Pertanika J. Soc. Sci. & Hum. 25 (2): 805 - 822 (2017)

PERTANIKA JOURNALS

SOCIAL SCIENCES & HUMANITIES

Journal homepage: http://www.pertanika.upm.edu.my/

Re-structuring the Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) in the context of pre-service teachers in Malaysia

Goh, P. S. C.*, Wong, K. T. and Mahizer, H.

Department of Educational Studies, Faculty of Education and Human Development, Universiti Pendidikan Sultan Idris, 35900 Tanjong Malim, Perak, Malaysia

ABSTRACT

The Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) is a 20-item questionnaire used to measure higher education students' deep and surface approaches to learning. The purpose of the present study was to validate the Malay language version of the R-SPQ-2F factor structure, based on two data sets of Malaysian pre-service teachers. The methods used were: (a) an exploratory factor analysis (EFA) with an oblique rotation with the first data set ($n = 221$), and (b) a confirmatory factor analysis (CFA) with the second data set ($n = 231$). The factor analytic results showed a four-factor model of the scale data which supported the scale's original factor structure but marked differences were found in terms of the relationships between items and factors (items had moved to different scales). Based on the EFA, the scales were renamed to better reflect the meaning of each factor, but the two main constructs of deep and surface approach remained the same. In the cross-validation study, the results of the CFA suggested that out of three structural models, the best fit was achieved by a first-order four-factor model. Explanation of the Malay language R-SPQ-2F re-specified factor structure for Malaysian pre-service teachers are discussed as it is important that researchers do not blindly import measures used in another culture without adaptation. Included are implications for the Malay language R-SPQ-2F.

Keywords: Approaches to learning, deep and surface learning, Malaysian pre-service teachers, Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) cross-validation, teacher education

ARTICLE INFO

Article history:
Received: 01 March 2016
Accepted: 20 September 2016

E-mail addresses:
goh.sc@fppm.upsi.edu.my (Goh, P. S. C.),
thomas@fppm.upsi.edu.my (Wong, K. T.),
mahizer@fppm.upsi.edu.my (Mahizer, H.)
* Corresponding author

INTRODUCTION

In recent years, there has been increased interest in improving teacher education

ISSN: 0128-7702

in Malaysia (The World Bank, 2013). An understanding of pre-service teachers learning processes is deemed important in the context of recent criticism that pre-service Malaysian teachers who have graduated from teacher education institutions are graduating with deficits in how to teach, either due to the teacher education curriculum or learning processes within teacher preparation (World Bank: Worsening Obstacle to Malaysia's high income hopes, 2013). These have made new demands on teacher educators to improve the learning of their pre-service teachers. Learning styles of students have been touted as an important area of investigation into the learning processes used by students in higher education (Abd Rahman & Scaife, 2012). One of the learning styles research that is well documented among higher education students in Malaysia, but less developed in teacher education, is the examination of students' approaches to learning (e.g., Roziana et al., 2011; Chan & Mousley, 2005). In response to the call for an enhanced teacher preparation, teacher educators are also faced with the challenge of measuring the approaches to learning of their pre-service teachers – i.e., whether the approaches to learning practiced by pre-service teachers would enhance their learning.

Martön and Saljo (1976) initiated the first qualitative study into approaches to learning. They examined how learners read academic texts and then they were asked to describe what had been learnt. The interaction of the learners with the text showed that there were differences in intentions as they approached the reading tasks. The analysis of the study indicated that if the intentions of the learners were to seek out the deeper meaning of the text, then the learning processes would entail them looking for "meaning in the matter being studied" and relate it to "other experiences and ideas with a critical approach" (Duff, 2004, p. 57). Such intentions and processes were termed as deep approach to learning. On the other hand, if the intentions of the learners were to categorise important facts or isolate ideas which were thought to be important to complete the reading exercises and they failed to appreciate the deeper meanings in the text, these learners would most likely be surface approach learners. Such learning patterns would have learners focused on superficial aspects of the text with an over dependence on "rote-learning and memorization in isolation from other ideas" (Duff, 2004, p. 57).

