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Validity and Reliability of the Mathematics Self-Efficacy Questionnaire (MSEQ) on Primary School Students

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ABSTRACT

Mathematics self-efficacy is an important personal attribute and self-belief that can influence students' learning and performance in the subject, as supported by the Social Cognitive Theory. Literature review has shown that due to the scarcity of research on primary school students' mathematics self-efficacy, there is a lack of validated instrument to measure this psychological construct in the local school context. This study sets out to fill the literature gap by examining the validity and reliability of the Mathematics Self-Efficacy Questionnaire (MSEQ) (14 items). The contents of the instrument were validated before the instrument was administered to 100 primary students. The sample size was recommended based on a 1:5 subject-item ratio. Findings from the Exploratory Factor Analysis (EFA) suggested that mathematics self-efficacy is a unidimensional construct. It is highly reliable and can be used to gauge primary school students' mathematics self-efficacy in a Malaysian school setting. The educational implications of this study are discussed in this paper.

Keywords: Mathematics self-efficacy, primary school, reliability, self-efficacy, validity

INTRODUCTION

It is important to equip students with mathematical skills so that they can thrive in school and beyond. According to the Malaysia Education Blueprint (2013-2025) (Ministry of Education Malaysia, 2013), Malaysian students are underperforming in international assessments such as TIMSS (Trends in International Mathematics and Science Study) and PISA (Programme for International Student Assessment). Studies

have shown that students face difficulties in mastering mathematics due to their lack of confidence in the subject, especially when it is being infused with higher-order thinking skills as a result of the recent curriculum reform (Alhassora, Abu, & Abdullah, 2017). Students' mathematics self-efficacy has been demonstrated as a significant predictor of mathematics performance and mathematics problem solving skills (Callejo & Villa, 2009; Williams & Williams, 2010), which are among the key indicators of education quality (Doménech-Betoret, Abellán-Roselló, & Gómez-Artiga, 2017). In line with the recent curriculum reform, there is a pressing need to assess Malaysian students' mathematics self-efficacy from as early as primary school level so that timely interventional steps can be taken to help students gain confidence in the subject. To do so, a valid instrument is needed to help practitioners and researchers gauge local primary school students' mathematics self-efficacy so that their judgments of capabilities in mathematics can be assessed accurately.

Students' self-belief and perception about their own abilities affect the type of choices that they make in a very significant way (Artino Jr., 2012; Bandura, 1977). Self-efficacy increases when students have the perception that they are becoming more skillful learners or they are performing well in the learning processes. Students who are confident in executing learning tasks or activities judge themselves as capable learners. Students with high self-efficacy often set high goals and maintain endurance

in learning despite the challenges that they face. For instance, if they face low progression or failure, the students will persist because they believe that they can perform better by expending more effort (Locke & Latham, 2006; Schunk, 1995). These students also attribute failure to a lack of knowledge or skills, rather than to their personal capabilities (Bassi, Steca, & Fave, 2011; Bandura, 1997).

On the other hand, students with low self-efficacy always suffer from self-doubt and they also lack personal skills. These students would be likely to avoid learning tasks if they believe that such tasks are beyond their competencies (Bandura, 1977; Schunk & Pajares, 2009). They often exhibit minimum effort, set low academic goals, and are less likely to experience success. As a result, they often face obstacles and experience higher rates of failure, stress, and depression (Bandura, 1982; Redmond, 2010).

As academic self-efficacy is a multidimensional construct, students may have different levels of self-efficacy in different subject domains. They may feel efficacious in one subject (e.g., English) but have low self-efficacy in another (e.g., mathematics). Those who perform well in mathematics will also have high self-efficacy in the subject when dealing with new mathematical contents (Schunk & Pajares, 2002). For instance, students with high self-efficacy in mathematics are more likely to transfer their mastery of 'addition' onto 'multiplication', which makes it easier and faster for them to

learn new mathematical concepts. Self-efficacy has received increasing attention in educational research as it correlates with higher achievement outcomes (Pajares, 1996; Valiente, Swanson, & Eisenberg, 2012). In fact, self-efficacy has been found to be the strongest predictor of academic achievement (Komarraju & Nadler, 2013; Richardson, Abraham, & Bond, 2012; Van Herpen, Meeuwisse, Hofman, Severiens, & Arends, 2017).

