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RELIABILITY OF SECOND-ORDER FACTOR OF A REVISED TWO-FACTOR STUDY PROCESS QUESTIONNAIRE (R-SPQ-2F) AMONG UNIVERSITY STUDENTS IN MALAYSIA

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Abstract
The approach students use during the learning process is important in determining the outcome they obtained from any learning activities. Two learning approaches using (SAL) learning theory, were identified namely surface and deep approaches. This study aimed to validate the Revised Two Factor Study Process Questionnaire (R-SPQ-2F). The R-SPQ-2F consists of 20 items with ten items measuring surface approach to learning and ten items measuring deep approach to learning. The sample consisted of 312 students from three public universities in Klang valley. These items were tested using reliability procedure and confirmatory factor analysis. Confirmatory factor analysis indicated a good fit with the hypothesized two-factor structure after elimination of six items. The final two-factor version of the questionnaire has good Cronbach alpha values and reasonable goodness-of-fit values of the hypothesized two-factor structure via second-order CFA. This validation process has resulted in a reliable and valid questionnaire which can be used to measure the learning approaches of university students.

Keywords: confirmatory factor analysis, deep approach, higher education, learning approach, surface approach

INTRODUCTION

In a learning situation, what students aim to achieve from a learning task influences the approach they employ and the resulting outcomes. Therefore, a generic way of describing 'what the student does' is in terms of their ongoing approaches to learning. The approaches students use in their study influence both the quality of the learning and their academic success. The earliest research into 'approaches' and their impact on learning outcomes was undertaken by Marton and Saljo (1976). In their study, they asked students to read an article and then students were asked to recall how they handled the learning task and how it appeared to them. The interview with the students was transcribed, and the transcriptions analysed. They described these learning experiences as 'deep' and 'surface' approaches and these were referred to as 'approach to learning', which became the foundation for the emerging conceptual framework known generically as 'student approaches to learning' (SAL) theory (Biggs, 1993; Entwistle et al., 2001).

According to Marton and Saljo (1976), approaches to learning refer to qualitative differences in how students approach learning, identifying two levels of processing; surface approach, where the focus of the learning is on the text itself (the sign) and deep approach where the student concentrates on the internal content of the learning material (what is signified). Surface approach to learning enables students to meet varieties of learning objective in academic environments and these students prefer more structured learning environments, expected more direction and closer supervision (Fung, 2010). Kirby et al. (2003) state that when learners tend to seek meaning and understanding in their learning, deep approach is employed. Deep approach enables learners to integrate new information with previous knowledge, synthesize new materials and make connections to form a wider perspective.

Many inventories have been developed from SAL theory. One of them is the Revised Two-Factor Study Process Questionnaire (Biggs, 1987). It has been used specifically in Hong Kong (Biggs et al., 2001) in which the majority sample was of Chinese ethnicity. In Malaysia, this instrument has been used in studies by Chan Kah Yei and Mousley (2005), Fung (2010) and Roziana Shaari et al. (2011). As this instrument was developed for English speaking population, modification and adaptation was needed when applied to countries where English was not the primary language and whose cultures, including values and lifestyles were remarkably different from that of the West. Acceptable cross-cultural research involving language differences also must include rather sophisticated translation procedures, such as those outlined by Brislin et al. (1973). Therefore, this instrument needs to be back translated so that it can be administered among university students in Malaysia and validation studies were needed in order to assess its suitability in the Malaysian context.

The purpose of the present study was therefore, to validate the instrument measuring students' approaches to learning. Specifically, the study attempted to answer the following research objectives: (1) to construct-validate the measurement scale of students' approach to learning using the Revised Two Factor Study Process Questionnaire (R-SPQ-2F), (2) to analyse the second-order factor of the R-SPQ-2F, and (3) to examine the reliability of R-SPQ-2F.

