



INTERNATIONAL UNIVERSITY
SCHOOL OF BIOMEDICAL ENGINEERING



CONQUER THE STARS

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ABSTRACT

Disable children are the ones who have difficulty in thinking, studying, or solving more problems in their life. To help them recognize their difficulty to improve their skills in reality, as the same time - help them have fun as normal children, a toy is created serve the purpose. The toy can be used by hand with little calculation is needed so that the disabled children can play the game. On the other hand, they toy can be created using electrical system to build a more simplify and more easy interaction with the game.

KNOWLEDGEMENT

We would like to thank Mr. Toi and teaching assistants: Ms. Hoài Thương, Ms. Lan Anh... for supporting and giving us useful advice during this project.

I – INTRODUCTION:

1. Objective:

Design and build an appropriate toy to predict the level thinking for children with disabilities.

Apply the knowledge of engineering to:

Chose the best solution.

Make nice details.

Develop the simple and amazing system.

Understand and practice to do the project step-by-step.

Improve a lot of skills: teamworks skill, presentation skill, critical thinking skill, leadership skill, handmade skill, 3D design skill, time management skill...

Complete all of products in project before deadline.

2. Title:

CONQUER THE STARS

A person controls an UFO (unidentified flying object) which has modern technology can drop the full of energy in an aerolite to destroy not only subjects but also a planet. Lucifer system which is threatening to solar system includes ten planets like as the stars. Mission's people are breaking all of planets in Lucifer system, then remain the peaceful planet on The Earth.

II – INITIAL PREPARATION:

1. Timeline:

Order	Start day	Due day	Works	Note
1	15/10/2019	20/10/2019	<ul style="list-style-type: none"> - Create the initial idea for project. - Design 3D by Fusion. - Think about principle of the toy. - Design cover. 	Vy Sáng Minh
2	20/11/2019	27/11/2019	<ul style="list-style-type: none"> - Buy materials: foam paper, magnet, paper-knife. - Print the numbers to paste on the top side. 	Huyền Vy
3	27/11/2019	27/11/2019	<ul style="list-style-type: none"> - Making UFO - Completing the box system - Operating the magnet. - Pasting the numbers on top side. - Buying mica. 	Sáng, Minh, Huyền, Vy
4	7/12/2019	7/12/2019	<ul style="list-style-type: none"> - Buying registers, LCD, magnet. - Apply questions in test. And coded by arduino. - Completing the mica box, stick LCD on the toy. - Pasting the background. 	Sáng, Minh, Huyền, Vy
5	9/12/2019	9/12/2019	<ul style="list-style-type: none"> - Buying I2C, jumpers, ... - Use electrical devices on number pad. 	Minh Sáng
6	10/12/2019	10/12/2019	<ul style="list-style-type: none"> - All members prepare to operate the toy tomorrow - Checking code. - Decorating objects in system. - Apply electricity on LED and number pad, checking them certainly. 	Sáng, Minh, Huyền, Vy
7	20/12/2019	20/12/2019	Testing at Specialized School	Minh, Vy

8	23/12/2019	23/12/2019	Testing at Trường giáo dục chuyên biệt Khai Trí	Huyền, Minh, Vy
9	28/12/2019	30/12/2019	- Fusion - Story - Code improvement - Final report	Vy Sáng Sáng Huyền
10	29/12/2019	31/12/2019	- Final poster	Minh

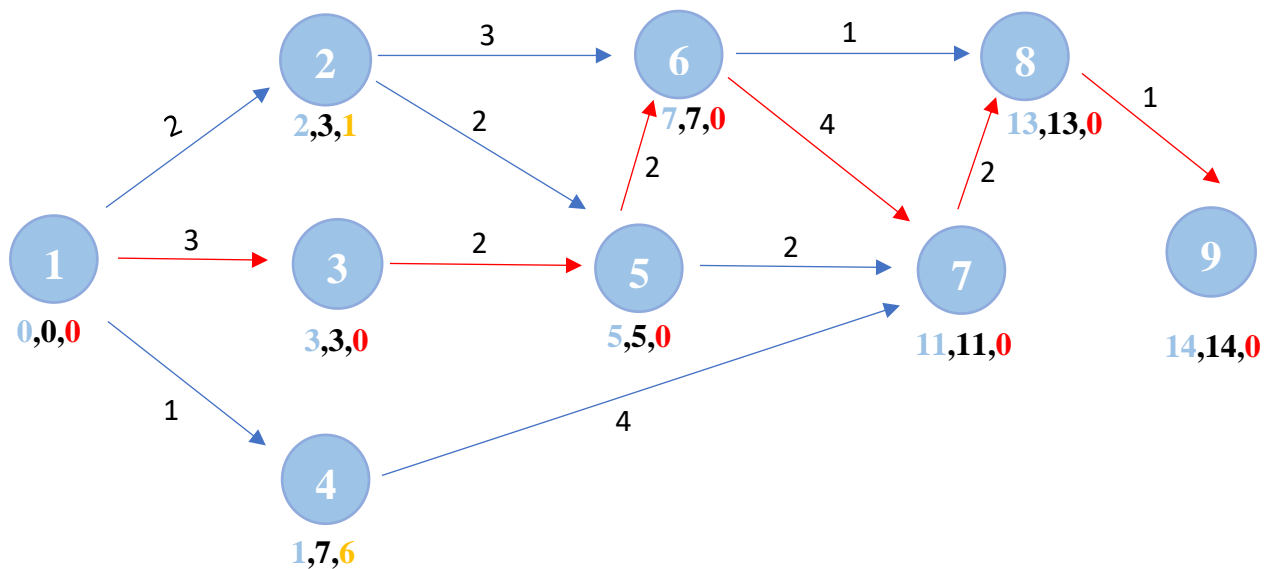
2. Design process:

1. Project begins
2. Literature study
3. Concept developing
4. Initial requirement
5. Final solution
6. Design 3D
7. Develop prototype
8. Final prototype
9. Project completed

	Activity	Duration (week)
1 – 2	Read the literature	2
1 – 3	Initial idea and concept development	3
1 – 4	Purchase equipment	1
2 – 5	Analysis the best possible direction for the solution	2
2 – 6	Base on the literature to upgrade the draft board	3
3 – 5	Determine and development process	2
4 – 7	Build the prototype	4
5 – 6	Base on the final solution to development to draw the 3D design	4
5 – 7	Do the prototype which is suitable with the solution	6
6 – 7	Build the prototype base on the 3D design	4
6 – 8	Test the specifications of prototype	1
7 – 8	Test, upgrade the prototype	2
8 – 9	Presentation with the final prototype	1

Total time to complete Introduction to BME project: 36 weeks.

