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**MODEL TULISAN TANGAN BERBANTUKAN TEKNOLOGI UNTUK  
MEMUDAHCARA PENULISAN MURID DISGRAFIA**

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## Ikhtisar

Disgrafia merujuk kepada masalah kemahiran menulis yang ketara dan tidak selaras dengan perkembangan usia murid. Bagi mengatasi masalah tersebut, pelbagai kaedah intervensi pembangunan kemahiran menulis kepada murid disgrafia telah dijalankan. Namun, kajian terdahulu tentang kaedah intervensi tersebut tidak merangkumi semua peringkat kemahiran menulis dari peringkat asas sehinggalah automatisiti. Ini mewujudkan lompong kajian terutama ketiadaan model sokongan yang menyeluruh berbantuan teknologi. Fungsi aplikasi sokongan menulis murid disgrafia akan lebih berkesan dengan adanya garis panduan reka bentuk interaksi (IxD). Justeru, kajian ini mencadangkan satu model tulisan tangan murid disgrafia (DCHM) berbantuan teknologi bagi meningkatkan penguasaan menulis mereka pada tahap visualisasi, imaginasi dan automatisiti. Model ini melibatkan gabungan komponen pembentukan huruf (transkripsi, visualisasi, imaginasi, penjaanaan teks dan kognitif) dan sokongan ICT (animasi pembentukan huruf, kawalan, surihan, animasi anak panah, maklum balas dan pengulangan). Tiga fasa metodologi dijalankan bagi mencapai objektif tersebut, iaitu 1) mengkategorikan dan menganalisa corak tulisan tangan, mereka bentuk dan menentusahkan model; 2) membangun prototaip; dan 3) menilai prototaip. Kebolehpercayaan model ini telah diuji melalui penilaian pengguna menggunakan instrumen *handwriting legibility scale* (HLS). Perbandingan sampel tulisan tangan dibuat sebelum dan selepas intervensi dengan berbantuan prototaip. Hasil penilaian mendapati HLS dapat menunjukkan kepekaan setiap parameter dalam DCHM. Secara spesifiknya, skor untuk kebolehbacaan global dan usaha yang diperlukan untuk membaca tulisan ialah 92 peratus, susun atur tulisan di atas lembaran kerja dan pembentukan huruf 96 peratus; manakala pindaan semasa menulis menunjukkan pencapaian 100 peratus. Penilaian keseluruhan model ini menunjukkan skor positif dari segi kebolehbacaan, memori, tatacara pembentukan huruf, dan seterusnya pencapaian automatisiti dalam tulisan tangan. Kesimpulannya, dapatan tersebut membuktikan DCHM yang diimplementasi dalam prototaip tersebut mampu meningkatkan penguasaan tulisan tangan secara signifikan dalam kalangan murid disgrafia. Dalam bidang reka bentuk interaksi pula, kajian ini secara substansial menyumbang kepada pemahaman baharu model reka bentuk yang novel.

**Kata kunci:** Disgrafia, Kemahiran menulis, Model tulisan tangan, Intervensi berbantuan teknologi, Reka bentuk interaksi

## Abstract

Dysgraphia is a student learning problem related to handwriting skills, which is not inline according to their age. To overcome the problem, various handwriting skills intervention methods to dysgraphic students have been conducted. However, past research on the intervention methods have not covered all levels of handwriting skills from the basic levels to automaticity. This embodies a research gap especially the absence of a comprehensive technology-assisted support model. The function of the dysgraphic student writing support application will be more effective with the presence of interaction design guidelines (IxD). Thus, this study proposes a technology-assisted handwriting model of dysgraphic students (DCHM) to improve their writing proficiency at the level of visualization, imagination and automation. The model involves a combination of letter formation components (transcription, visualization, imagination, text generation and cognitive) and ICT support (letter formation animation, control, tracing, arrow animation, feedback and repetition). To achieve the objective, three phases of research methods are involved namely 1) categorising and analysing handwriting patterns, model design and verifying the model; 2) developing the prototype; and 3) evaluating the prototype. The reliability of the model was tested through user's evaluation using handwriting legibility scale (HLS). Comparisons were made based on handwriting samples before and after the intervention with the assistance of the prototype. The findings demonstrated that, HLS is able to identify the sensitivity of each parameter in DCHM. To be more specific, the score achieved for global legibility and effort to read the script is 92 percent, layout on the page and letter formation attained 96 percent; while alterations to writing scored 100 percent. The overall evaluation of the model showed positive scores from the aspects of legibility, memory, correct letter formation, and ultimately automaticity achievement in handwriting. In conclusion, these findings confirmed that the implementation of DCHM in the prototype can significantly enhance the mastery of handwriting among dysgraphic students. More importantly, this study has contributed substantially to the field of interaction design by providing a novel understanding of the design model.

