INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PROGRESSIVE EDUCATION & DEVELOPMENT

OPEN ACCESS JOURNAL

Vol 11, Issue 2, (2022) E-ISSN: 2226-6348

The Content Validation of Malaysian Dyslexia Accommodating Screening Test (MYDAST) Through the Application of Fuzzy Delphi Method (FDM)

Suhana Ahmad
Institute of Teacher Education Dato' Razali Ismail Campus, Malaysia

Manisah Mohd Ali
Faculty of Education, Universiti Kebangsaan Malaysia Malaysia

Khazriyati Salehuddin
Faculty of Social Science and Humanities, Universiti Kebangsaan Malaysia

To Link this Article: http://dx.doi.org/10.6007/IJARPED/v11-i2/13161 DOI:10.6007/IJARPED/v11-i2/13161

Published Online: 12 April 2022

Abstract

This study aims to examine the content validity of malaysian dyslexia accommodating screening test (mydast) which was developed for english language teachers to identify dyslexia symptoms among their pupils. Fuzzy delphi method by Murray, Pipino, & Gigch (1985) was applied in the process of validation. This study used the survey design with a printed questionnaire distributed to 15 experts in related field selected through purposive sampling technique. Eight of them were professional experts at public universities and another seven were lay experts from various related professions such as clinical psychologist, english language teachers, and teachers of pupils with dyslexia. 230 items from 15 constructs were validated based on phonological processing deficit hypothesis (Snowling, 1998). The findings show that expert consensus on the items in all the constructs are at a good level except for the *'rhyming', 'digit span'* and *'reverse digit span'* constructs together with 45 items that must be omitted from mydast. Also, it was found that 24 items must be revised. The overall findings of the experts' consensus agreement exceed 75%, the overall value of the threshold (d) < 0.2 and α-cut value exceeds 0.5. This suggests that mydast could be promoted as a psychometric test to identify dyslexia symptoms among pupils by english language teachers.

Keywords: Content Validation, Dyslexia Screening Test, Fuzzy Delphi Method, ESL, Primary School Pupils

Introduction

Measuring and reporting the content validity of an instrument is one vital aspect in any research. Content validity is the first type of validity that needs to be measured when a new

instrument is developed, especially for researchers who need high quality measurement value. It gives confidence to researchers and readers about the psychometric quality of the instrument (Yaghmaei, 2003). Creswell (2014) describes content validity as an element that reflects whether or not the variables involved were successfully defined. Content validity can be defined as the extent to which an instrument measures the scope of the intended content (Cohen & Swerdlik, 2005). It validates each item in the subtest that represents the construct to be measured (Miller et al., 2011).

Content validity is guaranteed by three sources; literature review, representation of relevant population in the sampling, and experts' judgement (Matore etal., 2017). Experts' judgement and opinions must include the construct measurement and the content of the test while at the same time they need to decide whether the content is sufficient to represent the construct or variable under study. It is also crucial that the expert panel provides the researchers with constructive feedbacks on the quality of the instrument being developed for improvement purposes. Creswell (2014) emphasizes that the proof of content validity can be obtained from empirical evidence as well as experts in the field judgment. Therefore, for this study, the content validation process was carried out through the judgement of an expert panel to assess the items developed under all subtests in this instrument.

Problem Statement

Dyslexia is a very common learning disability. It is estimated that about ten percent of the world's population has dyslexia (Marshall, 2016). The inability to identify which child is having this problem results in teachers and parents having problems in help them to learn effectively. Therefore, it is important for teachers to have specific instruments to identify the symptoms of dyslexia in their classrooms.

Pupils with dyslexia mostly learn reading skills in English language in mainstream classrooms, along with their peers. As most teachers need to manage a big class size, this is not a conducive learning environment for pupils with dyslexia who ideally need one-to-one instruction (Ahmad et al., 2018). Many studies have shown that pupils with dyslexia should be taught effectively using multisensory plus phonics methods (International Dyslexia Association, 2017; Subramaniam et al., 2013). Typical strategies in teaching reading would not help them much. Thus, English language teachers need a dyslexia reading test in English language to assist them in identifying dyslexia in their classrooms before they could really provide specific intervention to pupils at risk of dyslexia.

A test battery named Malaysian Dyslexia Accommodating Screening Test (MYDAST) which is based on Phonological Processing Deficit Hypothesis, Cerebellar Processing Deficit Hypothesis, and Krashen Second Language Acquisition Input Hypothesis has been recently developed. The instrument development also considered several dyslexia identification models and Coaley (2010) Test Construction Model. This instrument encompasses Stimulus Booklet 1, Stimulus Booklet 2, Individual Score Record Form, Answer Booklet, Manual and a CD that contains audio clips for Oral Comprehension test. Altogether, this instrument consists of fifteen subtests which is aimed at identifying dyslexia symptoms among Malaysian Year 2 pupils who learn English as a second language (ESL). Thus, this paper aims to discuss the content validation process of MYDAST using the Fuzzy Delphi Method.

Research Objectives and Research Questions

The objective of this study is to obtain expert consensus on the development of MYDAST. Specifically, this study sought to examine (i) the main components of MYDAST, (ii) the

elements of MYDAST and (iii) the sequence of the elements in the main components of MYDAST for primary school pupils based on experts' agreement. Based on this objective, three research questions were formed:

1. What are the main components of MYDAST based on experts' agreement?
2. What are the items in the main components of MYDAST based on experts' agreement?
3. What is the sequence of the items in the main components of MYDAST based on experts' agreement?

Literature Review

This section will look at the literature related to history of Fuzzy Delphi Method, its elements and fulfilment criteria as well as its application in education research.

Fuzzy Delphi Method (FDM)

Fuzzy Delphi Method is a research technique introduced by Murray et al. (1985) by combining Delphi technique and fuzzy set theory. Delphi technique is a research technique introduced by Olaf Holmer and Norman Dalkey, which has been used widely to get expert's opinions via surveys (Manakandan et al., 2017). Basically, Delphi technique is a research technique to obtain data through a structured procedure based on a panel of experts' consensus (Yousuf, 2007). On the other hand, Fuzzy set theory was introduced by Lotfi A. Zadeh in the year 1965 as an extension from Classic Set Theory in which each element in a set is assessed based on Binary set (Yes or No) (Gottwald). However, the use of Delphi technique may take a few cycles to reach an acceptable percentage of expert consensus and can be time consuming (Abd Razak et al., 2018; Jamil et al., 2017). Thus, to solve this problem, the fusion of Delphi technique and Fuzzy Set Theory by Murray et al., (1985) which results in Fuzzy Delphi Method (Ridhuan, Siraj, Hussin, Noh, & Arifin, 2014) have been used to overcome the shortcomings of the two methods

It is very important for researchers who want to use Fuzzy Delphi Method to know that there are two main things; Triangular Fuzzy Numbers and Defuzzification Process. Triangular Fuzzy Numbers refers to the average value of fuzzy number which are *m1, m2* and *m3*. They are usually represented as m^1, m^2, m^3. M^1 refers to the smallest value, meanwhile m^2 refers to the most plausible value, and m^3 shows the maximum value. Those three values in the Triangular Fuzzy Numbers is represented by Figure 1 which shows mean triangle graph versus triangular value.

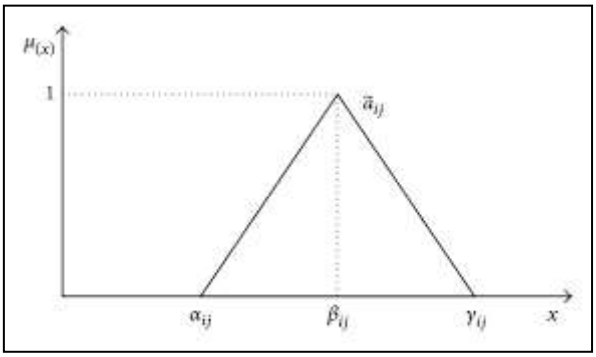

Figure 1. Triangle graph versus triangular value.