Underlying Theory of Self-Efficacy

Self-efficacy is a psychological construct which was first coined by Albert Bandura in 1969. Based on findings from empirical research, Bandura discovered that self-efficacy contributes to behavioural change, which is supported by Social Cognitive Theory (Bandura, 1977). According to Social Cognitive Theory, learning is influenced by a reciprocal causation cycle between behaviour, personal factors, and environmental influences (Bandura, 1986). The behavioural component of learning consists of responses that students make in the learning environment, which often translates into academic outcomes and performance (e.g., mathematics performance). The personal factors, on the other hand, encompass students' beliefs and attitudes, particularly their self-efficacy beliefs. Finally, the environmental factors include feedback given by significant others, such as the teachers, which can have a long-lasting effect on students' learning and self-belief. Founded on the importance and relevance of Social Cognitive Theory

in the field of education, self-efficacy is a topic which has been widely adopted and researched. It affects students' thoughts, commitment to their goals, anticipated outcomes from their efforts, resilience to adversity, quality of emotional life, and accomplishments they recognize (Bandura, 2006).

Figure 1 describes the theoretical framework that underpins self-efficacy. It explains the relationships between sources of mathematics self-efficacy, its components and how mathematics self-efficacy affects mathematics performance. Mathematics self-efficacy refers to students' self-appraisal of their own abilities in general mathematics, confidence in learning the subject in future, their capabilities in learning the subject in class and completing mathematics assignments.

According to Social Cognitive Theory, when students access their abilities in a particular subject (e.g., mathematics) they will reflect on their past performance or accomplishment (Arslan, 2013; Bandura, 1997). Successful performances in the past will contribute towards their beliefs that they can do well in the subject. In addition, according to Social Cognitive Theory, by observing peers' successes in learning the subject, students can also increase their self-efficacy beliefs in mathematics. This is because they are confident in achieving similar performance as their peers did, which is known as vicarious experience. Apart from peers, positive comments from significant others, such as teachers and family members also serve as sources of
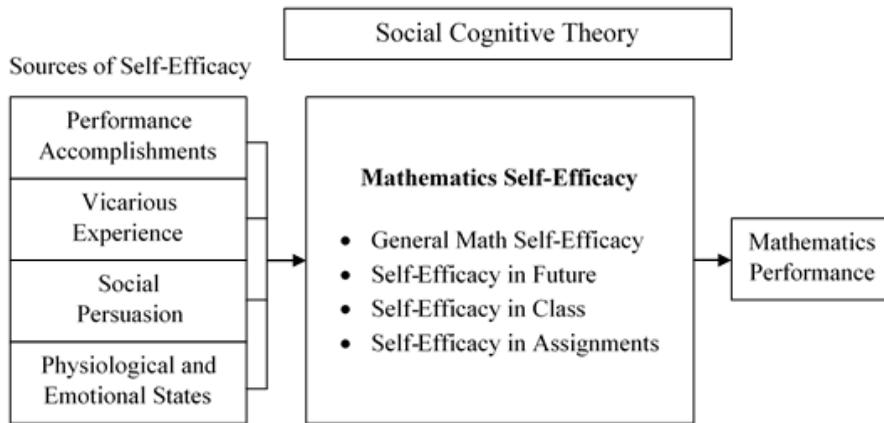
Figure 1. Theoretical framework in mathematics self-efficacy (adapted from Bandura, 1977; May, 2009; Stevens, Olivárez, & Hamman, 2006)

students' mathematics self-efficacy. These social persuasions reinforce their self-beliefs that they can learn and do well in mathematics. Lastly, students' positive psychological and emotional states during learning increase their mathematics self-efficacy further. The different sources of self-efficacy contribute towards students' efficacious beliefs in general mathematics, capabilities in mastering the subject in class, completing its assignments and learning mathematics in future. Students' mathematics self-efficacy will influence their mathematics performance positively.