**Keywords:** Dysgraphia, Handwriting skills, Handwriting model, Technology-assisted intervention, Interaction design



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## Daftar Singkatan

ADHD	<i>Attention Deficit Hyperactivity Disorder</i>
BSN	Bank Simpanan Nasional
DCHM	<i>Dysgraphic Children Handwriting Model</i>
HLS	<i>Handwriting Legibility Scale</i>
IPMDBP	Instrumen Pengesanan Murid Bermasalah dalam Pembelajaran
ISD	Instrumen Senarai Semak Disleksia
JKM	Jabatan Kebajikan Masyarakat
JPN	Jabatan Pendidikan Negeri
KKM	Kementerian Kesihatan Malaysia
KPM	Kementerian Pelajaran Malaysia
LINUS	Saringan Literasi dan Numerasi
MBK	Murid Berkeperluan Khas
OKU	Orang Kurang Upaya
PdP	Pengajaran dan Pembelajaran
PPD	Pejabat Pendidikan Daerah
PPI	Program Pendidikan Inklusif
PPKI	Program Pendidikan Khas Integrasi
PPPM	Pelan Pembangunan Pendidikan Malaysia
SPK	Sekolah Pendidikan Khas
KPM	Kementerian Pelajaran Malaysia

# BAB SATU

## PENGENALAN

### 1.1 Pengenalan

Masalah tulisan tangan murid perlu dititikberatkan kerana ia mengganggu proses pembelajaran. Tulisan tangan adalah asas dalam pembelajaran yang merangkumi perhatian, persepsi, linguistik dan kemahiran motor halus (Bourdin & Fayol, 2000; Feder & Majnemer, 2007; McCutchen, 2011; Dinehart & Manfra, 2013; Graham, Harris & Fink, 2000; Connelly & Dockrell, 2015). Kemahiran tulisan tangan penting bagi kejayaan akademik seseorang murid (Cahill, 2009; Oliver, 2014; McGlashan, Blanchard, Nicole, Lee, French & Sycamore, 2017; Biotteau, Danna, Baudou, Puyjarinet, Velay, Albaret & Chaix, 2019) kerana ia menyokong penglibatan murid di dalam kelas serta meningkatkan keyakinan diri (Giordano & Maiorana, 2015; Engel-Yeger, Nagauker-Yanuv & Rosenblum, 2009; Feder & Majnemer, 2007).

Walaupun di dalam era teknologi, tulisan tangan masih relevan sebagai kemahiran yang perlu dikuasai oleh kanak-kanak sebagai asas kepada aktiviti pembelajaran. Contoh keperluan tulisan tangan adalah mengambil nota, berkomunikasi, menyampaikan maklumat dan sebagai ukuran pengetahuan seseorang murid. Murid menghabiskan sehingga separuh daripada masa kelas untuk aktiviti atau tugas harian yang melibatkan penulisan (Kushki, Schweltnus, Iiyas & Chau, 2011; Valdez, 2017; Dinehart, 2015).

Bagi murid normal, tempoh 10 tahun diperlukan untuk menguasai tulisan tangan iaitu di antara umur lima (pra sekolah) hingga 15 tahun (Accardo, Genna & Borean,

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## Lampiran A

Laporan daripada pakar psikologi

PSIKOLOGI

LAPORAN	DISAHKAN OLEH
IQ score is 82, below average score. Has reversal in numbers, 5→2. When asked to write, d→q, b→d, n→h. In his workbook, no spatial discretion found and <del>no</del> letters were above and below line. Eg; kopi →kopi, hikopisusu. Characteristic of dyscalculia & dysgraphia (specific LD) found. Recommended to be in special education.	Cop Nama:  TIAHISHAH ALI ANBLAGAN Penolong Pengajar (Psikologi) Pusat Penaharasan Pendidikan Kebangsaan Cawangan Kelantan Dan Abulhasan Bahagian Pendidikan khas Kementerian Pendidikan Malaysia Tarikh:
LAPORAN	DISAHKAN OLEH
	Cop Nama:  Tarikh:

Pengesahan akhir doktor pakar terhadap status MBK

**D : MAKLUMAT BERKAITAN PENYAKIT** (yang menyebabkan ketidakupayaan)  
 diisi oleh Pegawai Perubatan atau Pengamal Perubatan  
 mental hanya boleh disahkan oleh Pakar Psikiatri)

masalah pembelajaran (dyscalculia, dysgraphia)

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DR. NUR SHAMUDDIN MOHD SALEH  
 (Tandatangan Pegawai Perubatan/Pengamal Perubatan Mental)  
 NAMA :  
 JAWATAN/COP RASMI

**E : MAKLUMAT BERKENAAN KETIDAKUPAYAAN (DISABILITY)**

diisi oleh Pegawai Perubatan atau Pengamal Perubatan Tandakan (√) jenis ketidakupayaan dalam petak (Boleh tanda lebih dari satu sekiranya berkenaan)

**Upaya Pendengaran**   
 Individu yang mempunyai kurang pendengaran di kedua-dua telinga

Frekuensi pendengaran :  
 Minimum ..... dB Telinga Kiri ..... dB

Tahap mengikut tahap pendengaran telinga yang lebih baik

Minimum  Sederhana  
 15 - < 30 dB 30 - < 60 dB  
 Teruk (Severe)  Sangat Teruk  
 60 - < 90 dB (Profound) ≥ 90 dB

**Upaya Penglihatan**   
 Individu yang mempunyai kurang penglihatan di kedua-dua mata atau sahaja mata sahaja.

Frekuensi penglihatan selepas pembetulan dengan cermin mata/kanta sentuh:  
 Kanan ..... Mata Kiri .....

