

# The Confirmatory Factor Analysis of Critical Thinking Disposition of Education Students

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Chotika Thamvsiet<sup>1</sup>, Pasana Chularut<sup>2</sup>,  
Wilailak Lanka<sup>3</sup>, Pattananusorn Sathapronwong<sup>4</sup>

## Abstract

The purpose of this study were to 1) study critical thinking disposition of education students 2) to study the confirmatory factors analysis of students. The populations in this study were 5,589 students, whom were first year students on academic year 2016 of 11 Rajabhat Universities in North-eastern region of Thailand. The sample of study was 1,594 students (73.1% female, 26.9% male) by multi-stage random sampling. Empirical data were collected by using interview expert form and critical thinking disposition questionnaire, which is a 1-5 rating scale questionnaire of 51 question items with reliability ( $\alpha$ ) of .954. For analyzing data, various statistics were used such as frequency, percentage, average, standard deviation, factor analysis and content analysis. The results shown that 1) there are 7 factors of critical thinking disposition in Thais context: open-minded, systematic, truth-seeking, self-confidence, maturity, empathy and persisting, 2) for analyzing data with second order confirmatory factor analysis (CFA), found that the critical thinking disposition

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<sup>1</sup> Ph.D. Candate in Research and Development on Human Potentials (Educational Psychology), Faculty of Education, Srinakharinwirot University, Thailand

<sup>2</sup> Faculty of Education, Srinakharinwirot University, Thailand

<sup>3</sup> Faculty of Education, Srinakharinwirot University, Thailand

<sup>4</sup> Faculty of Education, Mahasarakham University, Thailand

model of 7 factors were consist with the empirical data:  $\chi^2=173.80$   $df=162$   $p=.25$   $GFI=0.99$   $AGFI=0.98$   $CFI=1.00$   $RMSEA=0.01$   $SRMR=0.00$ . The factor loadings of each factor was between 0.67-0.98, and the factor loadings of each indicator was between .34-.90 at the significant level of 0.01.

**Keywords:** critical thinking disposition, confirmatory factor analysis

## Introduction

According to the revolutionary rapid change of environment, economy and technology, people need to develop themselves constantly to keep up with the changes and be able to solve apprehensively problems. The most of researchers in education and human development fields have a consistent agreement that critical thinking skill, which is very importance that direct relation to other abilities such as learning, conversation, problem solving and decision making skills that every person should be trained. Rotherham and Willingham (2009: 16) explained the idea of education in 21'st century, which must aim to develop learners to have both critical thinking and creativity thinking skills. Hence, every education related staff should cooperate to help the learners grow up to be the high quality citizen with high legitimate reason and responsibility (Paul and Elder, 2005: 9). Otherwise, Anuruthwong (2012: 111) explained that developing of critical thinking is very importance for Thais young students that can be divide into two dimensions: 1) critical thinking skill and 2) critical thinking disposition. Facione (2011: 1-28) explained that to promote critical thinking in classroom, the key factor is teacher, who have to help and guide students to think and consider before judge when they receive any information. If students have critical thinking disposition, they will able to analyst information by using a suitable theory, evidence and strategy. This skill can help to improve their high-order thinking that importance for studying and working in the future.

Critical Thinking Disposition (CTD) had been defined in several meanings. Facione (2000: 62) explained that CTD is a person's consistent internal motivation to act toward, or to respond to, persons, events, or circumstances in habitual, and yet potentially malleable, ways. Ennis (1985:48) explained that disposition includes such thing as being open-minded playing attention to the total situation seeking reasons and trying to be well informed. These are self-explanatory and trust, obviously desirable (Norris, 1992: 157-164). As the conclusion, CTD can be defined as the characteristics of person expressing as a habit to use their mind to do efficiently work.

