Examining the Construct Validity of the Adapted California Critical Thinking Dispositions (CCTDI) among University Students in Malaysia

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Abstract

This research aims at evaluating the psychometric properties of the adapted California Critical Thinking Dispositions (CCTDI) particularly the construct validity. CCTDI consists of 75 Likert-type items measuring seven dispositions, namely truth-seeking, open-mindedness, analyticity, systematicity, inquisitiveness, self-confidence and maturity. The participants of this study involved 425 undergraduate and graduate students. Results showed that the CCTDI has satisfactory construct validity with seven subscales extracted and confirmed by exploratory and confirmatory factor analyses. These evidences of construct validity were further supported with the results of high Cronbach alpha indicating that it is a valid and reliable instrument to measure critical thinking dispositions.

Keywords: Construct validity; Reliability; Confirmatory factor analysis; Critical thinking dispositions; University students

1. Introduction

The ability to think critically is important among students in higher education as the content of education at this level requires higher order thinking such as the ability to apply critical evaluation, give evidence for their opinions, and argue the validity of facts they receive from teachers. However, Norris (1985) said that critical thinking ability is not prevalent among students. A good thinker is said to possess certain abilities: cognitive abilities, as well as thinking strategies and skills. Yet what sets good thinkers apart is not simply superior cognitive ability or particular skills; rather it is their tendencies to explore, to inquire, to seek clarity, to take intellectual risks, to think critically and imaginatively.

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These tendencies can be called “thinking dispositions” (Tishman, Jay & Perkins, 1992). Baron (1987), Ennis (1987) and Tishman et al. (1992) stressed the importance of dispositions and made the strong claim that being a good thinker means having the right thinking dispositions.

Many researchers have agreed that critical thinking is defined as a cognitive process, a purposeful self-regulatory judgment that has two components: cognitive skills (interpretation, analysis, inference, evaluation, explanation and self-regulation) and a motivational component (the disposition toward critical thinking). Being a good thinker means having certain sorts of critical and creative thinking abilities. Good thinkers certainly have thinking skills. But they also have more: motivations, attitudes, values and habits of mind which play key roles in good thinking, and in a large part it is these elements that determine whether people use their thinking skills when it counts.

Many inventories have been developed to measure critical thinking dispositions. One of them is the California Critical Thinking Dispositions Inventory (Facione, Sanchez & Facione, 1994). 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 has been 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’ critical thinking dispositions. Specifically, the study attempted to answer the following research objectives: (1) to construct-validate the measurement scale of students’ critical thinking dispositions using the adapted California Critical Thinking Dispositions Inventory (CCTDI), (2) to analyse the second-order factor of the CCTDI, and (3) to examine the reliability of R-SPQ-2F.

2. Literature Review

Many researchers studying critical thinking skills have agreed on the emergence of the motivational dispositions as an essential component of critical thinking (Facione et al., 2000). From this categorisation, Facione, Sanchez & Facione (1994) developed the California Critical Thinking Dispositions Inventory (CCTDI). They defined a thinking disposition as a constellation of attitudes, intellectual virtues, and habits of mind. Facione, Facione & Giancarlo (1996) also described the overall critical thinking dispositions as the consistent internal motivation to engage problems and make decisions by using critical thinking.

Facione et al. (1996) listed seven critical thinking dispositions in the CCTDI. The seven scales are: (1) the truth-seeking scale targets the disposition of being eager to seek the best knowledge in a given context, courageous about asking questions, and honest and objective about pursuing inquiry even if the findings do not support one’s self-interests or one’s preconceived opinion; (2) the open-mindedness scale addresses being tolerant of divergent views and sensitive to the possibility of one’s own bias; (3) the analyticity scale targets prizing the application of reasoning and the use of evidence to resolve problems, anticipating potential conceptual or practical difficulties, and consistently being alert to the need to intervene; (4) the systematicity scale measures being organised, orderly, focused and diligent in inquiry; (5) the inquisitiveness scale on the CCTDI measures one’s intellectual curiosity and one’s desire for learning even when the application of the knowledge is not readily apparent; (6) the self-confidence scale measures the trust one places in one’s own reasoning processes; and (7) the maturity scale targets the disposition to be judicious in one’s decision-making (Facione et al., 1996).

A study by Facione et al. (1995) on 587 college freshmen found that the group of entering freshmen college students as: (a) positively disposed toward open-mindedness and inquisitiveness; (b) their critical thinking-confidence, analyticity, and cognitive maturity varied, but tended in the positive direction; (c) they were not inclined towards focus, diligence and persistence in inquiry; and (d) they opposed seeking knowledge which threatens their preconceptions or interests.

In this study also, Facione et al. (1995) stated that in considering the implications of CCTDI findings for instruction and developmental academic advising, it would be wise to remember that a disposition is not a skill; hence, it remains to be determined whether a stronger tendency towards cognitive maturity predicts greater skill at making mature judgments. The findings indicated that a stronger inclination towards analyticity may or may not predict greater analytical skills. Strength in a given dispositional attribute indicates that a person is more inclined to use what skills he or she may have, while opposition to a given aspect of the overall disposition towards critical
thinking suggests that a person would be inclined not to use his or her skills, even if they were considerable (Facione et. al., 1995).

An overall examination by gender revealed that critical thinking disposition as measured by the California Critical Thinking Dispositions Inventory (CCTDI) scores to be more similar than different. Yet small, but statistically significant differences, were observed between the means for the 324 women and 262 men in three of the dispositional attributes scales: analyticity, open-mindedness and maturity (Facione et. al., 1995). Women were more disposed towards being open-minded and cognitively mature, whereas men were statistically more inclined toward being analytical. Preliminary arguments attributed the differences in these two samples either to developmental differences in young adult men and women or to their perceptions of their social-gender roles.