Tahap mengikut tahap penglihatan mata yang lebih baik

Frekuensi di kedua-dua belah mata (Penglihatan lebih teruk daripada 3/60 J medan penglihatan kurang dari 20 darjah dari fixation).

Frekuensi di kedua-dua belah mata (Penglihatan kurang daripada 3/60 J medan penglihatan kurang dari 10 darjah dari fixation).

Frekuensi di sebelah mata

Frekuensi jika gangguan penglihatan kekal (hanya boleh disahkan oleh Pakar Oftalmologi)

**IV. Kurang Upaya Fizikal**

- Limb Defects (Acquired/Congenital)  
 (Nyatakan) : .....
  - Spinal Cord Injury
  - Stroke
  - Traumatic Brain Injury
  - Cerebral Palsy
  - Hemiplegia  Diplegia  Quadriplegia
  - Lain-Lain (Nyatakan) : .....
- (Cth: Duchennes Muscular Dystrophy, Chronic Diseases with physical disability, etc.)

**V. Masalah Pembelajaran**

- Lewat Perkembangan (Global Developmental Delay)  
 (Hanya kanak-kanak berumur < 5 tahun)  
 Minimum  Sederhana  Teruk
- Sindrom Down  ADHD  Autisme
- Kurang Upaya Intelektual  
 (Kanak-Kanak berumur > 5 tahun)  
 Minimum  Sederhana  Teruk

Masalah Pembelajaran Spesifik (Cth: Dyslexia, Dyscalculia, Dysgraphia)  
 Nyatakan: dyscalculia, dysgraphia

**VI. Kurang Upaya Mental**

- \* Organic Mental Disorder
- \*\* Schizophrenic, Paranoid & other Psychotic Disorders
- \*\* Mood Disorder (Depression, Bipolar)

## Lampiran B

### Dokumen keperluan murid

#### MAKLUMAT MURID 1

Nama	: Nur Aleeya Atieqah binti Mohd Khairil
Jenis OKU	: Masalah Pembelajaran Spesifik
Tahap OKU	: Disleksia, disgrafia, diskalkulia
Tahap pembelajaran	: KSSRPK 3
Keterangan program	: Program pendidikan khas integrasi
Kategori masalah	: (1), (10), (11), (12), (16), (18), (19), (20)
Penerangan murid	: <ul style="list-style-type: none"><li>• Menulis menggunakan tangan kanan</li><li>• Hanya dapat menghasilkan 15 abjad yang pertama dari memori</li><li>• Tidak mengikut susunan yang betul</li><li>• Mencampuradukkan huruf besar dan kecil</li><li>• Kenal abjad tetapi tidak dapat menghasilkannya</li><li>• Tidak fokus</li><li>• Cara genggam pensel tripod dinamik</li><li>• Memori jangka pendek baik</li><li>• Kemahiran visual tinggi</li><li>• Mahu mencuba</li></ul>

#### MAKLUMAT MURID 2

Nama	: Muhammad Khairul Nizam bin Ismail
Jenis OKU	: Masalah Pembelajaran Spesifik
Tahap OKU	: Disleksia, disgrafia, diskalkulia
Tahap pembelajaran	: KSSRPK 4
Keterangan program	: Program pendidikan khas integrasi
Kategori masalah	: (1), (3), (4), (10), (11), (12), (16), (18), (19), (20)
Penerangan murid	: <ul style="list-style-type: none"><li>• Menulis menggunakan tangan kiri</li><li>• Hanya dapat menghasilkan 10 abjad yang pertama dari memori</li></ul>

- Tidak mengikut susunan yang betul
- Mencampuradukkan huruf besar dan kecil
- Tidak fokus
- Cara gengaman empat jari
- Imaginasi tinggi
- Kemahiran visual tinggi
- Dapat meniru tulisan tangan betul tetapi memerlukan masa yang lama
- Genggaman pensel terlalu kuat
- Kurang berminat dalam pembelajaran
- Menulis dipertengahan kertas
- Tulisan yang dihasilkan tidak dapat dibaca

### MAKLUMAT MURID 3

- Nama : Nur Farisha Ayuni binti Mohd Fairuz
- Jenis OKU : Masalah Pembelajaran Spesifik
- Tahap OKU : Disleksia, disgrafia, diskalkulia
- Tahap pembelajaran : KSSRPK 5
- Keterangan program : Program pendidikan khas integrasi
- Kategori masalah : (1), (3), (4), (10), (11), (12), (18), (19)
- Penerangan murid :
- Menulis menggunakan tangan kanan
  - Hanya dapat menghasilkan 10 abjad yang pertama dari memori
  - Tidak mengikut susunan yang betul
  - Mencampuradukkan huruf besar dan kecil
  - Tidak fokus
  - Cara gengaman tripod dinamik
  - Menulis daripada bawah
  - Memori jangka pendek ok
  - Kemahiran visual tinggi