From the literature review, we found that factors of CTD had been classified in many ways. For examples, N. Facione and C. Facione (1996: 131) explained CTD into 7 factors: 1) Open-minded, 2) Inquisitiveness, 3) Systematic, 4) Analyticity, 5) Truth-Seeking, 6) Self-confidence, and 7) Maturity. Ennis (1985: 46) had classified CTD into 17 factors: 1) seek a clear statement of the thesis or question, 2) seek reasons, 3) try to be well informed, 4) use and mention credible sources, 5) take into account the total situation, 6) try to remain relevant to the main point, 7) keep in mind the original and/or basic concern, 8) look for alternatives, 9) be open-minded, 10) take a position and change a position when the evidence and reasons are sufficient to do so, 11) seek as much precision as the subject permits, 12) withhold judgment when the evidence and reasons are insufficient, 13) take a position and change a position when the evidence and reasons are sufficient, 14) seek as much precision as the subject permits, 15) deal in an orderly manner with the parts of a complex whole, 16) use one's critical thinking abilities, and 17) be sensitive to the feelings, level of knowledge and degree of sophistication of others. Perkins, Jay, and Tishman (1993: 7) had classified CTD into 7 factors: 1) the disposition to be broad and adventurous, 2) The disposition to wonder, to identify problem, to investigate, 3) The disposition to build explanation and understandings, 4) The disposition to make plans and be strategic, 5) The disposition to be intellectually careful and precise, 6) The disposition to ask for and evaluate reasons, and 7) The disposition to be metacognitive, etc. However, we found that there are some similar and dissimilar factors. Especially in Thailand, there is no study of critical thinking factors in Thai context. The existed CTD factors cannot be used direct to Thai students. Then, studying of CTD factors in Thailand is an important topic for education.

In summary, critical thinking disposition is the characteristics of the person expressing the use of the mind to work as a habit. And, Critical thinking disposition were important to personal attributes that demonstrate competence, Leadership, Learning and the elementary for the person to recognize the problem used reason. In order to promote students' critical thinking disposition, it is imperative that all levels of educational institutions pay attention to and develop their students.

For this reason, we aims to study and analyze the factors of Critical Thinking Disposition in Thai context based on the studied of N. C. Facione & Facione (1996: 5-6), Perkins *et al.*, (1993: 7), Paul and Elder (2005: 4-54), Ennis (1985: 46). Costa and Kallick (2000). However, this research focused to the university students. For confirmation the analyzed factors, we had evaluated the constructed CTD factors to the first year university students in faculty of education of 11 Rajabhat universities in northeastern region of Thailand.

## Objectives

The aim of this research are as follow;

1. To study critical thinking disposition of education students.
2. To measure the consistent of critical thinking disposition factors model by using confirmatory factors analysis.

## Hypothesis

The critical thinking disposition factors model of students in faculty of education of Rajabhat universities in northeastern region of Thailand is consistent with the empirical data.

## Methodology

### Research Framework

This study based on main concept of CTD factors of N. C. Facione and Facione (1996: 5-6), Perkins *et al.* (1993: 7), Paul and Elder (2005: 4-54), Ennis (1985: 46), Costa and Kallick (2000) and develop the suitable CTD concept in Thais context using in-depth interview and evaluated by experts. The findings showed that there were the following seven CTD factors: open-minded, systematic, truth-seeking, self-confident, empathy and persisting.

### Population and sample

The population of study included 5,589 students, who were first year student on academic year 2016, Faculty of Education of 11 Rajabhat Universities, northeastern region of Thailand.

For determining sample size, Krejcie and Morgan (1970: 607-610)'s technique used for investigating the sample by 361 subjects, then the sample size should be 20 times of the observed variable (Costello and Osborne, 2005: 3-4) and size of the sample, which used to analyze the data required a large sample of the sample to be suitable for a negative analysis of 500 or more. So, in order to make the research robust, we used 1,594 samples with multistage random sampling. Table 1 shows population and sample sampling that are determined by following these steps:

Step:1 Divide target universities into two groups by region: upper and lower northeast.

Step:2 Divide target universities into two groups by number of populations.

