



# Improvement in University Students' Critical Thinking Following a Strategic Thinking Training Program

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## ABSTRACT

Today's experts believe that critical thinking is a major output in higher education and teaching thinking is a basic point to learning. The aim of this study was to explore whether a strategic thinking training program could improve student's scores on a standardized measure of critical thinking. Sixty-six students aged between 20 and 35 were tested at their college on before the program CCTST and CCTDI. Thirty-nine of these students volunteered to be randomly allocated to the strategic thinking or control group. Students in the strategic thinking group received a strategic thinking training program, but not the students in the control group. The experimental and control groups were then re-tested on CCTST and CCTDI at after the intervention. Students in the strategic thinking group significantly improved their critical thinking skill and critical thinking disposition scores compared to the control group. On average, we observed no group differences between the strategic thinking and control groups. These results have important implications for implementing a strategic thinking training program to protect students from a decrease in critical thinking skill and critical thinking disposition during the achievement of educational goals.

**Key Words:** Critical Thinking, Strategic Thinking, Critical Thinking Skill, Critical Thinking Disposition

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## Introduction

Critical thinking is a process that evaluates opinions, information and the resources that provide the information and coherently and logically ordered and linked to other beliefs. During this process, other resources are also considered and their implicit implications are also evaluated (Andolina, 2001). Critical thinking is a cognitive process in which one investigates the reasons, analyzes the available information and concludes them by judgment and decision-making (Bruner and Goodnow, 1984).

The main output of higher education is critical thinking (Facione *et al.*, 1995). Nevertheless, many educational circles emphasize the learning of information and

content, rather than the importance of fostering students' intellectual talents. The education of medical and paramedical sciences is one of the areas in which the experts have a lot of efforts to improve their quality and consider the critical thinking skills necessary for medical sciences. In this regard, the World Federation for Medical Education (WFME) believes that critical thinking is one of the standards of medical education. Critical thinking in college accreditation is also one of the key points, and one of the criteria for accreditation institutions is to measure the growth of critical thinking in university students (WFME, 2009).

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Critical thinking is consisted of two aspects, including critical thinking skills and critical thinking dispositions. The critical thinking aspect emphasizes on the cognitive strategies and the critical thinking dispositions aspect on the attitudinal components of thinking and the sustained internal motivation for solving problems.

Critical thinking skills come from a kind of cognitive skills. An ideal critic thinker should not only have these skills, but it is impossible to refer to the title of ideal critic thinker, regardless of his general approach to life, issues, questions and special problems. In fact, without a positive attitude toward critical thinking (emotional dimension), this kind of thinking doesn't occur or is below the standard level, and thus, the critical thinking dispositions is a critical part of critical thinking (Profetto-McGrath, 2003; Facione, 1990; Facione, 2004; Yung-Kuan, 2017).

Today's universities, due to advances in science and technology and based on some psychological approaches, more focus their attention on moving information and facts and got away from educating thoughtful students. Critical thinking helps people to search truths among the clutter of events and information that surrounds people every day and to push them towards the goals that are the fullest possible understanding (Johnson, 2002). In the studies conducted by Lippman *et al.*, (Quoted from Cam, 2001), it was concluded that children attending classes in philosophy and thinking had more academic achievement at all levels. Miller (2003) studied college pharmacists in North Dakota. The results of his research showed that the mean score of critical thinking skills in fourth-grade students was higher than normal. Embrosciano's (1998) study on American children aged 9-11 years showed that students participated in thinking training classes received a higher score on the basis of general reasoning and mental assurance. All in all, evidence concerning direct relationships between strategic thinking training and critical thinking is weak.

We performed a strategic thinking training program for improving critical thinking among university students. Our first aim of this report was to test whether the strategic thinking training program could improve critical thinking in students. We hypothesized that students in the training group would score significantly higher on critical thinking after the training program period,

compared to participants in the control group that we hypothesized no significantly improve their score. We also tested performance on critical thinking skill and critical thinking disposition (Facione and Facione, 1990, 1992). Therefore, our second aim was to explore whether the performance on these critical thinking skill and critical thinking disposition improved after the training program period. We hypothesized that participants in the training group would have a shorter reaction time and make fewer errors after the training program period than participants in the control group.

## Methods

### *Participants*

We respectively received written, informed consent and assent from all the university students. We approved the study by the local ethical review committees at Henan University in China. University students participated in this study were recruited from an original sample of 66 students (51 undergraduate students and 15 master's degree students), recruited through their college, and tested on the CCTST and CCTDI. The study included 59 students (21 males; mean  $\pm$  SD age = 25.5  $\pm$  2.16 years) in the sample, following exclusion of 7 students determined by three criteria: 1) guest or transfer from other universities; 2) participated in a similar research; and 3) lack of familiarity with the study questionnaires.