### MAKLUMAT MURID 4

- Nama : Adam Mukhlis bin Aemi
- Jenis OKU : Masalah Pembelajaran Spesifik
- Tahap OKU : Disleksia, disgrafia, diskalkulia
- Tahap pembelajaran : Tahun 3



Keterangan program	: Program pendidikan khas integrasi
Kategori masalah	: (1), (3), (4), (10), (11), (12), (16), (19), (20)
Penerangan murid	: <ul style="list-style-type: none"> <li>• Menulis menggunakan tangan kanan</li> <li>• Hanya dapat menghasilkan 12 abjad yang pertama dari memori</li> <li>• Tidak mengikut susunan yang betul</li> <li>• Mencampuradukkan huruf besar dan kecil</li> <li>• Tidak fokus</li> <li>• Cara gengaman tripod lateral</li> <li>• Gengaman pensel terlalu kuat</li> <li>• Memori jangka pendek lemah</li> <li>• Kemahiran visual lemah</li> <li>• Tulisan yang dihasilkan tidak dapat dibaca</li> </ul>

<b>MAKLUMAT MURID 5</b>	
Nama	: Muhammad Eizdwan Fadzli bin Elias
Jenis OKU	: Masalah Pembelajaran Spesifik
Tahap OKU	: Disleksia, disgrafia, diskalkulia
Tahap pembelajaran	: Tahun 2
Keterangan program	: Program pendidikan khas integrasi
Kategori masalah	: (1), (3), (4), (10), (11), (12), (16), (18), (19), (20)
Penerangan murid	: <ul style="list-style-type: none"> <li>• Menulis menggunakan tangan kanan</li> <li>• Hanya dapat menghasilkan 20 abjad yang pertama dari memori</li> <li>• Tidak mengikut susunan yang betul</li> <li>• Mencampuradukkan huruf besar dan kecil</li> <li>• Tidak fokus</li> <li>• Cara gengaman pensel tripod dinamik</li> <li>• Memori jangka pendek baik</li> <li>• Mahu mencuba</li> <li>• Dapat mengeja suku kata yang mudah</li> <li>• Dapat menyalin ayat dengan cepat</li> <li>• Bentuk huruf dihasilkan kemas</li> </ul>

Pemetaan sampel tulisan tangan murid dengan Instrumen Senarai Semak Penilaian Jordan untuk disgrafia bagi mendapatkan ralat yang dilakukan mengikut ciri taksonominya.

Murid 1	Murid 2	Murid 3	Murid 4	Murid 5	Penilaian Jordan	Ciri mengikut taksonomi
.	.	.	.	.	1	Fizikal Menulis
				.	2	
	.	.	.	.	3	Utama menulis
	.	.	.	.	4	Utama menulis
					5	
				.	6	Fizikal Menulis
					7	
					8	
					9	
.	.	.	.	.	10	Fizikal Menulis
.	.	.	.	.	11	Utama menulis
.	.				12	Bentuk tulisan
				.	13	
					14	
					15	
.	.		.	.	16	Fizikal Menulis
					17	
.	.	.	.		18	Bentuk tulisan
.	.	.	.	.	19	Bentuk tulisan
.	.		.	.	20	Bentuk tulisan

**Ralat mengikut Instrumen Senarai Semak Penilaian Jordan untuk disgrafia**

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- (1) Sukar untuk membuat pusingan pensel ke arah yang betul apabila berada di sudut
  - (3) Kerap memadam tulisan (pindaan)
  - (4) Mencuba beberapa kali untuk menyalin dengan betul
  - (10) Genggaman dan tekanan yang kuat pada pensel semasa menulis
  - (11) Latihan pertama iaitu menulis huruf, hari dan bulan, tulisan sukar dibaca
  - (12) Kelemahan dalam jarak: huruf dan perkataan terlalu dekat atau terlalu jauh
  - (16) Kerap berhenti seketika semasa menulis
  - (18) Melakar garisan yang samar daripada melakukan garisan yang tetap
  - (19) Huruf yang disalin tidak sekata, lengkungan yang teruk atau perkadaran huruf yang lemah
  - (20) Bulatan dan garisan yang dihasilkan bertentangan dari arah yang betul
-

