

The Collaborative Problem Solving Questionnaire: Validity and Reliability Test

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Abstract

The aim of the study is to validate the questionnaire by using confirmatory factor analysis. Besides, it also would like to examine the internal reliability. Three hypotheses were tested. The questionnaires have been answered by 294 respondents among ten schools. The minimum criterion of model was achieved. The reliability of the questionnaires was high.

Keywords: Validity, Reliability, Questionnaire, Collaborative problem solving

Introduction

Collaborative problem solving method is active learning. During the problem solving activity, students work together to ensure that the problem posed will be solved. The collaborative group is able to solve the problem posed and is able to identify its own weaknesses (Vygotsky, 1997). Problems prepared by teachers were solved by working with partners (Ming Ming, 2000). Collaborative problem solving method requires that a problem is solved in groups and not merely by an individual's ability. This is caused by lack of experience, different individual perspectives and knowledge and experience levels about a different thing. There are many theories involved in the collaborative problem solving method such as instructional theory, behaviourist theory and constructivist theory. However, the focus of this study leads to the constructivist theory because this theory focuses on the mental activities which greatly influenced the learning outcomes through the collaborative problem solving method. The constructivist theory conflicted with the behaviourist theory which stressed on mental activities, knowledge originality and the way students develop knowledge from their actions. The collaborative problem solving method is learning based on the integration of cognitive and social perspectives to construct learning. Mergel (1998) considered the constructivist as a theory that involves learning from experience. According to Hong (2002), constructivism is a theory for learning and philosophy for understanding. Learning is a constructive process in which economics students build knowledge based on prior knowledge. This matter is a process which fills the students' minds with information. This learning only allows economics students to retain facts or concepts in their memory and retrieve them when needed. The modern cognitive psychology states learning as a retaining process and based on concepts. New

information can be used to collect and solve problems. Economics students are more suitable to be in collaborative learning that is a small group working together to solve problems.

Economics teaching in pre-university appears to be important when there is the deterioration of pre-university students take economics as an examination subject. This phenomenon was supported by the report from Malaysia Examination Council (2008) which showed that there were 30, 737, 29103 and 23,570 candidates took economics in 2005, 2006 and 2007 respectively. One of the main factors was students lost interest in this subject (Yin Yin, 2008).

Previous studies have shown the significant results between active learning and students' interest (Goldman, Cohen & Sheahan, 2008; Chudhary, Malik, Saeed-ul-Hassan & Mahmood, 2010). Therefore, CPS is claimed to be a practical strategy for fostering students' interest and performance. In addition, collaborative problem solving (CPS) is an active learning with the element of practical application on economics theory and concept. In this study, will measures the effect of CPS on improving students' interest, students' readiness in group learning and students' learning style.

Purpose of Study

The main purpose of this study is to investigate the reliability and validity of the instrument. This study is also undertaken to find out the fitting of the CPS model.

Hypotheses

The hypotheses for this study are as follow:

H₁ The CPS is influenced by three interrelated factors; a three –factor of CPS is construct-valid

H₂ Each factor reliably influences the variability of its indicators

H₃ Each factor is statistically reliable

Literature Review

Johnston et al. (2000) studied the collaborative problem solving among year two students in the University of Melbourne. In his opinion, it is one of the active learning methods that could stimulate learning. The project carried out could enhance communication skills and group work skills which increased learning. Collaborative learning assists students' discussion and integrates new ideas to learning in depth. Based on the findings, students' academic achievement after undergoing a nine-month project revealed that there are positive relationships between projects which utilize collaborative problem solving method. Students in these projects used a longer duration of time to prepare questions before proceeding to tutorial classes. Students' attendance showed an increase of 3% compared to the traditional tutorial classes. The findings of this study showed a change in the respondents' score which is not equivalent to the two months duration used for preparation. Students' achievement was significant for the international students group but there was no significance for the Asian students group

because they believed that the Asian students possess different learning styles. The findings from the study conducted by Johnston et al. (2000) also showed that different duration is taken by the semester one experimental group while the control group was taken during the second semester. Different duration of time is not suitable to conduct the experimental study as students had experienced psychology and mental changes after one semester.