Critical path method:



The critical time: 14 weeks

The critical path form 1 → 3 → 5 → 6 → 7 → 8 → 9

3. Gantt chart:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 – 2	Doing time	Doing time	Float time											
1 – 3	Doing time	Doing time	Doing time											
1 – 4	Doing time	Float time	Float time	Float time	Float time	Float time	Float time							
2 – 5			Doing time	Doing time	Float time									
2 – 6			Doing time	Doing time	Doing time	Float time								
3 – 5				Doing time	Doing time									
4 – 7				Doing time	Doing time	Doing time	Doing time	Float time	Float time	Float time	Float time	Float time	Float time	
5 – 6						Doing time	Doing time							
5 – 7						Doing time	Doing time							
6 – 7								Doing time	Doing time	Doing time	Doing time			
6 – 8								Doing time						
7 – 8												Doing time	Doing time	
8 – 9														Doing time

Note:

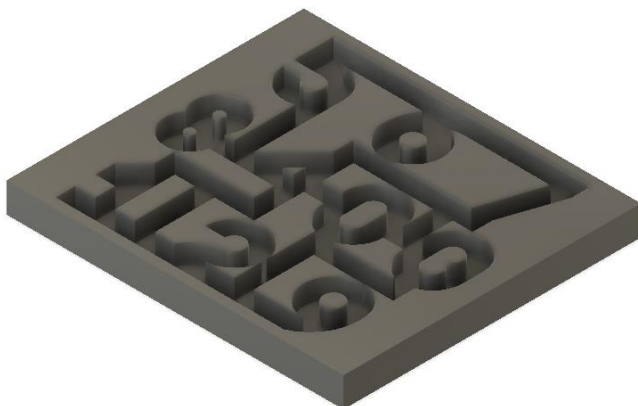


Doing time



Float time

4. Initial idea:



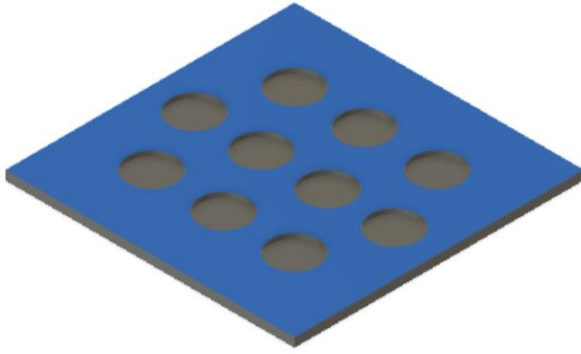
5. Materials:

Oder	Material	Fees (VND)
1	Foam paper	50.000
2	Iron circle (object)	20.000
3	More colors of decal	50.000
4	Magnet	80.000
	Total	200.000

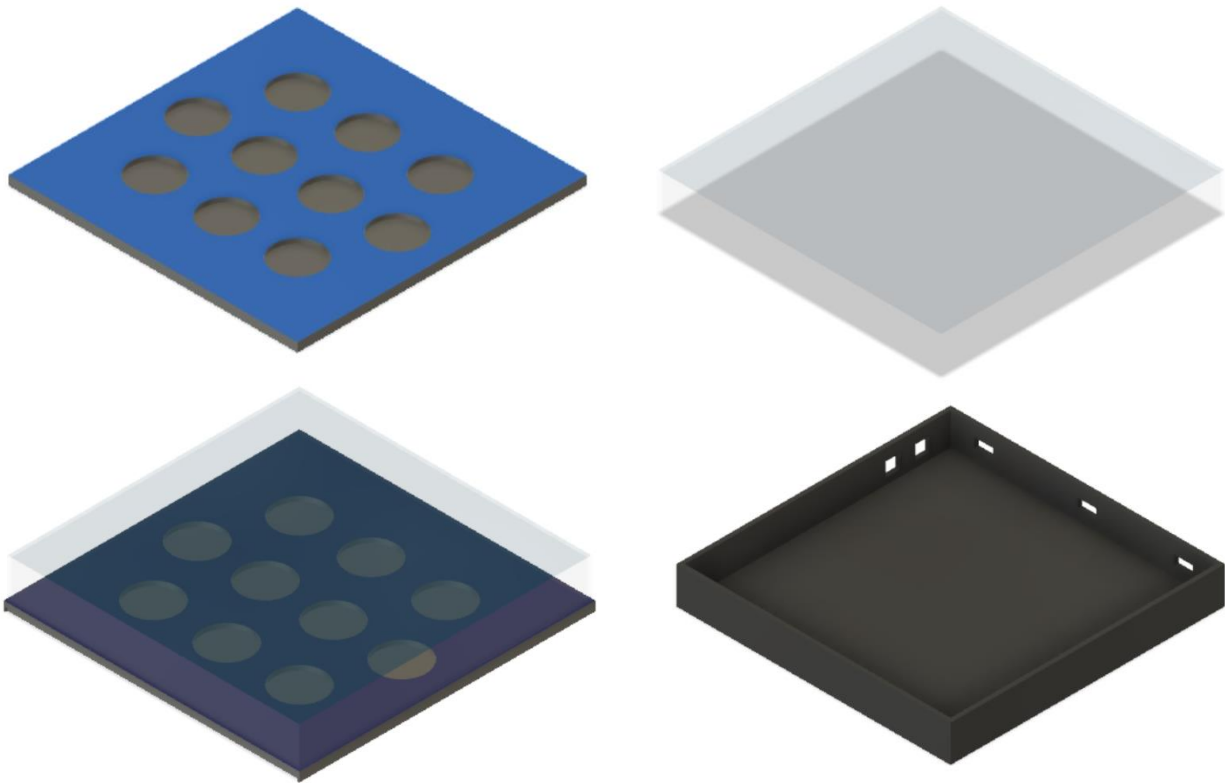
III – PROTOTYPE:

1. Prototype 1:





2. Prototype 2:



3. Prototype3:





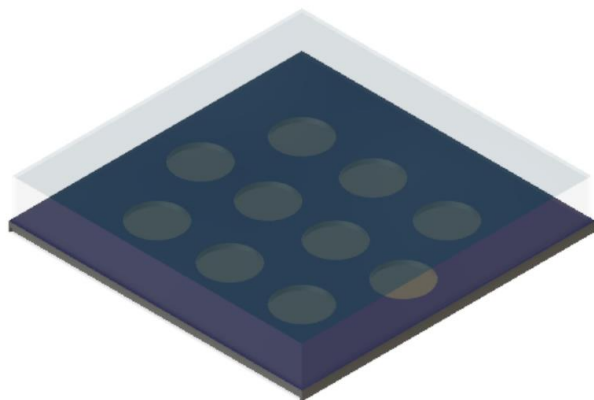
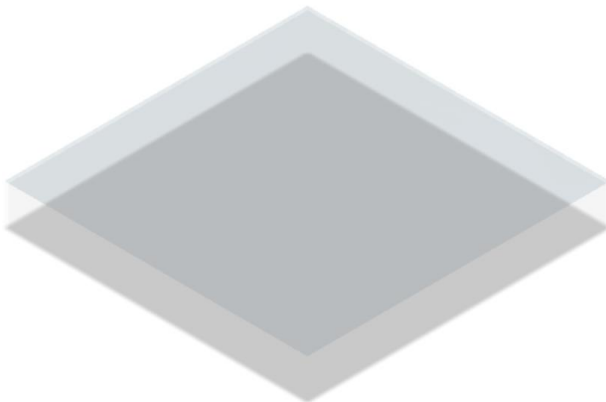
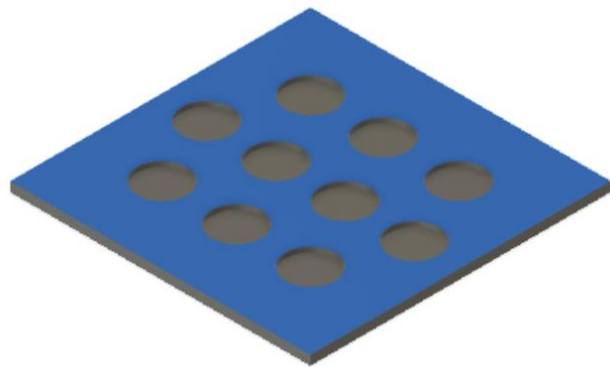
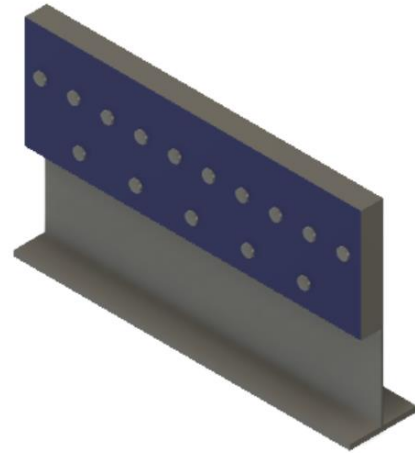
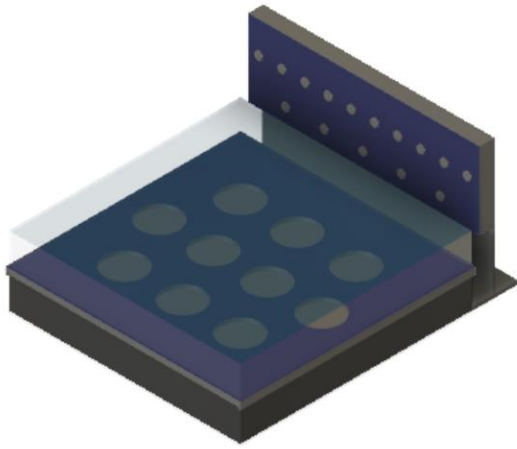