Understanding how students approach their studying is important as approaches to learning have been found to be related to their performance and other educational outcomes (Gijbels, van de Watering, Dochy, & van den Bossche, 2005). For example, students who are deep approach learners tend to be more confident and persistent when difficulties are encountered, have greater resilience in overcoming academic challenges and are more independent in their everyday work. On the other hand, students who are surface learners are less self-reliant or have less capacity to be independent in their learning. Lack of motivation, slow

academic engagement and difficulties in adjusting to the learning context have also been reported with surface approach learners (Biggs, 2001; Case & Gunstone, 2003; Goh, 2008; Gijbels D, van de Watering, Dochy & van den Bossche, 2005). Skills associated with learning such as critical thinking, self-directed learning, adaptability, problem solving and communication are essential to pre-service teachers if they are to become productive members of the teaching profession based on life-long learning that have been shown to require a deep-level approach to learning (Kember & Leung, 2005). The instrument that is widely used to measure deep and surface approaches to learning is the Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) developed by Biggs, Kember, and Leung (2001).

The 20-item R-SPQ-2F has two main scales: deep and surface approaches to learning. The deep approach main scale has deep strategy and deep motive as subscales, while the surface approach has surface strategy and surface motive subscales. The 'strategy' subscale measures the learners' way of learning, while the 'motive' subscale gauges the reasons a particular strategy are used. Students who are motivated with an intrinsic interest or seek to understand the learning task will use strategies such as relating ideas or deep comprehension learning to seek meaning. On the other hand, if students who are motivated to simply pass examinations or have fear of failing and have a desire to work with minimal effort (extrinsic motivation) will adopt strategies such as selective memorisation and have an attitude which is bounded by what is required to learn only (Biggs, 2001). Each subscale has five items with responses ranging from 1 ("Never true or only rarely true of me") to 5 ("Always true or almost always true of me"). Scores are calculated by adding up the items from each subscale and the scores may range from five, as the lowest, to 25 as the highest. Higher scores on a particular approach to learning indicates a higher adoption of that particular approach.

Validation of the R-SPQ-2F was carried out by Biggs, Kember and Leung in 2001. The authors used a group of 495 undergraduate students from a variety of disciplines from a Hong Kong university. Reliability coefficients were considered reasonable for the main scales and its subscales. The two main scales, deep approach had a Cronbach alpha of 0.73, surface approach had a Cronbach alpha of 0.64, while deep motive and deep strategy subscales had Cronbach alpha values of 0.62 and 0.63, respectively. The surface motive subscale had a Cronbach alpha value of 0.72 while the surface strategy subscales had a Cronbach alpha value of 0.57. In the study, Biggs, Kember and Leung (2001) hypothesised that there were two different ways that the instrument could be used. First, their confirmatory factor analysis showed a clear four-construct pattern (four subscales and its corresponding items). Correlations were found between the deep approaches subscales on one hand and between the surface approaches subscales on the other. The second model showed a

clear two main constructs (deep and surface) with the four subscales as indicators. Biggs, Kember and Leung (2001) posited that the R-SPQ-2F had appropriate psychometric qualities to be used as a two-factor form or to have clearly identified strategy and motive subscales. Since then, the R-SPQ-2F has been translated into various languages to be used to investigate the approaches to learning of students in higher education around the world and subject areas. However, there have been criticisms (e.g., Stes, De Maeyer, & van Petegem, 2013; Justicia, Pichardo, Cano, Berbe´n, & De la Fuente, 2008; Fryer, Ginns, Walker, & Nakao, 2011) that the dimensionality of the translated versions did not correspond to that of the original version.

When a Dutch version was administered to 2023 university students from various disciplines and the data submitted to a confirmatory factor analysis, the two-factor form for which Biggs, Kember and Leung (2001) had posited was not found (Stes et al., 2013). Instead the Dutch version was adapted to be suitable to the Dutch learners' context and had items which formed the motive/strategy subscales renamed in the instrument validation process. Similarly, in an empirical study of a Spanish version, which used two data sets of Spanish students, the authors (Justicia et al., 2008) could not differentiate between a motive and a strategy sub-components even though it could provide some empirical support for a two-factor structure. A qualitative study of a Japanese language version (Fryer et al., 2011) found that Japanese students were confused with some of the surface approaches wording and could not respond to the requirement of the items. When the original English version was used with first-year undergraduates in the United States of America, the analysis of the confirmatory factor analysis failed to provide empirical support for a two-factor structure (Immekus & Imbrie, 2010). Immekus and Imbrie (2010) cautioned whether the R-SPQ-2F represented the posited structures when tested with students with dissimilar cultural backgrounds.