Step:3 Random universities and students.

**Table 1:** Population and sample sampling

<b>Group of Rajabhat Universities</b>	<b>population</b>	<b>sample</b>
<b>1. Upper North-Eastern Group</b>		
Population $\geq 550$		
1. Rajabhat Maharakham University	596	232
2. Roi Et Rajabhat University	664	225
Population $\leq 550$		
3. Udon Thani Rajabhat University	527	191
4. Loei Rajabhat University	384	185
5. Sakon Nakhon Rajabhat University	391	-
<b>2. Lower North-Eastern Group</b>		
Population $\geq 550$		
6. Buriram Rajabhat University	687	228
7. Sisaket Rajabhat University	648	218
8. Nakhon Ratchasima Rajabhat University	563	-
Population $\leq 550$		
9. Surin Rajabhat University	268	145
10. Chaiyaphum Rajabhat University	412	170
11. Ubon Ratchathani Rajabhat University	449	-
<b>Total</b>	<b>5,589</b>	<b>1,594</b>

## Instruments

The instruments used for this study are:

- 1) The interview form was used for in-depth interview with experts.
- 2) The critical thinking disposition questionnaire was validated by the experts with index of congruence of 0.6 to 1.00 and overall reliability coefficient of ( $\alpha$ ) .949. The critical thinking disposition questionnaire uses five-point Likert scale, and consists with 51 items include open-minded (8 items), systematic (8 items), truth-Seeking (7 items), self-confidence (4 items), maturity (9 items), empathy (8 items) and persisting (7items).

## **Data Collecting**

The data collection this study used a combination of qualitative and quantitative studies, which divided into eight steps:

Step 1: Creating the semi-structured expert interview form by reviewing the theory and related researches of critical thinking disposition. Then, six experts were interviewed in-depth about the definitions and components of CTD by the constructed interview form.

Step 2: The collected data from interview were analyzed to find the preliminary critical thinking disposition factors in Thais context using content analysis.

Step 3: The preliminary CTD instrument was developed follow by analyzed factors and indices from step 2. The instrument has been determined by expert for examining the instrument consistent. The instrument was revised by following the expert comments.

Step 4: The revised CTD instrument was tried out with 75 of non-sample group of students.

Step 5: Then, the collected data from step 4 were analyzed, and the analyzed result was used to improve the CTD instrument.

Step 6: The improved CTD instrument was prepared to evaluate with the sample groups. There are 1,600 copies of CTD instruments were printed.

Step 7: We had asked for permission and coordinated with the target universities authority and make schedule for collecting data. Then, we had submitted the instruments to collect data from first year students of faculty of Education of 11 Rajabhat universities between February 2018 to May 2018.

Step 8: There were 1,594 copies or 99.31% of submitted instruments were returned. Finally, the collected data were analyzed with confirmatory factor analysis (CFA) model.

## **Data Analysis**

The collected data were analyzed using the SPSS that descriptive statistics, such as the frequency, percentage, average and standard deviation were utilized to obtain general characteristics of the sample. Moreover, Pearson's correlation coefficient was used for analyzing the correlation between variables, and factors were analyzed using the Lisrel for determining consistent between factors and empirical data with Chi-Square statistics. Finally, the goodness of fit indices: GFI, GFA, AGFL, CFL Standardized RMR and RMSEA, and content analysis were

used for qualitative examining of constructed CTD model.