Mathematics Self-Efficacy and Its Measurement

Mathematics self-efficacy is defined as "a situational or problem-specific assessment of an individual's confidence in her or his ability to successfully perform or accomplish a particular mathematics task

or problem" (Hackett & Betz, 1989). Students who perform well in mathematics are likely to have higher self-efficacy when learning new contents, compared to those who perform poorly in mathematics and those with learning difficulties (Schunk & Pajares, 2002). Numerous past studies have shown that students' mathematics self-efficacy is significantly related to their mathematical problem solving skills (Callejo & Vila, 2009; Kamalimoghaddam, Tarmizi, Ayub, & Wan Jaafar, 2016; Williams & Williams, 2010). The way students view themselves will influence their approach in mathematics. Students with high self-efficacy tend to be more interested in learning mathematics, whereas those with low self-efficacy have less interest and understanding of mathematics (Abedalaziz & Akmar, 2012). Students may perform poorly in mathematical problem solving because of their misperceptions about

themselves. They may be less likely to take risks, explore new ideas, or solve new problems, even though they may in fact have strong mathematical problem solving abilities. Past studies have found that mathematics self-efficacy had been used to evaluate a variety of academic performances, but a major focus was its relationship with mathematical skills (Mohd, Mahmood, & Ismail, 2011; Kranzler & Pajares 1997). Even though there are studies that examine the association between mathematics self-efficacy and performance, empirical studies that examine the psychometric properties of the measurement instruments are scarce, for instance the measurement of mathematics self-efficacy among primary school students, particularly in the Malaysian context (Karbasi & Samani, 2016; Pampaka, Kleanthous, Hutcheson, & Wake, 2011; Zimmermann, Bescherer, & Spannagel, 2011).

As emphasized by Bandura (1986), judgments of self-efficacy are task-specific. Therefore, it is important that assessment of mathematics self-efficacy is carried out using a validated instrument. Construct validity has been the focus in theoretical and empirical studies for over half a century, because it is important to measure an index of a variable that is not directly observable (e.g., intelligence), in order to ease the process of interpretation (Westen & Rosenthal, 2003). Hence, the construct validity of mathematics self-efficacy scale must be tested and established. Several scales and instruments have been developed to measure mathematics self-efficacy. The

earliest mathematics self-efficacy scale was the Mathematics Confidence Scale (MCS) developed by Dowling (1978). The Mathematics Self-Efficacy Scales (MSES), on the other hand, was developed by Betz and Hackett in 1982. It has three subscales: (1) mathematics problems self-efficacy; (2) mathematics tasks self-efficacy; and (3) college courses self-efficacy (Langenfeld & Pajares, 1993). Since then, the MSES have been used in a number of studies in mathematics (Hackett & Betz, 1989; Liu & Koirala, 2009; Nielson & Moore, 2003; Pajares & Miller, 1994). The MSES is a multidimensional measure of mathematics self-efficacy, which has been found to be a reliable and valid scale, allowing findings from these studies to offer valuable insights to strengthen Bandura's arguments on the role of self-efficacy (Langenfeld & Pajares, 1993). In 1993, Langenfeld and Pajares modified the Mathematics Self-Efficacy Scales (MSES). The Mathematics Self-Efficacy Scales-Revised (MSES-R) contains three subscales: (1) solution of mathematics problems; (2) completion of mathematics tasks used in everyday life; and (3) performance in college courses requiring knowledge and mastery of mathematics. The items on the MSES-R were taken from the original MSES, but mathematical problems scales were replaced by problems from MCS, which included arithmetic, algebra, and geometry (Dowling, 1978).

May and Glynn (2008) developed the Mathematics Self-Efficacy Questionnaire (MSEQ). It serves as a valid and reliable instrument to gauge college students'

mathematics self-efficacy. Research findings suggest that MSEQ is reliable, internally consistent, valid, and convenient to administer. MSEQ later underwent further improvements to capture students' anxiety in the subject of mathematics (May, 2009). It has been renamed as Mathematics Self-Efficacy and Anxiety Questionnaire (MSEAQ). Even though this instrument has been widely used to measure students' mathematics self-efficacy, such as in higher secondary schools and among universitiy students, it is yet to be tested on Malaysian samples, particularly at the primary school level (Kundu & Ghose, 2016; Rosly, Samsudin, Japeri, Rahman, & Abdullah, 2017). Due to a lack of empirical studies to examine its validity and reliability, it is unclear to what extent MSEQ can be applied in the local context. In summary, most studies have validated the instrument on older student populations such as college and secondary school students, as well as teachers (Karbasi & Samani, 2016; Kundu & Ghose, 2016; May, 2009). Even though several studies have focused on primary school students' self-efficacy, these studies did not specifically focus on the measurement of mathematics self-efficacy (Joët & Usher, 2011; Pajares, Johnson, & Usher, 2007). Pajeres, Johnson and Usher (2007) examined the sources of self-efficacy among elementary, middle, and high school students. Similarly, Joët and Usher (2011) had focused on elementary students' sources of self-efficacy in academic context. These studies did not measure mathematics self-efficacy among primary school students and