Closer to home, Seri Bunian, Goh, Mohd Yusof, and Saemah (2010) tested the two factor model of a Malay language version of the R-SPQ-2F with 160 Malaysian Engineering students at a university in Malaysia. A forced two-factor analysis was conducted through an exploratory factor analysis. This forced two-factor analysis revealed a two-factor structure as hypothesised by Biggs, Kember and Leung (2001). However, it had to have two items deleted. Wan Shahrazad, Wan Rafaei, Mariam Adawiah and Wan Samhanin (2013) conducted a confirmatory factor analysis with 312 Malaysian university students and found that only 14 items within the Malay language version R-SPQ-2F achieved acceptable fit. It appeared that the items in the translated Malay language version were not quite consistent with those found in the original R-SPQ-2F. This article contended that there were some concerns with both the analyses. Seri Bunian et al. (2010) focused on analysing the Malay language R-SPQ-2F structure at the two main-scale level only. An

examination at item-level was not conducted and neither was an analysis carried out separately at the subscale level. On the other hand, Wan Shahrazad et al. (2013) made an assumption to assess the factor structure through a confirmatory factor analysis for measurement models without first testing the translated scales for content validity. The integrity of each item and subscale were assumed to be valid and then going directly to explore first order and second order factor structures. In addition, many of the items were found interweaved within other factors in the validation process. However, instead of re-looking at the reasons the items did not load into the delineated factors, the authors fitted the model to the four subscales but had to delete 14 items.

Since the two investigations made claims to validate a culturally sensitive instrument for use by Malaysian higher education students, it is advisable that an exploratory factor analysis should be carried out first on the translated version. Conducting an exploratory factor analysis first allows the testing of items for internal consistency and content validity. Then, to further test for rigour, a confirmatory factor analysis for measurement model is conducted to allow an assessment of the quality of the factor structure by testing the significance of the overall model (or models), which is not possible by exploratory factor analysis alone (Floyd & Widaman, 1995; Hinkin, 1998; Justicia et al., 2008). Owing to the result contradictions of other translated versions of the R-SPQ-2F and underpinned by the limitations of previous validation process of the Malay language R-SPQ-2F, the purpose of this present study is firstly to analyse the underlying structure of a Malay language R-SPQ-2F with both an exploratory factor analysis and a confirmatory factor analysis on two different data. In addition, pre-service teachers have always been a rather neglected group of higher education students when it comes to their approaches to learning (Goh & Matthews, 2011). Darling-Hammond (2010) has frequently written about the complexity of pre-service teachers' learning processes as they may be influenced by the behaviours of their own teachers who taught them in schools. Researchers tend to have overlooked the learning environment of pre-service teachers which contains learning strategies such as project work and practical school based experiences and differs from the other typical full-time undergraduate university students (Darling-Hammond, 2010). Hence, although the current study sets out to determine if a Malay language R-SPQ-2F has the capacity to measure pre-service teachers learning processes (through approaches to learning), it also aims to determine if it needs to be adapted to be sensitive to be used by pre-service teachers in Malaysia.

METHODOLOGY

Participants

A total of 452 pre-service teachers from a Malaysian teacher education institution, who were in their second, third and fourth year of studies, participated in the study. The mean age was 21.86 with a standard

deviation of 0.60. They were from various subject specialisations, wherein 82.3% of the sample belonged to the Arts and Humanities specialisations (preparing to teach subjects such as History, Geography, and the languages); 3.2% to the Business and Economics specialisations (preparing to teach subjects such as Business studies, Economics and Accounting); and 13.4% to the Science and Technology specialisations (preparing to teach subjects such as Information Technology, Pure and Applied Sciences, and Mathematics). Nonetheless, the specialisation for 0.8% of the respondents was unknown.