## Results

The purpose of this study were to 1) study critical thinking disposition of education students 2) to study the confirmatory factors analysis of students. Overall, from The sample of study included 1,594 of collected data, there are 73.10% female, 26.90% male, and most participants were 19 years old (61.50%). The most of them had 3.01-4.00 G.P.A (61.60%). In this section, the result of analysis has divided into two parts follow the purpose:

### Part 1 Analytical results of critical thinking disposition

The content analysis result was constructed from reviewing the CTD literatures and in-depth interview from five experts. We can summarize that the definition critical thinking disposition is actions and behaviors or constant characteristics of person that express as a habit to use their mind to examination carefully of evidence. CTD consist of knowledge, thinking, motivation, belief and attitude. For Thais context, there are 7 CTD factors: open-minded, systematic, truth-seeking, self-confidence, maturity, empathy and persisting. The consistent experts' comments are student who has CTD will be good-thinker, and CTD can conduct people to have a good idea. So, all students have to be developed their critical thinking disposition. Especially, student in education field because if they are the good-thinker, they will be good teacher in the future, and able to teach their students to be the good-thinker as well.

In addition, the constructed instrument was used to measure CTD level of 1,594 students. The result is shown in table 2 as follow:

**Table 2:** Critical thinking disposition levels of students (n=1,594)

Critical Thinking Disposition Factors	$\bar{X}$	S.D	Level
OM1 - Open-minded Factor	4.21	0.45	high
OMF1 - Listen to different opinions of others without prejudice.	4.45	0.54	high
OMF2 - Listen to suggestions or criticisms from others without bias.	4.25	0.60	high
OMF3 - Communication to other with understanding.	4.26	0.56	high
OMF4 - Tolerance to other different ideas.	4.00	0.81	high
OMF5 - Kindness to share knowledge.	4.10	0.78	High

**Table 2:** (continue)

Critical Thinking Disposition Factors	$\bar{X}$	S.D	Level
SY2 - Systematic Factor	4.07	0.51	high
SYF1 - Carefully search for information before decision-making.	4.07	0.62	high
SYF2 - Goal-setting to search data.	4.09	0.59	high
SYF3 - Work and collect information systematically.	4.04	0.62	High
TS3 - Truth-Seeking Factor	4.04	0.54	high
TSF1 - Confident to ask question.	3.98	0.71	high
TSF2 - No bias with information.	4.04	0.69	high
TSF3 - Examination information from many sources.	4.10	0.77	high
TSF4 - Fact-finding and investigating.	4.05	0.66	high
SC4 - Self-confidence Factor	3.76	0.50	high
SCF1 - Dare to comment.	3.62	0.67	high
SCF2 - Dare to think differently.	3.51	0.71	high
SCF3 - Dare to decision-making and face to issue.	4.16	0.66	high
MF5 - Maturity Factor	4.02	0.51	high
MFF1 - Decision-making with considering	4.10	0.64	high
MFF2 - Tolerance and Self-control	3.92	0.63	high
MFF3 - Accepting more than one choice	3.95	0.69	high
MFF4 - Accepting individual differences	4.09	0.67	high
EM6 - Empathy Factor	4.24	0.53	high
EMF1 – Understanding other minds	4.07	0.65	high
EMF2 - Help others without expect anything return	4.27	0.61	high
EMF3 - Giving opportunities to others	4.31	0.74	high
EMF4 - Group awareness	4.32	0.64	high
PE7 - Persisting Factor	3.88	0.52	high
PEF1 - Determination and diligent	3.87	0.56	high
PEF2 - Patience with everything	3.89	0.60	high

The result is shown in table 2, that the lowest average score factor is 3.76, that mean all factors are in high level.

For analyzing individual factors, the open-minded factor items have average score from 4.00 to 4.45 that the item OMF1-Listen to different opinions of others without prejudice has highest score ( $\bar{X}$ = 4.45, S.D.= 0.54).

Systematic factor items have average score from 4.04 to 4.09 that the item SYF2-Goal-setting to search data has highest average score ( $\bar{X}$ =4.09, S.D.=0.59).