LITERATURE REVIEW

There has been a substantial amount of research into higher education students' perceptions of their learning environment, their approaches to learning and the quality of their learning outcomes (Martin, 2003; Martin et al., 1984; Ramsden, 1992; Streitwieser & Light, 2010). Several studies have shown that students' academic performance at the university level is linked with their learning approaches (Duff et al., 2004; Lu et al., 2003; Diseth et al., 2006; Spicer, 2004). Research suggests that higher quality and quantity learning outcomes are associated with deep approaches to learning, while lower quality and quantity learning outcomes are associated with more surface approaches to learning. Relations between the approach students adopted towards their learning in a specific task, and the quality of the resulting learning outcome were also found (Marton & Saljo, 1976; Armarego, 2007). Students' conceptions of learning were found to relate to the approaches they adopted and to their subsequent outcomes of learning (van Rossum & Hamer, 2010; Armarego, 2007). Students' perceptions of aspects of their learning context also showed relations with their learning approaches (Entwistle, 2000; Lizzio, Wilson & Simons, 2002; Meyer & Muller, 1990; Ramsden, 1997; Trigwell & Prosser, 1991; Gijbels et al., 2005).

In a study of 164 students in Bachelor of Physiotherapy by Mayya et. al. (2004), it was found that deep approach has shown significant negative correlation with surface

approach and perceived academic inadequacy. Surface approach has shown significant positive correlation with fear of failure and lack of confidence, perceived academic inadequacy, non-academic distractors and English language ability indicating more surface approach in students with various problems. Academic performance on the other hand, has shown significant negative correlation with surface approach ($r = -0.26$, $p < 0.01$).

Usually students in tertiary institutions progressively achieve equilibrium with their learning context with an increasing predisposition for a surface approach (Biggs, 1987; Gow & Kember, 1990; Ho et al., 2001; Rodriguez & Cano, 2007). Past research also reported that most students in most undergraduate courses became increasingly surface and decreasingly deep in their orientation to learning (Biggs, 1987; Gow & Kember, 1990; Rodriguez & Cano, 2007). There were however exceptions; students with aspirations for graduate study did not show this pattern in their chosen area of study (Biggs, 1987), nor do students taught using problem-based learning, who became increasingly deep, and less surface, in their orientations (Newble & Clarke, 1986; Scheau & Marina, 2008).

In the Malaysian context, Roziana Shaari et al. (2005) conducted a study to determine the method of learning approaches adopted by postgraduate students in Universiti Teknologi Malaysia (UTM) and to identify whether these approaches are associated with demographic factors. Participants included 354 postgraduate students from different faculties in UTM. Results showed that there were significant differences on the usage of the three postgraduates' learning approaches across age, main streams and years of working experience. Significance was not seen between learning approaches on gender and mode of study. Deep approach was found to be preferred approaches to their learning methods.

Chan Kah Yei and Mousley (2005) investigated the influence of Chinese Malaysian students' schooling in a tradition of abstract, technical mathematics and rote learning on ways that they responded to mathematical word problems. This research was undertaken in a Malaysian private college, with a total of 290 students enrolled in the first semester of a computing and information technology diploma course. The majority of the students were 17-18 year-old secondary school leavers from a Chinese school background. Findings indicated that what could be termed as surface approach can be used to build a foundation for the use of deeper learning approach.

Cross-cultural studies of students' learning approaches have been investigated by a number of researchers to identify differences between Australian and South East Asian and among students in a number of different disciplines, including accounting and engineering (Biggs & Watkins, 2001; Kember & Gow, 1990; Ramburuth, 2001; Volet & Renshaw, 2001; Ginns, Prosser & Barrie, 2007; Gow et al., 1994; Kember, 2000; Smith & Smith, 1999; Cooper, 2004; Biggs, 1991). For instance, Kember (2000) observed Asian students often move between surface and deep approaches depending upon the task and course requirements. Other researchers have found no differences in approaches to learning between different cultural groups. For example, Smith (2005) did not find any differences between the learning approaches of a culturally mixed group of students in the United Arab Emirates.

It has been argued that higher education in Malaysia is still based on 'reception based' learning in which students memorize information for the sake of passing exams (Fung, 2010). This is supported by Marton et al. (1996) who said that Chinese students prefer memorizing and understanding because they believe this strategy requires less effort, especially when they are preparing for the important examinations. In other words, if the students expect that the examination only requires them to reproduce what they have

learned; students tend to employ rote learning (Entwistle, 1988). Fung (2010) further observed in his study that students in Malaysia are more concerned with their scores obtained in the examinations and are more focused on the process of memorizing facts without in-depth thinking to acquire knowledge. As such, the approach that higher education students employ should be examined to determine the strategy most preferred and used in order to achieve desirable learning outcomes.