Procedure

As the teacher preparation programmes used the Malay Language in most of their courses, and to control for low English proficiency of the participants, the original English version of the R-SPQ-2F was translated into Bahasa Melayu (Malay language). The translation, interpretation and verification processes, according to Brislin (1980), were carried out by two professional certified translators. The first translator had the R-SPQ-2F into Bahasa Melayu, and then the second translator had it back translated into English for verification. In the translation process, the first author coordinated the process and made minor wording adjustments to the final version so as to make it suitable to the context of Malaysian pre-service teachers. A small qualitative pilot study involving 12 pre-service teachers were given the final translated versions. Spaces were given in each item for comments. They were requested to complete the survey and also to write down aspects of any words or sentences they felt confusing in the spaces provided. These 12 pre-service teachers did not find any misleading items and were able to understand the meanings of each item. The Bahasa Melayu version of R-SPQ-2F was then administered at the end of the 2014/2015 semester. Data were collected during normal class hours. In certain classes, the lecturer of the class or a research assistant administered the questionnaire. In all circumstances, the participants were briefed on the purpose of the study and the instrument. It was important that they knew that answering the questionnaire was on a voluntary basis and confidentiality of all the information collected was assured.

Analysis of data

In a preliminary analysis, the Cronbach's alpha for each scale and subscale was calculated. To conduct both an exploratory factor analysis and a confirmatory factor analysis, the data were randomly divided into two sets. The first set (n = 221) was used to test the factor structure through an exploratory factor analysis. Exploratory factor analysis was used to test the theoretical structure of the Bahasa Melayu R-SPQ-2F and to assure that the items were associated with the respective scales or subscales. Subsequently, the second set of data (n = 231) was used to test relevant hypothesised models using a confirmatory factor analysis for measurement models.

RESULTS

Internal consistency coefficients

Foremost, to ensure that the sample was appropriate for the analysis, two indicators were used. First, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy index was conducted and presented an index of 0.78. The second test, the Bartlett's test of Sphericity, had a significant result of $x^2 = 935.22$, $p < 0.0001$. These two indicators revealed that the sample and correlation matrix were within an acceptable range for the analysis (Snedecor & Cochran, 1989). Subsequently, the Cronbach's alpha coefficients of the *Bahasa Melayu* version of the R-SPQ-2F were conducted and are shown in Table 1. The internal consistency of the motive and strategy subscales were somewhat lower for surface motive and surface strategy when compared with the reliability coefficients obtained by Biggs, Kember and Leung (2001).

Table 1
Internal consistency coefficients of the Bahasa Melayu R-SPQ-2F (n=452)

Scale	Number of Items	Cronbach's alpha (current study)	Cronbach's alpha (Biggs, Kember & Leung, 2001)
Deep motive	5	0.62	0.62
Deep strategy	5	0.67	0.63
Surface motive	5	0.55	0.72
Surface strategy	5	0.48	0.57
Deep Approach (deep motive+deep strategy)	10	0.80	0.73
Surface Approach (surface motive+surface strategy)	10	0.71	0.64

Exploratory Factor Analysis

An exploratory factor analysis was applied at the item level to investigate the internal structure of the Bahasa Melayu version with the first set of data (n=221). A principal factor analysis with an oblique rotation, which had been done by Biggs, Kember and Leung (2001), was used to extract factors to facilitate the interpretation of the dimensions obtained. The factor loading criteria for inclusion was set at 0.50.

There were five underlying factors which showed an eigenvalue value of greater than one and a total variance of 50.98 percent (refer to Table 2). According to Gorsuch (1983), if the extracted variance contributes 40 to 50%, then "they are of definite interest" (p. 253). All items were loaded on one factor, except for item 4 ("I only study seriously what's given out in class or in the course outlines") which did not load on any factors. However, from the five factors, only four were detained as the final factors not detained had an eigenvalue of 1.1 but Cronbach's alpha of only 0.19 (refer to Table 2) which was deemed too

unreliable, and thus, item 2 ("I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied") and item 3 ("My aim is to pass the course while doing as little work as possible") were deleted.

