



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DEVELOPMENT OF AN ELECTRONIC-BASED  
EDUCATIONAL GAME BOARD FOR TEACHING  
KINDERGARTEN KID BASIC NUMBER THROUGH  
GAME USING ARDUINO**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Telecommunication) with Honours.

by

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**BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA**

Tajuk: DEVELOPMENT OF AN ELECTRONIC-BASED EDUCATIONAL GAME BOARD FOR TEACHING KINDERGARTEN KID BASIC NUMBER THROUGH GAME USING ARDUINO

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### **DECLARATION**

I hereby, declared this report entitled DEVELOPMENT OF AN ELECTRONICBASED EDUCATIONAL GAME BOARD FOR TEACHING KINDERGARTEN KID BASIC NUMBER THROUGH GAME USING ARDUINO is the results of my own research except as cited in references.

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This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronics Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

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## ABSTRAK

Matematik merupakan bahagian penting pembelajaran bagi semua kanak-kanak terutamanya dalam peringkat awal mereka. Selain itu, asas yang baik dan teguh dalam matematik juga merupakan kemahiran penting yang boleh digunakan dalam kehidupan seharian. Oleh itu, kanak-kanak akan mula belajar angka dalam peringkat pertama pembelajaran matematik kerana ia dapat membantu mereka meningkatkan kemahiran seperti menyelesaikan masalah, pemikiran kritikal dan memahami tahap konsep matematik yang lebih tinggi dengan senang. Masalah utama ialah kanak-kanak memerlukan sesuatu yang dapat menarik perhatian mereka dan jelaslah mereka mahu sesuatu yang seronok. Tujuan utama projek ini adalah untuk membentuk papan permainan pendidikan elektronik yang boleh mengajar nombor asas kepada kanak-kanak tadika melalui permainan menggunakan Arduino. Papan permainan ini akan dapat membantu guru untuk mengajar nombor asas kepada kanak-kanak. Senibina papan permainan menggunakan Arduino UNO sebagai mikrokontroler yang menerjemahkan kod ke pelaksanaan komponen elektronik. Selain itu, projek ini merupakan percubaan baru sepanjang semester. Papan permainan ini dibangunkan dengan gabungan perkakasan dan perisian. Anak-anak hanya perlu meletakkan kad RFID di pembaca RFID, kad yang nombornya merupakan jawapan soalan akan menyalakan LED warna kuning manakala kad yang nombornya merupakan jawapan salah akan menyalakan LED warna merah. Paparan kristal cecair I2C (I2C LCD) akan mempamerkan soalan. Di samping itu, projek ini perlu diuji di tadika sama ada tidak membantu guru dan anak-anak. Borang tinjauan

digunakan untuk mengumpul data. Selepas menganalisis data, statistik akan dilakukan sebagai rujukan untuk penambahbaikan projek ini pada masa akan datang.

## ABSTRACT

Mathematics is an essential part of learning for all children especially in their early childhood stage. Besides that, good and firm grounding in mathematics is also an important skill that can be applied in daily life. Therefore, children will start to learn numeracy in the first stage of learning mathematics because it can help them to improve their skills like problem solving, critical thinking and form the building blocks for higher math concept level. The main difficulty is that children need something that can attract their attention and obviously they want something which is funny and enjoyable. The main purpose of having this project is to design an electronic-based educational game board that can teach kindergarten kid basic number through game using Arduino. This game board will be able to help the teacher to teach kids basic number and as well as enumeration of big and small numbers. The architecture of the game board is using Arduino UNO as the microcontroller that translates the code to electronic components execution. Moreover, this project is a new attempt throughout all the semesters. This game board is developed with a combination of hardware and software. The questions will display on the I2C LCD and the kids need to place the correct answer card on the board. If the answer is correct, yellow LED will turn on and if it is wrong, the red LED will turn on. The game board contains 10 counting questions. The I2C liquid crystal display (I2C LCD) will display the questions and the instruction will display on smart phone by using MIT application. In addition, this project needs to be tested in kindergarten whether it is helpful of not for the teacher and the kids. Interview session will be done with



the teachers to collect the data. After analysing the data, a statistic will be done as a reference for future improvement of this project.

## **DEDICATION**

I dedicate this to my beloved parents, the one who always motivate me throughout the journey of achieving my dream. I couldn't express my feelings with words to describe my appreciation for their help and trust.

## ACKNOWLEDGEMENTS

Firstly, I would like to take this opportunity to thank both my supervisor and cosupervisor which are Mr Adam and Mr Amar Faiz for their guidance and support so that the project on the topic of Development of An Electronic-based Educational Game Board for Teaching Kindergarten Kid Basic Number Through Game Using Arduino can be completed successfully. Besides, I would like to express my deepest appreciation to my friends who helped me along the way to complete this project. In a nutshell, I want to thank my parents for their moral and financial support.

