Investigation of the Relationship between Gender, Field of Study, and Critical Thinking Skill: the Case of Iranian Students

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Abstract

Critical thinking, as a vital issue in the present world, has been the focus of many studies in recent years. To date, many attempts have been made to demonstrate the importance of critical thinking in peoples' lives and many researchers conducted studies to account for the influential factors, such as cooperative learning, technology, and different classroom activities, in its development. Despite the wealth of research in this field in other countries, there is a comparative dearth of research in the Iranian context. As a result and drawing upon the fact that a primary objective of graduate education is development of critical thinking skills (Abrams, 2005), the present study attempts to examine the extent to which Iranian students in Ilam university are critical thinkers. To this end, 84 students from Ilam University were randomly recruited to answer the self evaluation questionnaire designed by Cottrell (2005). Although participants did not achieve the minimum acceptable level of critical thinking, (i.e. 75), the effect of gender and field of study on critical thinking ability was supported. Surly, it goes without saying that improvement of critical thinking skills is essential in participant's lives.

Key words: Critical thinking; cooperative learning; graduate education; critical thinker; gender

1. Introduction

These days one of the most interesting and accepted issues in educational systems is critical thinking (hereafter C.TH). Critical thinking as a survival skill plays an important role in educational reform, and its achieving in education can be regarded as the central issue, around which other issues revolve.

Different definitions of the term were presented and there is no universal consensus on a unitary definition (Ab Kadir, 2007). For example, Halpern (1999) defined it as "the use of cognitive skills or strategies that increase the probability of a desirable outcome. Critical thinking is purposeful, reasoned, and goal-directed. It is the kind of thinking involved in solving problems, formulating inferences, calculating likelihoods, and making decisions" (p:70). In another attempt to define the term, Cottrell (2005) pointed out that critical thinking is a cognitive activity which means thinking in the best way and using mental processes like attention, selection, judgment, etc. It is seen as something which makes people more precise in the way they work and think, more accurate in relevant and irrelevant issues, and better decision makers about whether something is true and effective or not.

While incorporation of C.TH in different aspects of life has become prevalent, its assessment gained sophisticated attention. According to Wal (1999) two main approaches can be taken in the assessment of critical thinking: 1. by assessing critical thinking in relation to other relevant academic skills, such as writing, oral presentation, or practical problem solving. 2. By assessing

critical thinking skills as a trait or individual feature of the learner, by inviting the learner to complete an assessment scale.

Because of the importance of critical thinking in all aspects of life and education, and because this issue is a topic rarely discussed in our society, the present research was designed to study the extent to which this skill has been developed among Iranian students.

2. Review of literature

It is important to understand that thinking itself is not difficult. We can think as a natural process without using much energy and without engaging in any intellectual work. All people think in every aspect of their lives, about their world, their decisions, and choices. But a person cannot become a critical thinker over a night without engaging in intellectual works. Schapersman (1991) mentions that we are not born with the power of thinking critically and this skill cannot develop naturally. It is a learnable skill and many people never learn it. In addition, its learning needs trained teachers and instructors and we should not expect that a critical thinking course will develop students' thinking power. Because of the vitality of the issue, today, in some countries such as "north America, UK, and Asian pacific countries" (Ab Kadir, 2007) educational systems are moving toward developing critical thinking and different scholars examined the issue from different perspectives.

In so doing, Schapersman (1991) proposed two ways to teach critical thinking in the classroom. The first method, which is easier, less time-consuming, and less expensive, is to simply change one's teaching and testing methods slightly to increase critical thinking among one's students. The second method, more difficult, time-consuming, and expensive, makes use of formal critical thinking exercises, programs, and materials that have been prepared by specialists and can be purchased for use by the teacher or instructor. These materials are the dominant means by which critical thinking is now being taught in primary and secondary education.

Pertinent to issue, Limbach, Waugh and Duron (2006) developed a five step model to develop critical thinking ability. Their framework consisted of the following procedures: 1) determining learning objectives, 2) teaching through questioning, 3) practicing before assessing, 4) Providing feedback and assessment of learning, and 5) Reviewing, refining, and improving, that is teachers should strive to continually refine their courses to ensure that their instructional techniques are in fact helping students develop critical thinking skills.

Ab Kadir (2007) and Rumpagaporn and Darmawan (2007) admitted the role of technology in promotion of critical thinking. Ab Kadir (2007) pointed out that "arrival of the information age and growing influence of Internet "are reasons that educational systems need to incorporate critical thinking in their syllabi" (p. 2). So, this shift in modern world and education demands people to be equipped with the ability to think critically. In another study, Rumpagaporn and Darmawan (2007) examined the role of technology on thinking skills,

critical thinking, and systematic thinking in Thailand schools. In their pilot project, they concluded that students can learn critical thinking skills through integrating information and communication technology into teaching and learning process.