Truth-Seeking factor items have average score from 3.98 to 4.10 that the item TFS4 -examination information from many sources has highest average score ( $\bar{x}=4.10$ , S.D.= 0.77) and the item confident to ask question has lowest average score ( $\bar{x}=3.98$ , S.D.= 0.71)

Self-confidence factor items have average score from 3.51 to 4.16 that the item SCF3 dare to decision-making and face to issue has highest the average score ( $\bar{x}=4.16$ , S.D.= 0.66) and dare to think differently has lowest the average score ( $\bar{x}=3.51$ , S.D.=0.71)

Maturity factor items have average score of 3.92 to 4.10 that the item MFF1-decision-making with considering has highest ( $\bar{x}=4.10$ , S.D.= 0.64) and tolerance and self-control has lowest average score ( $\bar{x}=3.92$ , S.D.= 0.63)

Empathy factor items have average score of 4.07 to 4.32 that the item EMF4-group awareness has highest average score ( $\bar{x}=4.32$ , S.D.=0.64) and understanding other minds has lowest average score ( $\bar{x}=4.07$ , S.D.= 0.65)

Persisting factor items have average score of 3.87 to 3.89 that the item PEF2-patience with everything has highest average score ( $\bar{x}=3.89$ , S.D.=0.60) and determination and diligent has lowest average score ( $\bar{x}=3.87$ , S.D.= 0.56)

## **Part 2 The confirmatory factors analysis of CTD measurement model of students**

For measuring and validating the consistent and validity of constructed CTD factors, the confirmatory factor analysis (CFA) was used, that CFA analyzed results is shown in Table 3.

**Table 3** The confirmatory factors analysis of measurement model of critical thinking disposition of students (n=1,594)

Critical thinking disposition Factors	Factor loading					CR
	b	SE	t	FS	SC	
<b>OM1 – Open-Mind Factor</b>	<b>0.46</b>	<b>0.03</b>	<b>18.17**</b>	-	<b>0.90</b>	<b>0.81</b>
OMF1	1.00	-	-	0.03	0.51	0.26
OMF2	1.20	0.07	17.97**	0.09	0.61	0.37
OMF3	0.96	0.07	13.71**	0.08	0.65	0.42
OMF4	1.01	0.07	13.71**	0.05	0.49	0.24
OMF5	1.02	0.07	14.18**	0.07	0.51	0.26
<b>SY2 - Systematic Factor</b>	<b>0.55</b>	<b>0.02</b>	<b>23.27**</b>	-	<b>0.82</b>	<b>0.67</b>
SYF1	1.00	-	-	0.17	0.67	0.44
SYF2	1.18	0.05	23.11**	0.25	0.79	0.62
SYF3	1.18	0.05	23.96**	0.25	0.79	0.62
<b>TS3 - Truth-Seeking Factor</b>	<b>0.52</b>	<b>0.03</b>	<b>20.59**</b>	-	<b>0.91</b>	<b>0.83</b>
TSF1	1.00	-	-	0.08	0.57	0.32
TSF2	1.09	0.06	18.80**	0.07	0.62	0.38
TSF3	1.05	0.06	16.78**	0.07	0.59	0.35
TSF4	1.18	0.07	18.15**	0.11	0.67	0.45
<b>SC4-Self-confidence Factor</b>	<b>0.33</b>	<b>0.03</b>	<b>12.51**</b>	-	<b>0.87</b>	<b>0.76</b>
SCF1	1.00	-	-	0.04	0.38	0.14
SCF2	0.90	0.08	11.28**	0.02	0.34	0.12
SCF3	1.79	0.15	11.61**	0.12	0.68	0.46
<b>MF5-Maturity Factor</b>	<b>0.68</b>	<b>0.02</b>	<b>28.36**</b>	-	<b>0.98</b>	<b>0.95</b>
MFF1	1.00	-	-	0.11	0.70	0.49
MFF2	1.00	0.04	25.58**	0.11	0.70	0.49
MFF3	0.95	0.04	23.06**	0.06	0.66	0.44
MFF4	0.82	0.04	19.89**	0.05	0.57	0.33
<b>EM6-Empathy Factor</b>	<b>0.65</b>	<b>0.02</b>	<b>26.91**</b>	-	<b>0.93</b>	<b>0.86</b>
EMF1	1.00	-	-	0.15	0.70	0.49
EMF2	1.03	0.04	23.90**	0.16	0.72	0.52
EMF3	0.1	0.04	19.16**	0.03	0.57	0.32
EMF4	0.91	0.04	21.45**	0.06	0.64	0.41
<b>PE7-Persisting Factor</b>	<b>0.44</b>	<b>0.03</b>	<b>17.25**</b>	-	<b>0.67</b>	<b>0.45</b>
PEF1	1.00	-	-	0.16	0.66	0.44
PEF2	1.35	0.07	19.60**	0.49	0.90	0.80