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## **LIST OF ABBREVIATIONS**

**RFID** Radio-Frequency Identification

**I2C LCD**      I2C Liquid-Crystal Display



# CHAPTER 1

## INTRODUCTION

### 1.1 Background

Edutainment brings meaning which is the combination between education and entertainment. It is a type of learning process via medium that can educate and entertain using various media, such as animation, videos, games, mobile application or television. The introduction of edutainment is aimed to blend teaching and entertainment elements together so that the learning session is more fun. Besides, students can increase their interest and learn effectively at fundamental level of the education system (Depickere. A, 2006).

Refer to edutainment case study done by Carly Shuler (2012), the market of edutainment software is growing at about 30% a year. The statistics shown there is high demand for edutainment products in the market. Hence, the development of electronic-based educational game board is considered as one type of products that can apply edutainment concept in real thing. The game board manage to teach kindergarten kid basic numbering through game so that they can learn effectively and increase their interest on mathematics.

### 1.2 Problem Statement

Basic number concepts applied in kindergarten classroom to set the foundation for learning more advanced math concepts in future. Early exposure to math and number activities will make children more comfortable with the skills. If the children are not comfortable with math and number concepts at a young age, they will be lack of

confidence in their abilities and may lead to hesitation when more advanced math concepts are introduced. When this problem happens, they may start believing that they are not good in math and will have risks beginning a self-fulfilling cycle of failure. To solve this issue, electronic-based educational game board has been introduced as an alternative to help the children to learn basic numbers in an easy way. Math learning is most exciting for children when hands-on manipulatives are combined. Manipulatives give children physical illustrations of the numbers and counting concepts. However, children will also easily feel bored if the teachers using the same and traditional way to apply in their teaching. Therefore, the introduction of the electronic-based educational game board will be a great solution to help the teachers to teach math in a fun and easy way so that the children can have additional opportunities to practice these skills yet it will increase their confidence when working with math and number concepts.

### **1.3 Objective**

An electronic-based educational game board is a design that combines education and entertainment. The purposes of this project are:

1. To investigate the mechanism of edutainment for learning basic numbers.
2. To design and develop electronic-based educational game board that works with basic numbering game.
3. To determine and compare the effectiveness of learning basic numbering with the manual way and the effectiveness of learning basic numbers with electronic-based educational game board.

## **1.4 Scope**

The focus of this project will be mainly on development of an electronic-based educational game board for teaching kindergarten children basic number through game using Arduino. Moreover, this project also studies and compare between the effectiveness of learning basic numbers through game using electronic-based educational game board and with the manual teaching. The software implementation of the design is using Arduino IDE. In the other hand, Arduino UNO, I2C LCD, RFID card, RFID reader and LEDs will be used as the hardware implementation while MIT applications will be used as the software implementation.

## **1.5 Organization**

The purpose of developing this project is to help kindergarten teachers to teach the kid basic number easily with the aid of game. Kid can also learn and familiar with basic numbers by playing this educational game board. They can also have interaction between each another while playing the game board so that they will be more social and become active learner. Besides, the electronic-based educational game board can also increase their interest towards mathematics and can help them to firm their solving skills. They can also play the game board when they feel bored so that they can relax their mind and fulfil their leisure time by doing something knowledgeable.

## **CHAPTER 2**

### **LITERATURE REVIEW**

## **2.1 Hardware Components**

Researches on hardware components used to develop the educational game board will be discussed in this section. The components included are Arduino UNO, I2C liquidcrystal display (I2C LCD) and radio-frequency identification (RFID) card.

### **2.1.1 Arduino microcontroller**

Meaning of microcontroller is embedded controller which acts as a small computer on single integrated circuit design. It is combination of two sub terms which are micro and controller. Micro means the device is literally small size and controller describes that the device will be used to handle the system, object or process. Arduino microcontroller is one of the controllers produced by Arduino company which been widely used as controller to build electronic projects. Besides, it is also function as a physical programmable circuit both in a part of Arduino. According to Zolkapli et al (2013), Arduino microcontroller is readable using C++ programming language codes. It can make the work easier because it does not require to write a new code onto the hardware device. There are several types of Arduino microcontroller in the market such as Arduino UNO, Arduino NANO, Arduino MEGA, Arduino DUE, Arduino Leonardo, LilyPad Arduino and so on (Anders, 1995). Arduino contains two parts which are hardware and software. Hardware consists of main electronic components as follows:

#### **1) USB Plug**

It is used to upload a programme to microcontroller and has a regulated 5V power.

#### **2) External Power Supply**

It has regulated voltage of 9V to 12V and used to power the Arduino board.