Some researchers elaborated on the role of cooperative learning in development of critical thinking. The term collaborative learning means any instruction method in which students with different proficiency level work together in small groups toward a common goal. To shed light on the issue, in a study, Gokhale (1995) declared that students who participated in collaborative learning performed significantly better on the critical thinking test than students who studied individually. He mentions that the shared learning gives students an opportunity to think, engage in discussion, take responsibility of their own learning, and thus become critical thinkers. In another research, Abrams (2005) mentioned that "Working with a group of equal-status peers to solve a problem is particularly conducive to the development of critical thinking skills because it exposes individuals to different perspectives and interpretations of a problem or idea. Therefore, group work tends to expand an individual's scope of understanding, as well as their ability to learn to reason more complexly and effectively.

Thanks to the development of new methods to teach and develop critical thinking skills, its assessment has received highly sophisticated attention and standardized tests to measure the skills, e.g. the California critical thinking skills test, Watson-Glaser critical thinking appraisal, critical thinking test, etc. have been developed. Related to C.TH assessment, King, Wood, and Mines (1990) in their study investigated whether the critical thinking scores of college and graduate students would differ by educational level and gender, using tests of critical thinking that reflect different degrees of problem structure. They found significant main effects for educational level and gender on each of the three critical thinking tests, i.e. graduate students and males scored higher than the undergraduate seniors and females.

In her doctoral dissertation, Mulhall (2010) explored the differences in critical thinking skills between experienced physical therapists and novice physical therapists as assessed by the California Critical Thinking Skills Test (CCTST). The *t- test* was used to analyze the group differences in overall CCTST scores and sub-scores of deduction, induction, analysis, inference and evaluation. A Pearson correlation test was used to investigate the relationship between age and experience with respect to the CCTST scores. No statistically significant difference in the overall CCTST score or CCTST sub scores was noted between the novice group and the experienced group.

In spite of the importance of critical thinking, there is tertiary attention to this issue in Iranian culture. In a work in Isfahan University, Athary, Sharif, Nematbaksh & Babamohammadi (2009),

evaluated critical thinking skills and its relation with students ranking in university entrance examination. They found no significant relation between these two factors. Moreover, their findings indicated that students do not possess critical thinking skills when arriving at the university. In another work, Amini and Fazlinejad (2010) aimed to determine the critical thinking situation of medical students and compare this in different clinical students. They found that skills and abilities of Shiraz medical students did not improve by going to upper year of education.

Importance of the C.TH, its rarity in Iranian educational system, and conflicting results with respect to gender impelled the writers of the present research to examine the extent to which this skill is enhanced among Iranian students in Ilam University.

3. Statement of the problem

Why are some people better than others at supporting their beliefs and actions with good reasons? The answer seems obvious in Carrol's terms (2004): Some people have more knowledge or are more eloquent than others. Still, two equally intelligent people can be equally articulate and knowledgeable, but not be equally good thinkers. If only one of them is thinking critically, that one will be better at analyzing and evaluating facts and opinions, sources and claims, options and alternatives. The critical thinker will be a better problem-solver and better decision-maker.

As a purposeful activity, critical thinking influences human life as well as education. But most people cannot be critical thinkers, maybe because of barriers or lack of knowledge about the appropriate strategies. Non-critical thinkers are not interested in facts, they don't think, don't trust their reason for solving problems, and don't understand others' thought. On the contrary, a person who is a critical thinker "can ask appropriate questions, gather relevant information, creatively sort out this information, reason logically from this information, and come to reliable conclusion" (Schapersman, 1991, p: 3). Knowing the degree to which we are critical thinkers can help us improve ourselves and our critical thinking potential which, in turn, results in enhancement of the quality of our life and learning. Due to the significance of the issue in our life and because development of critical thinking is one of the main purposes of graduate education, the writers of the present study attempt to determine the extent to which Iranian students in Ilam University think critically in their lives.

In this regard, the present study investigates answers to the following questions:

1. To what extent are students in Ilam University critical thinkers?
2. Do male and female students in Ilam University differ in their degree of critical thinking?
3. Does field of study affect students' critical thinking ability?

4. Methodology

4.1. Subjects

The data used in this study were originally

collected for a study on evaluating critical thinking among students. The target population from which the sample for this study was recruited was eighty-four students in Ilam University, divided in to two equal groups of males and females, ranging in age from 19 to 35. The average age was 24.35 years old for females and 25.44 for males. Besides, the selected subjects were among engineering, humanities, and basic sciences, at master and bachelor degrees that were selected by simple random sampling.

4.2. Instrument

In this research the questionnaire primarily designed by Stella Cottrell in her book, *critical thinking skills*, was selected to assess critical thinking ability among students. The questionnaire which was a 25-item likert-type measure was translated into Persian by the researcher. The questionnaire provides comprehensive critical thinking skill scores from the assessment. The intensity scale ranges from 0 (strongly disagree) to 4 (strongly agree) [see appendix 2].