the validity of its measurement was not the focus of these previous studies. Hence, to fill the existing literature gap, researches ought to be conducted to establish the validity and reliability of mathematics self-efficacy questionnaire on primary school students in the local context.

Objectives

The objectives of the study were as follows:

1. To determine the construct validity of MSEQ on Primary School Students.

2. To determine the internal consistency reliability of MSEQ on Primary School Students.

MATERIALS AND METHODS

Samples

To achieve the objectives of the study, quantitative data were collected from a sample of 100 primary school students. Based on Gorsush's (1983) and Hatcher's (1994) recommendations, a minimum sample size of 100 students was required to run Exploratory Factor Analysis (EFA) on the 14-item MSEQ. This guideline was based on the subject-item ratio of 5:1. This implied that the sample size of the study (n=100) was adequate to carry out EFA. The Year 5 students were sampled from a National Type Primary School located in the northern area of Penang Island. The samples were selected using cluster random sampling method. To gain expedient data, samples were randomly selected using groups that have shared similar traits or characteristics. In this study, all samples

were chosen from the same school (Gay, Mills, & Airasian, 2011).

Mathematics Self-Efficacy Questionnaire (MSEQ)

The Mathematics Self-Efficacy Questionnaire (MSEQ), adapted from the MSEAQ (May 2009), was used to measure primary school students' mathematics self-efficacy. Permission to use this instrument has been granted by the original developer. It is a five-point Likert scale with responses ranging from (1) *Never* to (5) *Usually*. Past research (Cowan, 2010) showed that primary school students were able to respond to five units of information at one time. Offering more response options would induce unnecessary cognitive burden on them (Cowan, 2010) while increase in response scale might lead to less information or unsystematic measurement error.

MSEAQ is a highly reliable instrument with a Cronbach's alpha value of .96 (May, 2009). Even though MSEAQ is a reliable instrument, it was not originally designed for primary school students. Hence, for the purposes of this study, revisions were made to adapt the items for usage on primary school students in Malaysia. Changes were made to simplify the statements of each item and to orient its focus to mathematical learning at the primary school level.

The final version of the questionnaire was verified by a panel of experts in the field of Educational Psychology from a public university and later translated into Malay language using back translation method. Translating the questionnaire from the source language (English Language) into the target language (Malay Language) is a complex process and requires tremendous care to ensure that the final version is not only suitable for the new context, but also consistent with the original version. The back translation method was conducted by first translating the questionnaire into the Malay language and then, translating it back into English. Both English versions were then compared to ensure accuracy (Sowtali, Yusoff, Harith, & Mohamed, 2016). The back translations were done by two bilingual experts, who are experienced language panelists from the local primary schools. These experts are competent in both English and Malay languages and are familiar with the language competency and learning context of primary school students. In addition, clear explanations were provided by researchers during data collection to ensure that the instructions and items in the questionnaire were comprehensible to all students, so that they would have no difficulties in responding to the Likert scale.

MSEQ is made up of four subscales (Table 1), which measure the four domains of mathematics self-efficacy: (1) General Math Self-Efficacy, (2) Self-Efficacy in Future, (3) Self-Efficacy in Class, and (4) Self-Efficacy in Assignments.

When responding to the items in General Math Self-Efficacy domain, students typically reflect on their personal characteristics and self-belief which include how these characteristics and beliefs affect their self-efficacy in mathematics. Next, within the domain of Self-Efficacy in Future,

students build the connection between learning mathematics and their future. Their views and ideas on how confident they feel about working with mathematics in the future are captured in this subscale. The Self-Efficacy in Class, on the other hand, measures students' self-efficacy and their self-belief in relation to questions in class. Lastly, students judge their own self-efficacy in relation to mathematics homework, tests, or assignment completion.