The Defuzzification Process, on the other hand, is a process to determine the priority or ranking of the construct and sub-construct. The purpose of this process is to assist the researchers to see the importance and level among the constructs and sub-constructs that

are needed. The process of determining the ranking will reflect the data based on priority, which is based on experts' consensus who are acting as the respondents of the research (Jamil et al., 2017; Manakandan et al., 2017). The formula for the calculation is as below:

$$d(m,n) = \sqrt{\frac{1}{3}[(m1 - n1)^2 + (m^2 - n^2)^2 + (m^3 - n^3)^2]}$$

For each item to be accepted, it must fulfil at least one of the three criteria of Fuzzy Delphi Method which are first, the item must obtain threshold value (d) $\leq$ 0.2, second, the percentage of the expert panel's consensus for each item must exceeds 75%, and third, the defuzzification value exceeds the a-cut value= 0.5. Therefore, these criteria will be examined for each item in all the fifteen constructs.

The Rationale of Applying Fuzzy Delphi Method

The application of Fuzzy Delphi Method was used in this research because it is time and cost efficient in handling MYDAST in comparison to the common Delphi technique. The latter requires expert panel to gather at one particular location in order to give their opinions regarding the content of a subject (Jamil et al., 2017). It saves the experts from any hustle and instead provides them more time to concentrate on the real task of examining the content. In contrast, through Fuzzy Delphi Method, the experts' responses were collected via mails, emails, and/or face to face meetings at their convenience. Another benefit of Fuzzy Delphi Method is that the risk of biasness can be diminished by safeguarding anonymity while at the same time welcoming the opinion of diverse perspectives among the experts (Manakandan et al., 2017). This guarantees that the experts' responses are totally independent, and the fear of being judged by others, which usually exists in any common meetings or group discussions, is almost none.

Previous Research in Education with Fuzzy Delphi Method Application

Many previous research in education field have applied Fuzzy Delphi Method in validating the content of their instruments, modules as well as guidelines. The validation process is critical to ensure the validity and reliability of the developed products. For example, Morales, Montes, & Zerme (2018) applied Fuzzy Delphi Method to validate a questionnaire in Blended Learning by considering the fuzzy linguistic information as well. On the other hand, Abd Razak et al (2018) validated an Arabic Language for Specific Purposes Course Content using the same method and got fifteen experts who were selected as a panel involved in viewing the content using a questionnaire. Another study focusing on developing an Integrated Science Process Skills instrument applied Fuzzy Delphi Method (Karim et al., 2017) to obtain experts' consensus on the items in the instrument. Apart from these studies, works on developing teaching module could also incorporate the use of Fuzzy Delphi Method to validate the module content such; one example is the work of Mohd et al (2018) on Malay Poem. The Malay Poem teaching module was developed to improve secondary school students' skills in writing poem based on the meaning of Al-Quran verses. All these previous studies show that Fuzzy Delphi Method is versatile in the sense that it could be applied in the validation process of many types of content-based products regardless of the areas under study - language, science, religion, etc.

Methodology

The instrument used in this study is the Malaysian Dyslexia Accommodating Screening Test (MYDAST) which was developed by the researcher. This instrument consists of 15 subtests that measure various aspects of dyslexia screening such as phonological awareness, phonological memory, letter naming ability, word reading, non-word reading, spelling, reading comprehension, oral comprehension, reading aloud and rapid automatized naming. An Expert Validation Form is prepared for the experts to rate their opinions towards the content of MYDAST by circling a number out of scale 1 to 7 (*7=Totally Agree, 1=Totally Disagree*). Each expert was given a duration of one month to evaluate the instrument set.

In the first phase of this study, an extensive literature search on dyslexia identification among primary schools' pupils was conducted. Up to this day, many research have been carried out on dyslexia identification in many countries such as in Africa (Ogunsola, 2018), Malaysia (Devaraj, 2004), Poland (Lockiewicz & Jaskulska, 2016), and Norway (Helland & Kaasa, 2005), to name a few. Some of these studies focus on specific tests and instruments for dyslexia identification (Abu Zarim, 2016) while others developed specific games (Abdul Rahman et al., 2005), systems and assistive technologies (Balakrishnan et al., 2015) for pupils with dyslexia. In the current study, 15 professional experts and lay experts from various related backgrounds were gathered to validate this instrument. The experts were selected through non-random purposive sampling method that fulfils the criteria determined by the researchers; (i) they have more than 10 years' experience in their respective fields, and (ii) they are from specific fields related to the instrument being developed. When all the experts had agreed to be involved in this research, the second phase of this research, that is the validation of this instrument using Fuzzy Delphi Method, took place. It is a content validation method used in research to obtain experts' consensus on the subject under study (Jamil et al., 2017). For that purpose, the researchers came up with a list of panel experts to examine and comment on the content, procedures, and lay out of the instrument. The category and number of experts are summarised in table 1 below:

Table 1
Category and Number of Experts

Experts	Number
Special Education Teacher (Dyslexia)	2
Dyslexia Association Malaysia Staff	1
Lecturer (Dyslexia and Malay Language)	1
Lecturer (Literacy Learning)	1
Lecturer (Measurement and Evaluation)	3
Lecturer (TESL)	1
Lecturer (Special Education)	1
English Language Teacher	2
Clinical Psychologist	1
Child Developmental Psychologist	1
Special Education Department (Ministry of Education) Staff	1
TOTAL	**15**

The experts were first contacted through emails and a formal letter was sent to them later for their consent to be one of the experts in the panel. Once they agreed to validate this instrument, appointments were set through emails or phone calls for a face-to-face briefing

at different locations and different dates based on the availability of the experts. During the briefing, the instrument set, an appointment letter, an executive summary of the instrument and an expert validation form were given to them. The experts were briefed one by one on the research objectives, procedures to fill in the expert validation form as well as the correct usage of the instrument set. Each expert was also explained that they were expected to mention their level of agreement for each item in the instrument, whether they *Totally Agree, Strongly Agree, Agree, Quite Agree, Neutral Disagree, Disagree,* or *Strongly Disagree* with each item in the instrument. The score of experts' agreements on the 230 items-indicators were then converted into triangular fuzzy numbers based on the experts' responses, as shown in table 2:

Table 2
Category for the agreement of items-indicators

Category	**Likert scale**	**Fuzzy scale**
Totally Disagree	1	(0.0, 0.0, 0.1)
Strongly Disagree	2	(0.0, 0.1, 0.3)
Disagree	3	(0.1, 0.3, 0.5)
Moderately Agree	4	(0.3, 0.5, 0.7)
Agree	5	(0.5, 0.7, 0.9)
Strongly Agree	6	(0.7, 0.9, 1.0)
Totally Agree	7	(0.9, 1.0, 1.0)

All experts were given one month to examine and validate the instrument. One week before the duration ends, an email was sent to them, reminding them about the deadline. Once the validation forms were collected from all the 15 experts, the data from the Likert scale were transformed into Fuzzy score number and were analysed using Microsoft Excel Software version 2013. The findings from the data analysis were used to improve the items of the instrument before it can be pilot tested. A complete summary of MYDAST content validation process using Fuzzy Delphi Method is illustrated in figure 2 below:

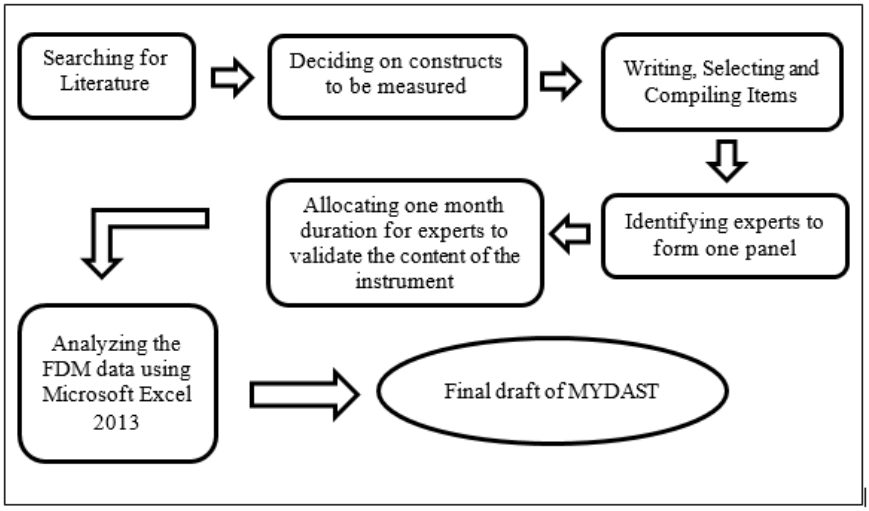

Figure 2: MYDAST Content Validation Process using Fuzzy Delphi Method

Result and Discussion

The summary of findings on the experts' consensus agreement based on the constructs of MYDAST is presented in table 3 until table 18.