$X^2 = 173.80$   $df=162$   $p=.25$   $173.80/162=1.072$   $GFI=0.99$   $AGFI=0.98$   $CFI=1.00$   $RMSEA=0.01$   $SRMR=0.00$

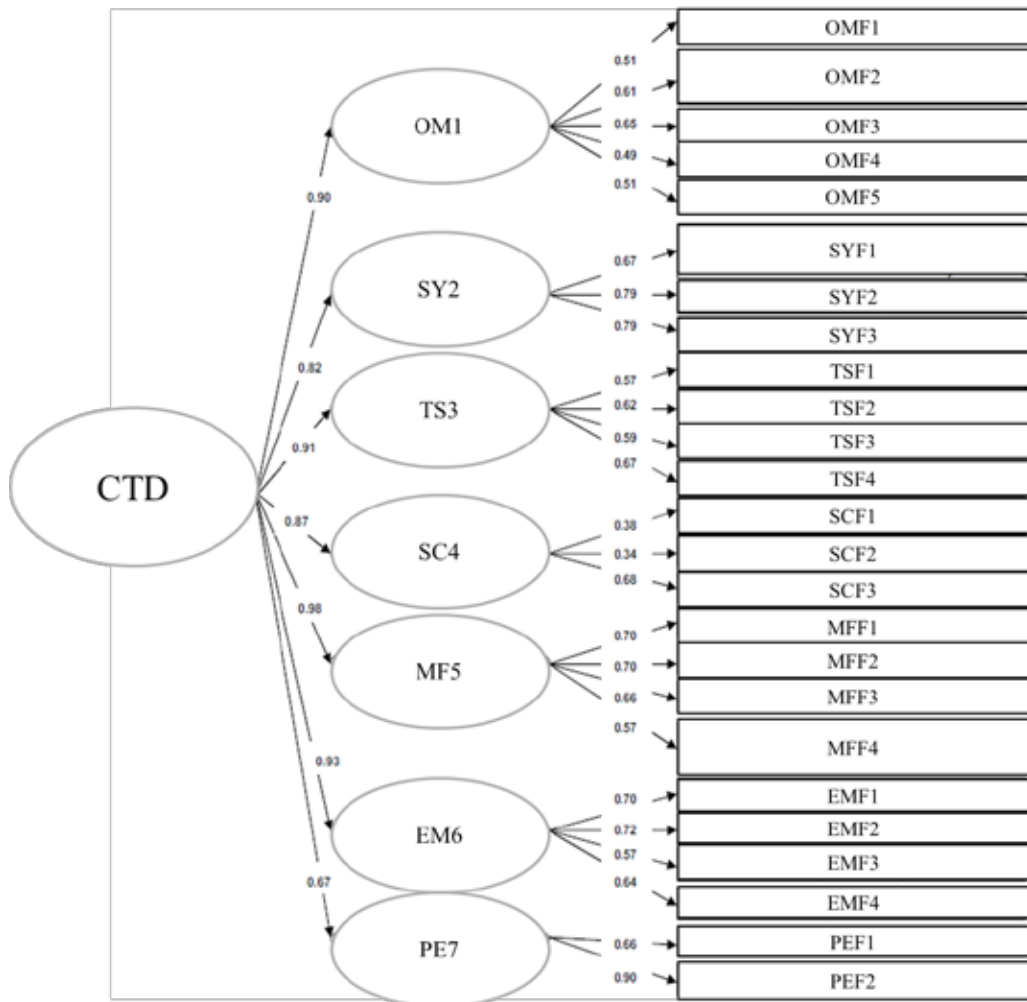


Figure 1: CTD measurement model for this student

From this result, we found that critical thinking disposition model of 7 factors are consist with the empirical data ( $X^2=173.80$   $df=162$   $p=.25$   $173.80/162=1.072$   $GFI=0.99$   $AGFI=0.98$   $CFI=1.00$   $RMSEA=0.01$   $SRMR=0.00$ ) by significantly different ( $p<.01$ ). In table 3 and figure 1 show that the factor loadings of all factors are 0.67 to 0.98 with significant level at 0.01, and the highest factor loading is maturity factor (0.98) with variation CTD high Level (95%). Empathy factor, open-minded factor and truth-seeking factor have factor loading at 0.93, 0.91 and 0.90 respectively, with variation CTD high level (86%, 83% and 81% respectively). Self-confidence factor and systematic factor have factor loading at 0.87 and 0.82 respectively, and variation with CTD high level (76% and 67%). At last, persisting factor is the lowest factor loadings at 0.67 with variation CTD at medium level (45%).

For analyzing detail of items in each factor, results are described as following:

The items of Open-minded factor have factor loadings between 0.49 and 0.65. First group, the items OMF3 (communication to other with understanding) and OMF2 (listen to suggestions or criticisms from others without bias) have factor loading 0.65 and 0.61 with variation at medium level (42%, 37% respectively). For other items, OMF1 (listening to different opinions of others without prejudice) and OMF5 (kindness to share knowledge) have same factor loadings at 0.51 and variation at low level (26%). The lowest item is DMF4 (tolerance to different ideas) has 0.49 factor loadings and variation at low level (24%).

The items of Systematic factor (SY2) have factor loadings between 0.67 and 0.79. First group, the items SYF2 (goal-setting to search data) and SYF3 (work and collect information systematically) have same factor loadings at 0.79 and variation at medium level (62%). The lowest item is SYF1 (carefully search for information before decision-making) has factor loading 0.67 with variation at medium level (44%).