METHODOLOGY

Participants

Participants comprised of 426 university students selected from three public universities in Klang valley. The number of sample size fulfills the general rule that the minimum number of respondents is at least five times as many observations as the number of variables to be analyzed (Hair, Black, Babin, Anderson & Tatham, 2006). As the number of items/variables to be analyzed was 20, the minimum number of respondents was 100, and the participating 426 respondents were more than adequately satisfied the sample size.

Instrument

The Revised Two Factor Study Process Questionnaire (R-SPQ-2F) consists of 20 items with two deep and surface factors each with 10 items. Within each of these two factors it is possible to distinguish strategy and motive subscales. Each of the subscales consists of five items. The questionnaire therefore has two main scales, Deep Approach and Surface Approach. The questionnaire was translated using back translation method (Brislin et al., 1973). First, the original English version of the questionnaire was translated into Malay. Then, the translated Malay version was translated back to English. The researcher then compared both the English versions of the questionnaire to ascertain that comparable meaning has been obtained.

Data Analysis

Confirmatory factor analysis (CFA) was employed to test how well the measured variables represent the constructs (Hair et. al., 2006). With CFA, the researcher must specify both the number of factors that exist within a set of variables and which factor each variable will load highly on before results can be computed (Hair et. al., 2006). The goodness of fit of the measurement models was evaluated using six indices, which reflected the overall model fit: (1) the chi-square statistic; (2) the minimum value of the discrepancy between the observed data and the hypothesized model divided by degrees of freedom (CMIN/DF); (3) the goodness-of-fit index (GFI); (4) the comparative fit index (CFI); (5) the Tucker-Lewis index which compared the estimated model with the null model; and (6) the root mean-square error of approximation (RMSEA). Arbuckle and Wothke (1995) stated that first, the CMIN/df with a value of less than 5 is considered acceptable. Second, the possible values of GFI, CFI and TLI range from 0 to 1, with values close to 1 demonstrating a good fit. Finally, a value of RMSEA of .08 or less shows a reasonable error of estimation.

RESULTS AND DISCUSSION

The first objective was to examine the construct validity of the R-SPQ-2F via confirmatory factor analysis (CFA). In this analysis, the items were analysed to determine whether they validly measured the two latent variables, surface and deep approaches.

Tests of normality showed that 114 cases were outliers and these data were eliminated. Therefore, the data for all measurement models were tested using 312 participants. Results of the assessment of normality for R-SPQ-2F showed no violations of normality. The distribution of scores for all 20 items in the instrument showed acceptable skewness within |3.0| and kurtosis in the range of |10.0|. The results are shown in Table 1.

Table 1 Assessment of normality for R-SPQ-2F

	Min	Max	Skew	Kurtosis
C18	0.00	5.00	-0.467	-0.108
C14	0.00	5.00	0.008	-0.418
C10	0.00	5.00	-0.557	-0.042
C6	0.00	5.00	-0.301	-0.109
C2	0.00	5.00	-0.879	0.832
C13	0.00	5.00	-0.688	0.306
C9	0.00	5.00	-0.352	-0.654
C1	0.00	5.00	-0.52	-0.351
C20	0.00	5.00	0.38	-0.901
C16	0.00	5.00	0.283	-0.927
C8	0.00	5.00	0.103 -0.908	
C19	0.00	5.00	0.613	-0.565
C7	0.00	5.00	1.083	0.639
C3	0.00	5.00	0.599	-0.611
C4	0.00	5.00	-0.144	-0.961
C5	0.00	5.00	-0.637	-0.019
C11	0.00	5.00	0.091	-0.933
C12	0.00	5.00	0.422	-0.574
C15	0.00	5.00	1.091	0.527
C17	0.00	5.00	0.106	-0.506

The results (Figure 1) showed that the model χ^2 (169) = 356.73, $p < 0.05$, indicating poor fit. The χ^2 statistic is the most conventional indicator which represents the size of the discrepancy between the sample and the model with a non-significant χ^2 value indicating good fit. The values of other goodness-of-fit indices also showed unacceptable values of GFI = 0.89, CFI = 0.85 and TLI = 0.83, all indices were below 0.90 as recommended by Bentler (1992) and Hu and Bentler (1999). Therefore, all the indices showed that the R-SPQ-2F has poor fit between the model and the data (N=312). Therefore this measurement model needed to be revised.

