

An Evaluation of Proposed Readability Formula in Malay Language

N. A. M. Hazawawi, M. H. Zakaria, S. Hisham, S. S. Sainawan

ABSTRACT: Based on discussions with counsellor at Kolej Komuniti Jasin, Melaka, we have found that most of young adults in Malaysia particularly students at Higher Education Institutions and TVET Colleges have a poor learning problem especially in reading and writing. This paper presents findings driven from an evaluation conducted in a field study on reading assessment using SPIKE. SPIKE or Sistem Kebolehbacaan Bahasa Melayu is a Malay readability test tool that can evaluate the readability competencies of a reader. SPIKE allows the teachers to screen students who may struggle to read and help to formulate action plans for specific forms of learning and interventions to enable them to obtain their academic qualifications. Results obtained has indicated that the tool can benefit general public as well as people with reading difficulties (including dyslexics) in measuring their reading competencies and the readability level of a reading material whether it is suitable for the reader's age. For future work, it is expected that this tool will help to increase the accuracy of measuring reading competencies of readers and be able to assist readers who have difficulties in reading by knowing the score level of their reading materials in Malay. It also can benefit them in upgrading young adults' academic performance.

KEYWORDS: Readability Test Tool, Reading Difficulties, Readability Level, Readability Formula.

1. INTRODUCTION

The Malay language readability test tool, also known as SPIKE is developed to assist readers in knowing the score of a Malay text and acquire the reading level and grade level based on several readability formulas [1].

Revised Manuscript Received on June 01, 2019.

N.A.M.Hazawawi, M.H.Zakaria, S.Hisham, S.S.Sainawan
Human Centered Computing-Information System Lab (HCC-ISL),
Faculty of Information and Communication Technology Universiti
Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 DurianTunggal,
Melaka, Malaysia.

S. S. Sainawan, Kolej Komuniti Jasin, Kementerian Pendidikan Tinggi,
, Merlimau, Melaka.

By having SPIKE, it could help them in reading by showing the level of Malay reading materials according to the age group. Four main groups can get benefit by using SPIKE, which are, 1) people who had difficulties in reading; 2) society who can read and write; 3) clinical psychologists; and 4) educators. Readability can be defined by numerous formulas based on sentence, word recognition and syllables by means of score to identify readability level [2]. Below shows an overview process of SPIKE:

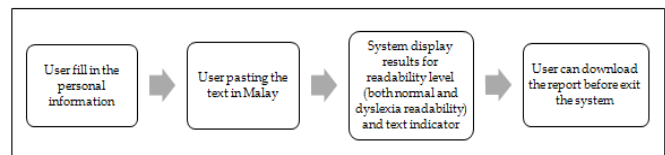


Figure 1: Overview Process of SPIKE

The readability level of a text shows the appropriateness of the text to a specific age group not to the grade level of the writing. It means that people at aged 13 and higher should be able to read and comprehend the text [3]. The main focus of this paper is to discuss on data analysis based on the experiment that we had conducted in KolejKomunitiJasin (KKJ), Melaka.

2. FORMULATION OF READABILITY FORMULA

Readability formula works as an indicator of readability of a text which is constructed from two basic parameters which are average words per sentence and average syllables per words [4]. This is consistent with Doverspike (2015), where readability formulas are normally developed on simple variables such as the number of syllables, number of words and sentence length [5].

There is a mathematical readability formula in Malay language which was proposed by KhadijahRohani in 1984, using two parameters that implied was number of words in sentences (construction of words) and number of syllables (vocabulary) [6]. Below is the mathematical formula in Malay language:

$$y_i = a + bn_i + c \tag{1}$$

where:

i = the sample in the case study

= 300/S, number of words in sentence. S is the number of sentence in 300 words.

= the number of syllables

a = -13.988

b = 0.3793

c = 0.0207

Using the readability formula that had been developed before, we proposed an expansion of readability formula in Malay language for dyslexia people. Below is the formula for dyslexic people in for text in Malay language:

$$y_i = a + bn_i + c(d_i + l) \tag{2}$$

where:

i = the sample in the case study

= 300/S, number of words in sentence. S is the number of sentence in 300 words.