## Lampiran C

### MAKLUMAT MURID 1

1	NAMA	:	NUR ALEEYA ATIEQAH BINTI MOHD KHAIRIL
2	NO IC	:	50818020370
3	TARIKH LAHIR	:	18-Aug-05
4	NO SIJIL LAHIR	:	BN96768
5	KOD JANTIN	:	PEREMPUAN
6	KETERANGAN KAUM	:	MELAYU
7	KETERANGAN AGAMA	:	ISLAM
8	WARGANEGARA	:	MALAYSIA
9	TARIKH MASUK SEKOLAH	:	30-Apr-15
10	TARIKH MASUK KELAS	:	5-Jan-17
11	KETERANGAN TAHUN	:	KELAS KHAS RENDAH
12	KOD SEKOLAH	:	KBA2091
13	NAMA SEKOLAH	:	SEKOLAH KEBANGSAAN PEREMBA
14	NAMA KELAS	:	3 BESTARI
15	KETERANGAN ALIRAN	:	KHAS
16	KETERANGAN BIDANG	:	PEMBELAJARAN
17	JENIS SEKOLAH	:	SEKOLAH KEBANGSAAN
18	KETERANGAN PPD	:	KOTA SETAR
19	STATUS OKU	:	YA
20	TARIKH DAFTAR	:	1-Feb-17
21	NO OKU	:	LD020717000036
22	JENIS OKU	:	Masalah Pembelajaran Spesifik
23	TAHAP OKU	:	Masalah Pembelajaran Spesifik (Dyslexia, Dyscalculia, Dysgraphia)
24	TAHAP PEMBELAJARAN	:	KSSRPK 3
25	KETERANGAN PROGRAM	:	PROGRAM PENDIDIKAN KHAS INTEGRASI

## MAKLUMAT MURID 2

1	NAMA	:	MUHAMMAD KHAIRUL NIZAM BIN ISMAIL
2	NO IC	:	70520021061
3	TARIKH LAHIR	:	20-May-07
4	NO SIJIL LAHIR	:	BU48298
5	KOD JANTIN	:	LELAKI
6	KETERANGAN KAUM	:	MELAYU
7	KETERANGAN AGAMA	:	ISLAM
8	WARGANEGARA	:	MALAYSIA
9	TARIKH MASUK SEKOLAH	:	1-Jan-17
10	TARIKH MASUK KELAS	:	1-Jan-18
11	KETERANGAN TAHUN	:	KELAS KHAS RENDAH
12	KOD SEKOLAH	:	KBAB015
13	NAMA SEKOLAH	:	SEKOLAH KEBANGSAAN BUKIT PAK KIAU
14	NAMA KELAS	:	PPKI 4 BESTARI
15	KETERANGAN ALIRAN	:	KHAS
16	KETERANGAN BIDANG	:	PEMBELAJARAN
17	JENIS SEKOLAH	:	SEKOLAH KEBANGSAAN
18	KETERANGAN PPD	:	KOTA SETAR
19	STATUS OKU	:	YA
20	TARIKH DAFTAR	:	18-Jul-16
21	NO OKU	:	LD021216000011
22	JENIS OKU	:	Masalah Pembelajaran Spesifik
23	TAHAP OKU	:	Masalah Pembelajaran Spesifik (Dyslexia, Dyscalculia, Dysgraphia)
24	TAHAP PEMBELAJARAN	:	KSSRPK 4
25	KETERANGANPROGRAM	:	PROGRAM PENDIDIKAN KHAS INTEGRASI

### MAKLUMAT MURID 3

1	NAMA	:	NUR FARISHA AYUNI BINTI MOHD FAIRUZ
2	NO IC	:	71208020392
3	TARIKH LAHIR	:	8-Dec-07
4	NO SIJIL LAHIR	:	BX10285
5	KOD JANTIN	:	PEREMPUAN
6	KETERANGAN KAUM	:	MELAYU
7	KETERANGAN AGAMA	:	ISLAM
8	WARGANEGARA	:	MALAYSIA
9	TARIKH MASUK SEKOLAH	:	8-Dec-07
10	TARIKH MASUK KELAS	:	1-Jan-19
11	KETERANGAN TAHUN	:	KELAS KHAS RENDAH
12	KOD SEKOLAH	:	KBAB015
13	NAMA SEKOLAH	:	SEKOLAH KEBANGSAAN BUKIT PAK KIAU
14	NAMA KELAS	:	PPKI 5 ARIFF
15	KETERANGAN ALIRAN	:	KHAS
16	KETERANGAN BIDANG	:	PEMBELAJARAN
17	JENIS SEKOLAH	:	SEKOLAH KEBANGSAAN
18	KETERANGAN PPD	:	KOTA SETAR
19	STATUS OKU	:	YA
20	TARIKH DAFTAR	:	27-Mar-18
21	NO OKU	:	LD021218000006
22	JENIS OKU	:	Masalah Pembelajaran Spesifik
23	TAHAP OKU	:	Masalah Pembelajaran Spesifik (Dyslexia, Dyscalculia, Dysgraphia)
24	TAHAP PEMBELAJARAN	:	KSSRPK 5
25	KETERANGANPROGRAM	:	PROGRAM PENDIDIKAN KHAS INTEGRASI



