FACTOR ANALYSIS OF CRITICAL THINKING AMONG NURSING STUDENTS FROM PRIVATE HIGHER EDUCATION INSTITUTIONS

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ABSTRACT:

Background: Nursing Council of Thailand defined the critical thinking as a main competency of registered nurse and midwives. Critical thinking as Facione and Facione's concept consisted of critical thinking skill and disposition component of critical thinking. This was the second order confirmatory factor analysis that would affect to theoretical and practical instruction management as the guidelines for promoting the critical thinking of nursing students further.

Methods: The participants were 549 first year nursing students from private higher education institutions: Huachiew chalermprakiet university, Vongchavalitkul university, Western university, Siam university and College of Asia Scholars. Simple random sampling was used in this research. Research instruments were questionnaires on general characteristics among nursing students and critical thinking. The data were analyzed by using descriptive statistics and confirmatory factor analysis .

Results: Critical thinking consisted of two elements: the first element was critical thinking skills which were thinking skills on other experiences such as interpretation, analysis, evaluation, inference, explanation, and meta-cognitive self-regulation. The second element was disposition element of critical thinking. It comprised personal characteristics which supported intellectual development process. It consisted of truth-seeking, open-mind, analyticity, systematicity, critical thinking self-confidence, inquisitiveness and maturity. The results showed that the critical thinking model was consistent with empirical data, chi-square = 54.845, df = 42, p-value = .088 (p-value higher than .05 is consistency), χ^2/df = 1.306 (acceptable levels is not over 2), GFI = .985, CFI = .997 (acceptable level gets close 1), RMR = .008, RMSEA = .024. (acceptable level gets close 0) .The coefficient of standard factor loading of variables was different from zero with statistical significance at .05. The variable with the highest level of factor loading was explanation (b_{sc} = .856) followed by inference (b_{sc} = .832). The variable with the lowest level of factor loading was analysis (b_{sc} =.637).

Conclusion: Critical thinking consisted of two main elements: 1) critical thinking skills and 2) personal characteristics of critical thinkers. Factor analysis of critical thinking among nursing students from private higher education institutions showed that critical thinking model was consistent with empirical data. In theoretical and practical teaching, nursing academies should promote critical thinking by using the following critical thinking skills and personal characteristics of critical thinkers to improve critical thinking in nursing students.

Keywords: Factor analysis, Critical thinking, Nursing students, Private higher education institutions

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INTRODUCTION

Critical thinking is important for professional nursing. Nursing is regarded as holistic care requiring the application of both sciences and arts to patient treatment. As a result, critical thinking becomes important for nursing. For the 21st Century learning management, it is important for learners to

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possess critical thinking [1]. Nursing Council of Thailand [2] defined the critical thinking as a main competency of registered nurses and midwives. The requirement of critical thinking for nursing is because registered nurses must have unique knowledge to explain situations which are significant for nursing science and required reasonable thinking and deliberate consideration. Nursing practice is a professional practice which must have technical and conceptual knowledge about nursing and ability to apply nursing science to other sciences for proper practice. Therefore, nursing students necessarily require critical thinking skill [3, 4].

Facione and Facione [5, 6] showed that the critical thinking was necessary skill for clinical decision competency. The critical thinking consisted of two components. The first component was critical thinking skill which was thinking skill on other experiences such as interpretation, analysis, evaluation, inference, explanation, and meta-cognitive self-regulation. Second, disposition component of critical thinking was personal characteristic which supported intellectual development process. It consisted of truth-seeking, open-mind, analyticity, systematicity, critical thinking self-confidence, inquisitiveness and maturity [3].

Critical thinking as Facione and Facione's concept was covered both internal character; personal brain thinking skill, and external character which expressed the critical thinking. The concept is suited for enhancing the critical thinking of nursing students and interlard with the nursing instructional model. Moreover, there was no study on nursing students from private higher education institutions with critical thinking analysis in order to use such concept in the development of critical thinking for nursing students [5]. Hereby the researcher interested to take it to analyze critical thinking factors of nursing students in private higher educational institutes to find the theory consistency.

Based on those elements of critical thinking, the researcher was interested in utilizing such concept as the foundation of this analysis on the elements of critical thinking of nursing students. In addition, the researcher also wanted to figure out whether the critical thinking model was suitable with nursing students in private higher education. This was the second order confirmatory factor analysis that would affect to theoretical and practical instruction management as the guidelines for promoting the critical thinking of nursing students further.

