

Spelling Scoring Metrics in Malay Language: An Investigation among Young Spellers

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Abstract—The aim of this study was to investigate the relationship among three spelling scoring metrics, namely, words spelled correctly (WSC), correct letter sequences (CLS), and phonological coding (PC) in Malay language. The relationship between spelling measure and word reading measure was studied. There were 866 Primary 1 (Grade 1 equivalent) students from 11 randomly selected public primary schools in Kuching, Sarawak Malaysia who participated in this study. The study showed that the scores from each scoring metric were highly correlated to each other. There was a strong relationship between each spelling outcome to word reading.

Index Terms—scoring metrics, spelling, reading, Malay language

I. INTRODUCTION

Literacy skills are clearly more than just reading. It involves both reading and writing. Spelling is an essential part in both reading and writing. It helps improve learner's reading, writing fluency, and vocabulary (McCardle, Chhabra, & Kapinus, 2008). However, reading is always treated to be more important than spelling at schools (Treiman, 1998). According to Snow, Griffin, and Burns (2005, p.86) "spelling and reading build and rely on the same mental representation of a word. Knowing the spelling of a word makes the representation of it sturdy and accessible for fluent reading". Besides, spelling is a foundation for helping students master the basic language, especially those students who may struggle with reading (Jones, 2009). Therefore, spelling must still be specially taught and learned in schools.

A. *The Malay Language*

Malay (Bahasa Malaysia) is the official language of four South East Asia countries, namely Brunei, Indonesia, Malaysia, and Singapore. It is also the first language of majority of the 27 million people in Malaysia (Department of Statistics Malaysia, 2011).

The Malay alphabet has the same 26 roman alphabet letters like English, which is, the letters from <a> to <z>. There are three types of sounds in the Malay writing system, which are consonants, vowels, and diphthongs (Awang, 2004). In addition, there are 21 consonants and the correspondence between the consonant letters and consonant sounds of the Malay language is almost perfectly one to one (Awang, 2004; Lee, Liow, & Wee, 1998; Lee, 2008). There are five pure vowels (a, e, i, o, u) with six vowel sounds. Nevertheless, there is an exception for the letter 'e'. It has carries two vowel sounds, overlapping in the grapheme-phoneme coding of vowel letters and vowel sounds, such as /e/ as in *enak* (delicious) and /ə/ as in *emas* (gold) whereas other graphemes carry only one unique sound. There are three diphthongs in the Malay language written as 'ai', 'au' and 'oi' which carry a single phoneme (/ai/, /au/ and /oi/). There are five digraphs written as 'gh', 'kh', 'ng', 'ny' and 'sy' that also correspond to one phoneme each (/gh/, /kh/, /ng/, /ny/ and /sy/) (Awang, 2004). The Malay language is based on phonemic units but the syllable is a salient unit because Malay words have distinct syllable structures (Isahak, 1990). Syllable is a phonological unit formed by a vowel, diphthongs or with or without surrounding consonants. The native Malay words are typically based on four types of syllable: V, VC, CV and CVC (Gomez & Reason, 2002; Hamdan, 1988). The phonological structure of Malay words can be described in terms of both syllable and phonic structures. Words can range from very simple syllable structures CVCV (i.e. *susu* which means milk) to more complex syllable structures like CVCCVVCV (i.e. *sentiasa* which means always). The Malay language is consistent and transparent language as the grapheme-phoneme correspondences is almost perfect one-to-one relationship (Awang, 2004).

B. *Spelling and Reading*

Many studies have found that spelling and reading are related (Ehri, 2000; Henry, 2003; McCardle et al., 2008; Treiman, 1998); Ehri (2000) described spelling and reading as “two sides of the same coin”. The similarity between spelling and reading is that they rely on the same mental representation (i.e. grapheme-phoneme correspondence) but the direction is different (McCardle et al., 2008). The differences between spelling and reading are they are underlying principles as decoding and encoding, which are different from one another (McCardle et al., 2008). They undergo different processes. Reading entails the decoding of letters into sounds, while spelling entails the encoding of sounds into letters (Carreker, 2011).

According to Treiman (1998), learning to spell does not just come as a product of learning to read. Spelling needs something more and beyond the experience of reading. According to some researchers, the ability to read a word does not guarantee the ability to spell a word. Thus, some students may be good readers but poor spellers (Frith, 1980; Bruck & Waters, 1990; Lee & Al Otaiba, 2017). However, the opposite pattern of being good spellers but poor readers is less common. The real value of spelling is being able to spell a word that is mentally represented so that it is easier for reading (Snow et al., 2005). However, sometimes students learn spelling through reading. For example, first graders who were taught primarily by whole-language methods tried to avoid using ck (i.e. *ckocoo*) at the beginning of words (Treiman, 1993). This was true even for students who were not explicitly taught that ck may not occur in such position. So, students must have learned and picked up this orthographic pattern through reading.