Letter Naming

Letter Naming refers to the task that involves naming letters in alphabet, and this can be very challenging to some pupils who experience dyslexia. The table 5.1 below illustrates the result of Fuzzy Delphi Method for the construct *Letter Naming:*

Table 3
Findings on the items in the Letter Naming construct

No	Item / Element	Triangular Fuzzy Numbers		Defuzzification Process				Experts' Agreement Consensus	Accepted Element	Ranking
		Threshold Value, d	Percentage of Experts' Agreement Consensus, %	m1	m2	m3	Fuzzy Score (A)			
1	x	0.315	86.7%	0.660	0.800	0.887	0.782	ACCEPTED	0.782	20
2	z	0.228	93.3%	0.720	0.860	0.933	0.838	ACCEPTED	0.838	8
3	k	0.392	26.7%	0.633	0.760	0.840	0.744	REJECTED	0.840	6
4	p	0.181	93.33%	0.780	0.907	0.960	0.882	ACCEPTED	0.882	3
5	s	0.354	80.00%	0.660	0.787	0.867	0.771	ACCEPTED	0.771	21
6	e	0.305	80.00%	0.680	0.813	0.893	0.796	ACCEPTED	0.796	18
7	q	0.304	86.67%	0.707	0.833	0.900	0.813	ACCEPTED	0.813	15
8	g	0.247	93.33%	0.720	0.853	0.927	0.833	ACCEPTED	0.833	9
9	b	0.153	100.00%	0.793	0.920	0.973	0.896	ACCEPTED	0.896	1
10	a	0.397	20.00%	0.647	0.767	0.840	0.751	REJECTED	0.751	22
11	d	0.153	100.00%	0.793	0.920	0.973	0.896	ACCEPTED	0.896	1
12	m	0.200	93.33%	0.753	0.887	0.953	0.864	ACCEPTED	0.864	3
13	w	0.277	86.67%	0.720	0.847	0.913	0.827	ACCEPTED	0.827	12
14	n	0.174	100.00%	0.767	0.900	0.967	0.878	ACCEPTED	0.878	2
15	u	0.251	93.33%	0.733	0.860	0.927	0.840	ACCEPTED	0.840	6

16	i	0.304	86.67%	0.707	0.833	0.900	0.813	ACCEPTED	0.813	15
17	j	0.277	86.67%	0.720	0.847	0.913	0.827	ACCEPTED	0.827	12
18	f	0.304	86.67%	0.707	0.833	0.900	0.813	ACCEPTED	0.813	15
19	t	0.397	20.00%	0.647	0.767	0.840	0.751	REJECTED	0.751	22
20	o	0.307	86.67%	0.680	0.813	0.893	0.796	ACCEPTED	0.796	18
21	c	0.247	93.33%	0.720	0.853	0.927	0.833	ACCEPTED	0.833	9
22	l	0.252	93.33%	0.693	0.833	0.920	0.816	ACCEPTED	0.816	14
23	h	0.247	93.33%	0.720	0.853	0.927	0.833	ACCEPTED	0.833	9

Based on table 3, all items in the *Letter Naming* construct obtained threshold value (d) $\leq$ 0.2, except for item number 1, 3, 5, 6, 7, 10,16,18,19 and 20. The percentage of the experts' panel's consensus for each item exceeds 75% except for item 3, 10 and 20. The defuzzification value for each item exceeds the a-cut value= 0.5. By examining the comments given by the experts in the Expert Validation Form during the validation phase, the causes of the disagreement were identified. Item 3 should not be presented as a practice item while item 4 should be presented using Century Gothic font instead of Comic Sans. On the other hand, item 19 failed to obtain agreement from the expert panel due to the shape of letter '*t*' which may confuse pupils who are mostly taught to write it as 't'. This shows that most items analysed in this construct have obtained a consensus of agreement from the expert panel except for the three items mentioned. All the approved items can later be used to measure pupils' ability in identifying letters and naming them correctly, while the four items will be revised. Table 5.1 also shows that item 9, 11 and 14 obtained 100% experts' panel's consensus of agreement. This means letter *b, d* and *n* must be included in the assessment of letter naming among pupils to identify symptoms of dyslexia.

Blending

Blending can be defined as a test to measure pupil's ability to combine individual phonemes into one word. Using the same analysis procedures, items in *Blending* construct were analysed. Table 4 below shows the analysis of items in the construct.

Table 4
Findings on the items in the Blending construct

No	Item / Element	Triangular Fuzzy Numbers		Defuzzification Process				Experts' Agreement Consensus	Accepted Element	Ranking
		Threshold Value, d	Percentage of Experts' Agreeme	m1	m2	m3	Fuzzy Scor			

			nt Consensus, %				e (A)			
1	is	0.357	33.3%	0.593	0.733	0.840	0.722	REJECTED	0.722	15
2	get	0.185	93.3%	0.713	0.867	0.953	0.844	ACCEPTED	0.844	10
3	mop	0.160	100.0%	0.727	0.880	0.967	0.858	ACCEPTED	0.858	4
4	mat	0.148	100.00%	0.753	0.900	0.973	0.876	ACCEPTED	0.876	1
5	hot	0.148	100.00%	0.753	0.900	0.973	0.876	ACCEPTED	0.876	1
6	pin	0.160	100.00%	0.727	0.880	0.967	0.858	ACCEPTED	0.858	4
7	duck	0.185	93.33%	0.713	0.867	0.953	0.844	ACCEPTED	0.844	10
8	red	0.185	93.33%	0.713	0.867	0.953	0.844	ACCEPTED	0.844	10
9	sit	0.175	100.00%	0.713	0.867	0.960	0.847	ACCEPTED	0.847	9
10	cool	0.136	100.00%	0.727	0.887	0.973	0.862	ACCEPTED	0.862	3
11	tree	0.160	100.00%	0.727	0.880	0.967	0.858	ACCEPTED	0.858	4
12	sing	0.215	86.67%	0.673	0.833	0.933	0.813	ACCEPTED	0.813	14
13	peach	0.169	93.33%	0.727	0.880	0.960	0.856	ACCEPTED	0.856	8
14	arm	0.205	93.33%	0.713	0.860	0.947	0.840	ACCEPTED	0.840	13
15	jump	0.160	100.00%	0.727	0.880	0.967	0.858	ACCEPTED	0.858	4

Based on table 4, all items in the Blending construct obtained threshold value (d) $\leq$ 0.2, except for item number 1. The percentage of the expert panel's consensus for each item exceeds 75% except for item 1. The defuzzification value for all item exceeds the a-cut value= 0.5. The comments given by the experts in the Expert Validation Form reflects the causes of the disagreement. Item 1 is a sight word, thus, it should not be used in this subtest and should be replaced with a CVC-word which consists of three letters. Other items were all accepted by the expert panel. However, based on the written comments by the experts in the Expert Validation Form, it is realised that it is more suitable to use items that do not contain diphthong or diagraph for this subtest. For instance, item 7=*duck* and item 13=*peach* are the examples of diagraphs. Therefore, these three items (item 1,7 and 13) will be replaced with better words. Other items in this construct will be retained.