Prior to data collection, approval from the Ministry of Education (MoE) and clearance from both the State Education Department and the school authorities were obtained. Quantitative data were collected using survey questionnaires. Analysis was done using Exploratory Factor Analysis (EFA) to determine the construct validity of the instrument, while Cronbach's Alpha analysis was carried out to measure the internal consistency reliability of the scale.

RESULTS AND DISCUSSION

The results and discussions of the study are divided into findings on validity and reliability of MSEQ, in line with the two objectives of the study.

Validity of MSEQ

Validity refers to the degree to which an instrument measures what it is intended to measure (Gay & Airasian, 2000). It is the most fundamental consideration in developing and evaluating tests, as it determines whether the dimension(s) underlying a variable are actually being measured (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 1999). Validity is specific to the interpretation being made by the researchers and to the group being tested in the population (Gay, Mills, & Airasian, 2011). Hence, validity of MSEQ in this study would indicate to which extent this instrument measures mathematics self-efficacy of primary school students in the Malaysian context.

In this study, a statistical method known as the Exploratory Factor Analysis (EFA) was used to determine the underlying structure of mathematics self-efficacy. EFA is currently the method of choice for examining construct validity, as evidenced by previous studies in the area of psychology and education (Laher, 2010). Before running

Table 1
Item-sspecification of Mathematics Self-Efficacy Questionnaire (MSEQ)

No.	Dimension	Item No.	No. of Items
1	General Math Self-Efficacy	4, 10, 13	3
2	Self-Efficacy in Future	5, 11, 14	3
3	Self-Efficacy in Class	1, 6, 8, 12	4
4	Self-Efficacy in Assignments	2, 3, 7, 9	4
Total			14

EFA, the content validity of MSEQ was verified by a panel of experts in the field of Educational Psychology from one public university. In addition, the assumptions and practical considerations underlying EFA were assessed before the analysis was run. Procedures to test normality were carried out. The visual displays suggested that the data formed a normal distribution. The suitability of the data for factor analysis was also tested. The correlation matrix indicated that a number of correlations exceeded .30, thus it was suitable for factoring. The Bartlett's Test of Sphericity was significant at .01, which indicated that there were no zero correlations. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (.915) was greater than the minimum value required (.60) to run a factor analysis (Coakes & Steed, 2007). Furthermore, the anti-image matrices showed that all the values were above the acceptable level of .50 (Coakes & Steed, 2007). It was, thus, concluded that items in MSEQ were factorable.

Examination of the initial statistics revealed that two factors were extracted as shown in Table 2. This implied that primary school students' mathematics self-efficacy, as measured by MSEQ, was not a four-dimensions construct. It is made up of two-dimensions of factors, which accounted for 62.72% of the variance. Factor I was predominant, it explained 55.17% of the variance and had an eigenvalue of 7.72, whereas Factor II accounted for 7.543% of the variance and had an eigenvalue of 1.05. Eigenvalues greater than one were accepted for the latent root criterion, as recommended by Hair, Anderson, Tatham and Black (1998).

Table 2

Results of extraction of common factors in MSEQ

Factors	Eigenvalues	Percentage of Variance	Cumulative Percentages
I	7.72	55.17	55.17
II	1.05	7.54	62.72

The scree plot (Figure 2) graphically displayed the eigenvalues for each factor. Generally, factors above the inflection point of the slope should be retained. Factor I was above the inflection point of the slope. However, Factor II was eliminated because it fell on the inflection point and only accounted for 7.54% of the variance. Factor II had an eigenvalue greater than 1.0, Varimax rotation method was used to assist with the interpretation of the factors, as it yielded meaningful item groupings.