C. *The Reading Process*

There are generally two kinds of processing in reading which are top-down and bottom-up (Treiman, 2001). Top-down processes are prior knowledge of someone guiding the intake of information. Reading by top-down process is a “psycholinguistic guessing game” (Goodman, 1967). This is because theories that emphasize top-down processing claim that readers form hypotheses regarding the words readers will face and put in only just enough visual information to test the hypotheses (Goodman, 1967, Smith, 1971). Bottom-up processes are those that take in the information from the outside world (i.e. letters and words for reading) and deal with those information with little recourse to higher-level knowledge. Theories that emphasize bottom-up processing focus on how readers remove the information from the printed page then deal with letters and words in a relatively complete and systematic fashion (Gough, 1972). Basically, reading comprises five components: phonemic awareness, phonics, fluency, vocabulary, and comprehension (National Reading Panel, 2000). In order to be good in the reading, the foundation in phonemic awareness and phonics are important and needed.

D. *Spelling*

Spelling is part of both reading and writing (McCardle et al., 2008). This is because spelling relies on the same knowledge of the grapheme-phoneme relationship that is needed and necessary for reading, students will get help in reading when they learn to spell. However, spelling was not included as a component of reading (National Reading Panel, 2000). There are some researchers who disagreed with this omission. Several studies emphasized the importance of spelling in literacy (Ehri, 2000; Henry, 2003; McCardle et al., 2008; Treiman, 1998; Snow et al., 2005). Besides, there is a gap between reading and spelling performance. Researchers discovered that although the growth of students in passage comprehension maintained close to the average from Grade 1 to Grade 4, their spelling scores dropped significantly by Grade 3 and continue to drop in Grade 4 (Mehta, Foorman, Branum-Martin & Taylor, 2005). Therefore, spelling instruction should be explicitly taught to enhance students’ spelling skills.

E. *Scoring Metrics*

In conventional grading, spelling is graded as either correct or incorrect (Treiman, Kessler, & Caravolas, 2018). According to Ritchey, Coker and McCraw (2010), when a child enters kindergarten, he or she is unlikely to spell a word completely or accurately. So, an assessment that focuses solely on students’ complete spelling ability may limit the information that the students had gained. Therefore, more precise or sensitive analysis of students’ spelling skills that examines incomplete or inaccurate spelling can be used to provide extra information (Ritchey et al., 2010). For example, students’ partial spelling (e.g., cr for car) or substitution of phonetically similar letters (e.g. kar for car) may show knowledge of sound-spelling relationships.

Besides, Lee and Al Otaiba (2017) stated that sensitive spelling tasks and spelling error analysis are significant for the early identification and early intervention relating to children’s spelling and reading. With the spelling error analysis, a spelling task can be a powerful teachable opportunity for young children. This is because spelling error analysis can provide a window of information about young children’s phonological, orthographic, and morphological knowledge. At the same time, it also brings up a better understanding about learning disabilities (Lee & Al Otaiba, 2017). For instance, data from spelling test can provide a lens or ideas for teachers to place children in homogenous groups according to their spelling ability and difficulties.

To address precision and sensitivity, different alternative scoring metrics can be used. For example, the invented spelling scoring system developed by Tangel and Blachman (1992) which awards point using a 7-point scale ranging from 0 to 6. Similar scoring approaches have been used by Craig (2006), and Lee and Al Otaiba (2017). Previous studies have used phonological coding rubric with students in kindergarten and found that it is most sensitive to growth

over time among kindergartners when compared with total words correct, correct sounds and correct letter sequences (Ritchey et al., 2010).

Another scoring metric that has been commonly used for spelling assessments is curriculum-based measurement (CBM). According to Hosp, Hosp, and Howell (2007) and Wright (1992), this CBM method of scoring words is quite sensitive to capturing students' spelling skills. CBM spelling probes is designed to give credit to students even when they do not fully complete the spelling (Wright, 1992). When using the CBM approach, words are perceived as comprising smaller units letter sequences (Wright, 1992). Correct letter-sequences (CLS) are pairs of letters that are placed in proper sequences in a word. For instance, students are awarded points for the word spelled if they are able to write some letters in a proper sequence. Previous longitudinal studies, which involved students in Grades 1 to 4, compared CLS with WSC, both of which were sensitive to weekly growth. CLS was found to be a more sensitive scoring metric of spelling scores because it shows high slope coefficient and it is more likely to capture small changes in students' spelling test (Fuchs et al., 1993). However, many researchers who used CLS scoring as spelling research have found that the use of CLS has been limited to students in Grade 2 and higher (Deno, Mirkin, & Marston, 1980; Fuchs et al., 1993).