Table 2
Exploratory factor analysis and Cronbach Alpha value of the 20-item Bahasa Melayu R-SPQ-2F

	Factors					Cronbach Alpha
Items	1	2	3	4	5	
DS18	.75					0.75
DS6	.67					
DS14	.66					
DM13	.65					
DM17	.59					
DM5	.54					
SM15		.64				0.66
SS12		.62				
SM19		.61				
SS16		.60				
SM7		.60				
DM9			.74			0.64
DS10			.71			
DM1			.50			
SM11				.77		0.54
SS8				.72		
SS20				.56		
DS2					.69	0.19
SM3					.58	
Eigenvalue	3.95	2.61	1.31	1.21	1.10	
Percentage explained	19.74	13.06	6.56	6.04	5.58	
Cumulative percentage explained variance	19.74	32.80	39.36	45.40	50.98	

Note: DM (deep motive), DS (deep strategy), SM (surface motive), SS (surface strategy)

In the development of the R-SPQ-2F, Biggs, Kember and Leung (2001) proposed a motive/strategy model of learning and noted that each motive/strategy combined together to define a distinct approach to learning. Examination of the factor analytic results showed the relationships between motive and strategy items, but not the posited constituent four-factor structure (motive/strategy subscales). A clear motive/strategy factors could not be labelled from the present data. Items had moved to a different scale. Differences were found in terms of the relationships

between items and factors compared to the study reported by Biggs, Kember and Leung (2001). Nevertheless, an examination of the structure matrix (refer to Table 3) revealed that although items had moved to different scales, Factor 1 and Factor 4 were still interpretable to correspond to a deep approach to learning, while Factor 2 and Factor 3 still supported a surface approach construct. As shown in Table 3, Factor 1 and Factor 4 were correlated ($r = 0.55$, $p<0.01$), as were Factor 2 and Factor 3 ($r = 0.36$, $p<0.01$).

Table 3
Interfactor correlation matrix of the renamed Bahasa Melayu R-SPQ-2F

	1	2	3	4
Learning with Interest	1.00			
Learning with Minimal Effort	0.11	1.00		
Learning with Satisfaction	0.55**	0.09	1.00	
Learning through Memorizing	0.06	0.36**	0.03	1.00
** p < 0.01				

On the basis of these findings, it is suggested that the items should be adapted to make them meaningful to the Malaysian pre-service teacher respondents. Hence, the new scales were renamed as Factor 1 (6 items) 'Learning with Interest'; Factor 2 (5 items) as 'Learning with Minimal Effort'; Factor 3 (3 items) as 'Learning with Satisfaction' and Factor 4 (3 items) as 'Learning through Memorising'. The internal consistency estimates for the Deep Approach scale (Cronbach alpha = 0.80) and Surface Approach scale (Cronbach alpha = 0.70), shown in Table 4, were aligned, if not higher, with those reported by Biggs, Kember and Leung (2001). The four new subscale score alpha ranged from 0.54 to 0.75 with a median of 0.65, which exceeded the threshold of 0.60 set by Nunnally and Bernstein (1994) as being acceptable reliability for research purposes. In addition, Schmitt (1996) proposed that the use of any cut-off value (including 0.70) is shortsighted and argued that an alpha value of 0.50 would not attenuate validity coefficients.

Table 4
Scale and subscale reliabilities of the re-structured Bahasa Melayu R-SPQ-2F

Scale	Number of items	Cronbach's alpha
Learning with Interest (LInt)	6	0.75
Learning with Minimal Effort (LMinEFF)	5	0.66
Learning with Satisfaction (LSatis)	3	0.64
Learning through Memorizing (LMem)	3	0.54
Deep Approach (LInt + LSatis)	9	0.80
Surface Approach (LMinEFF + LMem)	8	0.70

Confirmatory Factor Analysis

The testing of the model using a confirmatory factor analysis for the *Bahasa Melayu* R-SPQ-2F was based on the current exploratory factor analysis result and guided by insights into approach to learning presented by Biggs (1987) and Biggs, Kember and Leung (2001). In a confirmatory factor analysis, goodness-of-fit indices were used for analysis derived from maximum-likelihood and also to reduce sensitivity to distribution (Schumacker & Lomax, 2004). They include the goodness-of-fit index (GFI), adjusted goodness-of-fit (AGFI), comparative fit index (CFI), standardised root mean square residual (SRMR) and Root Mean Square Error of Approximation (RMSEA). The GFI, AGFI and CFI values, equal to or greater than 0.90, and SRMR and RMSEA values equal to or smaller than 0.05 were indicators of a good model fit in a confirmatory factor analysis (Schumacker & Lomax, 2004).