According to Alexander and McDougall (2001), tutors and students showed significance in the change of the traditional tutorial method to the collaborative problem solving method as a new tutorial method. Mergendoller, Lahart and Mass (2002) studied the difference between the collaborative problem solving method and the traditional teaching in a secondary school. From the findings, students who participated in the researcher program did not show any significance in the change of the students' attitude towards economics and interest in the collaborative problem solving method. This finding showed the opposite situation from that which was hypothesized based on the review of the reading of the medical education work that is collaborative problem solving method is more effective compared to conventional learning.

Findings from studies are mostly taken from university students. However, the study conducted by Mergendoller, Maxwell and Bellisimo (2002) was carried out in a secondary school. It showed positive findings. The findings from the study conducted by Yin Yin and Kassim (2005) on 200 form six economics students in four secondary schools in Penang in 2004 showed that students studied economics through memorization. They obtained higher scores in examinations if the examination questions were similar to their notes and work books. Students obtained better scores for lower thinking questions which were questions that tested knowledge, comprehension and simple application. On the other hand, for questions that were of high thinking levels such as synthesis and evaluation, students faced great difficulties. Al-Dujarj and Ryu (2007) stated that CPS could develop a positive learning style. The findings showed that CPS is able to train students to develop an independent learning style. Ravitz (2009) also supported the findings.

All the methodology of the studies conducted was experimental and quantitative in the form of data analysis. One of the setbacks of the previous studies is that the experimental groups were collaborative in nature compared to individual learning. This setback will be given attention and will not be repeated by the researcher. Prior researches have ignored the influences on students' readiness. This is the research gap that enables researchers to develop some powerful insights through CPS model to explain patterns of collaborative learning.

Methodology

Samples

This questionnaire was distributed to 400 pre-university students from ten schools in Malaysia. However, this survey has been answered by 294 respondents. All the students were in their lower six grade and range in age 17-18 years. Racial distribution can represent the actual ratio of Malaysia's population as follow: Malay (70%), Chinese (23%) and Indian (7%).

Instrument

The set of questionnaires (Collaborative Problem Solving Questionnaire-CPSQ) employed was constructed by researchers for this study. This was a new instrument and there were no preexisting measures of reliability. The structured questionnaire consisted of 31 close-ended items. All the items were phrased positively based on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The three underlying factors, (interest, students' readiness and learning style) in the questionnaires were identified as three factors relating specially to items of collaborative problem solving. The CPSQ measuring interest consisted of 10 items; whereas the CPSQ measuring students' readiness consisted of 10 items and there were 11 items of the instrument measuring learning style.

Content and face validity had been measured to ensure that a set of systematic assessments can be employed in this study. First of all, a draft of the CPSQ of this study was distributed to relevant experts in order to get feedback concerning the content, adequacy, suitability and layout of the items. The instrument had also examined the clarity and found valid by referring to the experts. In order to provide meaningful information to researchers, the instruments must be valid and consistence (Gay, Mills & Airasian, 2011; Martin, Caughtry, Flory, Murphy & Wisdom, 2011). The validity and the internal consistency reliability of the instrument was measured by using Confirmatory Factor Analysis (CFA).

Procedures

Survey was carried out after obtaining the permission from Ministry of Education, Malaysia. This study employed quasi experimental design. In order to control the threat of validity, all teachers had to teach the same microeconomics content using CPS method. Besides, the teachers involved were required to attend two sessions of briefing prior to implementation of CPS method in the class to ensure proper implementation of the method. The head of department was assigned to supervise teachers for the progress of the implementation of the CPS method. A team of ten enumerators collected data from ten different schools. The students completed the questionnaires after the intervention. The intervention took ten weeks.