II. METHOD

A. Participants

The participants were 866 Primary 1 students from 11 primary public schools in Kuching, Sarawak Malaysia. The age of students was from 6.61 to 7.82 ($M = 7.13$, $SD = .29$) and consisted of 462 (53.3%) boys and 404 (46.7%) girls. The major ethnic groups were comprised as follows: Malay (67.1%), Iban (13.9%), Bidayuh (8.3%), Chinese (3.1%), and others (5.9%). There were 1.7% missing data for the ethnicity of the students. Students were included in this study only if their parents had given consent.

B. Measures

The measures represented the following constructs: *Ejaan* (Spelling), and *Pembacaan Perkataan* (Word Reading Accuracy). Both spelling assessment and word reading assessment contained 10 words which were chosen from the Primary 1 Malay text books, respectively. Examples of the Malay words are *susu* (milk), *gula* (sugar), *kerusi* (chair), *epal* (apple), *penyu* (sea turtle), *Isnin* (Monday), *menyiram* (watering), *terjatuh* (fell down), *berhati-hati* (be careful), and *buah-buahan* (fruits).

C. Spelling

The spelling test was used to test students' ability to spell the words that were verbalized by the research assistant. The spelling assessment was administered prior to the Word Reading Accuracy assessment because 10 same words were used for both measures. The assessment was scored based on three scoring metrics.

D. Word Reading Accuracy (WRA)

The WRA test was used to assess students' ability to read 10 single real words. The total score was based on the total number of words read correctly. The range of scores was 0 to 10.

E. Procedures

Data were collected between August and October in the school year. The spelling assessment was group administered while the Word Reading Accuracy assessment was administered individually. For WRA, marks were given on the spot while the students read the word. For spelling, each word was scored with three scoring metrics. Across all scoring metrics, letter reversals that did not form different letters were not scored as errors, except b and d. Table 1 describes the three spelling scoring metrics for Malay.

TABLE 1.

DESCRIPTION OF SPELLING ERROR CODING RUBRICS IN MALAY		
Scoring Metric	Explanations	Example word: Menyiram
Words spelled correctly	This metric determines if students spelled the words correctly completely. Students receive a point if the whole word is spelled correctly, or else they receive zero points.	1 = Menyiram 0 = Mengiram
Correct letter sequences	This metric determines students' ability to spell the words in the correct letter sequence. A point is given for a correct first letter, a point also given for a correct last letter and a point is awarded for each additional correct letter sequence within the word. The total points for each word is the total number of letters in the word plus one.	0 = bunga 9 = Menyiram 8 = Menyiraam 7 = Meyiram 6 = Megiram 5 = yiram 4 = giram 3 = ram 2 = me 1 = m 0 = nia
Phonological coding	This metric determines students' phonological representations in spelling. The score for each word ranges between 0 and 6. 0 = no relation between the letters or random strings of letters 1 = A phonologically related letter (initial sound or another sound in the word) 2 = initial sound represented by the correct letter, with and without any other letters. 3 = initial sound spelled correctly and there are more than one phonemes spelled correctly. 4 = all phonemes are represented with phonetically related letters 5 = all phonemes are represented with conventional letters 6 = correct spelling	6 = Menyiram 5 = Meyiram 4 = Mengiram 3 = meny 2 = me 2 = m 1 = ngi 1 = nyi 1 = i 0 = Abu

III. RESULTS

Descriptive statistics for each outcome of spelling scoring metrics and word reading measures are presented in Table 2.

TABLE 2.
DESCRIPTIVE STATISTICS OF WRA AND THE SPELLING IN MALAY

Variables	<i>M</i>	<i>SD</i>	Minimum	Maximum	Skewness	Kurtosis
WRA	7.34	3.61	0	10	-1.00	-0.64
Spelling: WSC	4.84	3.23	0	10	0.02	-1.35
Spelling: CLS	41.72	21.13	0	64	-0.73	-0.95
Spelling: PC	40.83	18.77	0	60	-0.85	-0.63

Note. WRA = Word Reading Accuracy; WSC = Words Spelled Correctly; CLS = Correct Letter Sequences; PC = Phonological Coding.

