Exploring the Critical Thinking Development Process of Supply Chain (Critical Thinking Skill and Tendency toward Critical Thinking) in Students (Case Study: Tabriz University)

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***Abstract*- The present study was done for studying the critical development process (tendency toward critical thinking and critical thinking skill) in students of general groups of Tabriz University. The method of present research, from goal perspective, was practical, and from identity perspective, it was descriptive-survey. Cluster and random sampling method was used for selecting the research's samples about 341 people. The research tool included questionnaire attended to the California Critical Thinking of supply chain. For analyzing the accessed data from questionnaire, descriptive statistical tests and one-way variance analysis and schematic follow up test and independent t-test were used. The findings showed that the critical thinking development of supply chain (the critical thinking skill and tendency toward critical thinking) of students of general groups of Tabriz University in first, second, third and fourth years were different and included development and increasing process, and also there was difference between girls and boys in the critical thinking skill, but there was not difference in the tendency toward critical thinking of supply chain.**

Keywords: *Critical Thinking Skill, Tendency toward Critical Thinking, Tabriz University, Development Process, Supply Chain.*

1. Introduction

These days, students' learning as an important index for achievement in the changing world has been attended. Educational theorists have concentrated their investigations on recognizing the effective factors on learning in the changing world. Facing with changes and alignment with them need to high thinking ability. One of the goals which is followed through the curriculum is learners' critical thinking of supply chain. The critical thinking is one of the important aspects of thinking; this type of thinking leads to training the people who have moderate mind, out of motive, real and committed and accurate [17]. The critical thinking of supply chain means the thoughtfully and reasonably thinking which concentrates on decision making for doing something or believing in that thing; therefore, thinking impacts on students' motivation for learning and evaluating the knowledge and modern technology, and on the other hand, the existing of learning motivation is the factor for encouraging the students for using the high-level skills of thinking and critical thinking of supply chain [14]. The critical thinking included two dimensions of critical thinking skill and tendency toward critical thinking of supply chain. The critical thinking skill dimension emphasizes on conceptual methods and approaches and the tendency toward critical thinking emphasizes on thinking perspective details and sustained internal motivation for solving the issues. The critical thinking skills is a kind of conceptual skills by itself. An idealist critical thinker not only should have these skills but also should be suitable for calling him as the idealistic critical thinker without considering his total approach in front of life, issues, questions and special problems. In fact, without positive tendency toward critical thinking, this type of thinking has not been occurred or made up under the standard level, and by this tendency toward critical thinking is the vital part of critical thinking and can defend in front of creating such thinking and tendency [1]. The critical thinking skill and tendency toward critical thinking of supply chain in the students can be increased by educating, but training the

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students is done by written and blank curriculum. What plays the important role in critical thinking is hide curriculum. The researches have shown that hide curriculum plays an important role on increasing the spirit of obedience, imitation and pure adherence and decreasing the tendency emotion to critical thinking and critical touch with issues and scientific discussions [2].

Each society's high educational system is not out of clear and hide transmission of norms and special perspectives toward learners. In the high educational system, students are being taught clear and codified schedules and access the experience which forms their culture and value [3]. Forming such skill and critical thinking perspective in learners is not accidental and needs to suitable trains and has the special development process. If the learner is going to be taught critics and wonderful, his thinking power should not be deposited to chance. The ideal critical thinking emphasizes the (reasonable person) who can think independently and without controlling the others. Student doesn't accept or reject the believes and reasoning, without evaluating and refereeing if he thinks critically. Such characteristic is necessary in nowadays' information society and for information literacy as the prior literacy in this type of society. The critical thinking of supply chain in people is emphasized under the environment and education and social and cultural conditions. So, it can be said that the critical thinking skill, tendency toward critical thinking in students have development process; therefore, the present research is exploring the critical thinking development process, tendency toward critical thinking in students of general groups of Tabriz University to answer the below questions: 1- is there a difference between critical development process (critical thinking skill and critical thinking tendency) of students of general groups of Tabriz University in first, second, third and fourth years? 2- Is there difference between critical thinking of supply chain (critical thinking skill and critical thinking tendency) of different years' students of general groups of Tabriz University? 3- Is there a difference between critical thinking of supply chain (critical thinking skill and critical thinking tendency) of girl and boy students of general groups of Tabriz University?