The hypothesised first-order four-factor model with 17 items, similar to the model suggested in Biggs, Kember and Leung (2001), was subsequently fitted to data from the second set of sample (n=231). The model contained the four factors as its latent variable (Learning with Interest, Learning with Minimal Effort, Learning with Satisfaction and Learning through Memorising) and each factor corresponded to the indicators (items) extracted by the exploratory factor analysis. The model, named Model A, showed reasonable fit (refer to Table 5), x^2 = 127.7, df = 84, GFI = 0.93, AGFI = 0.91, CFI = 0.93, SRMR = 0.05, RMSEA = 0.05.

Subsequently, Model B, a simple two correlated factors model, which is also similar to the model posited in Biggs, Kember and Leung (2001), was fitted to the data. The first latent variable contained the items from Learning with Interest and Learning with Satisfaction as indicators, while the other contained the items from Learning with Minimal Effort and Learning through Memorising as the indicators. Model B did not quite show adequate model fit, x^2 = 212.3, df = 118, GFI = 0.90, AGFI = 0.88, CFI = 0.87, SRMR = 0.06, RMSEA = 0.06.

To test whether the deep and surface constructs were needed, a hierarchical second-order (latent variables of Deep and Surface), four-factor model was again fitted to the sample. Model C almost replicated

Table 5
Goodness-of-fit of the Bahasa Melayu R-SPQ-2F

Model	x^2	df	GFI	AGFI	CFI	SRMR	RMSEA
Model A	127.7	84	0.93	0.91	0.93	0.05	0.05
Model B	212.3	118	0.90	0.88	0.87	0.06	0.06
Model C	191.0	84	0.95	0.92	0.91	0.06	0.05

Note: GFI, goodness-of-fit index; AGFI, adjusted goodness-of-fit; CFI, comparative fit index; SRMR, standardised root mean square residual; RMSEA, root mean square error of approximation

the fit data in similar ways as Model A, x^2 = 191.02, *df* = 84, GFI = 0.95, AGFI = 0.92, CFI = 0.91, SRMR = 0.06, RMSEA = 0.05. The difference between Model A and Model C was that Model A had a lower standardised root mean square residual (SRMR) and the x^2 difference between the two models was statistically significant at 63.32, $p < 0.05$, indicating that Model A fitted the data slightly better.

DISCUSSION

As mentioned earlier in the paper, previous researchers have extensively tested various translated versions of the R-SPQ-Q and also alerted some concerns about non-loading and cross-loading of some of the items. Similarly, previous studies to validate a Malay language R-SPQ-2F revealed some unsatisfactory results, partly due to some questionable decisions in conducting the various factor analyses. The *Bahasa Melayu* translation of the R-SPQ-2F, to the best knowledge of the authors, has never been tested in the Malaysian pre-service teachers' context, and given that response-context "… is an important point to be borne in mind when using the questionnaire" (Stes et al., 2013, p. 5), this study focused on analysing the underlying structure of the *Bahasa Melayu* R-SPQ-2F by using both an exploratory factor analysis and a confirmatory factor analysis for measurement models on two different sets of pre-service teacher data. The first step was to measure the internal consistencies of the *Bahasa Melayu* R-SPQ-2F through the alpha reliability coefficients (*n*=452) so as to determine if the scales within the R-SPQ-2F were representatives of the constructs suggested by Biggs, Kember and Leung (2001). The pre-service teachers' perceptions of their approaches to learning and the variation in their responses to the R-SPQ-2F items were then captured through a common factor model using the first data set (*n*=221). Finally, goodness-of-fit for confirmatory factor analysis for measurements models for the *Bahasa Melayu* R-SPQ-2F, which reflected the final exploratory factor analysis results, were constructed and analysed using the second data set (*n*=231).