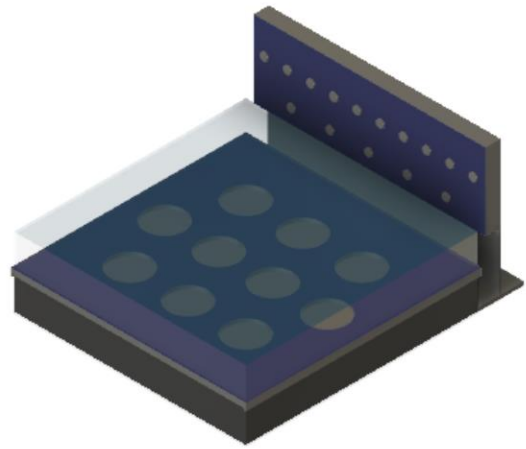
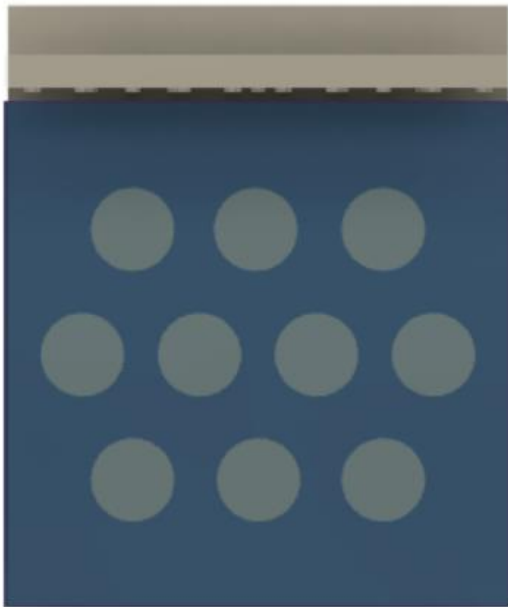
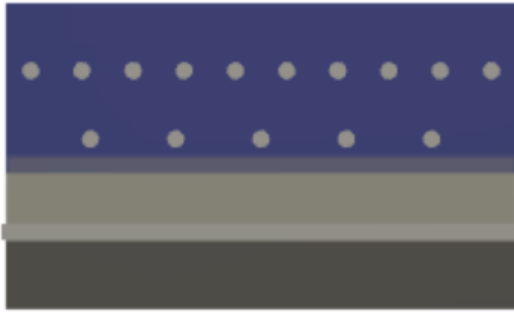
4. Fees:

Order	Material	Fee (VND)
1	Foam paper	50.000
2	Paper - knife	20.000
3	Magnet + LCD + registers	90.000
4	Mica	130.000
5	Printing + side things	75.000
6	I2C + jumper	30.000
7	LEDs + button	30.000
8	Services	20.000
9	Unplanned spending	50000
	Total fee of materials	495.000

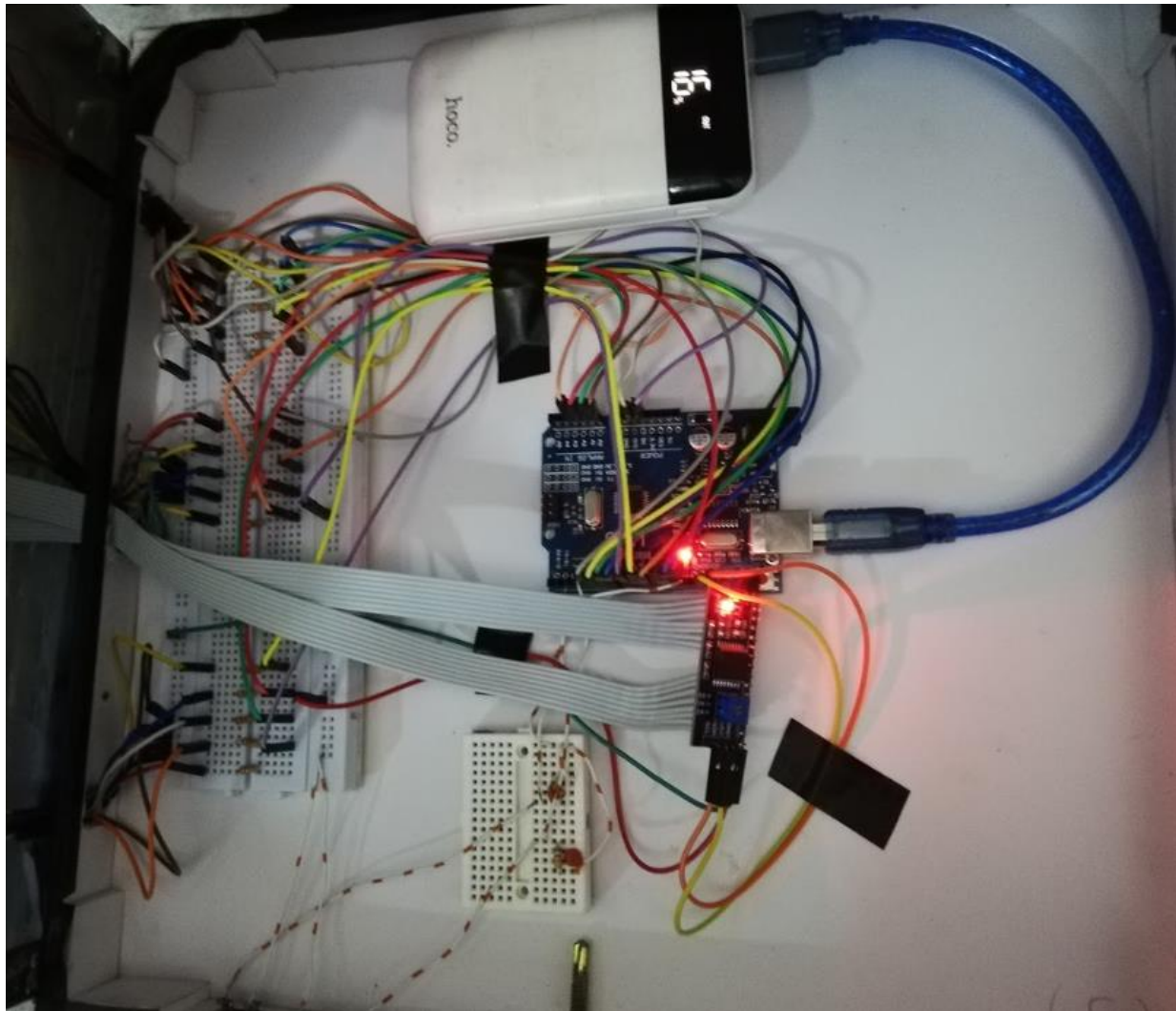
IV – PRODUCT:

1. Final 3D – design:





2. Electrical devices (Number pad):



3. Code:

```
#include <Wire.h>
#include
<LiquidCrystal_I2C.h>
```

```
LiquidCrystal_I2C
lcd(0x27,16,2);
```

```
int interrupt_pin2 = 2;
```

```
int interrupt_pin3 = 3;
```

```
long unsigned int
time1,time2,tie2=0,tie3,tie1,
tie4;
```

```
byte t=0,iq=0,cout=0,l=0;
```

```
//byte ledPin[0] = 1,
ledPin[1] = A1, ledPin[2] =
A2, ledPin[3]=A3,
ledPin[4]=13, ledPin[5]=A0;
```

```
//byte ledPin[6] = 4,
ledPin[7] = 5, ledPin[8] = 6,
ledPin[9]=7;
```

```
//byte ledPin[8] = 8,
ledPin[9] = 9, ledPin[10] = 10,
ledPin[11]=11,
ledPin[14]=12;
```

```
byte
ledPin[]={1,A1,A2,A3,13,A0,4
,5,6,7,8,9,10,11,12};
```

```

byte i;

void pin2Interrupt(void)
{
    if (l==0)
    {
        tie3=millis()/1000+2;

        l=1;
    }

    if ((cout < 11) && (
millis()/1000>tie3 ))
    {
        cout++;

        t=0;

        l=0;

        if ( cout >= 1 && cout <= 3)
            iq=iq+1;

        if ( cout>= 4 && cout <= 6)
            iq=iq+2;

        if ( cout>=7 && cout <= 9)
            iq=iq+3;

        if ( cout == 34)
            iq=iq+5;
    }
}

void pin3Interrupt(void)
{
    if (l==0)
    {
        tie3=millis()/1000+2;

        l=1;

        if ((cout < 11) && (
millis()/1000 > tie3 ))
        {
            cout++;

            l=0;

            t=0;
        }
    }

    void tatled()
    {
        for ( i=0; i<15;i++) {

            digitalWrite(ledPin[i],LOW);
            //Mặc định các đèn LED sẽ
            tắt

        }
    }

    void setup()
    {
        lcd.init();

        lcd.backlight();

        pinMode(interrupt_pin2,
INPUT);

        attachInterrupt(0,
pin2Interrupt, FALLING);

        pinMode(interrupt_pin3,
INPUT);

        attachInterrupt(1,
pin3Interrupt, FALLING);

        for (int i=0;i<15;i++) {

            pinMode(ledPin[i],OUTPUT);
            //Các chân LED là OUTPUT

            digitalWrite(ledPin[i],LOW);
            //Mặc định các đèn LED sẽ
            tắt

        }

        Serial.begin(9600);
    }

    void loop()
    {
        Serial.print("time1=");

        Serial.print(time1);

        Serial.print("; time2=");

        Serial.print(time2);

        Serial.print("; IQ=");

        Serial.print(iq);

        Serial.print("; tie2=");

```

```

Serial.print(tie2);

Serial.print("; cout=");
Serial.println(cout);
switch (cout) {

case 0:

if (t == 0)

{

t=1;

lcd.print("Xin chao!den
voi");

lcd.setCursor(0,1);

lcd.print("Conquer the
stars");

}

time1=millis()/1000;
tie1=millis()/1000;
delay(1000);
break;
case 1:

time2= millis()/1000-tie2;
if (t == 0)
{

delay(1000);

tie2=tie2+time1;

t=1;

lcd.clear();

lcd.setCursor(0,0);

digitalWrite(ledPin[1],
HIGH);

}

```

```

delay(1000);

break;
case 2:

time1=millis()/1000-tie2;
if (t == 0)

{

tie2=tie2+time2;

lcd.print(time2);

t=1;

digitalWrite(ledPin[1],
LOW);

delay(1000);

digitalWrite(ledPin[4],
HIGH);

}

delay(1000);
break;
case 3:

time2 = millis()/1000-tie2;
if (t == 0)

{

tie2=tie2+time1;

lcd.print(time1);

lcd.clear();

lcd.setCursor(0,0);

t=1;

digitalWrite(ledPin[4],
LOW);

```

```

delay(1000);

digitalWrite(ledPin[7],
HIGH);

lcd.print(time1);

}

delay(1000);
break;
case 4:

time1=millis()/1000-tie2;
if (t == 0)

{

tie2=tie2+time2;

lcd.clear();

lcd.setCursor(0,0);

t=1;

lcd.print(time2);

digitalWrite(ledPin[7],
LOW);

delay(1000);

digitalWrite(ledPin[1],
HIGH);

delay(2000);

digitalWrite(ledPin[10],
HIGH);

delay(2000);

digitalWrite(ledPin[4],
HIGH);

delay(2000);

digitalWrite(ledPin[14],
HIGH);

```

```

        time1=millis()/1000-tie2;
    }
    delay(1000);
    break;
case 5:
    time2=millis()/1000-tie2;
    if (t == 0)
    {
        tie2=tie2+time1;
        lcd.clear();
        lcd.setCursor(0,0);
        tatled();
        delay(1000);
        t=1;
        lcd.print(time1);
        digitalWrite(ledPin[7],
HIGH);
        delay(2000);
        digitalWrite(ledPin[11],
HIGH);
        delay(2000);
        digitalWrite(ledPin[4],
HIGH);
        delay(2000);
        digitalWrite(ledPin[14],
HIGH);
    }
    delay(1000);

    break;
case 6:
        time1=millis()/1000-tie2;
        if (t == 0)
        {
            tie2=tie2+time2;
            lcd.clear();
            lcd.setCursor(0,0);
            tatled();
            delay(1000);
            t=1;
            lcd.print(time2);
            digitalWrite(ledPin[3],
HIGH);
            delay(2000);
            digitalWrite(ledPin[10],
HIGH);
            delay(2000);
            digitalWrite(ledPin[6],
HIGH);
            delay(2000);
            digitalWrite(ledPin[14],
HIGH);
        }
        delay(1000);
        break;
case 7:
        time2=millis()/1000-tie2;
        if (t == 0)
        {
            tie2=tie2+time2;
            lcd.clear();
            lcd.setCursor(0,0);
            tatled();
            delay(1000);
            t=1;
            lcd.print(time1);
            digitalWrite(ledPin[8],
HIGH);
            delay(2000);
            digitalWrite(ledPin[13],
HIGH);
            delay(2000);
            digitalWrite(ledPin[4],
HIGH);
            delay(2000);
            digitalWrite(ledPin[14],
HIGH);
        }
        delay(1000);
        break;
case 8:
        time1=millis()/1000-tie2;
        if (t == 0)
        {
            tie2=tie2+time2;
            lcd.clear();
            lcd.setCursor(0,0);
            tatled();
            delay(1000);
            t=1;
            lcd.print(time2);
            digitalWrite(ledPin[3],
HIGH);
            delay(2000);
            digitalWrite(ledPin[10],
HIGH);
            delay(2000);
            digitalWrite(ledPin[6],
HIGH);
            delay(2000);
            digitalWrite(ledPin[14],
HIGH);
        }
        delay(1000);
        break;