For the strategic thinking training program phase, we sent out the consent forms to all the 59 students to take part in the program. We returned 39 consent forms to the students, allowing 39 students to participate in after the program test. The program group consisted of 22 students (of the 39), however 4 of the students did not participate regularly in the sessions, and we excluded them from the intervention process (strategic thinking group; 4 females; mean  $\pm$  SD age=24.31  $\pm$  2.16 years). The remaining 17 students (of the 39) were consisted in the control group and did not complete the strategic thinking program (control group; 10 females; mean  $\pm$  SD age=25.31  $\pm$  2.24 years).

### *Measures*

#### *California Critical Thinking Skill Test (CCTST)*

We used the California Critical Thinking Skill Test, form B (CCTST) to measure critical thinking skills (Peter, 1992). The test consisted of 34 questions



and covers ratings of analysis (9 items), inference (11 items) and evaluation (14 items). In this study, obtaining a total score of more than 10 indicates a normal level pattern and a total score of less than 10 as a pattern less than the normal level. Empirical evidence supported the reliability and validity of CCTST (American Philosophical Association, 1990; Facione *et al.*, 1996; Wanxi Peng, 2017).

#### *California Critical Thinking Disposition Inventory (CCTDI)*

We used the California Critical Thinking Disposition Inventory (CCTDI) to measure critical thinking disposition (Facione & Facione, 1992). The inventory consisted of 75 questions and covers ratings of truth-seeking (12 items), Criticism-accepting (12 items), power to analysis (11 items), power to organize information (11 items), self-confidence (9 items), growth rate (10 items), searching (10 items). Empirical evidence supported the reliability and validity of CCTDI (Yeh, 2002; Iskifoglu, 2014; O'Hare, 2005; Sulaiman *et al.*, 2010; Pang *et al.*, 2004; Meici *et al.*, 2004, Ge, 2017).

#### *Design and procedure*

First all students completed CCTST-B and CCTDI in the college during an introductory session. Participants in the strategic thinking group then completed the strategic thinking program over the next weeks. Students in the control group did not receive the program during this period, but the trainer informed them about what students in the strategic thinking group were doing. The students in both the strategic thinking and control groups then performed CCTST-B and CCTDI directly one week after the intervention in the college.

#### *The program*

Our study asked students in the strategic thinking group to participate in a strategic thinking program over a period of 16 weeks. The main approach in this intervention was a combination of discussion, problem solving and participation, which included, in addition to the theoretical aspect, the operational and experimental aspects. The sessions are as following:

Introductory session: the purpose of this session was to introduce students, establish initial communication, and evaluate them, and questionnaires and necessary tests were carried

out at this session. In addition, a brief explanation was given about the intervention style and the importance of thinking.

Session 1: Definition of thinking

Session 2: Conceptualization, classification, and organization

Session 3: Hypothesis-making

Session 4: Curiosity and questioning

Session 5: Argue

Session 6: Listening, empathy, and communication

Session 7: Avoiding bias and respecting differences

Session 8: Free-thinking and critique

Session 9: Imagination

Session 10: Flexibility and fluidity of mind

Session 11: Hesitation and asking for reason

Session 12: Judgment and evaluation

Session 13: Predict

Session 14: Analyze and interpret

Session 15: Profoundness, comprehensiveness, and inference

Final session: Final evaluation (participants filled the questionnaires at after the intervention and then they were thanked for participating in these classes).



**Figure1.** Screenshot of an example of the training intervention sessions

#### **Results**

We used  $\alpha$  level of 0.05 in our study. We also presented the results with respect to the two dependent variables (critical thinking skill and critical thinking disposition) for the strategic thinking group and control group.

#### *Critical thinking skill and critical thinking disposition*

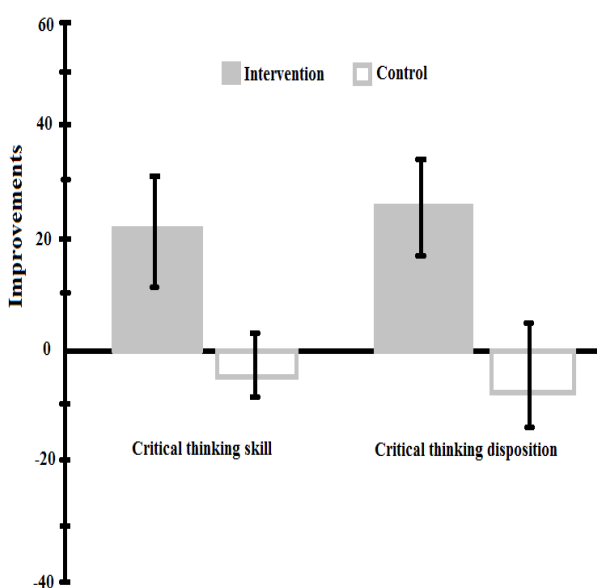
Given the students' critical thinking skill value at baseline, we observed no significant differences between the strategic thinking group ( $M = 46.81$ ,  $SD = 5.11$ ) and the control group ( $M = 45.67$ ,  $SD =$