Data Analyses

Structural Equation Modeling (SEM) techniques were used to conduct CFA. AMOS 18 was used to estimate the maximum likelihood. Chi-square was examined to find out the model fit index; Adjusted Goodness of Fit index (AGFI) and Incremental fit Index were examined too. The values greater than .90 for the CFI and GFI indicate acceptable fit (Kline, 2005). The Root Mean Square Error of Approximation Index (RMSEA) was examined too. A few assumptions have to be considered while doing CFA; for example:

- Each indicator should be normally distributed and correlated with other indicators.

- Each dependent latent variable in the model should be normally distributed for each value of another latent variable.
- SEM also assumes linear relationship between indicator and latent variables and between latent variables.

Findings

Table 1 revealed the analyses of CPSQ. These results indicated that the model (Figure 1) has achieved the minimum good fit based on the following indexes. $X^2 = 1300.248$, $df = 402$, $p < .001$, $GFI = .729$, $CFI = .797$, $RMSEA = .80$.

Table 1 Statistical Analyses of item in CPSQ

Item	Mean	S.R.W	CR
Interest			
1. Confident with problem solving	3.555	.421	6.852
2. Like economics theory	3.456	.438	7.340
3. Interest in economics	3.398	.472	7.835
4. Enjoy learning economics	3.745	.466	7.682
5. Discuss economics topic	3.469	.618	9.722
6. Discuss with peers during CPS	3.326	.738	12.324
7. Problem solving become very simple	3.238	.710	11.188
8. Present better task	3.414	.783	13.118
9. More time to spend on this subject	3.403	.736	12.434
10. Study economics in group Students' Readiness	3.457	.741	12.354
11. Prepare before lesson	2.979	.621	9.302
12. Answer the question before lesson	2.900	.653	9.425
13. Search the material before lesson	3.188	.689	9.828
14. Discuss the lesson with peers	3.142	.594	8.740
15. Do the revision consistently	3.056	.652	9.414
16. Understand better after preparation	3.442	.605	8.872
17. Complete all the task given by teacher	3.763	.589	8.673
18. Ask the teacher when	3.147	.710	10.047

doubtful			
19. Search for external source related with topic	2.987	.712	10.070
20. Use more time for learning economics	3.088	.735	10.310
Learning Style			
21. Like group discussion	3.325	.654	10.007
22. Understand better through discussion	3.440	.680	10.346
23. Provide assistance to peers	3.705	.610	9.408
24. Evaluate the views from peers	3.316	.699	10.587
25. Think critically after discussion	3.234	.684	10.395
26. Good in problem solving	3.198	.651	9.962
27. Learning become meaningful in group	3.299	.736	11.063
28. Discuss economics concept in group	3.379	.775	11.547
29. Learning in group stimulate my thinking	3.279	.708	10.713
30. More confident with problem solving	3.232	.657	10.209
31. Deep understanding after discussion	3.551	.640	9.867

This table also revealed the mean, standardized regression weight (SRW) and critical ratios. The results showed the mean between 2.999 to 3.745, is considered as quiet a high mean. Figure 1 indicated the hypothesis model. All items loaded their factor was significant at $p < .001$ with CR > 2 and ranging from 6.896 to 13.098. The latent variable of Interest explained ranges from 32% to 68% of the variance, whereas the latent variable of the readiness (students' readiness) explained ranges from 41% to 53% of the variance. Besides, the latent variable of the learning style explained ranges from 48% to 89% of the variance.