```

delay(1000);	digitalWrite(ledPin[8],	digitalWrite(ledPin[3],
t=1;	HIGH);	HIGH);
lcd.print(time2);	delay(2000);	delay(2000);
digitalWrite(ledPin[2],	digitalWrite(ledPin[13],	digitalWrite(ledPin[11],
HIGH);	HIGH);	HIGH);
delay(2000);	delay(2000);	delay(2000);
digitalWrite(ledPin[12],	digitalWrite(ledPin[1],	digitalWrite(ledPin[9],
HIGH);	HIGH);	HIGH);
delay(2000);	delay(2000);	delay(2000);
digitalWrite(ledPin[3],	digitalWrite(ledPin[14],	digitalWrite(ledPin[14],
HIGH);	HIGH);	HIGH);
delay(2000);	}	}
digitalWrite(ledPin[14],	delay(1000);	delay(1000);
HIGH);	break;	break;
}		case 11:
delay(1000);	case 10:	time2=millis()/1000-tie2;
break;	time1=millis()/1000-tie2;	tie4=millis()/1000-tie1;
	if (t == 0)	if (t == 0)
	{	{
case 9:	tie2=tie2+time2;	lcd.clear();
	lcd.clear();	lcd.setCursor(0,0);
time2=millis()/1000-tie2;	lcd.setCursor(0,0);	tatled();
if (t == 0)	tatled();	t=1;
{	delay(1000);	lcd.print(time1);
tie2=tie2+time1;	t=1;	}
lcd.clear();	lcd.print(time2);	
lcd.setCursor(0,0);	digitalWrite(ledPin[6],	if (tie4 > 600)
tatled();	HIGH);	iq=iq+0;
delay(1000);	delay(2000);	else
t=1;	digitalWrite(ledPin[10],	if (tie4>540)
lcd.print(time1);	HIGH);	iq=iq+1;
	delay(2000);	

else	else	cout=0;
if (tie4>480)	iq=iq+7;	lcd.clear();
iq=iq+2;	delay(10000);	lcd.setCursor(0,0);
else if (tie4>420)	lcd.clear();	iq=0;
iq=iq+3;	lcd.setCursor(0,0);	tie2=0;
else if (tie4>360)	lcd.print("IQ=");	t=0;
iq=iq+4;	lcd.print(iq);	break;
else if (tie4>300)	lcd.setCursor(0,1);	}
iq=iq+5;	lcd.print("Total:");	}
else if (tie4>240)	lcd.print(tie4);	
iq=iq+6;	delay(10000);	

4. Final product:





5. Story of the toy:

This is not only a toy but also a real story base on material of imaginary friction. you trust me, it will be reality. If not, we do not any thing to prove it. The story is about the UFO controlled by a best human from the Earth. UFO is applied the modern technology can drop down an aerolite to destroy all planet. One day, Lucifer system which include 10 planets, there are threatening to solar system. Mission's players are controlling UFO to destroy ten stars in Lucifer system and protect the Earth.

Players have to do ten challenges to break wall of planet and then drop down and destroy that star. Good luck to you, be hero!

6. Principle:

Player will control the UFO to destroy ten planets like numbers by dropping out the aerolite. Children look at number pad, then LEDs will be lighted, according to ten coded questions, people must memorize the operation and have the result form calculation.

The list of the challenges:

I) Easy: Numbers

Level	1	2	3
Request	Go to number 1	Go to number 4	Go to number 7
Answer	Move object to the land No. 1	Move object to the land No.4	Move object to the land No.7
Complete Score	+1	+1	+1

II) Medium: Add and subtract

Level	4	5	6
Request	Colored land (number 1) plus colored land (number 4) is?	Colored land (number 7) minus colored land (number 4) is?	Colored land (number 3) plus colored land (number 6) is?
Answer	Move object to the land No.5	Move object to the land No. 3	Move object to the land No.9
Complete Score	+2	+2	+2

III) Hard: multiply and divide

Level	7	8	9
Request	Colored land (number 8) divided colored land (number 4) is?	Colored land (number 2) multiply colored land (number 3) is?	Colored land (number 8) divided colored land (number 1) is?
Answer	Move people to the land No.2	Move people to land No. 6	Move people to the land No.8
Complete Score	+3	+3	+3

IV/ Very hard: complex operation

Requirement: Colored land (number 6) plus colored land (number 3) minus colored land (number 9) is?

Answer: Move people to the land No.0

Complete score: +5

Completing this magical journey, including 10 problems equivalent to 10 small lands, finally the alient have discovered all of this fairy land.

Total points decrease: +23

Space base on the average time:

$$\text{Average time} = \frac{\text{Total time}}{\text{N level}}$$

Time score:

< 30 second: +7

48 - 54 second: +3

30 - 36 second: +6

54 - 60 second: +2

36 - 42 second: +5

60 - 66 second: +1

42 - 48 second: +4

>66 second: +0

Maximum value is 30 points. Note: The value is only true when the child's age is not more than 12, this is true because the diseases children are mostly less than 12 years old.