Segmenting

Segmenting is a construct or task in MYDAST that requires pupils to separate the sounds in CVC words. Table 5 below shows the items in the Segmenting construct

Table 5
Findings on the items in the Segmenting construct

No	Item / Element	Triangular Fuzzy Numbers		Defuzzification Process				Experts' Agreement Consensus	Accepted Element	Ranking
		Threshold Value, d	Percentage of Experts' Agreement Consensus, %	m1	m2	m3	Fuzzy Score (A)			
1	bat	0.220	86.7%	0.633	0.793	0.913	0.780	ACCEPTED	0.780	5
2	big	0.220	86.7%	0.633	0.793	0.913	0.780	ACCEPTED	0.780	5
3	fish	0.272	46.7%	0.600	0.760	0.880	0.747	REJECTED	0.747	15
4	lip	0.223	86.67%	0.647	0.807	0.920	0.791	ACCEPTED	0.791	1
5	pot	0.223	86.67%	0.647	0.807	0.920	0.791	ACCEPTED	0.791	1
6	ten	0.237	80.00%	0.620	0.780	0.900	0.767	ACCEPTED	0.767	11
7	rat	0.223	86.67%	0.647	0.807	0.920	0.791	ACCEPTED	0.791	1
8	car	0.237	80.00%	0.620	0.780	0.900	0.767	ACCEPTED	0.767	11
9	put	0.220	86.67%	0.633	0.793	0.913	0.780	ACCEPTED	0.780	5
10	fan	0.241	80.00%	0.633	0.793	0.907	0.778	ACCEPTED	0.778	9
11	zip	0.237	80.00%	0.620	0.780	0.900	0.767	ACCEPTED	0.767	11
12	bus	0.237	80.00%	0.620	0.780	0.900	0.767	ACCEPTED	0.767	11
13	sit	0.220	86.67%	0.633	0.793	0.913	0.780	ACCEPTED	0.780	5
14	mat	0.223	86.67%	0.647	0.807	0.920	0.791	ACCEPTED	0.791	1
15	van	0.241	80.00%	0.633	0.793	0.907	0.778	ACCEPTED	0.778	9

Based on the Table 5.3, all items in the Segmenting construct obtained threshold value (d) $\leq$ 0.2. The percentage of the expert panel's consensus for each item exceeds 75% except for item 3 (*fish*) which is only 46.7%. The defuzzification value for each item exceeds the a-cut value= 0.5. By examining the comments given by the experts in the Expert Validation Form, the causes of the disagreement was identified. Item 3 (*fish*) should not be included in this construct because it contains diagraph which makes it challenging for pupils to segment the existing sounds in that particular word. All the approved items will be used to measure pupils'

ability in segmenting the sounds correctly while item 3 will be replaced with a more precise word. **Table 6. Findings on the items in the Sound Matching construct**

Table 6
Findings on the items in the Sound Matching construct

No	Item / Element	*Triangular Fuzzy Numbers*		*Defuzzification Process*				Experts' Agreement Consensus	Accepted Element	Ranking
		Threshold Value, d	Percentage of Experts' Agreement Consensus, %	m1	m2	m3	*Fuzzy Score (A)*			
1	/f/=sweet/fruit/circle	0.274	93.3%	0.680	0.813	0.900	0.798	ACCEPTED	0.947	1
2	/ch/=potato/chime/car	0.274	93.3%	0.707	0.833	0.907	0.816	ACCEPTED	0.816	2
3	/r/=rat/pear/balloon	0.274	93.3%	0.680	0.813	0.900	0.798	ACCEPTED	0.798	6
4	/t/=computer/toys/write	0.330	40.00%	0.620	0.753	0.853	0.742	REJECTED	0.742	11
5	/k/=king/boat/cap	0.269	93.33%	0.693	0.827	0.907	0.809	ACCEPTED	0.809	4
6	/n/=square/nine/papaya	0.269	93.33%	0.693	0.827	0.907	0.809	ACCEPTED	0.809	4
7	/g/=cake/hug/snake	0.342	86.67%	0.660	0.787	0.867	0.771	ACCEPTED	0.771	8
8	/w/=straw/fan/touch	0.466	26.67%	0.540	0.667	0.773	0.660	REJECTED	0.660	12
9	/l/=listen/ground/fifty	0.342	86.67%	0.660	0.787	0.867	0.771	ACCEPTED	0.771	8
10	/p/=open/watch/top	0.252	93.33%	0.693	0.833	0.920	0.816	ACCEPTED	0.816	2
11	/ng/=clever/strong/lizard	0.348	86.67%	0.673	0.793	0.867	0.778	ACCEPTED	0.778	7
12	/l/=fingernail/robot/sorry	0.334	40.00%	0.633	0.767	0.860	0.753	REJECTED	0.753	10

Sound Matching

The next construct is Sound Matching. This task entails pupils to identify the first sound in six words and the last sound in another 6 words. Table 6 below shows the items in the Sound Matching construct.

Based on the Table 6, all items in the Sound Matching construct obtained threshold value (d) $\leq$ 0.2, except for item number 4, 7, 8, 9,11 and 12. The percentage of the expert panel's consensus for each item exceeds 75% except for item 4, 8 and 12. The defuzzification value for each item exceeds the a-cut value= 0.5. The comments given by the experts in the Expert Validation Form show the causes of the disagreement. Item 4 should be revised since all the three stimuli do not consist the same number of syllables. The word *computer* has 3 syllables while the word *toys* and *write* are monosyllable. Item 8 failed to obtain agreement from the expert panel due to the sound of letter '*w*' which is not clear in the pronunciation of the word straw. For item 12, the problem is with the stimulus *fingernail* which has 3 syllables while other two stimuli, namely, *robot* and *sorry*, only have two syllables. This shows that most items analysed in this construct have obtained a consensus of agreement from the expert panel except for the three items mentioned. All the approved items will be used to measure pupils' ability in matching sounds correctly while the three items will be revised.

Rhyming

Rhyming is a test to identify pupil's ability to hear similar final sound in two or more words. For each item in this subtest, pupils must listen to three words said out loud by the examiner

and identify the only word that does not rhyme. Table 5.5 below shows the items in the Rhyming construct

Table 7
Findings on the items in the Rhyming construct

No	Item / Element	Triangular Fuzzy Numbers		Defuzzification Process				Experts' Agreement Consensus	Accepted Element	Ranking
		Threshold Value, d	Percentage of Experts' Agreement Consensus, %	m1	m2	m3	Fuzzy Score (A)			
1	one, fun, long	0.327	46.7%	0.620	0.760	0.860	0.747	REJECTED	0.747	9
2	book, cat, rat	0.336	86.7%	0.647	0.780	0.867	0.764	ACCEPTED	0.764	1
3	glass, lamp, class	0.334	40.0%	0.633	0.767	0.860	0.753	REJECTED	0.753	6
4	bag, great, eight	0.334	40.00%	0.633	0.767	0.860	0.753	REJECTED	0.753	6
5	not, hot, desk	0.336	86.67%	0.647	0.780	0.867	0.764	ACCEPTED	0.764	1
6	tall, red, ball	0.336	86.67%	0.647	0.780	0.867	0.764	ACCEPTED	0.764	1
7	zoo, bike, blue	0.451	33.33%	0.533	0.660	0.767	0.653	REJECTED	0.653	15
8	rubber, apple, purple	0.387	40.00%	0.560	0.693	0.807	0.687	REJECTED	0.687	14
9	ugly, sugar, silly	0.322	46.67%	0.607	0.747	0.853	0.736	REJECTED	0.736	12
10	potato, tomato, onion	0.334	40.00%	0.633	0.767	0.860	0.753	REJECTED	0.753	6
11	grass, boat, coat	0.336	86.67%	0.647	0.780	0.867	0.764	ACCEPTED	0.764	1
12	monster, sister, coffee	0.329	46.67%	0.633	0.773	0.867	0.758	REJECTED	0.758	5
13	eleven, seven, teacher	0.349	40.00%	0.607	0.747	0.847	0.733	REJECTED	0.733	13
14	yummy, mummy, robot	0.356	33.33%	0.620	0.753	0.847	0.740	REJECTED	0.740	11
15	snake, cake, glue	0.327	46.67%	0.620	0.760	0.860	0.747	REJECTED	0.747	9

Based on Table 7, all items in the Rhyming construct did not obtain threshold value (d) $\leq$ 0.2. Out of all the 15 items, only item 2, 5, 6 and 11 exceed 75% of expert panel consensus. The defuzzification value for each item exceeds the a-cut value= 0.5. From the comments given by the experts in the Expert Validation Form, it is understood that experts believe this subtest is difficult for Year 2 pupils. Firstly, it is challenging for them in terms of understanding the instruction, and secondly, in terms of identifying the words that rhyme together. Some experts wrote in the comment section that the number of syllables in each stimulus is not standardised. This shows that most items analysed in this construct did not obtain a consensus of agreement from the expert panel except for the four items mentioned. Therefore, it is believed that it is not a good idea to include this subtest in this instrument, thus this construct will be discarded.