The analysis results showed that MSEQ is a unidimensional instrument. According to the rule of thumb by Hair et al. (1998), factor loadings of .50, or higher are acceptable. Items 1, 6, and 9 have dual loadings and their values were larger than .50, thus, these items could be loaded in either Factor I or II (Table 3). Data analysis suggested that there were overlapping concepts. Nonetheless, this instrument was designed to measure students' mathematics self-efficacy. Therefore, the extracted factors would be related to each other. Moreover, based
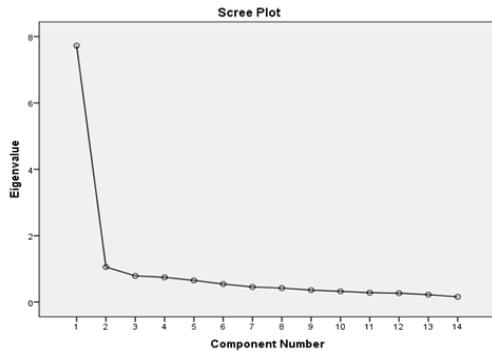
Figure 2. Scree plot of factors in MSEQ

Table 3
Rotated component matrix of MSEQ

Items	Component	
	1	2
Item 7	0.798	
Item 4	0.783	
Item 11	0.755	
Item 12	0.737	
Item 13	0.730	
Item 2	0.721	
Item 10	0.716	0.412
Item 5	0.684	
Item 8	0.652	
Item 14	0.643	
Item 9	0.571	0.510
Item 1	0.554	0.520
Item 3		0.890
Item 6	0.501	0.659

on the scree plot in Figure 2, Factor II only accounted for 7.5% of variance and fell on the inflection point. Only factors above the inflection point of the slope should be retained. Hence, based on these reasons,

Factor I was retained and the instrument was considered unidimensional.

Reliability of MSEQ

Reliability is the degree to which an instrument consistently measures whatever it is measuring (Gay & Airasian, 2011). An instrument or a scale is considered to have high reliability when the scale was re-administered to the same samples and the scores obtained are essentially the same. There are a numbers of different reliability coefficients. One of the most commonly used is Cronbach's Alpha, which is based on the average correlation of items within a test. This analysis determines how all items within the instrument measure the same construct (Sweet & Grace-Martin, 2003). Reliability is expressed numerically; the values of internal consistency are rated in between 0 to 1. The closer the alpha is to 1.00, the greater the internal consistency of items in the instrument being assessed. As a whole, the 14-item MSEQ has yielded a Cronbach's Alpha value of .936, which suggested that the instrument was highly reliable (George & Mallery, 2003).

The EFA analysis and reliability test showed that MSEQ was a valid and reliable instrument. Even though the Extraction of Common Factor in MSEQ (Table 2) initially suggested that mathematics self-efficacy was a two-dimensional construct, the results of the analysis showed that the construct was unidimensional. After deletion of items 3 and 6, the unidimensional instrument still recorded a Cronbach's Alpha value exceeding $\alpha > 0.90$ (Table 4).

The reliability of the 12-item MSEQ was excellent (α = 0.939) based on George and Mallery's (2003) guidelines and all the 12 items solidly measure mathematics self-efficacy as a unidimensional construct.

CONCLUSION

In conclusion, this study has found that the 12-item Mathematics Self-Efficacy Questionnaire (MSEQ) is a valid and reliable instrument. Its content validity has been verified by a panel of experts in the field of Educational Psychology while its construct validity has been tested through Exploratory Factor Analysis (EFA). Even though the original instrument has four subscales, the results of EFA show that the construct is unidimensional when tested on a sample of primary school students. An

Table 4
Item-Total Statistics of MSEQ

Items	Scale mean if Item Deleted	Correlated Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item 1	50.32	0.688	0.932
Item 2	49.79	0.693	0.932
Item 3	49.08	0.376	0.939
Item 4	50.23	0.793	0.928
Item 5	49.84	0.592	0.934
Item 6	49.56	0.713	0.931
Item 7	49.69	0.644	0.933
Item 8	49.49	0.709	0.932
Item 9	49.37	0.700	0.932
Item 10	49.93	0.784	0.929
Item 11	49.72	0.741	0.930
Item 12	50.26	0.772	0.929
Item 13	50.59	0.759	0.930
Item 14	49.84	0.694	0.932

instrument is seen as unidimensional if the item variance is controlled and only due to one latent variable (Ziegler & Hagemann, 2015). In this study, the four-dimensional MSEQ, when tested with the local primary school population, was found to be a single dimension latent variable, which is mathematics self-efficacy.