Example in Level 3:



7. Price:

Order	Content	Price (VND)
1	Materials	495.000
2	Coding	900.000
3	Decoration	500.000
4	Build hardware	500.000
5	Validation by tests	500.000
Total price for a product		2.895.000

V – COLLECT DATA AND ANALYSIS:

1. Testing:



Normal children



Disable children

2. Validation:

2.1. Data from disable children:

Order	Gender	Age	Ability	Level passed	Time	Total time	Average Time	X	Observation
1	Female	8	Underdevelop	1 2 3	20 19 13	52	17.33	10	- Low - Know numbers and colors. - Unknow addition and subtraction
2	Male	12	Attention deficit hyperactivity disorder	1 2 3 4 5 6	26 11 18 35 25 39	154	25.67	16	- Medium - Know numbers and colors. - Calculate addition and subtraction clearly.
3	Male	10	Attention deficit hyperactivity disorder	1 2 3 4 5 6	18 11 12 20 30 32	123	20.5	16	- Medium - Know numbers and colors. - Calculate addition and subtraction clearly.

4	Male	10	Attention deficit hyperactivity disorder	1 2 3 4 5 6	11 16 29 31 28 33	148	24.67	16	- Medium - Know numbers and colors. - Calculate addition and subtraction clearly.
5	Female	10	Down	1 2 3	20 19 33	72	24	10	- Low - Know numbers and colors. - Unknow addition and subtraction.
6	Male	10	Down	1 2 3	14 15 16	45	15	10	- Low - Know numbers and colors. - Unknow addition and subtraction.
7	Male	10	Know English Poor memory	1 2 3 4	9 7 7 37	60	20	12	- Medium - Know numbers and colors. - Unknow addition and subtraction exactly.
8	Female	11	Down (high level)	1	59	59	59	3	- Low - Unknow numbers and colors. - Unknow addition and subtraction.
9	Female	12	Down	1 2 3 4 5 6	16 11 11 28 24 34	124	20.67	16	- Medium - Know numbers and colors. - Calculate addition and subtraction clearly.
10	Female	8	Underdevelop	1 2	60 58	118	59	4	- Low - Know numbers and colors.

									- Unknow addition and subtraction.
11	Male	9	Down	1 2 3	49 80 29	158	52.67	6	- Low - Know numbers and colors. - Unknow addition and subtraction.
12	Female	10	Attention deficit hyperactivity disorder	1 2 3	55 40 20	115	38.33	8	- Low - Know numbers and colors. - Unknow addition and subtraction.
13	Female	9	Down	1 2 3	49 30 26	105	35	9	- Low - Know numbers and colors. - Unknow addition and subtraction.
14	Male	8	Down	1 2 3	35 30 36	101	33.67	9	- Low - Know numbers and colors. - Unknow addition and subtraction.

Order	Gender	Age	Ability	Level passed	Time	Total time	Average Time	X	Observation
1	Female	10	Autism	1 2 3 4 5 6	13 14 24 30 40 31	152	25.33	16	- Medium - Know numbers and colors. - Calculate addition and subtraction clearly.

2	Male	8	Attention deficit hyperactivity disorder Autism	1 2 3 4 5 6	10 10 10 33 31 44	138	23	16	- Medium - Know numbers and colors. - Calculate addition and subtraction clearly.
3	Male	8	Attention deficit hyperactivity disorder Autism	1 2 3	24 21 41	86	28.67	10	- Low - Know numbers and colors. - Unknow addition and subtraction.
4	Female	11	Attention deficit hyperactivity disorder Autism	1 2 3 4 5 6	8 11 14 35 40 48	156	26	16	- Medium - Know numbers and colors. - Calculate addition and subtraction clearly.
5	Male	11	Attention deficit hyperactivity disorder Autism	1 2 3 4 5 6	15 15 16 29 36 24	135	22.5	16	- Medium - Know numbers and colors. - Calculate addition and subtraction clearly.
6	Male	10	Attention deficit hyperactivity disorder Autism	1 2 3 4 5 6	10 12 18 43 28 59	170	28.33	16	- Medium - Know numbers and colors. - Calculate addition and subtraction clearly.

7	Female	10	Attention deficit hyperactivity disorder Autism	1 2 3 4 5 6	8 7 13 20 25 38	111	18.5	16	- Medium - Know numbers and colors. - Calculate addition and subtraction clearly.
8	Male	10	Attention disorder	1 2 3 4 5 6	15 14 27 102 44 60	262	43.67	13	- Medium - Know numbers and colors. - Know calculation by directing from teacher.
9	Female	12	Attention deficit hyperactivity disorder Autism	1 2 3 4 5 6	19 14 10 27 16 45	131	21.83	16	- Medium - Know numbers and colors. - Calculate addition and subtraction clearly.
10	Female	12	Underdevelop	1 2 3	65 70 52	187	62.33	4	- Low - Know numbers and colors slowly. - Unknow addition and subtraction.

2.2. Data from normal children:

Order	Gender	Age	Ability	Level passed	Time	Total time	Average Time	X	Observation
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1	Female	8	Normal	1 2 3 4 5 6 7 8 9 10	9 8 10 15 17 19 19 20 15 23	155	15.5	30	- High - Know numbers and colors clearly. - Know addition and subtraction very fast. - Calculate multiply and divided operation exactly.
2	Male	8	Normal	1 2 3 4 5 6 7 8 9 10	10 9 10 15 16 18 19 20 20 26	163	16.3	30	- High - Know numbers and colors clearly. - Know addition and subtraction very fast. - Calculate multiply and divided operation exactly.
3	Male	8	Smart	1 2 3 4 5 6 7 8 9 10	8 7 7 15 16 15 16 15 15 24	138	13.8	30	- High - Know numbers and colors clearly. - Know addition and subtraction very fast. - Calculate multiply and divided operation exactly.