Non-word Reading

The next construct in MYDAST is Non-Word Reading. For this subtest, pupils are required to read out loud non-words. Table 5.6 below shows the items in the Non-word Reading construct

Table 8
Findings on the items in the Non-Word Reading construct

No	Item / Element	Triangular Fuzzy Numbers		Defuzzification Process				Experts' Agreement Consensus	Accepted Element	Ranking
		Threshold Value, d	Percentage of Experts' Agreement Consensus, %	m1	m2	m3	Fuzzy Score (A)			
1	um	0.258	93.3%	0.707	0.840	0.920	0.822	ACCEPTED	0.947	1
2	kib	0.258	93.3%	0.680	0.820	0.913	0.804	ACCEPTED	0.804	7
3	claz	0.258	93.3%	0.707	0.840	0.920	0.822	ACCEPTED	0.822	2
4	og	0.252	93.33%	0.693	0.833	0.920	0.816	ACCEPTED	0.816	5
5	co	0.258	93.33%	0.707	0.840	0.920	0.822	ACCEPTED	0.822	2
6	ga	0.280	86.67%	0.667	0.807	0.900	0.791	ACCEPTED	0.791	11
7	ek	0.258	93.33%	0.680	0.820	0.913	0.804	ACCEPTED	0.804	7
8	rop	0.272	86.67%	0.653	0.800	0.900	0.784	ACCEPTED	0.784	13
9	vev	0.252	93.33%	0.693	0.833	0.920	0.816	ACCEPTED	0.816	5
10	tib	0.258	93.33%	0.680	0.820	0.913	0.804	ACCEPTED	0.804	7
11	wat	0.258	93.33%	0.680	0.820	0.913	0.804	ACCEPTED	0.804	7
12	gyte	0.330	86.67%	0.673	0.800	0.880	0.784	ACCEPTED	0.784	13
13	cauv	0.342	33.33%	0.647	0.773	0.860	0.760	REJECTED	0.760	15
14	demb	0.280	86.67%	0.667	0.807	0.900	0.791	ACCEPTED	0.791	11
15	fusk	0.258	93.33%	0.707	0.840	0.920	0.822	ACCEPTED	0.822	2

Based on the table 5.6, all items in the Non-word Reading construct obtained threshold value (d) $\leq$ 0.2, except for item number 12 and 13. The percentage of the expert panel's consensus for each item exceeds 75% except for item 13, while the defuzzification value for each item exceeds the a-cut value= 0.5. The comments given by the experts in the Expert Validation Form during the validation phase reveal the causes of the disagreement. Some experts believed that item 13 (*cauv*) should not be included in this construct because it may not distinguish between pupils who are able to decode from those who have difficulties in decoding due to its spelling structure which is challenging. This shows that most items analysed in this construct have obtained a consensus of agreement from the expert panel except for item 13. Therefore, item 12 and 13 will be revised and replaced with better items.

Table 9
Findings on the items in the Syllable Detection construct

No	Item / Element	Triangular Fuzzy Numbers		Defuzzification Process				Experts' Agreement Consensus	Accepted Element	Ranking
		Threshold Value, d	Percentage of Experts' Agreement Consensus, %	m1	m2	m3	Fuzzy Score (A)			
1	three	0.300	86.7%	0.667	0.807	0.893	0.789	ACCEPTED	0.789	4
2	cupboard	0.307	86.7%	0.680	0.813	0.893	0.796	ACCEPTED	0.796	1
3	coconut	0.307	86.7%	0.680	0.813	0.893	0.796	ACCEPTED	0.796	1
4	rabbit	0.300	86.67%	0.667	0.807	0.893	0.789	ACCEPTED	0.789	4
5	pen	0.324	80.00%	0.640	0.780	0.873	0.764	ACCEPTED	0.764	14
6	banana	0.302	86.67%	0.653	0.793	0.887	0.778	ACCEPTED	0.778	9
7	egg	0.300	86.67%	0.667	0.807	0.893	0.789	ACCEPTED	0.789	4
8	elephant	0.307	86.67%	0.680	0.813	0.893	0.796	ACCEPTED	0.769	13
9	balloon	0.302	86.67%	0.653	0.793	0.887	0.778	ACCEPTED	0.778	9
10	crocodile	0.307	86.67%	0.680	0.813	0.893	0.796	ACCEPTED	0.796	1
11	strawberry	0.300	86.67%	0.667	0.807	0.893	0.789	ACCEPTED	0.789	4
12	orange	0.300	86.67%	0.667	0.807	0.893	0.789	ACCEPTED	0.789	4
13	bag	0.324	80.00%	0.640	0.780	0.873	0.764	ACCEPTED	0.764	14
14	desk	0.302	86.67%	0.653	0.793	0.887	0.778	ACCEPTED	0.778	9
15	purple	0.302	86.67%	0.653	0.793	0.887	0.778	ACCEPTED	0.778	9

Syllable Detection

Syllable detection is a subtest included in this test battery that assesses pupils' ability to identify the number of syllables. Ali (2005) used almost a similar task in her study named '*Syllabic Segmentation*' to assess pupils's phonological awareness. In this subtest, pupils were asked to clap their hand according to the syllables as they repeat the words said out loud by examiner. Table 5.7 below shows the items in the Syllable Detection construct.

Based on Table 9, all items in the Syllable Detection construct did not obtain threshold value (d) $\leq$ 0.2, however, the percentage of the expert panel's consensus for all items exceed 75%. For the construct and items to be accepted, at least one of the three criteria in Fuzzy Delphy Method must be fulfilled. Therefore, this construct and all the items can be included as a part of this instrument since they fulfill the second criteria.

Word Reading

Another subtest included in this test battery is Word Reading. It is a test that is commonly used to identify dyslexia early symptoms. Table 5.8 below shows the items in the Word Reading construct

Table 10
Findings on the items in the Word Reading construct

No	Item / Element	*Triangular Fuzzy Numbers*		*Defuzzification Process*				Experts' Agreement Consensus	Accepted Element	Ranking
		Threshold Value, d	Percentage of Experts' Agreement Consensus, %	m1	m2	m3	*Fuzzy Score (A)*			
1	toy	0.195	100.0%	0.713	0.860	0.953	0.842	ACCEPTED	0.842	4
2	baby	0.237	93.3%	0.687	0.833	0.927	0.816	ACCEPTED	0.816	8
3	butterfly	0.402	26.7%	0.593	0.727	0.820	0.713	REJECTED	0.713	14
4	go	0.205	93.33%	0.713	0.860	0.947	0.840	ACCEPTED	0.840	5
5	two	0.205	93.33%	0.713	0.860	0.947	0.840	ACCEPTED	0.840	5
6	jam	0.205	93.33%	0.713	0.860	0.947	0.840	ACCEPTED	0.840	5
7	soap	0.166	100.00%	0.740	0.887	0.967	0.864	ACCEPTED	0.864	1
8	under	0.182	100.00%	0.727	0.873	0.960	0.853	ACCEPTED	0.853	3
9	brother	0.166	100.00%	0.740	0.887	0.967	0.864	ACCEPTED	0.864	1
10	chilli	0.237	93.33%	0.687	0.833	0.927	0.816	ACCEPTED	0.816	8
11	coffee	0.292	40.00%	0.627	0.773	0.880	0.760	REJECTED	0.760	11
12	hibiscus	0.440	26.67%	0.547	0.680	0.787	0.671	REJECTED	0.671	15
13	battery	0.300	86.67%	0.667	0.807	0.893	0.789	ACCEPTED	0.789	10
14	lollipop	0.388	26.67%	0.620	0.747	0.833	0.733	REJECTED	0.733	12
15	pineapple	0.388	26.67%	0.620	0.747	0.833	0.733	REJECTED	0.733	12

Based on Table 10, all items in the Word Reading construct obtained threshold value (d) $\leq$ 0.2, except for item number 3, 12, 13, 14 and 15. The percentage of the expert panel's consensus for each item exceeds 75% except for item 3,11,12,14 and 15. The defuzzification value for each item exceeds the a-cut value= 0.5. By examining the comments given by the experts in the Expert Validation Form during the validation phase, the causes of the disagreement were identified. Item 3 should not be presented as a practice item because it is a long word and is quite difficult in comparison to other short words. On the other hand, '*hibiscus*', '*battery*', '*lollipop*' and '*pineapple*' are also considered by the experts as very challenging items for Year 2 pupils. This shows that most items analysed in this construct have obtained a consensus of agreement from the expert panel except for the five items mentioned. All the approved items will be used to measure pupils' ability in single word reading while the five items will be revised. Table 5.8 also shows that item 1, 7, 8 and 9 obtained 100% expert panel's consensus of agreement.