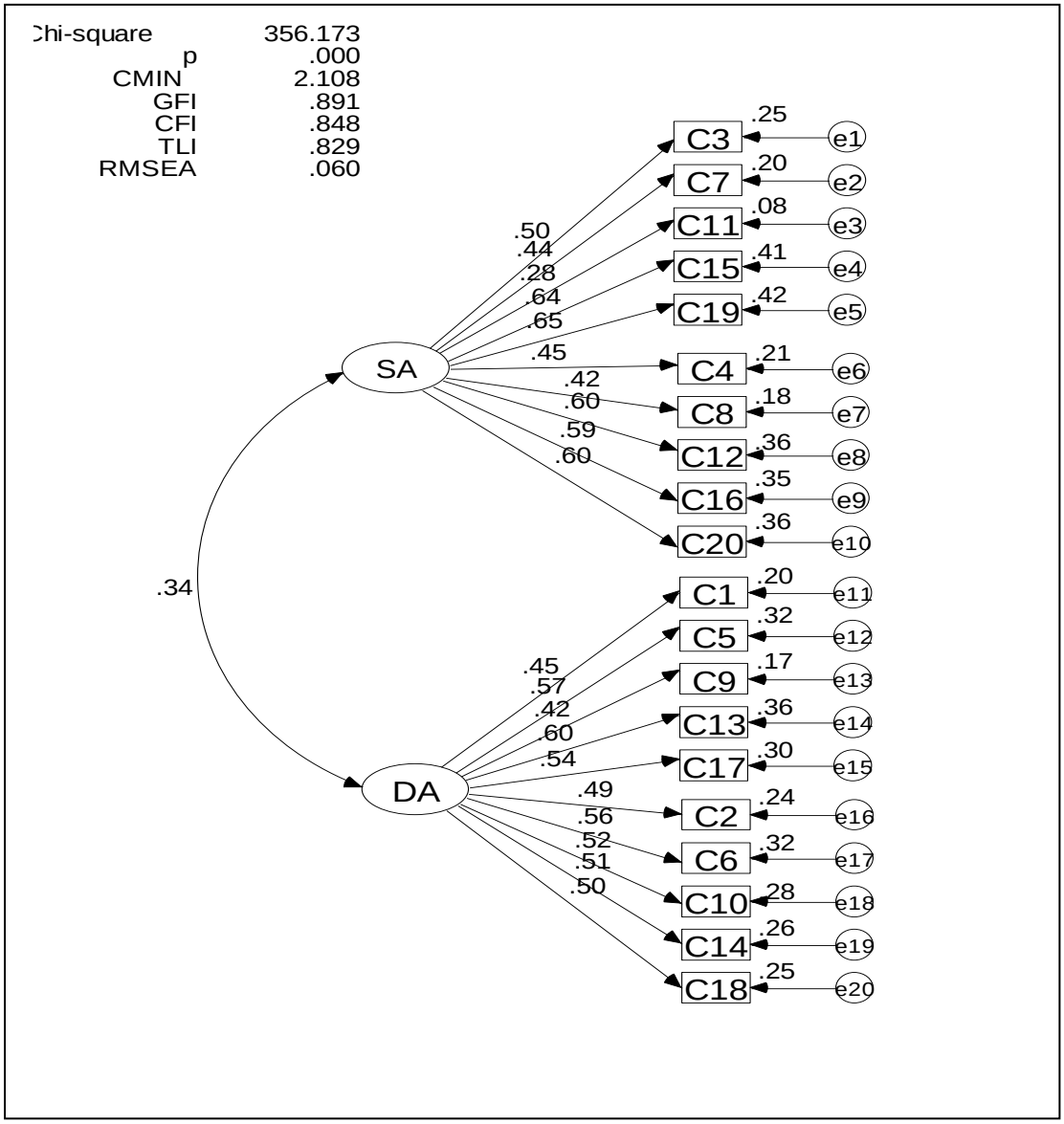

Figure 1 Measurement model of the R-SPQ-2F

The measurement model was revised by examining the modification indices. Apart from that, Hair et. al. (2006) suggested that all factor loadings should be statistically significant. As a result, six items were eliminated which were C11, C15, C4, C12, C5 and C17. The model was analysed again using 14 items. Items C11, C15, C4 and C12 were items measuring surface approach. These items were not statistically significant and showed that they did not validly measure surface approach such as item C4 “I only study seriously what’s given out in class or in the course outlines”, item C11 “I find I can get by in most assessments by memorizing key sections rather than trying to understand them”, item C12 “I generally restrict my study to what is specifically set as I think it is unnecessary to do anything extra”, and item C15 “I find it is not helpful to study topics in depth. It confuses and wastes time, when all you need is a passing acquaintance with topics”. When we examined these items, these strategies may not be practice by all students; students were expected to study and search for materials which were not confined to lecture notes only and they also have to engage in in-depth search of materials in order to complete course assignments.

Two items which were item C5 “I feel that virtually any topic can be highly interesting once I get into it”, and item C17 “I come to most classes with questions in mind that I