2. Methodology

The present research method is practical from goal perspective and descriptive-survey type from identity point of view. The statistical population of the research is formed by all general courses of Bachelor students with 6000 people of Tabriz University. In the present research, the cluster sampling and relative random sampling method was used; that is, from the educational groups of Humanistic Sciences, Basic Sciences, Agricultural Sciences, Technical and Engineering and Veterinary, the educational courses were selected and in each of the educational courses, one educational tendency was selected, in each of the educational courses and in each of the educational years in base of Morgan Table relative to general groups and educational courses and girl and boy students among the research samples were selected which finally 341 people were studied as the studying sample which these numbers were 93 in the first year, 75 in the second year,77 in the third year, and 96 in the fourth year.
The tendency toward California critical thinking questionnaire was used for evaluating the tendency to critical thinking. The questionnaire included 75 questions which was scored from Totally Agree, to most agree, Agree, Disagree, Most Disagree and Totally Disagree with Likert criteria from one to six according to the questionnaire's guiding order. The content validity of this test was done by "national experts in critical thinking issues and an ideal thinker". The test reliability of tendency toward California critical thinking was counted by using the Cronbach Alpha 0.9 (United State of America Philosophy Association, 1990). For evaluating the tendency toward critical thinking, the tendency toward California critical thinking questionnaire was used. The questionnaire included 75 questions which was scored from Totally Agree, to most agree, Agree, Disagree, Most Disagree and Totally Disagree with Likert criteria from one to six according to the questionnaire's guiding order. The test scientific reliability of tendency toward California critical thinking of supply chain was counted by using 0.68-0.70 Coder Richardson Formula 20. In Iran, the reliability, validity and normality of this test were determined. In a study, methodology, formal and content validity of test were verified. The reliability of this test in the present research was counted according to Cronbach Alpha 0.91.

3. Findings

Below the demographic information related to research samples has been presented.

Table 1: Demographic Information Related to Gender of Research Samples in the Educational Courses

Percent	Total	Gender				Educational Course
		boy		Girl		
		Percent	No.	Percent	No.	
34	116	14/50	49	19/50	67	**Humanistic Science**
19	65	6/50	22	12/50	43	**Basic Science**
21/50	73	13/50	46	8	27	**Technical and Engineering**
25/50	87	10	34	15/50	53	**Agricultural and Medical**
100	341	44/50	151	55/50	190	**Total**

As the table (1) shows, majority of research samples in the educational courses of Humanistic Science group are studying. For determining the normality of research data, Kolmogorov–Smirnov test was used.

Table (2): Kolmogorov–Smirnov Test for Exploring the Normality of Research Data

Significance	K-S	SD.	Mean	No.	Variable	Sample
0/120	1/18	8/49	97/86	93	Tendency to critical thinking	**First**
0/83	1/26	2/87	12/12	93	Critical thinking skills	
0/53	0/80	42/16	222/46	75	Tendency to critical thinking	**Second**
0/087	1/25	2/12	17/77	75	Critical thinking skills	
0/079	1/27	45/85	331/64	77	Tendency to critical thinking	**Third**
0/27	0/99	4/46	21/19	77	Critical thinking skills	
0/10	1/22	12/52	397/46	96	Tendency to critical thinking	**Fourth**
0/23	1/03	5/02	28/17	96	Critical thinking skills	

As the table (2) shows that all research variables in all educational years in base of the significant level bigger than 0.05 (P>0.05) have normal distribution. Therefore, it is possible to use parametric statistical methods for analyzing the data. For exploring the students' critical thinking of supply chain development skill of general groups of Tabriz University in first, second, third and fourth years, the one-way analyzing variance test was used.

Table 3: One-Way Variance Analyzing Test for Determining the Student's Critical Thinking Skill Differences of General Groups of Tabriz University in First, Second, Third, and Fourth Years

Significance	**F**	**Variance Mean**	**F. d.**	**Total Variance**	**Variance**
0/000	283/673	4220/305	3	12660/915	**Inter-group**
		14/877	338	5013/666	**Intra-group**
			341	17674/581	**Total**

As table (3) shows, by attention to significant level 0.000 (P>0.05), there is difference between students' critical thinking skill of general groups of Tabriz University in first, second, third and fourth years. For determining the critical thinking skill differences among the students of each of the educational different years, the schematic follow up test was used whose results have been presented in the below table.