Spelling

Spelling is considered a challenging skill for foreign and second language learners of English because the ability to spell in English language comes with a lot of effort, predominantly when the English spelling system is known to be a multifaceted system, even among native speakers (Alipour, Salehuddin, & Stapa, 2019). Spelling is also included as a subtest in MYDAST since it is one dominant indicator in identifying dyslexia. Table 11 below shows the items in the Spelling construct.

Table 11
Findings on the items in the Spelling construct

No	Item / Element	Triangular Fuzzy Numbers		Defuzzification Process				Experts' Agreement Consensus	Accepted Element	Ranking
		Threshold Value, d	Percentage of Experts' Agreement Consensus, %	m1	m2	m3	Fuzzy Score (A)			
1	fat	0.252	93.3%	0.693	0.833	0.920	0.816	ACCEPTED	0.816	6
2	dog	0.166	100.0%	0.740	0.887	0.967	0.864	ACCEPTED	0.864	1
3	rubber	0.252	93.3%	0.693	0.833	0.920	0.816	ACCEPTED	0.816	6
4	see	0.205	93.33%	0.713	0.860	0.947	0.840	ACCEPTED	0.840	5
5	one	0.182	100.00%	0.727	0.873	0.960	0.853	ACCEPTED	0.853	2
6	cow	0.182	100.00%	0.727	0.873	0.960	0.853	ACCEPTED	0.853	2
7	write	0.262	86.67%	0.680	0.827	0.913	0.807	ACCEPTED	0.807	8
8	pencil	0.175	100.00%	0.713	0.867	0.960	0.847	ACCEPTED	0.847	4
9	circle	0.294	86.67%	0.653	0.800	0.893	0.782	ACCEPTED	0.782	10
10	sorry	0.251	86.67%	0.660	0.813	0.913	0.796	ACCEPTED	0.796	9
11	carrot	0.295	86.67%	0.640	0.787	0.887	0.771	ACCEPTED	0.771	11
12	beautiful	0.469	26.67%	0.507	0.640	0.753	0.633	REJECTED	0.633	14
13	seventeen	0.486	20.00%	0.533	0.660	0.760	0.651	REJECTED	0.651	12
14	vegetable	0.486	20.00%	0.533	0.660	0.760	0.651	REJECTED	0.651	12
15	favourite	0.504	20.00%	0.513	0.640	0.747	0.633	REJECTED	0.633	14

Based on Table 11, all items in the Spelling construct obtained threshold value (d) $\leq$ 0.2, except for item number 12, 13, 14 and 15. The percentage of the expert panel's consensus for each item exceeds 75% except for item 12, 13, 14 and 15. The defuzzification value for each item exceeds the a-cut value= 0.5. From the comments given by the experts in the Expert Validation Form during the validation phase, the causes of the disagreement were identified. The experts believed that those four items were of unsuitable length to be tested to Year Two pupils. This shows that most items analysed in this construct have obtained a consensus of

agreement from the expert panel except for the four items mentioned. All the approved items will be used to measure pupils' ability in spelling while the four items will be revised.

Reading Aloud

The difficulties in reading aloud sentences is also a good indicator to identify early symptom of dyslexia. Table 12 below shows the items in the Read Aloud construct:

Table 12

Findings on the items in the Read Aloud construct

No	Item / Element	*Triangular Fuzzy Numbers*		*Defuzzification Process*				Experts' Agreement Consensus	Accepted Element	Ranking
		Threshold Value, d	Percentage of Experts' Agreement Consensus, %	m1	m2	m3	*Fuzzy Score (A)*			
1	This	0.195	100.0%	0.713	0.860	0.953	0.842	ACCEPTED	0.842	1
2	is	0.216	93.3%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
3	my	0.216	93.3%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
4	bag	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
5	The	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
6	size	0.195	100.00%	0.713	0.860	0.953	0.842	ACCEPTED	0.842	1
7	is	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
8	small	0.195	100.00%	0.713	0.860	0.953	0.842	ACCEPTED	0.842	1
9	It	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
10	is	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
11	blue	0.195	100.00%	0.713	0.860	0.953	0.842	ACCEPTED	0.842	1
12	and	0.195	100.00%	0.713	0.860	0.953	0.842	ACCEPTED	0.842	1
13	orange	0.266	93.33%	0.653	0.793	0.893	0.780	ACCEPTED	0.780	27
14	I	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
15	put	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
16	my	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
17	books	0.195	100.00%	0.713	0.860	0.953	0.842	ACCEPTED	0.842	1
18	and	0.195	100.00%	0.713	0.860	0.953	0.842	ACCEPTED	0.842	1
19	pencils	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
20	in	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
21	it	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
22	I	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
23	bring	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
24	this	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
25	bag	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
26	to	0.216	93.33%	0.700	0.847	0.940	0.829	ACCEPTED	0.829	8
27	school	0.286	86.67%	0.640	0.780	0.880	0.767	ACCEPTED	0.767	28
28	everyday	0.266	93.33%	0.667	0.807	0.900	0.791	ACCEPTED	0.791	26

Based on Table 12, all items in the Read Aloud construct fulfill all the three criteria to be accepted based on Fuzzy Delphi Method. All these items can be used to measure pupils' ability to read aloud sentences.

Reading Comprehension

Reading Comprehension is a subtest in MYDAST that entails pupils to match simple sentences with pictures. For pupils with dyslexia, this task is even more challenging because it requires them to decode the words and make meaning at the same time. Table 13 shows the items in the Reading Comprehension construct.

Table 13

Findings on the items in the Reading Comprehension construct

No	Item / Element	Triangular Fuzzy Numbers		Defuzzification Process				Experts' Agreement Consensus	Accepted Element	Ranking
		Threshold Value, d	Percentage of Experts' Agreement Consensus, %	m1	m2	m3	Fuzzy Score (A)			
1	The baby is sleeping.	0.308	40.0%	0.627	0.767	0.867	0.753	REJECTED	0.753	11
2	My father drives a car.	0.311	86.7%	0.640	0.780	0.873	0.764	ACCEPTED	0.764	7
3	The bird is flying.	0.308	40.0%	0.627	0.767	0.867	0.753	REJECTED	0.753	11
4	The goat eats leaves.	0.311	86.67%	0.640	0.780	0.873	0.764	ACCEPTED	0.764	7
5	Rani plays badminton.	0.311	86.67%	0.640	0.780	0.873	0.764	ACCEPTED	0.764	7
6	Chong is jumping.	0.311	86.67%	0.640	0.780	0.873	0.764	ACCEPTED	0.764	7
7	My friend is very tall.	0.252	86.67%	0.647	0.800	0.907	0.784	ACCEPTED	0.784	4
8	My cat drinks milk.	0.251	86.67%	0.660	0.813	0.913	0.796	ACCEPTED	0.796	2
9	There is a plane.	0.251	86.67%	0.660	0.813	0.913	0.796	ACCEPTED	0.796	2
10	Amin reads a book.	0.246	86.67%	0.673	0.827	0.920	0.807	ACCEPTED	0.807	1
11	My mother cooks rice.	0.273	86.67%	0.647	0.800	0.900	0.782	ACCEPTED	0.782	5
12	My family watches television.	0.319	86.67%	0.653	0.787	0.873	0.771	ACCEPTED	0.771	6

Based on Table 13, all items in the Reading Comprehension construct obtained threshold