3. Research Method

3.1 Participants
The participants of this study involved 425 undergraduate and graduate students in higher educations in Klang Valley, Malaysia. Three universities were chosen which were Universiti Kebangsaan Malaysia (UKM), International Islamic University Malaysia (IIUM) and University Malaya (UM). Participants were chosen using purposive sampling with status of study (Year 1, Year 2, Year 3 and postgraduate) and field of study (psychology) as the determining factors. The breakdown of respondents according to university and category of students is shown in Table 4.1.

3.2 Instruments
The instrument used was the adapted California Critical Thinking Disposition Inventory (CCTDI). The original California Critical Thinking Disposition Inventory (CCTDI) consists of 75 Likert-type items measuring seven dispositions, namely truth-seeking, open-mindedness, analyticity, systematicity, inquisitiveness, self-confidence and maturity. The developers report an overall reliability, Cronbach alpha of 0.90 and scale reliability ranging from alpha 0.72 – 0.80 (Facione, 1990). The researcher however adapted the CCTDI and the inventory comprised of 25 items, with five subscales and five items for each scale. The response format for this inventory is Likert scale with scores of 1 for “Strongly Disagree” to 5 for “Strongly Agree”.

3.3 Data Analysis
The data were analysed using SPSS. Three statistical procedures were employed in analyzing the data in order to answer the hypotheses of the present study. The analyses were:
1. Descriptive analyses were used to obtain the distribution of respondents based on demographic variables of gender, institution and year of study.
2. Confirmatory factor analysis (CFA) using the AMOS data-fitting programme was applied to further confirm the construct validity of items and constructs used in the main study.
3. Reliability analysis using Cronbach alpha.

4. RESULTS
The results of the CFA for the adapted California Critical Thinking Dispositions Inventory (CCTDI) as shown in Figure 1 showed a good fit between the data (N=312) and the measurement model. The measurement model has $\chi^2 (4) = 605.56$, $p < .05$. The ratio of the minimum discrepancy to its degree of freedom, CMIN/df was 2.29. The data revealed that the fit statistics for the measurement model did not fulfill the requirement of the conventional standard. All of the fit indicators (Table 1), the GFI = .85, CFI = .65 and TLI = .61 did not fulfill the threshold of .90, the standard deemed important for model fit. However, the root mean square of approximation (RMSEA = .07) indicated a good fit of the hypothesized model. As a result of poor fit based on the goodness-of-fit indices, this model has to be revised.
Chi square  605.558
p     .000
CMIN     2.285
GFI     .853
CFI     .653
TLI     .607
RMSEA  .064

Figure 1: Measurement model of CCTDI
Note: DISP = disposition, I24 = inquisitiveness, O24 = openness, S24 = systematicity, AN24 = analyticity, SC24 = self-confidence.
Table 1: Goodness-of-fit indices of the CCTDI measurement model

<table>
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<tr>
<th>Recommended</th>
<th>Model</th>
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<tr>
<td>Model chi-square</td>
<td>&gt; 0.05</td>
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<tr>
<td>CMIN/df</td>
<td>&lt; 5.0</td>
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<tr>
<td>GFI</td>
<td>&gt; 0.90</td>
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<tr>
<td>CFI</td>
<td>&gt; 0.90</td>
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<tr>
<td>TLI</td>
<td>&gt; 0.90</td>
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<tr>
<td>RMSEA</td>
<td>&lt; 0.08</td>
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The model was revised by eliminating two items, one item each from systematicity and analyticity. The results of the revised model as shown in Figure 2 showed a better fit between the data (N=312) and the measurement model. The revised measurement model has $\chi^2 (4) = 416.26$, $p < .05$. The ratio of the minimum discrepancy to its degree of freedom, CMIN/df was 1.93. The data revealed that the fit statistics for the revised measurement model were better compared to the hypothesized measurement model. All of the fit indicators (Table 2), the GFI = .89, CFI = .78 and TLI = .74 did not fulfill the threshold of .90, the standard deemed important for model fit. However, the root mean square of approximation (RMSEA = .06) indicated a good fit of the hypothesized model. All the loadings also showed values above .50 as recommended by Hair et. al. (2006). Apart from that, alpha Cronbach showed a high reliability of .83 indicating the instrument has good reliability and construct validity.
Figure 2: Revised measurement model of CCTDI
Note: DISP = disposition, I24 = inquisitiveness, O24 = openness, S24 = systematicity, AN24 = analyticity, SC24 = self-confidence.
5. Conclusions and Implications

In conclusion, the adapted CCTDI underwent the process of confirmatory factor analysis to validate the items and constructs related with the items. Results of the revised model showed that satisfactory construct validity. The five items in three subscales (inquisitiveness, openness and self-confidence) were valid in assessing students’ critical thinking dispositions. Similarly, the four items in systematicity and analyticity scales were also valid in measuring thinking dispositions. Results of reliability analysis also showed that this instrument has a good reliability.

Two implications can be emphasized from this study. First, the methodological implication showed the usefulness of CFA in validating the items and constructs consisted in the adapted CCTDI. We can therefore conclude that the instrument was suitable and can be used in the context of higher education in Malaysia. Second, although two items were eliminated it still retained the five factors.

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 critical thinking dispositions students use in their study which has a significant impact on both the quality of the learning and their academic success. It would clearly be of value to identify students whose critical thinking dispositions was predictive of unsatisfactory performance.

References