4	Female	8	Excellent	1 2 3 4 5 6 7 8 9 10	8 8 10 15 15 17 15 20 15 22	145	14.5	30	- High - Know numbers and colors clearly. - Know addition and subtraction very fast. - Calculate multiply and divided operation exactly.
5	Female	9	Normal	1 2 3 4 5 6 7 8 9 10	10 8 7 20 15 17 15 19 15 25	151	15.1	30	- High - Know numbers and colors clearly. - Know addition and subtraction very fast. - Calculate multiply and divided operation exactly.
6	Female	9	Normal	1 2 3 4 5 6 7 8 9 10	10 9 7 18 20 17 15 19 15 25	155	15.5	30	- High - Know numbers and colors clearly. - Know addition and subtraction very fast. - Calculate multiply and divided operation exactly.

7	Male	9	Good	1 2 3 4 5 6 7 8 9 10	7 11 7 15 17 17 21 19 15 25	154	15.4	30	- High - Know numbers and colors clearly. - Know addition and subtraction very fast. - Calculate multiply and divided operation exactly.
8	Male	10	Normal	1 2 3 4 5 6 7 8 9 10	10 9 8 15 16 18 21 20 20 26	163	16.3	30	- High - Know numbers and colors clearly. - Know addition and subtraction very fast. - Calculate multiply and divided operation exactly.
9	Male	10	Normal	1 2 3 4 5 6 7 8 9 10	9 8 10 15 17 19 19 15 15 23	147	14.7	30	- High - Know numbers and colors clearly. - Know addition and subtraction very fast. - Calculate multiply and divided operation exactly.

10	Female	10	Excellent	1 2 3 4 5 6 7 8 9 10	10 8 7 15 15 17 15 19 15 20	141	14.1	30	- High - Know numbers and colors clearly. - Know addition and subtraction very fast. - Calculate multiply and divided operation exactly.
11	Female	10	Good	1 2 3 4 5 6 7 8 9 10	9 8 10 15 17 19 19 19 15 23	154	15.4	30	- High - Know numbers and colors clearly. - Know addition and subtraction very fast. - Calculate multiply and divided operation exactly.

2.3. Analysis data and Validation:

X	Learning
0-10	Low
11-16	Medium
17-25	Good
26-30	High

$$X = N \times \text{complete core} + \text{time score}$$

	Disable 1	Disable 2	Normal
1	100% (14)	100% (10)	100% (11)
2	92.86% (13)	100%	100%
3	85.71% (12)	100%	100%
4	35.71% (5)	80%	100%
5	28.57% (4)	80%	100%
6	28.57% (4)	80%	100%
7	0%	0%	100%
8	0%	0%	100%
9	0%	0%	100%
10	0%	0%	100%

	Female	Male	Total
Disable	50%	50%	14
Disable	50%	50%	10
Normal	54.55%	45.45	11

Level	8	9	10	11	12	TOTAL
Disable	3	2	6	1	2	14
Disable	2	0	4	2	2	10
Normal	4	3	4	0	0	11

VI – DISCUSSION:

The quantity of disable children can know numbers and colors in our toy is about 92.86% (in Specialized School) and 100% (in Khai Tri School)

The quantity of disable children know the calculation of addition and subtraction between 30.95% and 80% (in Specialized School and Khai Tri School). There are more differences in person's ability, or they were learned dissimilar lessons from educational environment, and the ratio of children in the variance of age have the change.

The quantity of disable children can do the multiply and dividing operation at 0% (for twenty-five student in both schools). Their teacher said that they did not teach children the division and multiplication at that class.

In normal children, one hundred percent of them can make ten challenges exactly in less time and get maximum score for each level.

Otherwise, disable children have difficulty in looking at number pad (attention disorder), and then memorize the calculation to do it (some of people unknown addition or subtraction), so they pass some of challenges rightly during a long time.

About the toy: During the testing, the toy operates in stable condition by arduino and electrical devices. The button is sensitive when monitor push up, LED lights up and LCD show more data such as completed time or each level, total time and total score of calculation.

The building of toy is not very strong to use for a long time, the handmade skill has little trouble during pasting mica box and film paper on top side.

VII – WORKING PLANING:

Order	Name	Working
1	Vũ Lê Ngọc Huyền	<ul style="list-style-type: none"> - Group leader. - Developing idea project. - Checking list works and reminding to complete the project on time. - Managing working time of group members. - Buying mica and foam paper. - Making the UFO and mica box. - Writing ten operations. - Testing - Make the statistic table form testing data. - Completing written report.
2	Nguyễn Ngọc Tuyền Vy	<ul style="list-style-type: none"> - Developing idea project. - Building 3D prototypes designed by Fusion. - Making gantt chart. - Design the background in decal, print and paste them on top side of the toy. - Design the background of represented-questions box. - Completing boxes in prototype handmade. - Design number pad handmade. - Decorating engineer. - Testing.
3	Tăng Lê Quang Minh	<ul style="list-style-type: none"> - Developing idea project. - Design cover of report. - Design and print the poster. - Cut pieces of foam paper and connect mica with each other. - Purchase the electrical devices (led, buttons, I2C, jumpers,...) - Final completing the represented-questions in mica box with wires and led, LCD, vv... - Electrical engineer. - Testing.

4	Đinh Hoàng Sáng	<ul style="list-style-type: none"> - Creating and developing idea project. - Determining the principle of toy. - Design the mode of operation during enjoy the toy. - Cut pieces of foam paper. - Buying magnets, LCD, resistors... - Writing code for operating the system: to represent data on LCD, lighting up led following questions, calculate grades after playing game,... - Creating the IQ equation for disable kids.
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VIII – REFERENCES:

<https://services.anu.edu.au/human-resources/respect-inclusion/different-types-of-disabilities>