of cardboard which is a rather flimsy material and could be broken accidentally. We could have used other materials such as plastic to increase the strength of the infrastructure.

5. Conclusion

The challenges included assembling the game board from scratch using cardboard as it took a lot of effort and many hours to glue them together. The circuit set-up and coding aspect of the resource was also challenging since none of us knew a lot about it. We had to learn from scratch. We learnt how to work together and delegate tasks so that we can work more efficiently as a team. We also learnt the importance of thinking creatively to get around the obstacles we faced. Lastly, since learning through play can help improve children's cognitive abilities at an early age, we should encourage more of such activities which are rarely seen in a society as academically competitive as Singapore.

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