TABLE 3.
PEARSON'S CORRELATIONS BETWEEN WRA AND THE SPELLING SCORING METRICS

Variables	Malay: WRA	Malay: WSC	Malay: CLS	Malay: PC
Malay: WRA ^b	1.00			
Malay: WSC ^a	.80**	1.00		
Malay: CLS ^a	.90**	.92**	1.00	
Malay: PC ^a	.90**	.91**	.99**	1.00

Note. WSC = Words Spelled Correctly; CLS = Correct Letter Sequences; PC = Phonological Coding; WRA = Word Reading Accuracy; As a result of missing data, ^an = 863; ^bn = 865.

**p < 0.01 (2-tailed)

A. Relationship between Three Different Scoring Metrics

The correlations among the spelling scores in Malay were determined using Pearson's correlation coefficients and are presented in Table 3. All of the students spelling scores from different measures correlated significantly with one another, with the correlation coefficients ranging from .91 to .99, and $p < 0.01$. This showed that the scoring metrics capture equivalent similar spelling skills of students.

B. Relationship of Three Different Scoring Metrics to Word Reading

The correlations among the spelling scores with different scoring metrics to word reading were determined using Pearson's correlation coefficients and are presented in Table 3. The results showed students' spelling with different scoring metrics correlated significantly with WRA, with the correlation coefficients ranging from .80 to .90, and $p < 0.01$. For the measures that phonological plausibility and orthographic acceptability which are more precise and sensitive, they showed same correlations with WRA ($r = .90$). WSC measures showed the lowest correlations with WRA ($r = .71$). The same correlation between PC and CLS suggest that they are equivalent index of Primary 1 spelling skill and they are given better information than WSC to word reading.

IV. DISCUSSION

Young children such as kindergarteners and children who are in transition from kindergarten to Primary 1 often spell incompletely and inaccurately. Therefore, assessment that focuses solely on students' complete spelling like WSC may limit the information that teachers could gather from the spelling outcome. In contrast, precise and sensitive analysis of students' incomplete spelling (i.e., <tejato> for *terjatuh* which means fell down), spelling sequential letters spelling (i.e., <gulla> for *gula* which means sugar), spelling that is phonetically related but unconventional (i.e., <Ismin> for *Isnin* which means Monday), or spelling with a mix of phonetically related and conventional letters (i.e., <apel> for *epal* which means apple) may provide additional information that teachers can use for remediation purposes. For instance, orthographical or phonological analysis of spelling may indicate that students have some knowledge about the relations between the sounds and the letters. It provides insight to the teachers in being able to individualize instruction or to group students according to their ability and in turn, this decision making insights enable the teachers to group the students for interventions that meet their needs. Based on the widespread view that phonics is effective in teaching students to read and spell (Ehri, 2015; McCardle et al., 2008), one would expect measures of early spelling performance to be based on phonological acceptability, which serves as a good indicator of students' current knowledge of spelling. For example, one would know students who spelled <terjatu> for *terjatuh* (fell down) have better knowledge in phonics when compared with another student who spelled <tjt> for *terjatuh* (fell down). Besides, one would also expect reading and spelling to be correlated since both of them rely on the same mental representation as mentioned earlier in the literature review. However, no research has been conducted to test these ideas in the Malay language. The current study examined how the three scoring metrics (i.e., WSC, CLS, and PC) are related to each other and which scoring metrics have the highest correlation with word reading performance in the Malay language.

This study found an expected and consistent strong relationship among the spelling performance from the three different scoring metrics which is similar to previous findings (Deno et al., 1980; Ritchey et al., 2010). Another finding of the study is that, there are consistently strong correlations between all the spelling performance and WRA, which is the same as the finding from Ritchey et al. (2010). These results, together with previous findings show that there is high stability in the relationship among different spelling scoring metrics, and the spelling performance with word reading regardless of the language.

A surprising finding of this study is that PC which is based on phonological acceptability and has been the most popular scoring method recent years, was not correlated highest with WRA and did not outperform CLS scoring metric that was based on orthographic correctness. PC and CLS showed the same correlations with WRA, and showed higher correlation with WRA when compared with WSC. This study found that PC and CLS are equivalent in its relation to students' WRA and provided better information regarding students' knowledge of phonemic awareness in relation to WRA in comparison to WSC, which is based on correct or incorrect spelling.

V. CONCLUSION

These findings suggest that three different spelling scoring metrics used to score dictated spelling samples of Primary 1 students were closely related. In addition, each spelling scoring metrics showed high relationship to word reading. For PC and CLS, they showed the same correlation to word reading. WSC showed lowest correlation to word reading. The results suggest that PC and CLS are equivalent indexes of Primary 1 spelling skill and can give better and more information to word reading than WSC. Future research on these scoring metrics beyond Primary 1 and further investigation on the relationship between scoring metrics and students' spelling development among Malaysian students are needed.

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