want answering" were categorized as deep approach. Results showed that these two items were not statistically significant and needed to be eliminated. When we examined these two items, they had low construct validity indicating that they did not accurately measure deep learning approach among Malaysian students. These strategies may not be employed by students due to vast syllabus and increased workload (Mayya et al., 2004).

The results of the revised model (Figure 2) showed that the model χ^2 (73) = 111.48, $p < 0.05$. However, looking at other five indices showed that the R-SPQ-2F has acceptable goodness-of-fit between the model and the data (N=312). The model has adequate fit indices of a good model according to CMIN/df = 1.53. The goodness-of-fit indices showed acceptable values of GFI = 0.95, CFI = 0.94 and TLI = 0.93, all indices were above 0.90 as recommended by Bentler (1992) and Hu and Bentler (1999). The value of RMSEA was 0.04 which also fulfilled the conventional standard of a good fit. In addition, the correlation between surface and deep approaches showed a low correlation indicating subscales measuring two different approaches. This was supported by Biggs' theoretical model which stated that surface approach items tap into learning motivation and strategies similar to those of externally motivated learners. Deep approach on the other hand is characterized by internally motivated learners with intrinsic motivation and deep learning strategies. In addition, alpha Cronbach of the 14-item R-SPQ-2F yielded a good reliability of 0.71 for surface approach, 0.73 for deep approach and 0.70 for the total items.