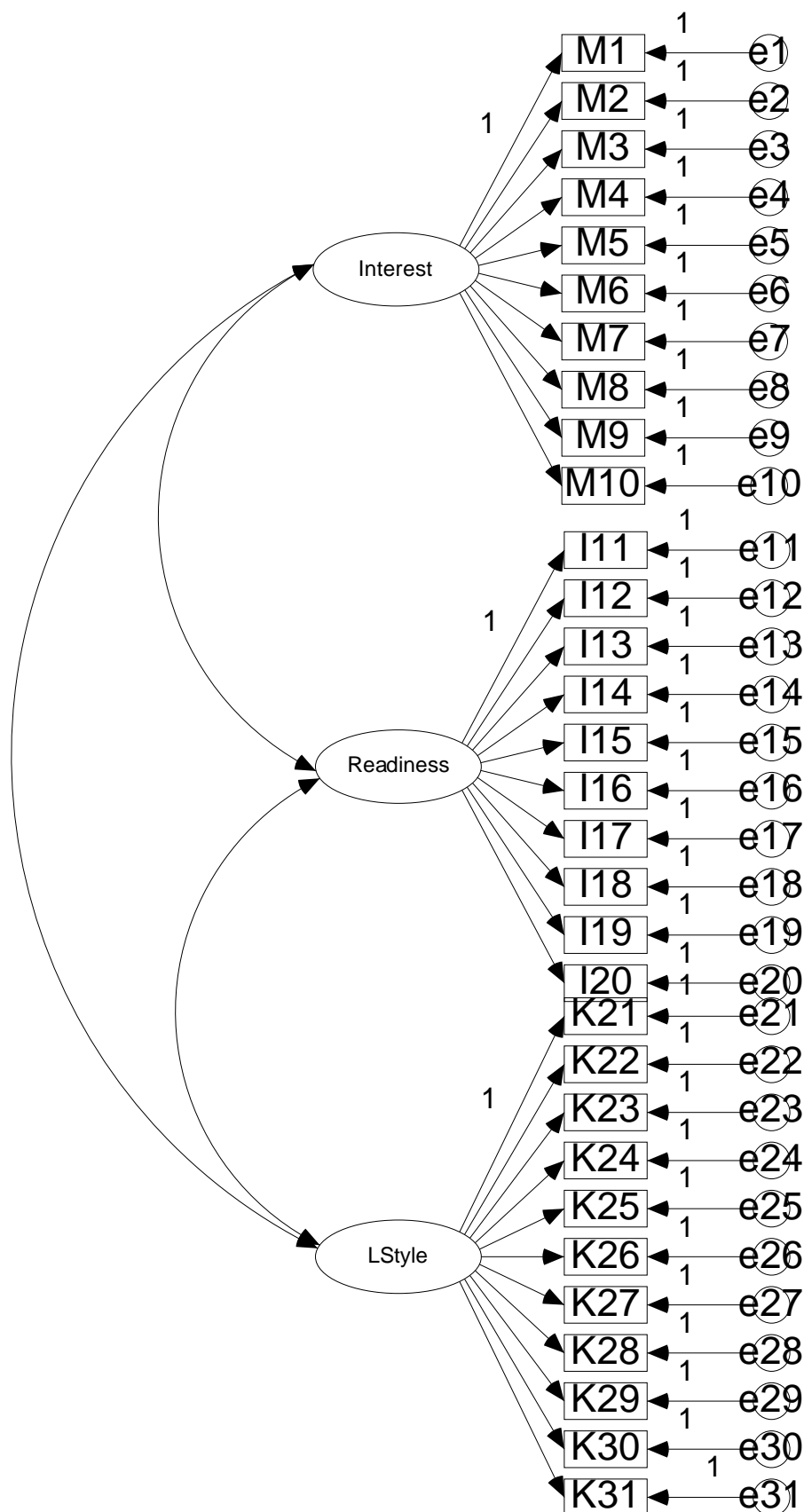


Figure 1: Path Diagram of CPSQ

Reliability

Conbach's alpha test was employed in this study to measure the internal consistency of the instrument. After running the data, the results indicated that all the items were high in reliability ranging from 0.851 to 0.875. These results are in line with the benchmark that an instrument with the coefficient of 0.70 or above has a high reliability standard (Sekaran and Bougie, 2010). Therefore, all the items are reliable and usable.

Discussion

Hypothesis 1 was failed to be rejected although the model is not perfect but it achieved the minimum criteria of the model. Hypothesis 2 and 3 were accepted. The CPSQ was considered as a reliable instrument. However, based on the CFA results, the CFI and CFI are below the criteria of 0.90. The model of three latent factors, most of the items are provided substantial loadings ($>.40$) and provide evidences of convergent validity. On the other hand, the reliability from Conbach's alpha showed positive results.

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