4.3. Data collection and analysis

To carry out the investigation, the researchers translated Cottrell's questionnaire into Persian and distributed it randomly among 84 students in Ilam University in November 2010. After questionnaires were collected, the SPSS database was used for analyzing the data. By the use of interval data obtained from the questionnaire, they were analyzed in terms of descriptive statistics (mean and standard deviation), t-test, and One-Way ANOVA. The obtained mean of both sexes were calculated in order to understand which one is a better critical thinker. *T-test* was performed on all the obtained mean of scores from males and females to determine any statistical significant difference between them and One-Way ANOVA for determining the effect of field of study on critical thinking skills.

5. Results and discussion

Data was analyzed to find answer to the research questions in this study. The first question posed in the study, whether students in Ilam University are critical thinkers, was evaluated using total mean of obtained scores. Total mean shows the number of 64.03 which means that students were not totally familiar with critical thinking skills simply because they failed to meet minimum acceptable level of the questionnaire, i.e. 75. So, improvement of critical thinking skills is essential for them.

The second purpose was to compare males and females in critical thinking abilities. We found a significant main effect for gender; with males scoring consistently higher ($p < .05$). As shown in table 1, the obtained mean for males (67.04) was higher in comparison with their female counterparts (61.02), which supports that males outperformed females on critical thinking skills. To compare these two means, *t-test* was applied to test this hypothesis (table 2). The *t-test* value (sig=.02) revealed statistically significant difference between males and females. As a result, it can be claimed that males are better critical thinkers than women.

Table1. Total mean for males and females in their received scores on the questionnaire

mean	mean	Std. deviation
Males	67.04	10.78
females	61.02	11.62

Table2. Independent T-test results for received scores on the questionnaire for males and females

t	df
2.30	82

*= statistically significant (p<.05)

In the next step, answer to the third question put forward, i.e. the relation between critical thinking ability and students' major of study. Students were divided in to three groups according to their field of study, humanities, basic sciences, and engineering. Figure 1 shows a graphic comparison of the total mean scores of the three groups. Significant main effects for major of study were found on critical thinking test. For engineering students, the obtained mean was 66.93, for humanities 62.33, and for basic science 55.90. So, gaining higher mean by engineering students supports the effect of major on critical thinking skills. After that, one-way ANOVA was used to determine the significance of the findings. Table 3 shows the ANOVA results for the comparison of the three groups. Evidently, there was significant difference (sig=.013) in critical thinking ability among students of humanity, engineering, and basic science.

Figure1. Obtained mean for three groups of students according to major of their study

Table3. One-way ANOVA results to show the relation between fields of study and critical thinking skills

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1168.049	2	584.024	4.561	.013*
Within Groups	10370.844	81	128.035		
Total	11538.893	83			

*= statistically significant (p<.05)

Besides the analysis of total scores, all items in the questionnaire were analyzed individually (table 4, appendix 1). From among a total of 25 items included in the questionnaire, items 18 (presenting arguments clearly) and 17 (If I am not sure about something, I will research to find out more) received higher means for males and females respectively (3.19, 3.04). It can be concluded that males were more familiar with argument which is regarded as one of the significant factors of critical thinking.

Results demonstrated that, among from a total of 25 items, females used 6 of them more frequently than males, whereas, this number was 18

for males. Items 6, 13, 18, 19, 20, and 21 (24%) were used more by females and in all remaining items save 10, males received higher means. Besides, none of the higher obtained means for females was statistically significant while higher means in items 2, 5, 8, and 16 were significant in favor of males. Finally, obtained mean was common for both males and females in one out of twenty five items, item 10 (I find it easy to separate key points from other materials).

Of 25 items of the questionnaire, females know the meaning of line of reasoning, are good at reading between lines, present an argument clearly, understand how to make an argument, recognize descriptive writing from analytical writing, and spot inconsistencies in an argument better than males. Although they received higher means in these items, the results were not statistically significant.

When we look at table 4 in order to find items used more frequently by males, we see that from a total of 25 items 18 items were claimed to be used more by males. These are items 1, 2, 3, 4, 5, 7, 8, 9, 11, 12, 14, 15, 16, 17, 22, 23, 24, and 25. From among these items, items 2, 5, 8, and 16 which relate to concentrating on requirements of an activity, criticizing without bad feeling, identifying line of reasoning, and weighing up different points of view fell in the high usage items with significant results. Item 10, separating key points from other materials, gained the same mean in both sexes (3.02).