Table 14
Findings on the items in the Oral Comprehension construct

No	Item / Element	Triangular Fuzzy Numbers		Defuzzification Process				Experts' Agreement Consensus	Accepted Element	Ranking
		Threshold Value, d	Percentage of Experts' Agreement Consensus, %	m1	m2	m3	Fuzzy Score (A)			
1	Passage one: My Family	0.161	100.0%	0.660	0.833	0.953	0.816	ACCEPTED	0.816	1
2	What is the boy's name?	0.166	100.0%	0.647	0.820	0.947	0.804	ACCEPTED	0.804	6
3	What is his mother's job?	0.166	100.0%	0.647	0.820	0.947	0.804	ACCEPTED	0.804	6
4	What is his father's job?	0.166	100.00%	0.647	0.820	0.947	0.804	ACCEPTED	0.804	6
5	Does he love his mother and father?	0.161	100.00%	0.660	0.833	0.953	0.816	ACCEPTED	0.816	1
6	Passage two: Hobbies	0.215	93.33%	0.673	0.833	0.933	0.813	ACCEPTED	0.813	3
7	Does Siti like drawing?	0.223	93.33%	0.647	0.807	0.920	0.791	ACCEPTED	0.791	14
8	What does she like to draw?	0.222	93.33%	0.660	0.820	0.927	0.802	ACCEPTED	0.802	9
9	When does she like to draw?	0.213	93.33%	0.647	0.813	0.927	0.796	ACCEPTED	0.796	12
10	Is her drawing beautiful?	0.222	93.33%	0.660	0.820	0.927	0.802	ACCEPTED	0.802	9
11	Passage three: Garden	0.230	93.33%	0.673	0.827	0.927	0.809	ACCEPTED	0.809	4
12	Who likes gardening?	0.223	93.33%	0.647	0.807	0.920	0.791	ACCEPTED	0.791	14
13	What does she plant?	0.222	93.33%	0.660	0.820	0.927	0.802	ACCEPTED	0.802	9
14	When does she water the plant?	0.213	93.33%	0.647	0.813	0.927	0.796	ACCEPTED	0.796	12
15	How is her garden?	0.230	93.33%	0.673	0.827	0.927	0.809	ACCEPTED	0.809	4

value (d) $\leq$ 0.2, except for item number 1, 2, 3, 4, 5, 6 and 12. The percentage of the expert panel's consensus for each item exceeds 75% except for item 1 and 3. The defuzzification value for each item exceeds the a-cut value= 0.5. Based on the comments given by the experts in the Expert Validation Form during the validation phase, the causes of the disagreement were identified. First, the experts did not think the pictures depict the sentences accurately. Second, the pictures should be culturally appropriate so that pupils can easily comprehend them to be matched with the correct sentences. Therefore, item 1 and item 3 will be revised while some pictures will be replaced with the more appropriate ones. All the approved items will be used to measure pupils' ability in comprehending a reading text.

Oral Comprehension

Oral comprehension task in MYDAST demands pupils to listen to three short audio clips and answer comprehension questions verbally. Table 14 shows the items in the Oral Comprehension construct

Based on Table 14, all items in the Oral Comprehension construct obtained threshold value (d) $\leq$ 0.2. The percentage of the experts' panel's consensus for each item exceeds 75%. The

defuzzification value for each item exceeds the a-cut value= 0.5. All the approved items will be used to measure pupils' ability in comprehending a text through listening.

Digit Span

Digit Span is another subtest of this instrument. It is a common task in measuring short-term memory of an individual. Table 15 below shows the items in the Digit Span construct.

Table 15

Findings on the items in the Digit Span construct

No	Item / Elemen	Triangular Fuzzy Numbers		Defuzzification Process				Experts' Agreement Consensus	Accepted Element	Ranking
		Threshold Value, d	Percentage of Experts' Agreement Consensus, %	m1	m2	m3	Fuzzy Score (A)			
1	7,3	0.393	33.3%	0.613	0.747	0.840	0.733	REJECTED	0.733	1
2	8,5,9	0.468	26.7%	0.580	0.707	0.800	0.696	REJECTED	0.696	9
3	3,6,1,2	0.483	20.0%	0.567	0.687	0.780	0.678	REJECTED	0.678	10
4	5,1	0.401	33.33%	0.573	0.707	0.813	0.698	REJECTED	0.698	8
5	9,2,3	0.393	33.33%	0.613	0.747	0.840	0.733	REJECTED	0.733	1
6	7,6,4	0.393	33.33%	0.613	0.747	0.840	0.733	REJECTED	0.733	1
7	3,5,8,2	0.421	20.00%	0.613	0.740	0.827	0.727	REJECTED	0.727	4
8	1,2,4,9	0.421	20.00%	0.613	0.740	0.827	0.727	REJECTED	0.727	4
9	9,1,2,3,6	0.447	20.00%	0.600	0.727	0.813	0.713	REJECTED	0.713	6
10	2,5,6,9,7	0.447	20.00%	0.600	0.727	0.813	0.713	REJECTED	0.713	6
11	8,7,3,2,5,1	0.519	13.33%	0.540	0.660	0.753	0.651	REJECTED	0.651	11
12	1,6,4,5,9,2	0.519	13.33%	0.540	0.660	0.753	0.651	REJECTED	0.651	11
13	3,5,7,9,2,6,8	0.519	13.33%	0.540	0.660	0.753	0.651	REJECTED	0.651	11
14	4,7,2,9,5,1,3	0.519	13.33%	0.540	0.660	0.753	0.651	REJECTED	0.651	11
15	8,6,1,5,3,2,7,9	0.519	13.33%	0.540	0.660	0.753	0.651	REJECTED	0.651	11

Based on table 15, all items in the Digit Span construct did not obtain threshold value (d) $\leq$ 0.2. None of the items exceeds the acceptable 75% value of the expert panel's consensus. However, all the defuzzification value for each item exceeds the a-cut value= 0.5. By examining the comments given by the experts in the Expert Validation Form during the

validation phase, the causes of the disagreement were identified. Several experts in the panel believe that this construct is not necessary to be tested on Year 2 pupils since it only assesses their memory. Therefore, it is decided to exclude this test from the instrument.

Reverse Digit Span

Reverse Digit Span is almost similar to Digit Span except that, pupils must repeat the digits verbally in reverse. Table 16 shows the items in the Reverse Digit Span construct

Table 16
Findings on the items in the Reverse Digit Span construct

No	Item / Element	Triangular Fuzzy Numbers		Defuzzification Process				Experts' Agreement Consensus	Accepted Element	Ranking
		Threshold Value, d	Percentage of Experts' Agreement Consensus, %	m1	m2	m3	Fuzzy Score (A)			
1	5,1	0.393	33.3%	0.613	0.747	0.840	0.733	REJECTED	0.733	1
2	7,6,8	0.393	33.3%	0.613	0.747	0.840	0.733	REJECTED	0.733	1
3	5,4,2,3	0.477	20.0%	0.553	0.680	0.780	0.671	REJECTED	0.671	15
4	7,4	0.393	33.33%	0.613	0.747	0.840	0.733	REJECTED	0.733	1
5	3,8	0.393	33.33%	0.613	0.747	0.840	0.733	REJECTED	0.733	1
6	6,1,5	0.393	33.33%	0.613	0.747	0.840	0.733	REJECTED	0.733	1
7	4,7,1	0.393	33.33%	0.613	0.747	0.840	0.733	REJECTED	0.733	1
8	9,2,8	0.393	33.33%	0.613	0.747	0.840	0.733	REJECTED	0.733	1
9	8,3,6	0.393	33.33%	0.613	0.747	0.840	0.733	REJECTED	0.733	1
10	6,3,7,2	0.421	20.00%	0.613	0.740	0.827	0.727	REJECTED	0.727	9
11	5,7,1,6	0.421	20.00%	0.613	0.740	0.827	0.727	REJECTED	0.727	9
12	9,8,4,2	0.421	20.00%	0.613	0.740	0.827	0.727	REJECTED	0.727	9
13	8,9,6,3	0.421	20.00%	0.613	0.740	0.827	0.727	REJECTED	0.727	9
14	5,9,1,8,2	0.447	20.00%	0.600	0.727	0.813	0.713	REJECTED	0.713	13
15	9,1,7,3,2	0.447	20.00%	0.600	0.727	0.813	0.713	REJECTED	0.713	13

Table 16 refers to the items in the Reverse Digit Span construct. All items in the Reverse Digit Span construct did not obtain threshold value (d) $\leq$ 0.2. None of the items exceeds the acceptable 75% value of the expert panel's consensus. However, all the defuzzification value for each item exceeds the a-cut value= 0.5. This is the same case with the previous construct which is Digit Span. Therefore, it is decided that this test will be in the instrument.

Rapid Automatized Naming

Rapid automatized naming (RAN) is widely seen as an important indicator of dyslexia (Bexkens, Wildenberg, & Tijms, 2015). Therefore, it is included as a subtest in MYDAST that requires pupils to name thirty pictures quickly as the time taken is recorded. Table 17 shows the items in the Rapid Automatised Naming construct.