= the number of syllables

= the potential difficult words

a = -13.988

b = 0.3793

c = 0.0207

Potential Difficult words in our scope are Kata Ganda, Diftong, Kata Pinjaman and KekeliruanHuruf. The k_i is calculated as below:

$$(Kata Ganda + Diftong + Kata Pinjaman + Kekeliruan Huruf) * 5 \tag{3}$$

The potential of difficult words for dyslexia is based on a study that was conducted on dyslexic’s spelling aspect in Malay language, where these difficult words are the main mistakes that dyslexic people tend to do when reading a text [7].

The addition of parameter $k_i = 5$, is supported by a research in 1999 by University of Washington (UW), where dyslexic children tend to use nearly five times the brain area as normal children while carrying out a simple

language task [8]. Lucid in his article discussed on conservative way for diagnosing children who had dyslexia who is failing in literacy development where, the child’s reading and spelling age is ominously behind his ordered age (typically 2 or more years behind)[9].

Both readability formulas were transformed into programming code to formulate an algorithm in SPIKE by using Java language [19].

After we calculated the score, we need to match the level with the age group. Below is the expansion of the readability level table from the existing readability level [20].

Table 1: The Readability Level Table

Readability	Year/ Form (Age)	TextIndicator
1	Year 1 (7 years old)	RED
2	Year 2 (8 years old)	
3	Year 3 (9 years old)	
4	Year 4 (10 years old)	
5	Year 5 (11 years old)	YELLOW
6	Year 6 (12 years old)	
7	Form 1 (13 years old)	
8	Form 2 (14 years old)	GREEN
9	Form 3 (15 years old)	
10	Form 4 (16 years old)	
11	Form 5 (17 years old)	
12	Adults (18 years old and above)	

Table 1 above shows the readability levels that had been improved based on the existing readability level table ranging from Level 1 Level 11 that suits the academic level of Year 1 until Form 5 at school

level [21]. Should the score falls in decimal place (e.g. 1.9), then the readability level indicates that the material is stronger towards Year 2 level. Level 12 and above is added to match the adult reader competencies aged 18 years old and above. Compared to the existing readability test tools, SPIKE have one additional feature that give a colored indicator to show the difficulty of a text [22]. Indirectly, helps them choose the article to read wisely. Each indicators indicates different type of text:

- Red - this text is difficult for people with reading difficulty
- Yellow - this text is quite difficult for people with reading difficulty
- Green - this text is suitable for all people

3. TEST PROCEDURE

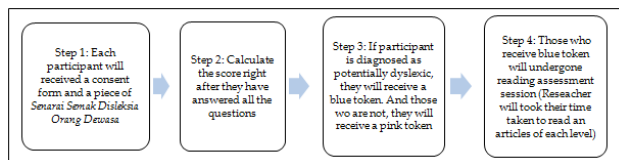


Figure 2: Process in Conducting Field Study

All 204 participants of KKJ will gathered at auditorium early in the morning. Each of them will receive a consent form and a piece of paper of Senarai Semak Disleksia Orang Dewasa to test either the participants was potentially dyslexia or not.

Each questions will be showed through projector and will read it aloud twice to ensure all of participants understand and answered all the questions. The score will be calculated right after they answered all the questions. If the participant was potentially dyslexia based on the results (those who got three and above for most critical symptoms questions), they will received a blue card. And those who were not potentially dyslexia (those who got two and below for most critical symptoms questions), they will received a pink card and will be dismissed. Those who received a blue card, they need to undergone the reading assessment session at counselling room.

Out of 204, only 32 participants were selected for second session. Unfortunately, two of them did not attend the session and made only 30 participants involved. We allocated 15 minutes to 20 minutes for each participants in this session. Each students need to fill in the personal

information form first. Aside of it, there was five questions related to reading skills that need to be answered ‘Yes’ or ‘No’ by the participants before proceed to the next section.

After finished answered the questionnaires, we will randomly choose the articles regardless the level of the articles starting from readability level 11 to readability level 9. Each participant must on their stopwatch application on their smartphones to record their time taken when reading the text. They were asked to press “Start” when they begin to read the first word of the text and press “Stop” when they reached the last word. If the time taken for the respective level of articles is higher than the suggested time, they will be asked to read another articles that have lower readability level than the previous articles until their time taken is below the suggested time taken.