6. Conclusion

By the changes in modern world, educators recognized the need to integrate critical thinking skills in educational systems. In this research with regard to the importance of critical thinking, it was intended to investigate how critical thinking percolates into students' lives. Data was collected to test three research questions mentioned above. The information was studied and many significant but limited findings resulted from the examination of data. The results revealed that participants were not totally familiar with critical thinking skills, i.e. total mean was 64.03. The obtained mean (64.03) shows that students didn't reach the minimum acceptable level (75) so, they should try to develop C.TH skills in their lives. The development of the skills is necessary due to the fact that, critical thinking is related to all aspects of our lives and its improvement can result in better quality of life and education. When we look at the research results there is another conclusion that we can draw upon: almost all the items, except for one item, were different among males and females, so results support the difference between males and females in critical thinking ability and the fact that males outperformed their female counterparts in four items.

Students' poor performance in critical thinking questionnaire can be related to different factors among which are unawareness about necessary skills and strategies. For example, argument is among important critical thinking skills that participants as evidenced by their performance on the questionnaire, items 3, 9, 18, 19, and 21, were not aware of. Another reason can be attributed to

the lack of interest in criticizing others. Though important in critical thinking, criticizing others is not regarded as an acceptable manner in our country as shown by items 1 and 5 especially among females. The higher obtained mean for males in both of the items can be attributable to the fact that men are, somehow, freer and have more tendencies to criticize in our society than women.

Evidently, higher education doesn't have any strong effect in the promotion of critical thinking skills of students. Lack of attention to critical thinking skills in Iranian schools and universities may be regarded as an important factor in unawareness of students. According to Hashemi et al. (2010) Iranian education system's emphasis on knowledge transmission and learning is limited to memorizing materials and the main problem that Iranian education system encounters is the goal-centered being instead of being process-centered. Perhaps, if schools and universities apply critical thinking as one of their goals, students would become better critical thinkers.

In short, I have determined the extent to which Ilamian students use critical thinking in their lives. Although somehow familiar, they must improve it to an acceptable level in order to have better life. On the other hand, males use C.TH skills more frequently than females which is indicative of the difference between sexes and more familiarity of male students with the skills. Based on the inadequacies of this research, recommendations are made for further research. As mentioned in literature, cooperation can be regarded as a factor to increase the potential of critical thinking. So, investigation of the effect of the same phenomenon to enhance critical thinking is recommended. Further research into this subject can also include extending the domain of research into other universities in other cities and contributing more students. In addition in the field of foreign language learning (FL), the power of critical thinking can be correlated with mastery of four skills.

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Appendix A

Table4. Obtained results of items in the questionnaire

Items	Mean females	Mean males	sig
1	1.88	2.30	.12
2	2.52	2.85	.03*
3	2.16	1.90	.22
4	2.38	2.57	.39
5	2.35	2.58	.03*
6	2.73	2.55	.46
7	2.45	2.67	.30
8	2.57	2.90	09*
9	2.33	2.50	.42
10	3.02	3.02	1
11	2.52	2.71	.35
12	2.23	2.59	.16
13	2.90	2.28	.43
14	2.38	2.61	.22
15	2.85	2.88	.92
16	2.26	2.69	.04*
17	2.73	3.04	.11
18	3.19	2.56	.24
19	2.35	2.28	.75
20	2.78	2.47	.20
21	2.73	2.71	.90
22	2.47	2.66	.41
23	2.76	2.85	.61
24	2.42	2.59	.41
25	1.95	2.1	.37

*p< .05

Appendix B. Cottrell's questionnaire of critical thinking

For each of the following items, rate your responses as outlined below. Note that "strongly disagree" has no point.

5. Strongly disagree 3. Agree 2. Sort of agree 1. Disagree 0. Strongly disagree

		Rating 0-4
1	I feel comfortable pointing out potential weaknesses in the work of expert.	
2	I can remain focused on the exact requirement of an activity	
3	I know the different meanings of the word argument in critical thinking	

4	I can analyze the structure of an argument	
5	1 can offer criticism without feeling this makes me a bad person	
6	1 know what is meant by a line of reasoning	
7	1 am aware of how my current beliefs might prejudice fair consideration of an issue	
8	I am patient in identifying line of reasoning in an argument	
9	I am good at recognizing the signals used to indicate stages in an argument	
10	I find it easy to separate key points from other materials	
11	I am very patient in going over the facts in order to reach an accurate view	
12	I am good in identifying unfair techniques used to persuade readers	
13	I am good at reading between lines	
14	I find it easy to evaluate the evidence to support a point of view	
15	I usually pay attention to small details	
16	I find it easy to weigh up different points of view fairly	
17	If I am not sure about something, I will research to find out more	
18	I can present my own argument clearly	
19	I understand how to make an argument	
20	I can tell descriptive writing from analytical writing	
21	I can spot inconsistencies in an argument easily	
22	I am good at identifying patterns	
23	I am aware of how my own up-bringing might prejudice fair consideration of an issue	
24	I know how to evaluate source materials	
25	I understand why ambiguous language is often used in research papers	