Coefficient alphas of the scales with the original R-SPQ-2F were generally acceptable as reported by Biggs, Kember and Leung (2001). However, the study was done in Hong Kong and with undergraduate Chinese students. This original finding of the present study used the Bahasa Melayu version of the R-SPQ-2F in the context of pre-service teachers in Malaysia, and thus deemed an important contribution to the R-SPQ-2F literature. Although the coefficient alphas of the *Bahasa Melayu* R-SPQ-2F had satisfactory alphas for subscales of the deep approach to learning (motive/strategy subscales), it was somewhat flawed for the subscales of the surface approach to learning which had lower alphas compared to the original version. It indicated that, in some probability, the transferability of the *Bahasa Melayu* R-SPQ-2F could be compromised, and moreover, some of the constructs were not valid in a different response context, specifically the pre-

service teachers' learning environment in Malaysia. The lower alphas required a need to admit some changes in the structure to best capture the variations as hypothesised by the constructs.

The integrity of the *Bahasa Melayu* R-SPQ-2F underwent an exploratory factor analysis. It used a principal factor analysis with an oblique rotation, using an eigenvalue greater than one rule to determine the number of domains to be extracted. The *Bahasa Melayu* R-SPQ-2F did not provide evidence to support the clear differentiation between the motive and strategy components as posited by Biggs, Kember and Leung (2001) (that is, there were no clear factor patterns on the intended subscales), instead there were conceptual overlap between the motive and strategy components which made up the four new factors (refer to Table 4) at least for this particular group of pre-service teachers. Although the items in the current study did not fall onto the scales they were theorised to load, as posited by Biggs Kember and Leung (2001), the four new re-structured factors in this study could still explain the motive/strategy intent of the original instrument. The re-structured subscale, Learning with interest showed that those pre-service teachers, who were motivated to work hard because they have interest (deep motive) in their learning, used strategies (deep strategies) such as "looking at most of the suggested readings", "spend extra time trying to obtain more information" or "finding out more about interesting topics which have been discussed in different classes". However, Learning with Minimal Effort indicated that if the pre-service teachers perceived that the learning did not arouse interest (surface motive), but probably still did not want to get into trouble for not studying, then their strategy (surface strategy) was to spend as little time as possible in their studies as in the statement "restrict my study to what is specifically set". This was hardly surprising as in any classroom situation, students would exhibit differences in their level of interest in the class topics and task. For those students who learned from interest would tend to devote more attention and effort to the academic task and for those who lacked interests would not expand additional energy towards their learning task. Such a phenomenon is not surprising since interest is an aspect of intrinsic motivation, that is, students seem to have energy or drive that come from within (Biggs, 1987; Ramdsen, 2003; Hidi & Renninger, 2006). The subscale Learning with Satisfaction implied that pre-service teachers who derived satisfaction (for example: "I find that at times studying gives me a feeling of deep personal satisfaction") from their learning (deep motive) were those who would use strategy (deep strategy) that could enable them to fully understand their academic topics such as the statement "I test myself on important topic until I understand them completely". In contrast, the subscale Learning through Memorising have revealed that those pre-service teachers who wanted to "get-by" or "pass examinations" (surface motive) would use memorisation as their strategy (surface strategy). Satisfaction is an intrinsic motivation that is able to

drive students' commitment and the use of beneficial strategies towards their learning and the inverse is true, that is, the lack of it can undermine their enthusiasm for their studies (Biggs, 1987; Chiou & Liang, 2012; Ramdsen, 2003).

The correlations of the factor structure of the new factors were examined and importantly, found strong correlations between Learning with Interest and Learning with Satisfaction; and that Learning with Minimal Effort strongly correlated with Learning through Memorising (refer to Table 3). The items of 'Learning with Interest' and 'Learning with Satisfaction' were observed to belong to a deep approach learning, while the 'Learning with Minimal Effort' and 'Learning through Memorising' both contained items subsumed under the surface approach construct. However, item 2 ("I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied") and item 3 ("My aim is to pass the course while doing as little work as possible") were deleted after the exploratory analysis phase as they had low reliability and seemed difficult to interpret as a factor. It would seem that some interweaving of understanding and learning with minimal effort is possible in this case and will require further investigation. In the case of item 4 ("I only study seriously what's given out in class or in the course outlines"), pre-service teachers might have interpreted it to mean that only important materials distributed by their lecturers were to be studied for examination. These could be due to the fact that students in Malaysia have been accustomed to a 'spoon feeding' type of teaching that embraced photocopying notes for students and a drill and practice approach for examination (Raja Musa & Nik Yusoff, 2000; "UPSR and PMR may be abolished", 2010; Goh, 2012).