## MAKLUMAT MURID 4

1	NAMA	:	ADAM MUKHLIS BIN AEMI
2	NO IC	:	81005020359
3	TARIKH LAHIR	:	5-Oct-08
4	NO SIJIL LAHIR	:	CB19090
5	KOD JANTIN	:	LELAKI
6	KETERANGAN KAUM	:	MELAYU
7	KETERANGAN AGAMA	:	ISLAM
8	WARGANEGARA	:	MALAYSIA
9	TARIKH MASUK SEKOLAH	:	1-Jan-15
10	TARIKH MASUK KELAS	:	1-Jan-18
11	KETERANGAN TAHUN	:	KELAS KHAS RENDAH
12	KOD SEKOLAH	:	KBB2080
13	NAMA SEKOLAH	:	SEKOLAH KEBANGSAAN BOHOR
14	NAMA KELAS	:	PERMATA 3
15	KETERANGAN ALIRAN	:	KHAS
16	KETERANGAN BIDANG	:	PEMBELAJARAN
17	JENIS SEKOLAH	:	SEKOLAH KEBANGSAAN
18	KETERANGAN PPD	:	KOTA SETAR
19	STATUS OKU	:	YA
20	TARIKH DAFTAR	:	2-Apr-17
21	NO OKU	:	LD020717000113
22	JENIS OKU	:	Masalah Pembelajaran Spesifik
23	TAHAP OKU	:	Masalah Pembelajaran Spesifik (Dyslexia, Dyscalculia, Dysgraphia)
24	TAHAP PEMBELAJARAN	:	Tahun 3
25	KETERANGAN PROGRAM	:	PROGRAM PENDIDIKAN KHAS INTEGRASI

## MAKLUMAT MURID 5

1	NAMA	:	MUHAMMAD EIZDWAN FADZLI BIN ELIAS
2	NO IC	:	40203020797
3	TARIKH LAHIR	:	3-Feb-04
4	NO SIJIL LAHIR	:	
5	KOD JANTIN	:	LELAKI
6	KETERANGAN KAUM	:	MELAYU
7	KETERANGAN AGAMA	:	ISLAM
8	WARGANEGARA	:	MALAYSIA
9	TARIKH MASUK SEKOLAH	:	
10	TARIKH MASUK KELAS	:	
11	KETERANGAN TAHUN	:	KELAS KHAS RENDAH
12	KOD SEKOLAH	:	KBB2080
13	NAMA SEKOLAH	:	SEKOLAH KEBANGSAAN BOHOR
14	NAMA KELAS	:	PERMATA 3
15	KETERANGAN ALIRAN	:	KHAS
16	KETERANGAN BIDANG	:	PEMBELAJARAN
17	JENIS SEKOLAH	:	SEKOLAH KEBANGSAAN
18	KETERANGAN PPD	:	KOTA SETAR
19	STATUS OKU	:	YA
20	TARIKH DAFTAR	:	
21	NO OKU	:	
22	JENIS OKU	:	Masalah Pembelajaran Spesifik
23	TAHAP OKU	:	Masalah Pembelajaran Spesifik (Dyslexia, Dysgraphia)
24	TAHAP PEMBELAJARAN	:	Tahun 2
25	KETERANGAN PROGRAM	:	PROGRAM PENDIDIKAN KHAS INTEGRASI

## Lampiran D

### Biodata pakar penilai

Nama	Jawatan	Sekolah / Organisasi	Pengalaman sebagai MD/pakar bidang
Pn. Norfishah Bt Shariff	Penolong Kanan Pendidikan Khas	Sekolah Kebangsaan Sungai Layar	14
Pn. Nor Hafizah Bt Ahmad Hadi	Guru Khas Spesifik Disleksia	Sekolah Kebangsaan Jalan Datuk Kumbang	10
Pn. Hanifa Bibi Shafi Mohamad	Guru Khas Spesifik Disleksia	Sekolah Kebangsaan Jalan Datuk Kumbang	15
Dr Yusni Bt Yusuff	Pakar Perunding Psikiatri (Kanak-kanak dan remaja)	Jabatan Psikiatri & Kesihatan Mental, Hospital Sultanah Bahiyah	16

## Lampiran E

### Instrumen penilaian pakar

Tuan/Puan

#### PENILAIAN PAKAR MODEL TULISAN TANGAN MURID-MURID DISGRAFIA BERBANTU TEKNOLOGI (DCHM)

Saya Norsafinar Rahim, pelajar PhD dalam bidang Teknologi Maklumat di Universiti Utara Malaysia. Saya menjalankan kajian berkaitan dengan masalah pembelajaran spesifik iaitu memfokuskan kepada kesukaran menulis dikalangan murid-murid yang diklasifikasikan sebagai disgrafia. Kajian PhD saya bermatlamat untuk menghasilkan model tulisan tangan berbantuan teknologi khusus kepada murid disgrafia berdasarkan kelemahan-kelemahan yang telah dikenalpasti.

Penentuan model adalah salah satu sub-objektif yang perlu dicapai dalam kajian ini. Soalan yang diajukan adalah berdasarkan kriteria pengesahan komponen model seperti yang terdapat dalam borang penilaian. Diharapkan agar Tuan/Puan sudi meluangkan masa untuk menjawab soalan yang diberikan. Kerjasama yang diberikan sangat dihargai. Sebarang pertanyaan boleh hubungi saya di alamat e-mel (norsafinar@yahoo.com).

Terima kasih atas bantuan dan masa yang diluangkan.

## A. MAKLUMAT PERIBADI

Nama : .....

Jawatan : .....

Sekolah/  
Organisasi : .....