4. DATA ANALYSIS

Three hypothesis that would be tested along the experiment, which were:

- Participants who scored 6 and above in questionnaires took a longer time in reading assessment.
 - There is a correlation between scores and the time taken in reading.
 - There is a correlation between scores and the range of time taken in reading.
- a) Field Study

Field Study was conducted with participants from (KKJ) with aims to test the developed readability tool with the proposed readability formula and capture the data of readability level based on reader competencies with the targeted user. Below were the results of data analysis based on these three hypothesis.

Hypothesis	Type of Analysis	Results
Participants Who Scored 6 and above Towards Time Taken For Level 8, Level 9, Level 10 and Level 11	Bivariate Pearson Correlations	Level 8 n=30 r= 0.690 (positive) (high strength correlation) p-value<0.005 = statistically significance correlation
		Level 9 n=30 r= 0.638 (positive) (high strength correlation) p-value<0.005 = statistically significance correlation
		Level 10 n=30 r= 0.598 (positive) (high strength correlation) p-value<0.005 = statistically significance correlation
		Level 11 n=30 r= 0.374 (positive) (medium strength correlation) p-value=0.05 = no statistically significance correlation

Table 2: Correlations Participants Who Scored 6 and Above Towards

Time Taken For Each Level

Hypothesis	Type of Analysis	Results
Participants Who Scored Below 5 Towards Time Taken For Level 8, Level 9, Level 10 and Level 11	Bivariate Pearson Correlations	Level 8 n=30 r=-0.711 (negative) (high strength correlation) p-value<0.005 = statistically significance correlation
		Level 9 n=30 r=-0.573 (negative) (high strength correlation) p-value<0.005 = statistically significance correlation
		Level 10 n=30 r=-0.805 (negative) (high strength correlation) p-value<0.005 = statistically significance correlation
		Level 11 n=30 r=-0.649 (negative) (high strength correlation) p-value<0.005 = statistically significance correlation

Table 3: Correlations Participants Who Scored Below 5 Towards Time Taken For Each Level

Hypothesis	Type of Analysis	Results
There is a correlation between score and time taken	Bivariate Pearson Correlations	Level 8 n=30 r=0.094 (positive) (low strength correlation) p-value>0.005 = no statistically significance correlation
		Level 9 n=30 r=0.444 (positive) (medium strength correlation) p-value>0.005 = no statistically significance correlation
		Level 10 n=30 r=0.045 (positive) (low strength correlation) p-value>0.005 = no statistically significance correlation
		Level 11 n=30 r=-0.223 (negative) (low strength correlation) p-value>0.005 = no statistically significance correlation

Table 4: Correlation Analysis of Variables between Score and Time Taken

Hypothesis	Type of Analysis	Results
There is a correlation between score and range of time taken	Bivariate Pearson Correlations	Level 8 n=30 r=0.066 (positive) (low strength correlation) p-value>0.005 = no statistically significance correlation
		Level 9 n=30 r=0.389 (positive) (medium strength correlation) p-value>0.005 = no statistically significance correlation
		Level 10 n=30 r=0.082 (positive) (low strength correlation) p-value>0.005 = no statistically significance correlation
		Level 11 n=30 r=-0.220 (negative) (low strength correlation) p-value>0.005 = no statistically significance correlation

Table 5: Correlation Analysis of Variables between Score and Range of Time Taken

5. DISCUSSION

After the data were analysed, some of the hypothesis could be accepted and some could be rejected. Below are some factors that can influenced the results of data.

i) Research Instruments Used in Assessment

The participants who scored more score in questionnaires, the time taken for reading for each level will be increased. This is supported by M.D.Vinegrad, where if the majority of the questionnaires were ticked (“Yes”), this was a strong indication of dyslexia. A SenaraiSemakDisleksia Orang Dewasa will not offer

sufficient information, yet it can be very suitable in helping a better self-understanding and also can directed to future assessment needs. In all, only an assessment with a specialist will determined if someone was diagnosed as dyslexic [10]. If dyslexics was not diagnosed before entering school, they do not fit for accommodations regardless whether they meet dyslexia criteria on evidence-based assessment [11].