Table 4: Schematic Following up Test for Determining the Differences of Students' Critical Thinking Skill of General Groups of Tabriz University Among the each of First, Second, Third and Fourth Years with Together

Upper Bound	Lower Bound	Significance	Standard Error	Mean Difference	Educational Year	
-3/962	-7/326	0/000	0/598	-5/644	Second	
-7/396	-10/735	0/000	0/594	-9/065	Third	**First**
-14/471	-17/624	0/000	0/561	-16/048	Fourth	
7/326	3/962	0/000	0/598	5/644	First	
-1/663	-5/179	0/000	0/625	-3/421	Third	**Second**
-8/733	-12/073	0/000	0/594	-10/403	Fourth	
10/735	7/396	0/000	0/594	9/065	First	
5/179	1/663	0/000	0/625	3/421	Second	**Third**
-5/324	-8/640	0/000	0/590	-6/982	Fourth	
17/624	14/471	0/000	0/561	16/048	First	
12/073	8/733	0/000	0/594	10/403	Second	**Fourth**
8/640	5/324	0/000	0/590	6/982	Third	

The results of table (4) show that students' critical thinking of supply chain skill of the educational general groups in all educational years in base of significant level 0.000 had difference with each other. The above table shows that students' critical thinking skill in first had significant difference with second, third and fourth years and the mean differences show that critical thinking skill in first year is lower than second, third and fourth years. The results show that students' critical thinking skill in the second year had significant difference with first, third and fourth years and the mean difference shows that critical thinking skill in second year is lower than third, fourth and upper than first year. Also, the results show that students' critical thinking skill in third year had significant difference with first, second and fourth years and the mean difference show that critical thinking skill in the third year is lower than fourth year and upper than first and second years. Also, the results show that the students' critical thinking skill in fourth year had difference with first, second and third years and the mean difference show that critical thinking skill in the fourth year is upper than first, second and third years. For exploring the tendency toward students' critical thinking of supply chain development process of general groups of Tabriz University in first, second, third and fourth years, the one-way analytical variance test was used.

Table 5: One-Way Analytical Variance Test for Determining the Tendency Toward Students' Critical Thinking Difference of General Groups of Tabriz University in First, Second, Third and Fourth Years

Significance	F	Variance Mean	F.D.	Total Variance	Variance
0/000	E31/727	1579530/503	3	4738591/501	**Inter-group**
		914/368	338	304484/495	**Intra-group**
			341	5043076/006	**Total**

As table (5) shows, by attention to the significant level of 0.000 (P>0.05), there is difference between the tendency toward students' critical thinking of supply chain of general groups of Tabriz University in first, second, third and fourth years. For determining the difference of tendency toward critical thinking among the students of each different educational year with together, the schematic following up test was used whose results have been presented below.

Table 6: Schematic Following up Test for Determining the Difference of Tendency toward Students' Critical Thinking of General Groups of Tabriz University among the each of First, Second, Third and Fourth Years with together

Upper Bound	Lower Bound	Significance	S.D.	Mean Differences	Educational Year	
-111/420	-137/729	0/000	4/692	-124/606	Second	
-220/497	-247/069	0/000	4/728	-233/783	Third	**First**
-278/246	-311/970	0/000	4/399	-299/608	Fourth	
137/729	111/420	0/000	4/692	124/606	Frist	
-95/207	-123/146	0/000	4/971	-109/177	Third	**Second**
-161/908	-188/096	0/000	4/660	-175/002	Fourth	
188/096	220/497	0/000	4/728	233/783	First	
123/146	95/207	0/000	4/971	109/177	Second	**Third**
-52/630	-79/019	0/000	4/695	-65/824	Fourth	
970-311	-287/246	0/000	4/399	299/608	First	
188/096	161/908	0/000	4/660	175/002	Second	**Fourth**
79/019	52/630	0/000	4/695	65/824	Third	