The items of Truth-seeking factor (TS3) had factor loadings between 0.57 and 0.67 that the item TSF4 (fact-finding and investigating) has highest factor loading at 0.67 with variation at medium level (45%). TSF2 (no bias with information) and TSF3 (examination information from many sources) have factor loading at 0.62 and 0.59 respectively with variation at medium level (38%, 35% respectively), and TSF1 (confident to ask question) has 0.57 factor loading with variation at lower level (32%).

The items of Self-confidence factor (SC4) had factor loadings between 0.34 and 0.68. The item SCF3 (dare to decision-making and face to issue) has highest factor loading at 0.68 with variation at medium level (46%). The items SCF1 (dare to comment) and SCF2 (Dare to think differently) have factor loading at 0.38 and 0.34 with variation at low level (14%, 12%).

The items of Maturity factor (MF5) have factor loadings between 0.57 and 0.70 that items MFF1 (decision-making with considering) and MFF2 (tolerance and self-control) have highest factor loading at 0.70 with variation in medium level (49%). MFF3 (Accepting more than one choice) and MFF4 (accepting individual differences) have factor loading at 0.66 and 0.57 variation in low level (33%).

The items of Empathy factor (EM6) have factor loadings between 0.57 and 0.72 that the item EMF2 (help others without expect anything return) has factor loadings 0.72 with variation at medium level (52%). EMF1 (understanding other minds) and EMF4 (group awareness) have 0.70 and 0.64 respectively with

variation at medium level (49%, 41%). EMF3 (giving opportunities to others) has lowest factor loadings at 0.57 with variation at low level (32%).

The items of Persisting factor (PE7) have factor loadings between 0.6 and 0.90 that PEF2 (patience with everything) is highest factor loading item at 0.90 with variation at high level (80%) and PEF1 (determination and diligent) has factor loading at 0.66 with variation at medium level (44%).