Next on the list, the sample of articles used in the reading assessment were chosen wisely from educational magazine and newspaper. The content and whole idea could be different for each articles. Some articles may contained features that can influence the readers like numbers and some of new terms or Kata Pinjaman that are incompetent to the readers.

ii) Aspect of text in passage

The reason why all the results have weak and no statistically significant between these two variables, when choosing and revising the material samples, we did not take into account language aspects. This included but not limited to scientific language and (komponensastera) KOMSAS including pantun, gurindam, seloka, syair and sajak. This was agreed by [6]; where she explained that a sample that will be measured preferably do not comprised of exercises, poem, articles that had too many numbers, Kata Nama Khas, short forms or anything that cannot be considered as a word. We excluded all these components when measuring the difficulty level of text.

Dani from Harian Metro newspaper and MyNewsHub (2016) disclose eight Malay terms that before this, we used in English, which are tular (viral), suriteladan(role model), jerayawara (road show), latarpentas (back drop), gegantung (bunting), imejtumpu(highlight), pascanilai (post mortem) and swafoto (selfie) [12]. Even though all these words had been published for a long time in Malay dictionary (KamusBahasaDewandanPustaka), yet less of exposure made them looks like unfamiliar words and awkward to use. [13].

iii) Reading Speed

A study in 2017 was conducted by Cayir to analyze reading skills and visual perception levels of first grade students by using three aspects which are reading speed, reading comprehension and reading errors. The results showed that students with better visual perception had better time in reading speed and comprehension. They also tend to do less errors in reading [14].

Reading rate should be considered a significant factor in reading. People tend to argue as long as they understand the text, reading rate is not important. Reading rate can be an instrument for assessing students' performance. Slow readers consumed a lot of time in reading than people who are reading at appropriate reading rate based on their level [15].

iv) Aspect of language

Next on the list, aspects of first languages in Malaysia. Participants involved not only Malays participants but also participants from other races including Chinese and Indians. Most of Chinese community in Malaysia speaks a wide variety of Chinese dialects including Cantonese, Mandarin, Teo-chew, Hakka, Hainanese, Hok-chew and Hokkien. In the other hand, most commonly spoken Indian language is Tamil; others include Malayalam, Punjabi and Telugu [17].

Bahasa Malaysia is used as the medium of instruction in education system in Malaysia in both primary and secondary school. As our country is multilingual, the relationship of Bahasa Malaysia and other languages tend to induce questions in the linguistic aspect [16].

This was supported by Preliminary Report Malaysia Education Blueprint 2013-2025, (Ministry of Education Malaysia, 2012), Bumiputera students performed strongly achieving at least a Credit in SPM Bahasa Malaysia with 84%. Yet, only 63% of Chinese students and 57% of Indian students achieved the same level of achievement (Exhibit 4-6). This was because of lower disclosure to Bahasa Malaysia in National-type schools. 96% of Chinese and 56% of Indian students attended National-type schools where content subjects were taught in Chinese language or Tamil [18].

6. CONCLUSION

The readability concept have been discussed over the past decades, till now there are only readability test tool that developed in English speaking countries, that may give inaccurate scores for other languages. This approach was developed based on the lack of awareness about the impacts of dyslexia to young adults and identifying potentially dyslexics among young adults could be a difficult task.

SPIKE is developed based on algorithm of readability formula in Malay and expansion of readability formula. We had transformed calculation from manually to calculation through online test tool. Compared to the existing readability test tools, SPIKE have one additional feature that gives benefits to potential dyslexics by offering a parameter named, potential difficult words and give a colored indicator

to show the difficulty of a text. Indirectly, helps them choose the article to read wisely.

By having SPIKE, we can help people to know the level of the reading materials that they read and test the readability of an article in Malay language. One main objective using SPIKE, we can provide ease for normal and dyslexia people in reading.

ACKNOWLEDGMENTS

We are grateful to Universiti Teknikal Malaysia Melaka and the Ministry of Higher Education Malaysia for the Knowledge Transfer Programme Grant (GLuar/KTP/1/2016/FTMK-CACT/LLS/G00046) that provided financial support of this study.