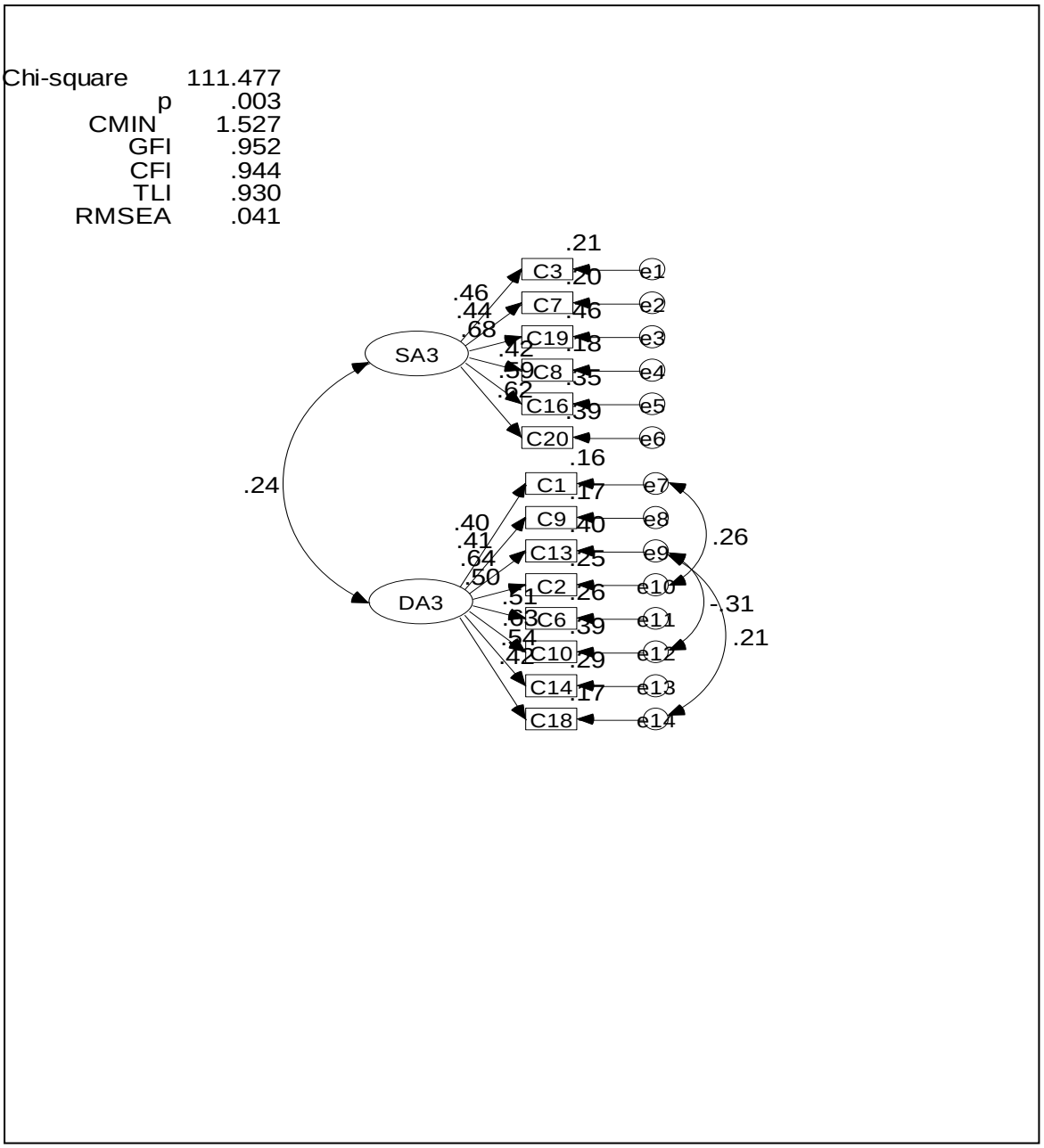

Figure 2: Revised measurement model of R-SPQ-2F

The second objective of this study was to determine the two-factor structure validly measure learning approach using second-order CFA model. The hypothesized second order latent constructs were surface and deep approaches. Six items were identified as the best items to measure surface learning approach while eight items measured deep learning approach. The results of second order measurement model of R-SPQ-2F are presented in Figure 3.