Table 17
Findings on the items in the Rapid Automatised Naming construct

No	Item / Element	*Triangular Fuzzy Numbers*		*Defuzzification Process*				Experts' Agreement Consensus	Accepted Element	Ranking
		Threshold Value, d	Percentage of Experts' Agreement Consensus, %	m1	m2	m3	*Fuzzy Score (A)*			
1	pencil	0.286	86.7%	0.667	0.807	0.893	0.789	ACCEPTED	0.947	1
2	square	0.254	93.3%	0.693	0.833	0.913	0.813	ACCEPTED	0.813	2
3	frog	0.269	93.3%	0.693	0.827	0.907	0.809	ACCEPTED	0.809	3
4	K	0.365	26.67%	0.647	0.773	0.853	0.758	REJECTED	0.758	5
5	five	0.286	86.67%	0.667	0.807	0.893	0.789	ACCEPTED	0.789	4

Based on Table 17, all items in the Rapid Automatised Naming construct obtained threshold value (d) $\leq$ 0.2, except for item 4. The percentage of the expert panel's consensus for each item exceeds 75% excluding item 4 which refers to the letter '*K*'. The defuzzification value for each item exceeds the a-cut value= 0.5. The panel of experts rejected item 4 (letter *K*) and the researcher will replace it with a better item to ensure that five stimuli of various types (object, shape, animal, letter and number) can be included in this construct. All the approved items will be used to measure pupils' ability in recalling the name of each stimulus from the long-term memory.

Hence, the findings show that one out of the fifteen constructs need to be omitted from the instrument namely *Rhyming*. Other constructs accepted by the panel of experts as the main components of MYDAST are *Letter Naming, Blending, Segmenting, Sound Matching, Non-word Reading, Syllable Detection, Word Reading, Spelling, Read Aloud, Reading Comprehension, Oral Comprehension, Digit Span, Reverse Digit Span* and *Rapid Automatised Naming*. From the 230 items presented to the panel of experts, 161 items were accepted, 24 items were to be revised and 45 items to be deleted. The sequence of items in each construct or subtest based on experts' agreement was as displayed in the tables above according to the ranking generated.

Conclusion and Recommendation

Content validation is crucial in the development of an instrument such as MYDAST. Fuzzy Delphi Method is a useful technique that can be used to validate the items in an instrument based on panel of experts' agreement. This study has obtained consensus agreement of the experts for all the 161 items in the instrument. The findings show that response and expert consensus on the items in all the constructs are at a good level except for the construct 'Rhyming', 'Digit Span' and 'Reverse Digit Span' which needs to be omitted from the test battery, 45 items to be deleted and 24 items to be revised. The application of Fuzzy Delphi Method could show the strengths and weaknesses of items through experts' consensus agreement.

Acknowledgement

The preparation of this work has been supported by Malaysian Ministry of Education.

Corresponding Author
Suhana Ahmad
Institute of Teacher Education Dato' Razali Ismail Campus, 21030, Kuala Nerus, Terengganu, Malaysia.
Email: suhana.ahmad@ipgkdri.edu.my

References

Abd Razak, N. S., Samad, N., & Mhd Ramli, M. F. (2018). Experts' Validation on Arabic Language for Specific Purposes Course Content using Fuzzy Delphi Technique. *Advances Science Letters*, (April).

Abu Zarim, N. A. (2016). *Android Based Dyslexia Early Screening Test*. Universiti Teknikal Melaka Malaysia.

Ahmad, S., Ali, M. M., & Salehuddin, K. (2018). ESL Teachers' Experience in Teaching Pupils with Dyslexia in Mainstream Classrooms. *Creative Education*, *09*(14), 2171–2182. https://doi.org/10.4236/ce.2018.914158

Alipour, M., Salehuddin, K., & Stapa, S. H. (2019). An Overview of the Persian EFL learners' Spelling Difficulties. *International Journal of Multicultural and Multireligious Understanding*, *6*(6), 127. https://doi.org/10.18415/ijmmu.v6i6.822

Balakrishnan, B., Chong, H. B., Idris, M. Z., Othman, A. N., Wong, M. F., Nor, M., & Azman, A. (2015). Improving the English literacy skills of Malaysian dyslexic children: The case of culturally responsive mobile multimedia tool. *Geografia Online*, *11*(13), 49–59.

Coaley, K. (2010). *Psychological testing*. SAGE.

Cohen, R. J., & Swerdlik, M. E. (2005). *Psychological testing and assessment: an introduction to tests and measurement*. (E. Barrosse, Ed.) (6th editio). New York: McGraw-Hill Higer Education.

Creswell, J. W. (2014). *Research Design: qualitative, quantitative & mixed methods approaches*. London: SAGE.

Devaraj, S. C. (2004). *The Identification of Primary School Students with Symptoms of Dyslexia, their Academic Achievements and Discipline Problems*. Universiti Putra Malaysia.

Helland, T., & Kaasa, R. (2005). Dyslexia in English as a second language. *Dyslexia*, *11*(1), 41–60. https://doi.org/10.1002/dys.286

International Dyslexia Association. (2017). *Dyslexia in the Classroom -What every Teacher needs to Know.* (Vol. 1). Retrieved from https://dyslexiaida.org/wp-content/uploads/2015/01/DITC-Handbook.pdf

Jamil, M. R. M., Siraj, S., Hussin, Z., Noh, N. M., & Sapar, A. A. (2017). *Pengenalan asas kaedah fuzzy delphi dalam penyelidikan rekabentuk dan pembangunan* (2nd Edition). Bangi: Minda Intelek.

Karim, E., Ahmad, J., & Osman, P. K. (2017). Fuzzy Delphi Method for Content Validation of Integrated Science Process Skills Instrument. *International Journal of Academic Research in Business and Social Sciences*, *7*(6), 1–12.

Lockiewicz, M., & Jaskulska, M. (2016). Difficulties of Polish students with dyslexia in reading and spelling in English as L2. *Learning and Individual Differences*, *51*, 256–264. https://doi.org/10.1016/j.lindif.2016.08.037

Manakandan, S. K., Ismail, R., Ridhuan, M., Jamil, M., & Ragunath, P. (2017). Pesticide applicators questionnaire content validation: A fuzzy delphi method. *Medical Journal of Malaysia*, *72*(4), 228–235.

Marshall, A. (2016). *Panduan lengkap ibu bapa dengan kanak-kanak disleksia*. Kuala Lumpur:

Institut Terjemahan & Buku Negara.

Matore, M. E. M., Idris, H., Rahman, N. A., & Khairani, A. Z. (2017). Kesahan Kandungan Pakar Instrumen IKBAR Bagi Pengukuran AQ Menggunakan Nisbah Kesahan Kandungan. In *International Conference on Global Education V (ICGE V)* (pp. 979–997).

Miller, L. A., McIntire, S. A., & Lovler, R. L. (2011). *Foundations of psychological testing: a practical approach*. California: SAGE.

Mohd, R., Siraj, S., & Hussin, Z. (2018). Aplikasi Kaedah Fuzzy Delphi Dalam Pembangunan Modul Pengajaran Pantun Melayu Berasaskan Maksud Al-Quran Mengenai Keindahan Flora, Fauna dan Langit Tingkatan 2. *Malay Language Education Journal*, *8*(2), 57–67.

Morales, J., Montes, R., & Zerme, N. (2018). The use of fuzzy linguistic information and Fuzzy Delphi method to validate by consensus a questionnaire in a Blended-Learning environment. In *International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems* (pp. 137–149). Cham: Springer.

Murray, T., Pipino, L., & Gigch, J. (1985). A Delphi. *Human System Management*, 60–80.

Ogunsola, B. A. (2018). Teachers' Qualifications and Dyslexia Identification in Primary Schools in Oyo State, Nigeria. *Africa Education Review*, *6627*, 1–31. https://doi.org/10.1080/18146627.2017.1302308

Snowling, M. (1998). Dyslexia as a Phonological Deficit: Evidence and Implications. *Child Psychology and Psychiatry Review*, *3*(1), 4–11. https://doi.org/10.1017/S1360641797001366

Subramaniam, V., Mallan, V. K., & Mat, N. H. C. (2013). Multi-senses explication activities module for dyslexic children in Malaysia. *Asian Social Science*, *9*(7), 241–267. https://doi.org/10.5539/ass.v9n7p241

Yaghmaei, F. (2003). Content validity and its estimation. *Journal of Medical Education*, *3*(1), 25–27.