MATERIALS AND METHODS

Participants

The sample group of this research was the first year nursing students of academic year of 2014 from some private higher education institutions, The result of studies concerning the critical thinking of nursing students in Thailand found that they had the medium level [7, 8], in order to study critical thinking elements and create guidelines in promoting critical thinking prior taking up professional nursing practice [6]. The researcher determined the sample size based on the criteria of Hair et al., [9]. The sample size and number of variables was able to be observed from the confirmatory factor analysis (CFA) should have the ratio of 10-20 per 1 observed variable. There were 15 variables in this study, the minimum sample size required was 300 people. Five private universities having nursing program was randomly selected from 20 of the private universities. Then first year nursing students were randomly recruited into the study proportional to the total number of 1st year students. Total 549 of the first year nursing students was included into this study to encourage the strength model for testing hypothesizes and testing fit with the empirical data. The researcher had specified the sample size 25 percent of 20 nursing private higher education institutions, 5 institutions, then casted the samples by simple random sampling, and got 549 samples.

Materials

Tools used in this research and quality audit were consisted of: Critical thinking test, which was adapted from Amonchai [10] Critical Thinking Test, consisted of Critical thinking skills test, 27 multiple choice questions, and disposition component of critical thinking test, 39 five rating scale questions. The critical thinking test was consisted of the test for testing content validity and the Index of Item Congruence (IOC). The accepted questions had the index of consistency .80 or over [11]. For this study, they showed between of .86-1.00. Moreover, the difficulty was calculated from the ratio of all correct answer persons of each question and the accepted questions had the criteria of difficulty between of .20-.80 [11] and they showed between .47 - .60. The discrimination has to show .20 or over [11], and it showed between .36 - .80. The reliability test has show .80 or over, and the critical thinking skills test was tested

Table 1 The number and percentage of general characteristics of 549 nursing students

General characteristics	Number	%
Sex		
male	58	10.6
female	491	89.4
Age (years)		
<20	382	69.6
20-22	116	21.1
>22	51	9.3
Religion		
Buddhists	532	96.9
Muslims	17	3.1

Table 2 Statistics of the results of the second order confirmatory factor analysis of critical thinking model

Observed variance	Factor analysis of critical thinking			
	b_{sc}	SE	t	R^2
First order:				
Meta-cognitive self- regulation (MET)	.652**	.067	14.350	.425
Analysis (ANA)	.637**	.075	13.416	.406
Inference (INF)	.832**	.066	17.397	.692
Explanation (EXP)	.856**	.068	17.527	.733
Evaluation (EVA)	.739**	.049	20.332	.546
Interpretation (INT)	.734**	<-->	<-->	.539
Maturity (MAT)	.792**	.079	13.090	.448
Inquisitiveness (INQ)	.739**	.058	17.407	.547
Open-mind (OPE)	.856**	.056	19.770	.734
Systematicity (SYS)	.754**	.056	17.681	.568
Analyticity (ANL)	.808**	.056	19.040	.654
Truth-seeking (TRU)	.803**	.057	18.428	.645
Critical thinking self-confidence (CON)	.734**	<-->	<-->	.539
Second order:				
Critical thinking skill (SK)	.818**	<-->	<-->	.777
Disposition component of critical thinking (DI)	.811**	<-->	<-->	.598

Notes: **p < .01; b_{sc}= the coefficient of standard factor loading; Mark <--> = parameters no report is SE and t

the reliability by KR-20, it showed 90.. The disposition component of critical thinking test was tested the reliability by considering on the internal consistency of tools based on the cronbach's alpha coefficient was .97.

Ethical consideration

This study has been approved by the Faculty of Industrial Education, King Monkut's Institute of Technology Ladkrabang, on 23 February 2015, and also got the approval from the Association of Private Higher Education Institutions of Thailand on 30 September 2015 to collect the data.

Data analysis

Preliminary data of the samples were analyzed by using frequency and percentage and confirmatory factor analysis.