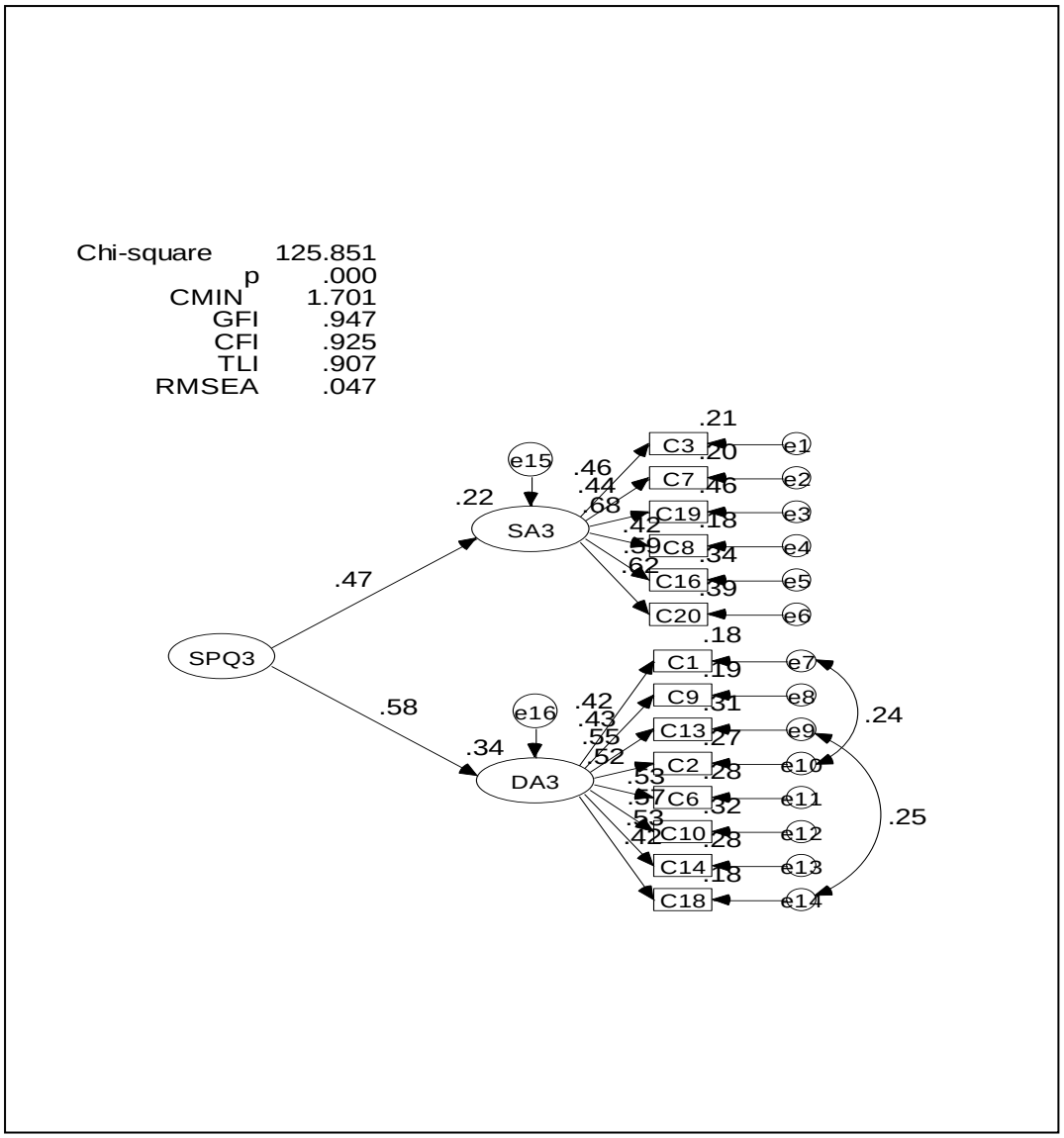

Figure 3: Second order measurement model of SPQ

The results (Figure 3) of construct validity for the second-order model showed that the model has goodness-of-fit value, χ^2 (74) = 125.85, $p < 0.05$. In addition, looking at other five indices showed that the R-SPQ-2F has acceptable goodness of fit between the model and the data (N=312). The model has adequate fit indices of a good model according to CMIN/df = 1.70. The goodness-of-fit indices showed acceptable values of GFI = 0.95, CFI = 0.93 and TLI = 0.91, all indices were above 0.90 as recommended by Bentler (1992) and Hu and Bentler (1999). The value of RMSEA was 0.05 which also fulfilled the conventional standard of a good fit. The loading between the latent construct of surface approach subscale with the construct of SPQ showed an acceptable loading of 0.47. The loading between the latent construct of deep approach subscale with the construct of SPQ also showed an acceptable loading of 0.58.

CONCLUSIONS AND IMPLICATIONS

In conlusion, the R-SPQ-2F underwent the process of confirmatory factor analysis to validate the items and constructs related with the items. Results of CFA showed that it has good construct validity and has goodness-of-fit indices fulfilling the standard conventions. The eight items in the deep approach subscale were valid in assessing to what extent the students were motivated by intrinsic factors. Similarly, the six items in

surface approach scale were also valid in measuring how much the students were motivated by extrinsic factors. Results of reliability analysis also showed that this instrument has a good reliability.

Two implications can be emphasised from this study. First, the methodological implication showed the usefulness of CFA in validating the items and constructs consisted in the R-SPQ-2F. We can therefore conclude that the instrument was suitable and can be used in the context of higher education in Malaysia. Second, although six items were eliminated, it still retained the two factors. We can also conclude that the results validated the theoretical SAL framework which specifically measures extrinsic nature of the surface approach to learning and the intrinsic nature of intrinsic learning approach.

Future research would be of great value if it can examine the actual processes going on during the learning activities by using qualitative method in analyzing the items. This is due to the importance of the approaches students use in their study which have significant impact on both the quality of the learning and their academic success. It would clearly be of value to identify students whose approach to learning was predictive of unsatisfactory performance.

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