The results of table (6) show that tendency toward students' critical thinking of educational general groups in all educational years have difference in base of 0.000 significant level. The above-mentioned table shows that tendency toward students' critical thinking of supply chain in first year have significant difference with second, third, fourth years, and the differences show that tendency toward critical thinking in the first year is lower than second, third and fourth years. The results show that tendency toward students' critical thinking in the second year have significant difference with third and fourth years and the difference shows that tendency toward critical thinking in the second year is lower than third and fourth years and upper than first year. Also, the results show that students' critical thinking in the third year had significant difference with first, second and fourth years, and the mean difference show that tendency toward critical thinking in the third year is lower than fourth year and upper than first and second years. The results show that students' critical thinking in the fourth year had significant differences with first, second and third years, and the mean difference show that tendency toward critical thinking in the fourth year is upper than first, second and third years. Below, the difference between girl and boy students of general groups of Tabriz University in the critical thinking and tendency toward critical thinking have been explored. For this exploration, t-test has been used.

Table 7: Independent T-test for Determining the Difference between Girl and Boy Students of General Groups of Tabriz University in Critical Thinking of supply chain and Tendency toward the Critical Thinking

Significance	t	F	S.D.	Mean	No.	Gender	Variance
0/017	-1/108	5/74	7/65	20/32	190	Girl	**Critical Thinking Skills**
			6/60	19/45	151	Boy	
0/343	0/204	0/901	124/79	260/35	190	Girl	**Tendency to Critical Thinking of supply chain**
			120/03	263/09	151	Boy	

The results of the table (7) show that there is not significant difference between girl and boy students of general groups of Tabriz University in tendency toward critical thinking of supply chain ($P>0.05$). But in the critical thinking skill, there is significant difference between girl and boy students of general groups of Tabriz University ($P<0.05$). By attention to the means, it can be said that girl students of general groups of Tabriz University have upper critical thinking skill than boy students.

4. Discussion and Conclusion

The findings show that the critical thinking development of supply chain (critical thinking and tendency toward critical thinking) of students of general groups of Tabriz University in the first, second, third and fourth years had developmental and increasing process and also there was positive and significant relationship between critical thinking and tendency toward it, and there was difference between girl and boy students in critical thinking skill, but

there is not difference between them in tendency toward critical thinking. In real, tendency toward critical thinking is different in the different educational years. So, tendency toward critical thinking is increased in the first to the fourth years, and totally tendency toward critical thinking in the students of general groups of Tabriz University in the first, second, third and fourth years had developmental process and from first to fourth years was increased. Also, critical thinking skill was different among the educational years. So, the critical thinking in students of general groups of Tabriz University in the first, second, third and fourth years had the developmental process and had high increase from first to fourth years. Also, the findings showed that there was not significant difference between girl and boy students of general groups of Tabriz University in tendency toward critical thinking, but there was significant difference between girl and boy students of general groups of Tabriz University in critical thinking skill. So, girl students of general groups of Tabriz University had the high critical thinking of supply chain than boy students. The critical thinking is the targeted and self-set judgment which is formed as a result of interpretation, analyzing, evaluating and deducting, on the other hand it can be said that critical thinking of sis the targeted process which causes to solve the problems and make the suitable decision in the different conditions. This thinking lets the person judge the used theories, the existent proofs, described criteria or standards or using methods values reasonably. These days, growing the students' critical thinking of supply chain is one of the complicated and important issues in the education issue since the output of the society's data from person's critical thinking about these data has been proceeded so that in the recent years, the educational experts have been worried about students' disabilities in critical thinking. The importance of critical thinking training is in a degree that some of the experts counted it as the goal of educations' general goal and university experiences (Villavicencio, 2016). In the critical thinking development field, the researchers have accessed to two spectrums. The first division is the uneven researches with the present research's result. Those researches have shown that, in spite of the critical thinking as the basic tool for learning, totally the students' ability in using the critical thinking skill was less [11]. These researches have shown that most of the professors prevented to engage the students with critical thinking of supply chain [15].