Pengalaman  
dalam :  
bidang : .....

## B. PENILAIAN TERHADAP KESELURUHAN MODEL TULISAN TANGAN BERBANTU TEKNOLOGI (DCHM)

Bil	Kriteria penilaian	Sangat tidak setuju (1)	Tidak setuju (2)	Tidak pasti (3)	Setuju (4)	Sangat setuju (5)
1.	DCHM ini senang difahami.					
2.	Turutan dan proses yang terlibat adalah jelas.					
3.	Komponen DCHM yang dicadangkan bersesuaian dan perlu bagi meningkatkan kemahiran tulisan tangan murid disgrafia.					
4.	Model ini memberi pemahaman yang jelas keperluan pembelajaran tulisan tangan melibatkan kemahiran transkripsi hinggalah ke proses kognitif.					
5.	Sokongan ICT menunjukkan hubung kait yang jelas dengan parameter keperluan proses pembentukan huruf bagi pengukuhan di peringkat asas penulisan murid.					

6.	DCHM dapat diterjemahkan kepada pembangunan aplikasi tulisan tangan murid disgrafia dan memberi impak yang positif.					
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**C. PENILAIAN KOMPONEN PEROSSES PEMBENTUKAN HURUF DAN SOKONGAN TEKNOLOGI DCHM**

Bil	Kriteria penilaian	Sangat tidak setuju (1)	Tidak setuju (2)	Tidak pasti (3)	Setuju (4)	Sangat setuju (5)
7.	Animasi pembentukan huruf, surihan dan pengulangan dapat menyokong kemahiran asas menulis diperingkat transkripsi (pengukuhan terhadap visualisasi dan kawalan motor).					
8.	Komponen kawalan dan maklum balas merupakan ciri unik dalam model bagi pengkhususan laluan aktiviti murid dan rujukan segera terhadap kesalahan dilakukan. Ia dapat memberi kesan yang positif terhadap latihan sendiri dan penilaian prestasi pembelajaran setiap murid.					
9.	Pengukuhan kemahiran peringkat rendah melalui sokongan ICT dapat melancarkan kemahiran peringkat tinggi bagi mencapai automatisiti dan penghasilan huruf dari memori dalam tempoh masa yang singkat.					
10.	DCHM berbantuan teknologi yang					



<p>memfokuskan kepada visualisasi, imaginasi dan automatisiti dapat memberi kesan yang positif terhadap kecekapan menulis murid disgrafia secara keseluruhannya.</p>					
--	--	--	--	--	--

Adakah terdapat komponen lain yang dirasakan perlu dimasukkan dalam model DCHM ini untuk meningkatkan kemahiran tulisan tangan murid disgrafia?



Komen/cadangan secara keseluruhan

Terima kasih.

## Lampiran F

### Instrument Ujian Senarai Semak Jordan

1	Sukar untuk membuat pusingan pensel ke arah yang betul apabila berada di sudut	
2	Menambah bentuk garisan di setiap penghujung atau awalan garisan	
3	Kerap memadam tulisan (pindaan)	
4	Mencuba beberapa kali untuk menyalin dengan betul	
5	Menyerah dan tidak berusaha membetulkan kesilapan dalam menyalin ayat selepas 3 kali cubaan	
6	Mengubah kertas pada sudut yang berbeza untuk menyalin	
7	Memusingkan badan dalam arah yang berbeza untuk melihat pensel semasa menyalin	
8	Kerap memusingkan kepala untuk melihat pada sudut yang berbeza	
9	Melihat tulisan dalam keadaan yang dekat	
10	Genggaman dan tekanan yang kuat pada pensel semasa menulis	
11	Latihan pertama iaitu menulis huruf, hari dan bulan, tulisan sukar dibaca	
12	Kelemahan dalam jarak: huruf dan perkataan terlalu dekat atau terlalu jauh	
13	Memerlukan ruang yang lebih besar daripada yang disediakan di lembaran kerja	
14	Menunjukkan tanda kecewa dengan gambar dan tulisan tangan	
15	Bercakap dengan diri sendiri atau berbisik semasa menulis atau melukis	
16	Kerap berhenti seketika semasa menulis	
17	Enggan enggan melakukan sesuatu aktiviti ini	
18	Melakar garisan yang samar daripada melakukan garisan yang tetap	
19	Huruf yang disalin tidak sekata, lengkungan yang teruk atau perkadaran huruf yang lemah	
20	Bulatan dan garisan yang dihasilkan bertentangan dari arah yang betul	

## Lampiran G

### Handwriting Legibility Scale (HLS) (Barnett, Prunty & Rosenblum, 2017)

Nama murid: \_\_\_\_\_

Jantina : \_\_\_\_\_ Umur : \_\_\_\_\_ Tarikh: \_\_\_\_\_

Nama guru : \_\_\_\_\_

Sekolah : \_\_\_\_\_

Pengalaman mengajar murid (dalam kajian): \_\_\_\_\_

1. **Kebolehbacaan global** – Penilaian keseluruhan kebolehbacaan global sampel tulisan tangan berdasarkan bacaan teks pertama anda.



