

**THE DEVELOPMENT OF AN EARLY DYSCALCULIA  
TEST**



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UNIVERSITI MALAYSIA SABAH

**FACULTY OF PSYCHOLOGY AND EDUCATION  
UNIVERSITI MALAYSIA SABAH  
2016**

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TEST**

**WONG KEN KEONG**



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**THESIS SUBMITTED IN FULFILLMENT FOR THE  
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**FACULTY OF PSYCHOLOGY AND EDUCATION  
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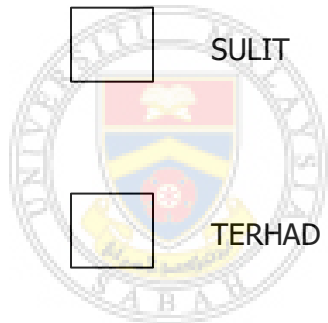
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JUDUL: **THE DEVELOPMENT OF AN EARLY DYSCALCULIA TEST**

IJAZAH: **DOCTOR OF PHILOSOPHY (EVALUATION IN EDUCATION)**

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## DECLARATION

I, Wong Ken Keong, hereby declare that this thesis "The Development of an Early Dyscalculia Test" is an original work done by me for the award of the degree of Doctor of Philosophy in the Faculty of Psychology and Education. I also declare that the materials in this thesis are of my own except for quotations, excerpts, equations, summaries and references, which have been duly acknowledged.

05 May 2016

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Wong Ken Keong  
05 May 2016

## **ABSTRACT**

Dyscalculia is a specific mathematics learning disability that affects the ability to acquire basic numeracy skill and is known as a deficit in numerosity. The primary cause of dyscalculia currently appears to be a genetically determined disorder of number sense. In an effort to raise awareness and understanding of dyscalculia among parents, teachers, and the general public, this thesis is the Design and Development research (DDR) and involved development of the Early Dyscalculia Test (EDT), a computer-based instrument for early diagnosis of dyscalculia. To ensure that the target students were relevant to learning disability in mathematics, students in Numeracy and Literacy Screening Programme (LINUS) were chosen as respondents. Due to the large and widely dispersed of the population of LINUS students in Sabah, the cluster sampling method was employed as the main sampling method in this study. As a result, the total sample size in this study consisted of 448 LINUS students. The study findings were analyzed by referring to the results obtained from the EDT and involving the analysis of data of Item Response Model (IRM), Microsoft Excel and Statistical Package for the Social Sciences (SPSS). Results of this study indicated that the instrument constructed from the numerosity concept and mathematical thinking framework provided valid and reliable measures of dyscalculia and basic numeracy skill among LINUS students. The results showed that 89.7% of the variance in students' basic numeracy skill was accounted for by the four predictor variables (number sense, matching items, dot enumeration and number comparison) as a whole. Dyscalculic students and their non-Dyscalculic peers were also compared in terms of arithmetic abilities; and the results revealed that dyscalculic students were significantly weaker than their peers in these abilities. The findings of the present study provided implications towards developing a better understanding about the learning problems of the children with special reference to learning disability in mathematics. The findings could guide policy makers, administrators, authorities, teachers and parents to take the necessary measurements to help the children.

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## **ABSTRAK**

### **PEMBANGUNAN UJIAN AWAL DYSCALCULIA (UAD)**

*Dyscalculia adalah merujuk kepada kesukaran pembelajaran matematik yang spesifik di mana ia memberi kesan kepada keupayaan untuk memperoleh kemahiran numerasi asas, dan juga dikenali sebagai defisit dalam numerositi. Setakat ini, punca utama dyscalculia adalah disebabkan oleh ketidakupayaan number sense secara genetik. Untuk memastikan bahawa murid sasaran adalah relevan dengan masalah pembelajaran matematik, murid-murid dalam program literasi dan numerasi (LINUS) telah dipilih sebagai responden. Oleh kerana populasi murid-murid LINUS di Sabah yang besar dan tersebar luas, kaedah pensampalan kelompok telah digunakan sebagai kaedah pensampelan utama di dalam kajian ini. Jumlah sampel yang terlibat dalam kajian ini terdiri daripada 448 murid LINUS. Dapatan kajian telah dianalisis berpandukan kepada keputusan yang diperolehi dari UAD dan melibatkan penganalisan data melalui Item Response Model (IRM), Microsoft Excel and Statistical Package for the Social Sciences (SPSS). Dapatan kajian ini menunjukkan bahawa instrumen yang dibina daripada konsep numerositi dan kerangka teori pemikiran matematik mempunyai kesahan dan kebolehpercayaan untuk mengukur dyscalculia dan kemahiran numerasi asas di kalangan murid-murid LINUS. Keputusan menunjukkan 89.7% daripada varians kemahiran numerasi asas murid telah menyumbang kepada empat pembolehubah peramal (number sense, matching items, dot enumeration and number comparison) secara keseluruhan. Murid-murid yang mempunyai dyscalculia dan rakan-rakan sebaya mereka yang tidak mempunyai dyscalculia juga telah dibandingkan melalui kebolehan aritmetik. Hasil kajian tersebut menunjukkan bahawa murid-murid ini adalah lebih lemah secara signifikan berbanding dengan rakan-rakan sebaya mereka dalam kebolehan-kebolehan ini. Dapatan kajian ini juga telah memberi implikasi dalam membangunkan kefahaman yang lebih baik tentang masalah pembelajaran murid-murid khususnya kepada masalah pembelajaran matematik. Hasil kajian ini boleh memberi motivasi kepada pengubal dasar, pentadbir, pihak berkuasa, guru-guru dan ibubapa untuk mengambil tindakan yang wajar dalam membantu pembelajaran murid-murid.*



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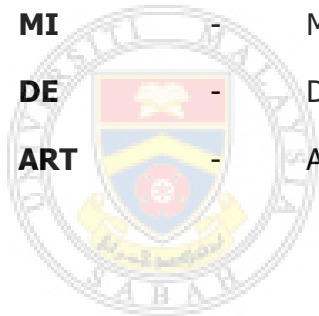
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## LIST OF ABBREVIATIONS

<b>EDT</b>	-	Early Dyscalculia Test
<b>GTP</b>	-	Government Transformation Programme
<b>LINUS</b>	-	Literacy and Numeracy Screening
<b>DS</b>	-	Dyscalculia
<b>RD</b>	-	Risk of Dyscalculia
<b>PA</b>	-	Poor Arithmetics
<b>NS</b>	-	Normal Students
<b>SRT</b>	-	Simple Reaction Time
<b>NS</b>	-	Number Sense
<b>MI</b>	-	Matching Items
<b>DE</b>	-	Dot Enumeration
<b>ART</b>	-	Arithmetics Test



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