4.72),  $t(17) = 2.73$ ,  $\rho = 0.34$  (one-tailed). Further given the students' prior critical thinking disposition value, we observed no significant differences between the strategic thinking group ( $M = 27.44$ ,  $SD = 4.18$ ) and the control group ( $M = 29.13$ ,  $SD = 4.35$ ),  $t(17) = 2.33$ ,  $\rho = 0.51$  (one-tailed). Consequently, we observed no significant differences between the strategic thinking group and the control group with respect to critical thinking skill and critical thinking disposition.

*Effects of the strategic thinking intervention on critical thinking skill*

The first hypothesis of this study stated that the strategic thinking intervention has a positive effect on critical thinking skill. As expected, the students reported an increase of critical thinking skill during the achievement of educational goals in the strategic thinking group ( $M = 46.81$ ,  $SD = 5.11$  at baseline, and  $M = 68.36$ ,  $SD = 4.43$  at after the program). In the control group, critical thinking skill decreased ( $M = 45.67$ ,  $SD = 4.72$  at baseline, and  $M = 40.31$ ,  $SD = 5.11$  at after the program), thereby confirming our first hypothesis.



**Figure 2.** Improvements in the strategy and control groups

*Effects of the strategic thinking intervention on critical thinking disposition*

The second hypothesis of this study stated that the strategic thinking intervention has a positive effect on critical thinking disposition. As expected, the students reported an increase of critical thinking disposition during the achievement of educational goals in the strategic thinking group

( $M = 27.44$ ,  $SD = 4.18$  at baseline, and  $M = 52.12$ ,  $SD = 5.04$  at after the program). In the control group, critical thinking disposition decreased ( $M = 29.13$ ,  $SD = 4.35$  at baseline, and  $M = 20.22$ ,  $SD = 5.08$  at after the program), thereby confirming our second hypothesis.

**Table 1.** Results for critical thinking skill and critical thinking disposition

Measure		Strategic Thinking group	Control group
Critical thinking skill	Baseline	46.81(5.11)	45.67(4.72)
	After intervention	68.36**(4.43)	40.31*(5.11)
Critical thinking disposition	Baseline	27.44 (4.18)	29.13 (4.35)
	After intervention	52.12* (5.04)	20.22*(5.08)

\* $\rho < 0.05$ , \*\* $\rho < 0.01$

**Discussion**

The main aim of this report was to explore whether a strategic thinking training program could improve critical thinking in university students. The findings of this study support our prediction that students in the strategic thinking group would score significantly higher on critical thinking skill and critical thinking disposition after the program period, compared to students in the control group who did not perform the strategic thinking program. Moreover, these findings support the notion that thinking training can be effective in the ability to critical thinking (Cota Bekavac, 2001; Schauer, 2003; Doddington, 2007; Grosser & Lombard, 2008; Demir *et al.*, 2011; Popil, 2011; Dunn, Halonen & Smith, 2009; Zembal-Saul, 2009; Aizikovitsh-Udi & Amit, 2011; Marchigiano *et al.*, 2011; Piawa, 2010; Gjoci & Kërënghi, 2010; Yang, 2008; Dunn, Curko & Kragic, 2008, 2009; Ku, 2009; Wells, 2009; Cruz *et al.*, 2009, Yu,2017; Yung,2017).

In the explanation of this research, we can say that Students' familiarity with the nature and process of thinking and stimulating their motivation to address the thinking process can be an accelerator in critical thinking and expand their intellectual abilities. In another word, increasing knowledge about thinking, strategies, and content enhances the cognitive and metacognitive abilities of learners. On the other hand, practicing and engaging in the essential skills of thinking, due to its pleasant and satisfactory implications, provides the intrinsic motivation necessary for learners to actively face life issues.



In another explanation for the findings of this study, we can say that strategic thinking training develops self-adherence and monitoring of self-learning through enhanced active and participatory learning, mechanism of observation, exploration, curiosity, judgment, cognitive flexibility, truthfulness, impartiality, inference, evaluation of arguments, discussion, development of new ideas, search for alternatives, and questioning and creates the necessary motivation for critical thinking. These findings can confirm the results of previous studies (Aizikovitsh-Udi & Amit, 2011; Dunn *et al.*, 2009; Zembal-Saul, 2009; Brown & Palincsar, 1989; Wenger, 1998; Daud & Husin, 2004).

The first limitation of this study was the spontaneous use of strategic thinking training that was not controlled for the control condition. The second limitation was the small intervention sample because the intervention was implemented in the last month of the semester. Another limitation of this study was time limit for sessions because the students could not take out of their classes.

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