The original MSEAQ has been widely used to measure students' mathematics self-efficacy in higher secondary schools and higher education (Kundu & Ghose,

2016; Rosly et al., 2017). Its psychometric properties, however, may not be generalizable to primary school context, as elementary students tend to pose lower level of cognitive maturity and have more simplistic self-evaluation mechanism. For instance, a study by Kranzler and Pajares (1997) on 522 undergraduates found that mathematics self-efficacy was a multidimensional construct, which measured students' perceived general and subject-specific capabilities. Another study by Zarch and Kadivar (2006) on 848 middle school students also discovered that mathematics self-efficacy was a multidimensional construct. The current study, however, found that primary school students' mathematics self-efficacy was a unidimensional latent variable, as validated by factor analysis. The strength of MSEQ lies in its simple single-factor construct and high internal consistency.

The uses of MSEQ among primary school students were relatively scarce. The findings of this study filled up the literature gaps by adapting its items and establishing its validity and reliability of using a primary school sample. The MSEQ has high internal consistency (α = .939) and can be used to gauge primary school students' mathematical self-efficacy in Malaysian school context. It can gauge mathematics self-efficacy of students aged between 10 to 12 years old (Year 4, 5, and 6) (Kundu & Ghose, 2016; Rosly et al., 2017). The instructions in the questionnaire were comprehensible to primary school students and they were able to respond to a five-point

Likert scale (Smith, Wakely, De Kruif, & Swartz, 2003; Toland & Usher, 2016).

It is recommended that more extensive research be carried out to further assess the usage of MSEQ in other primary schools (e.g., private schools, international schools) and to determine whether differences exist across the different school settings. This is in line with Social Cognitive Theory which postulates that students' self-efficacy is influenced by the students' immediate social learning environment (Dunbar, Dingel, Dame, Winchio, & Petzold, 2016). Future studies can also explore alternative techniques to ascertain the validity and reliability of the instrument, such as using the Structural Equation Modeling (SEM) analysis. SEM offers extensive analysis on the causal relationships between variables as a combination of factor analysis and regression (Hox & Bechger, 2007).

Practitioners and researchers in the field of education could now use the Malay version of the MSEQ to assess students' mathematics self-efficacy at all primary schools nationwide. Translations and further testing, however, are needed if the instrument were to be used in other school settings (e.g., international school). As a whole, the 12-item unidimensional scale was easy to administer and interpret. Assessments can be conducted in a regular classroom and the results can be obtained in a fairly short period of time. The results may help to identify students with low mathematics self-efficacy and timely intervention can be taken to help these students. The validated

instrument can also help researchers to profile primary school students' level of mathematics self-efficacy in a valid and reliable manner. As such, the sources or factors that contribute to their different levels of mathematics self-efficacy can be researched (Joët & Usher, 2011; Pajares, Johnson, & Usher, 2007). In conclusion, this study has contributed to the field of educational psychology and psychometrics by establishing the validity and reliability of MSEQ on primary school students. Having a valid and reliable instrument to measure students' mathematical self-efficacy at an early stage will empirically help teachers to understand students' learning behaviour and come up with more effective early interventions to enhance their self-efficacy in mathematics.

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APPENDIX

Supplementary Table 1
Translated items of MSEQ in Malay language

Items	
Item 1	Saya berasa cukup yakin untuk menanyakan soalan dalam kelas Matematik.
Item 2	Saya percaya bahawa saya dapat menjawab dengan baik dalam setiap ujian Matematik.
Item 3	Saya percaya bahawa saya seorang yang mahir dalam Matematik.
Item 4	Saya percaya bahawa saya dapat mengaplikasikan Matematik dalam pekerjaan saya pada masa depan.
Item 5	Saya percaya bahawa saya boleh mendapat "A" dalam ujian Matematik.
Item 6	Saya percaya bahawa saya dapat belajar dengan baik dalam kelas Matematik.
Item 7	Saya berasa yakin untuk menyiapkan kertas ujian Matematik dalam masa yang ditetapkan.
Item 8	Saya percaya bahawa saya dapat menyelesaikan masalah matematik.
Item 9	Saya berasa bahawa saya boleh mempelajari subjek Matematik dengan baik pada masa depan.
Item 10	Saya percaya bahawa saya dapat menyelesaikan soalan Matematik jenis kemahiran berfikir aras tinggi.
Item 11	Saya percaya bahawa saya dapat berfikir seperti seorang ahli Matematik.
Item 12	Saya berasa yakin apabila menggunakan Matematik di luar sekolah.