RESULTS

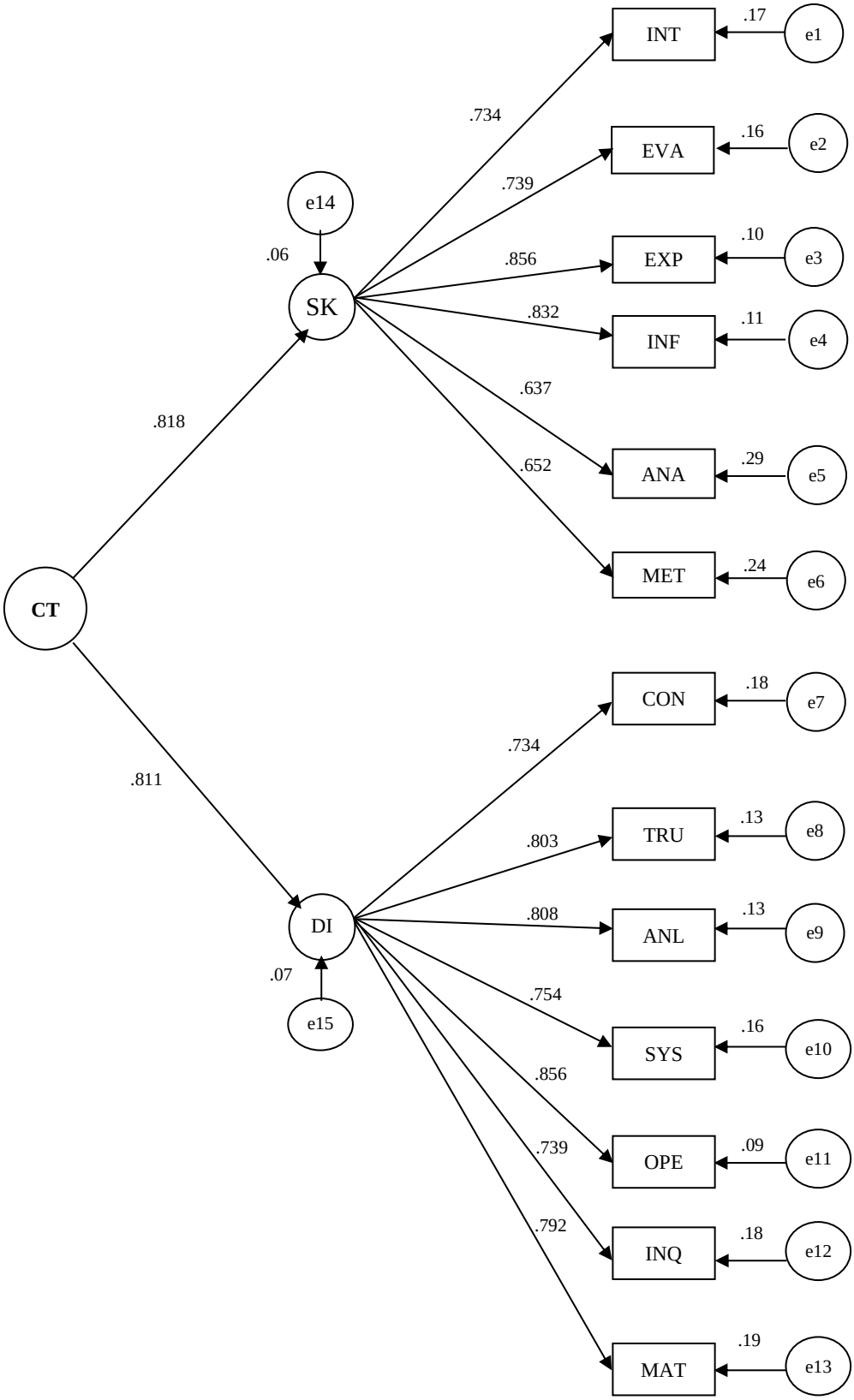
The analysis on critical thinking among nursing students from private higher education institutions was as follows:

General characteristics of the samples

Most of the samples were females 89.44%.The samples mostly were those aged less than 20 years old 69.58%.Majority were Buddhists as shown in Table 1.

Factor analysis of critical thinking

From the results of the second order confirmatory factor analysis, it was found that the critical thinking model was consistent with empirical data, chi-square = 54.845, df = 42, *p-value* = .088 (p-value higher than .05 is consistency), χ^2/df = 1.306 (acceptable levels is not over 2), GFI = .985, CFI = .997 (acceptable level gets close 1), RMR = .008,



Chi-square= 54.845, df= 42, *p-value*= .088, χ^2/df = 1.306, GFI = .985, CFI = .997, RMR = .008, RMSEA = .024

Figure 1 Model of critical thinking among nursing students

RMSEA = .024. (acceptable level gets close 0). The coefficient of standard factor loading of variables was able to be observed completely that it was different from zero with statistical significance at .01. The variable with the highest level of factor loading was explanation (b_{sc} = .856, SE = .068) followed by inference (b_{sc} = .832, SE = parameter no report is SE). The variable with the lowest level of factor loading was analysis (b_{sc} =.637, SE = .075). In addition, it was also found that the standard factor loading of critical thinking skills (SK) was .818 while the standard factor loading of disposition component of critical thinking (DI) was .811 as shown in Table 2 and Figure 1.

DISCUSSION

From the results of analysis on the second order confirmatory factor analysis of the critical thinking model of nursing students, it was found that general information of the samples was as follows: most of the samples were females 89.44%. The samples mostly were those aged less than 20 years old 69.58%. Majority were Buddhists.