This study was found that the critical thinking disposition model of 7 factors were consist with the empirical data. and the factor loadings of each indicator was between .34-.90 at the significant level of 0.01. So, The critical thinking disposition questionnaire can using in education students

## Discussion and Conclusion

The results of this research show that were 7 significant factors of CTD that are suitable for Thai university students including open-minded, systematic, truth-seeking, self-confidence, maturity, empathy and persisting. For measuring and validating the consistent and validity of constructed factors, the confirmatory factor analysis (CFA) was used. In generally analyzing with several statistical tests, we found that the CFA model of the proposed CTD factors fitted to the empirical data, and after considering with other fit indices, the results shown that the model can be used to measuring CTD level of the target group.

From evaluating the constructed CTD questionnaire with the first year students in faculty of education of 11 Rajabhat universities in northeastern of Thailand, Table 2 shows the result that the participants had summary CTD score in high level. However, when classified score into individual factor, we can order the CTD factors by highest to lowest average score as empathy (4.24), open-mind (4.21), systematic (4.07), truth-seeking (4.04), maturity (4.02), persisting (3.88) and self-confidence (3.76) respectively. From this point of view, self-confidence is the lowest score factor, because the participants are first year students that they were still shy and fear to debate with teacher or older students.

In conclusion, those CTD factors are very importance skills that should be encouraged to develop Thais students in all levels, because the concept of critical thinking disposition can directed them to have a good thinking, that consists with study of Kawashima & Shiomi (2007:187-194) and Gezer, Yildirim, & Özeydin (2017:2167-1168). Especially, the student in faculty of education and related fields, who will be teacher in the future, must be trained to have critical thinking disposition skill, then they will able to teach critical thinking skill to their young student as well.

## Suggestion

1. Should have found Norm in critical thinking disposition questionnaire
2. Should have development of a learning management to develop critical thinking disposition.

## References

- Anuruthwong, U. (2012). *Thinking skill: How to develop*. Bangkok: Inthanon Publishing. (in Thai).
- Costa, A. L., & Kallick, B. (2000). Assessing & reporting on habits of mind: A developmental series, Book 3. Association for Supervision and Curriculum Development, 1703 North Beauregard Street, Alexandria, VA 22311-1714.
- Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation, 10*(7), 1–9.
- Ennis, R. H. (1985). A logical basis for measuring critical thinking skills. *Educational Leadership, 43*(2), 44–48.
- Facione, N. C., & Facione, P. A. (1996). Externalizing the critical thinking in knowledge development and clinical judgment. *Nursing Outlook, 44*(3), 129–136.
- Facione, P. A. (1992). Critical thinking: What it is and why it counts. *Insight Assessment*.
- Facione, P. A. (2000). The disposition toward critical thinking: Its character, measurement, and relationship to critical thinking skill. *Informal Logic, 20*(1).
- Gezer, N., Yildirim, B., & Özeydin, E. (2017). Factors in the critical thinking disposition and skills of intensive care nurses. *Journal of Nursing Care, 6*(390), 2167–1168.
- Kawashima, N., & Shiomi, K. (2007). Factors of the thinking disposition of Japanese high school students. *Social Behavior and Personality: An International Journal, 35*(2), 187–194.
- Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30*(3), 607–610.
- Norris, S. P. (1992). Testing for the disposition to think critically. *Informal Logic, 14*(2).

- Paul, R., & Elder, L. (2005). Critical thinking competency standards. *Tomales, CA: Foundation for Critical Thinking*.
- Perkins, D. N., Jay, E., & Tishman, S. (1993). Beyond abilities: A dispositional theory of thinking. *Merrill-Palmer Quarterly*, 1–21.
- Rotherham, A. J., & Willingham, D. (2009). 21<sup>st</sup> century. *Educational Leadership*, 67(1), 16–21.