In a research which was done by [6], the results showed that the mean of nurse students' critical thinking of first to fourth years did not have significant differences with together. That researcher found that university educations and current educational method had no significant effect on training the critical thinking of students. [8] showed in the other research that there was not significant difference between girl and boy students' critical thinking of supply chain numbers' mean. Also, in the research which was done by [7], the results showed that the majority of first and last term students of the university had weak critical thinking ability, and there was not significant difference between mean possibility to assume preliminary detection and inference of first and last term students. In the research of [9], the mean scores of the critical thinking of supply chain in the first and last term students were compared by using the independent T-test and there was not significant difference between them [19]. The studies which were done in Iran showed that 93% of the first term students and 94% of the last term students had weak critical thinking ability and there was not significant difference between first and last term students' critical thinking. Some of the researches which were done inside Iran were in line with the present research. The findings of [10] showed that there was significant difference between students' critical thinking of supply chain mean of first and fourth years, but that difference was not significant between the other years' students. [9] found in their research that: A) there was not significant difference between first year students' critical thinking's mean score of Isfahan Medical Sciences Colleges B) significant differences were not seen between last year students' critical thinking mean scores of the mentioned colleges. C) But significant differences were seen in comparison with critical thinking mean scores in the first and last year students, so that the last year students' critical thinking scores were better than first year students. But in both groups of first and last years, the mean score of critical thinking was less than mean level. [10] found that the scores of critical thinking skill in the bachelor students, through the educational years, were developed. The one-way variance analysis statistical test of the scores of the bachelor students' different years showed the significant differences.

[12] showed that the scores accessed from 34 scores of the questionnaire in all midwifery courses of Tehran Medical Science universities were under 14 scores; that is, the students accessed 32.40% and the results of the average of all first and last term students' critical thinking scores' comparison showed that there was significant difference between first and last term bachelor students' critical thinking scores in Tehran and Iran universities. In the researches which were done I abroad, [4] by comparing 137 students of the last and first term students found that by increasing the educational years, significant increase was happened through the nursing schedule. He pointed out that there was significant difference between girl and boy students' critical thinking skills [4] which the findings are in line with current researches. [5] found that tendency toward critical thinking correlated with oral scores of students. The more studies showed that graduate students had high critical thinking of supply chain level than newcomer students [16]. In a research which was done by [17] between first and last year students of nursing, the results showed that the scores of last year students were significantly higher than first year students. [4] research

pointed out that the total mean scores of critical thinking skills (by using the California Questionnaire) of students in the first year was 15.28 and last year was 16.29. [6] in the longitudinal study attended to evaluate the students' critical thinking. He studied and explored the students from entering to 4 years later. The results of his study are as follow:

Through the four years, total score of students increased 14% which this increase in all tests and five conceptual fields related to it was significant. [8] found through the study that mean scores of the students' critical thinking skill from first to fourth years except third year were developed [13].

As it can be seen, different researchers found different and opposite results through their studies in the critical thinking skills and tendency toward university students' critical thinking. Some specified that there was significant difference between students' critical thinking value in base of education year and gender. While other researchers' findings described the lack of differences between students critical thinking value with attention to describing variables. One of the effective factors on educational development which is different in boys and girls but needs to learn is critical thinking skill. The thinking and accurate thinking skill is one of the important issues which have made busy the brain of different scientists and now training the different skill of thinking is one of the basic goals of training and growing system. Totally, thinking has different types which one of its important methods is critical thinking of supply chain [18]. The critical thinking is one of the important educational principals in each country, and each country for reaching to development and growing needs to people who have the high critical thinking. This component is considered as a basic conceptual process for development and utilizing the knowledge, and this type of thinking is usable for development and solving the problem [7]. Training the students for using the critical thinking ability develops their function and motivates them for more and effective, and this high motivation leads to more success in the educational fields and this cycle; that is, more success, high motivation, more success is continued. And, these days, most of students know their learning problems because of disability in their comprehension and weak in brain power, while the main problems of most of them are the quality of using learning approaches. According to [8], in the field of critical thinking, and that this kind of thinking is a process by which one evaluates the opinions, information, and resources that provide the information and coordinates it coherently and rationally, relates to other ideas and information. And considering other sources and evaluating implicit implications can be a factor in predicting the academic achievement of learners and affect the adoption of learning strategies for study. On the other hand, critical thinking can set the general, accept the new possibilities and stop the referring, so the researchers consider the critical thinking of supply chain as the help to better decision making and on the other hand recognizing or comprehending the issue and knowing the practical program for solving it which can be the curriculum [20]. Hence, it is possible to anticipate the ability of suitable decision making in suitable method for comprehending and favorite method for better learning with this factor which is high in girls.

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