- 1 - Pada bacaan pertama, hanya 10% perkataan yang dapat dibaca  
5 - Pada bacaan pertama, semua perkataan dapat dibaca

2. **Usaha diperlukan untuk membaca tulisan** - Penilaian keseluruhan sejauh mana tulisan itu dapat dibaca bagi percubaan pertama membacanya



- 1 - Pada bacaan pertama, usaha yang lebih mengenalpasti huruf serta ayat  
5 - Pada bacaan pertama, tiada usaha yang lebih diperlukan

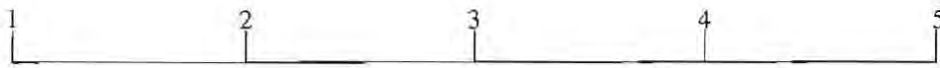
3. **Susun atur tulisan pada lembaran kerja** - Penilaian keseluruhan susun atur penulisan. Tulisan tangan yang tersusun secara konsisten, dengan setiap huruf diposisikan dengan tepat dalam hubungan antara satu sama lain. Ini termasuklah penggunaan margin, jarak di antara huruf dan perkataan, kedudukan huruf dan perkataan di atas garisan bertulis



- 1 – susun atur tulisan yang dihasilkan adalah sangat teruk.  
5 – susun atur kemas dan mudah dibaca.

Fokus pada huruf / perkataan individu dengan lebih terperinci:

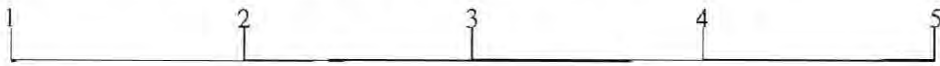
4. **Kualiti pembentukan huruf** – Penilaian pembentukan setiap huruf secara terperinci. Kualiti penghasilan bentuk huruf diteliti berdasarkan kepada enam elemen kebolehbacaan iaitu formasi huruf, saiz dan perkadaran, jarak, kemiringan, dan penjajaran



1 – pembentukan huruf adalah sangat lemah

5 – pembentukan huruf mengikut tatacara pembentukan yang betul

5. **Pindaan semasa menulis** – Penilaian keseluruhan percubaan yang dilakukan untuk membetulkan kerja bertulis seperti penambahan strok, menyurih semula, menulis semula dan memangkah tulisan yang telah dihasilkan.



1 – Banyak penambahan strok dilakukan, banyak surihan semula dilakukan atau banyak memangkah tulisan yang dihasilkan.

5 – Tiada penambahan strok dilakukan, banyak surihan semula dilakukan atau banyak memangkah tulisan yang dihasilkan.

Skala likert.

- |                 |
|-----------------|
| 1- Sangat lemah |
| 2- Lemah        |
| 3- Sederhana    |
| 4- Baik         |
| 5- Sangat baik  |

## Lampiran H

### Senarai penerbitan

- Rahim, N., & Jamaludin, Z. (2019). Write-Rite: Enhancing handwriting proficiency of children with dysgraphia. *Journal of Information and Communication Technology*, 18(3), 253-271.
- Rahim, N., Husni, H., & Jamaludin, Z. (2020). Technology-assisted Dysgraphic Children Handwriting Model. *Malaysian Journal of Information and Communication Technology*, 5(1), 49-59



**UUM**  
Universiti Utara Malaysia

## Lampiran I

### Senarai anugerah

Tarikh	Penyelidik	Tajuk produk	Pameran	Pingat
7-8 August, 2018	Norsafinar Rahim Prof. Dr. Zulikha binti Jamaludin	<i>Write-rite: Teaching handwriting to children with Dysgraphia</i>	The 2nd International Indonesia-Malaysia-Thailand symposium on innovation and creativity (iMIT SIC 2018). Universitas Riau, Pekanbaru. Indonesia.	Emas
16 November 2016	Norsafinar Rahim Prof. Dr. Zulikha binti Jamaludin	<i>Write-rite: Dysgraphic friendly tool for writing</i>	Pertandingan Reka Cipta dan Inovasi Institusi Pengajian Tinggi Swasta 2016 (PERINTIS 2016). Dewan Seri Sarjana UniTEN	Gangsa
28 Julai 2016	Norsafinar Rahim Prof. Dr. Zulikha binti Jamaludin	<i>Write-rite: Dysgraphic friendly tool for writing</i>	Pertandingan Reka Cipta dan Inovasi Institusi Pengajian Tinggi Swasta 2016 (PERINTIS 2016)	Emas
19 Mei 2016	Norsafinar Rahim Prof. Dr. Zulikha binti Jamaludin	<i>Write-rite: engaging dysgraphic children with ABC</i>	<i>Innovation and invention in education competition 2016.</i> Universiti pendidikan Sultan Idris.	Emas Inovasi terbaik
12-14 May, 2016	Norsafinar Rahim Prof. Dr. Zulikha binti Jamaludin	<i>Write-rite: Dysgraphic children writing assistance</i>	<i>27th international invention, innovation &amp; technology exhibition 2016 (ITEX 2016)</i>	Perak