The reliabilities for each of the new subscales and the overall deep and surface scales produced acceptable levels of reliability. The reliability of the overall approaches to learning scale was equivalent to the reliability shown in the study using the original R-SPQ-2F by Biggs, Kember and Leung (2001). A confirmatory factor analysis for measurement models was finally used to formally compare model-data fit between three models (refer to Table 5). The model parameter matrices generally supported the scales' re-structured factor structure as either a first-order four factor form (the four new subscales expressed as latent constructs with their corresponding items as indicators) or a higher order two factor model (the four new subscales as indicators of the two learning approaches). The present findings somewhat corroborated some previous studies of the translated version which supported either the four-factor model (Stes et al., 2013; Immekus & Imbrie, 2010) or a second order factor model (Justica et al., 2008).

CONCLUSION

Whilst more works need to be carried out to further confirm the psychometric properties of the re-structured *Bahasa Melayu* R-SPQ-2F, the instrument has demonstrated that it is still a useful means of evaluating pre-

service teachers' approaches to learning. However, the next important question for teacher educators or pre-serivce teachers is 'how to use this instrument?' Some of the uses have already been discussed in the literature on studies involving approaches to learning, however, the use for teacher education and pre-service teachers may vary slightly. From the point of view of pre-service teachers themselves, the *Bahasa Melayu* R-SPQ-2F can be used to self-evaluate their own approaches to learning. The instrument provides an avenue for them to self-reflect upon their effort towards developing their learning so as to be congruent with their course expectations and learning environment. Pre-service teachers, who possess deep approaches to learning, will also have a strong sense of teaching self-efficacy and will perceive that all pupils are teachable leading to the application of adaptive problem-solving strategies and high academic achievement (Chiou & Liang, 2012; Gordon, Simpson & Debus, 2001; Mahinay, 2014). Therefore, it would be in the interest of teacher educators to use the instrument to examine the quality of their pre-service teachers' approaches to learning and make necessary changes to the learning environment (for example, aligning teaching curriculum, teaching strategies and assessment strategies) to encourage deep approaches to learning. In addition, teacher educators can also use the instrument to raise awareness among their pre-service teachers of appropriate approaches to learning and examine the impact of their training during their internship experiences in schools. On the part of educational administrators, the instrument can be used to gauge the successes (or otherwise) of educational policies and innovations in teaching environment related to pre-service teachers' approaches to learning.

All the pre-service teachers in this study came from one teacher education university, and were non-randomly chosen as the first-year candidates were not included. In addition, the extent to which this group of pre-service teachers differs from other pre-service teachers from other institutions limits the generalisability of the results. For these reasons, the usual limitations about generalising to other groups of pre-service teachers or to other higher education students need caution. Nevertheless, establishing the validity of this translated version is important especially in the recent climate of criticism that student teachers' learning have deteriorated and teacher education have been questioned about its teacher preparation program. Therefore, the translated version is essential for future applications by teacher educators who hope to improve teacher education and pre-service teacher learning in Malaysia. In addition, the validation conducted in the present study can be used for comparison with earlier research and for future use by higher education institutions.

Although the initial qualitative pilot study did not indicate any confusion in the items among the pre-service teachers, the need to re-structure the *Bahasa Melayu* R-SPQ-2F indicated that the learning processes of pre-service teachers in

Malaysia might be constituted differently to that of Hong Kong undergraduate students. Nevertheless, the re-structuring exercise showed improvement in the approaches to learning scales. Therefore, while broadly supporting the *Bahasa Melayu* R-SPQ-2F instrument in informing the quality of learning processes among pre-service teahers, the findings do suggest the need for further development of the instrument for use, particularly in the pre-service teacher context.

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