The results showed that the critical thinking model was consistent with empirical data, chi-square = 54.845, df = 42, p-value = .088 (*p-value* higher than .05 is consistency), χ^2/df = 1.306 (acceptable levels is not over 2), GFI = .985, CFI = .997 (acceptable level gets close 1), RMR = .008, RMSEA = .024. (acceptable level gets close 0). The coefficient of standard factor loading of variables was able to be observed completely that it was different from zero with statistical significance at .05. This was consistent with the result of Amonchai [10] who also found that the critical thinking model of nursing students was also consistent with empirical data. From these results, the model was consistent with empirical data. As a result, it showed that such concept was appropriate with the context of the first year nursing students from private higher education of Thailand based on the concept of Facione and Facione [5] and Facione [6] consisted of 2 factors. The first factor was critical thinking skills that were the thinking skills related to several aspects of experiences consisted of some sub-skills including interpretation, analysis, evaluation, inference, explanation, and meta cognitive self-control. For disposition component of critical thinking, it was the characteristics of individual who is able to promote intellectual development process consisted of some sub-skills including investigation, open-minded, analyticity, systematicity, self-confidence on utilization of critical thinking, inquisitiveness, and maturity. The results showed that Factor analysis of critical thinking among nursing students from private higher education institutions showed that critical thinking model was consistent with empirical data, the coefficient of standard factor loading of variables was able to be observed completely that it was different from zero with statistical significance at .01. The variable with the highest level of factor loading was explanation (b_{sc} = .856, SE = .068) followed by inference (b_{sc} = .832, SE = parameter no report is SE). The variable with the lowest level of factor loading was analysis (b_{sc} =.637, SE = .075).

Critical thinking was consisted of 2 elements including critical thinking skill and disposition component of critical thinking. From the results, it was found that the factor loading of critical thinking skills was .818 while the factor loading of disposition component of critical thinking was .811. As a result, the critical thinking of nursing students should be promoted on skills and of disposition component of critical thinking. Consequently, it would affect to nursing practice, decision making on nursing, and the ultimate benefit for giving care to all patients.

Critical thinking skills were consisted of some sub-skills including interpretation, analysis, evaluation, reference, explanation, and Meta cognitive self-control on thinking. It was found that the coefficient of standard factor loading of variables was able to be observed completely that it was different from zero with statistical significance at .01. The variable with the highest level of factor loading was explanation (b_{sc} = .856) followed by inference (b_{sc} = .832). The variable with the lowest level of factor loading was interpretation (b_{sc} =.734). This was consistent with a study conducted by Balsiri et al. [12] who found that the factor loading of explanation skill was in the highest level. As a result, critical thinking skills should be promoted by universities in order to promote nursing students to have critical thinking skills according to the core competency of Nursing Council of Thailand and standards of qualification framework for higher education emphasizing on enabling students to have critical thinking. It was believed that critical thinking was a brain process that can be developed by providing some suitable theoretical and practical experiences of nursing career for leading to correct

decision making on nursing.

The disposition component of critical thinking was consisted of some sub-skills including investigation, open-minded, analyticity, systematicity, Meta cognitive self-confidence, academic inquisitives, and maturity. It was found that the coefficient of standard factor loading of variables was able to be observed completely that it was different from zero with statistical significance at .01. The variable with the highest level of factor loading was opened-mind (b_{sc} = .856) followed by analyticity (b_{sc} = .808). The variable with the lowest level of factor loading was self-confidence (b_{sc} =.734). This was consisted with a research of Wan Sulaiman et al. [13] who studied with some students in some Malaysian universities and found that the test model of disposition component of critical thinking was consistent with empirical. In addition, they also found that the factor loading of Opened-mind, Inquisitives and Self-confidence was on the first ranks. As a result, the characteristics of individual with critical thinking should be promoted by including it in both theoretical and practical nursing programs, in order to enable nursing students to be the nursing professionals with unique knowledge and reasonable thinking for considering information carefully as well as be able to apply nursing science to other sciences practically.

CONCLUSION

Critical thinking consisted of 2 main elements. The first element was critical thinking skill which was thinking skill on other experiences such as interpretation, analysis, evaluation, inference, explanation, and meta-cognitive self-regulation. Second, disposition component of critical thinking was person characteristic which supported intellectual development process. It consisted of truth-seeking, open-mind, analyticity, systematicity, critical thinking self-confidence, inquisitiveness and maturity. The result of critical thinking among nursing students from private higher education showed that critical thinking model was consistent with the empirical data.

RECOMMENDATIONS

1. Critical thinking of nursing students should be promoted on skills and of disposition component of critical thinking by including it in both theoretical and practical nursing programs.

2. The variables ordered by the standard factor loading should be applied for promoting critical thinking by developing them as the supplement courses for promoting critical thinking of nursing students.

3. The invariance of critical thinking model should be tested between nursing students of private higher education and nursing students of public universities.

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