REFERENCES

- [1] N.A.M, Hazawawi, M.H. Zakaria, S. Hisham, "SPIKE: Online Reading Competencies Measure For Malay Language", 4th International Conference on Engineering and ICT, 2016.
- [2] A. Kher, S. Johnson & R. Griffith, "Readability Assessment of Online Patient Education Material on Congestive Heart Failure", Advances in Preventive Medicine, vol. 2017.
- [3] R. Rambo. (2013). The Reading Level of Your Writing [Online]. Available: http://www2.ivcc.edu/rambo/eng1001/reading_level.htm
- [4] Shakeel, P.M., Tolba, A., Al-Makhadmeh, Zafer Al-Makhadmeh, Mustafa Musa Jaber, "Automatic detection of lung cancer from biomedical data set using discrete AdaBoost optimized ensemble learning generalized neural networks", Neural Computing and Applications, 2019, pp1-14. <https://doi.org/10.1007/s00521-018-03972-2>
- [5] D. Doverspike. (2015). Readability of Assessments in a Digital Age (Part 1): Bet You Won't Read This Whole Blog [Online]. Available: <http://asr.ipma-hr.org/2015/03/readability-of-assessments-in-a-digital-age-part-1-bet-you-wont-read-this-whole-blog/>
- [6] K. R. M. Yunus, "An Assessment of Structural Variable In Malay: A Readability Formula". Ph.D .dissertation, Abbrev. University of Miami, United States, 1982.
- [7] Z. Zubir, M. Daud & A. H. Ridzuan, "Disleksia Dalam Aspek Ejaan Bacaan Bahasa Melayu", Symposium of International Language & Knowledge, 2014.
- [8] Shakeel PM, Baskar S, Dhulipala VS, Jaber MM., "Cloud based framework for diagnosis of diabetes mellitus using K-means clustering", Health information science and systems, 2018 Dec 1;6(1):16. <https://doi.org/10.1007/s13755-018-0054-0>
- [9] Lucid Research Ltd, "Understanding

Dyslexia”, F19 v02.3 April 2006.

- [10] M. D. Vinegrad, “A Revised Dyslexia Checklist”, *Educare*, no.48, March 1994.
- [11] K. Nielsen, R. Abbott, W. Griffin, J. Lott, W. Raskind & V. W. Berninger, “Evidence-Based Reading and Writing Assessment for Dyslexia in Adolescents and Young Adults”, *PMC*, vol. 21, no. 1, pp: 38-56, 2016.
- [12] M. Dani. (2016). Sukarterimaswafoto, tular. *Harian Metro*. [Online]. Available: <http://www.hmetro.com.my/node/190257>
- [13] PusatRujukanPersuratanMelayu. DewanBahasakanPustaka.
- [14] Gomathi, P., Baskar, S., Shakeel, M. P., & Dhulipala, S. V. (2019). Numerical Function Optimization in Brain Tumor Regions Using Reconfigured Multi-Objective Bat Optimization Algorithm. *Journal of Medical Imaging and Health Informatics*, 9(3), 482-489.
- [15] T. V. Rasinki, “Speed Does Matter in Reading”, *International Reading Association*, 2002.
- [16] H. S. Ying, C.S. Heng & A. N. Abdullah, “Language Vitality of Malaysia Languages and Its Relation to Identify”, *Journal of Language Studies*, vol. 15, no.2, pp. 119-136, June 2015.
- [17] D. Owen. *Languages in Malaysia*. Gapyear. [Online]. Available: <https://www.gapyear.com/countries/malaysia/languages>
- [18] Ministry of Education Malaysia, “Preliminary Report Malaysia Education Blueprint 2013-2025”, 2012.
- [19] N.A.M. Hazawawi, M.H.Zakaria & S.Hisham, “Formulating an Algorithm to Detect Readability Level of Malay Texts”, presented at the Unabbrev. Proceedings of Mechanical Engineering Research Day, Melaka, March 2017.
- [20] Scott A. C., David B. Allen & Danielle S. McNamara, “Text Readability and Intuitive Simplification: A Comparison of Readability Formulas”, *Reading in a Foreign Language*, vol. 23, no.1, pp. 84-101, April 2011.
- [21] J. Schwarz. (1999). University of Washington; Dyslexic children use nearly five times the brain area [Online]. Available: <http://www.washington.edu/news/1999/10/04/dyslexic-children-use-nearly-five-times-the-brain-area/>
- [22] A. Cayir, “Analyzing the Reading Skills and Visual Perception Levels of First Grade Students”, *Universal Journal of Educational Research*, vol. 5, no.7, pp. 1113-1116, 2017.