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THE CHANGE IN ACADEMIC ACHIEVEMENT AND CRITICAL THINKING DISPOSITION SCORES OF PRE-SERVICE SCIENCE TEACHERS OVER TIME

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Abstract

Critical thinking is one of the most popular concepts studied in the field of education. In this study, the changes in pre-service science teachers' critical thinking disposition levels were studied according to the grade levels. Participants (60 pre-service science teachers) of the study were selected purposely and "The California Critical Thinking Disposition Inventory (CCTDI)" was applied them twice. CCTDI was first applied in October 2008 and the second time it was applied again in October 2010. According to results of the study; while the pre-service science teachers' critical thinking disposition levels decreased, their cumulative grand point averages (CGPA) increased over the years.
Keywords: Critical thinking, critical thinking dispositions, pre-service science teachers.

INTRODUCTION

Information society requires individuals to have many diverse qualifications such as knowing and applying various ways of thinking, researching, problem solving, and having creative and critical thinking skills (Güven & Kürüm, 2006). Critical thinking is one of the aspects of thinking, which is accepted as a way of overcoming problems and facilitates the way of reaching the information in our lives (Hudgins & Edelman, 1988). Critical thinking helps to improve the inner power of individuals, and so raises their self-confidence. Lipman (2003) describes the critical thinking as "thinking that (1) facilitates judgment because it (2) relies on criteria, (3) is self-correcting, and (4) is sensitive to context". In addition, Daniels (1998) defines the person who is a critical thinker, as someone who is thinking well. To think well in any area of human practice, one must make judgments using relevant criteria and standards.

Critical thinking has two dimensions which are skill and disposition (Facione, 1990). Teachers play a great role in developing the critical thinking skills and dispositions of students. Therefore determining critical thinking skills and dispositions of teachers and developing these skills are essential for the provision of effective education (Yücel & Koçak, 2010).

Critical thinking is said to be a defining characteristic of a university graduate. In literature on critical thinking, conceptions range from a focus on generic skills to a notion of person as critical being. However, there isn't enough research on university students' critical thinking dispositions (CTD), and change in CTD scores over time (Beşoluk & Önder, 2010). University education is supposed to affect students' critical thinking. Therefore this study was conducted to explore whether pre-service science teachers CTD levels change over time. In this sense, the following questions are explored in the study.

1. Is there any significant difference between the mean CTD scores of the pre-service science teachers when they were in second grade and fourth grade?

2. Is there any significant difference between the mean CGPA scores of the pre-service science teachers when they were in second grade and fourth grade?

METHOD

In this study, survey methodology was used and participants of the study were selected purposively. The data were collected from 60 pre-service science teachers twice over time. CCTDI was first administered in October 2008 when they were sophomore students and the second time in October 2010 when they were senior students. CGPA scores were obtained from registar office.

Data in this study was collected by using "The California Critical Thinking Disposition Inventory (CCTDI)" which was developed by Facione et al. (1998) and was adapted to Turkish by Kökdemir (2003). The Turkish version of the original scale contains 51 items and has 6 factors which are Analyticity, Open-mindedness, Inquisitiveness, Self-confidence, Truth-seeking, Systematicty. The internal consistencies of the subscales were, .75, .75, .78, .77, .61, 63 respectively and the scale's total consistency was 0.88 (Kökdemir, 2003). Data were analyzed by using Statistical Package for Social Sciences (SPSS) software. In the data analysis, a paired sample t-tests were applied and the significance level was set at .05.

FINDINGS

A paired sample t-test was conducted to evaluate whether pre-service science teachers CTD levels changes over time and the results of the analysis were presented in Table 1.

Table 1. A pair sample t- test results regarding CTD scores

	Grade	N	$\overline{X}$	SD	df	t	p
Analyticity	2th 4th	60	48.15 50.28	4.72 5.39	59	-3.42	0.00
Open-mindedness	2th 4th	60	45.39 55.78	6.85 7.54	59	-11.52	0.00
Inquisitiveness	2th 4th	60	44.64 41.85	5.87 5.94	59	4.05	0.00
Self-confidence	2th 4th	60	39.25 30.11	8.43 5.25	59	8.66	0.00
Truth-seeking	2th 4th	60	36.25 25.73	7.91 5.18	59	12.02	0.00
Systematicty	2th 4th	60	41.76 26.41	7.06 4.65	59	15.91	0.00
TOTAL (CTD)	2th 4th	60	255.99 230.18	25.25 22.26	59	7.96	0.00

There was a statistically significant difference between the total mean CTD scores of pre-service science teachers in favour of second graders ($t_{(59)}$=7.96, p<.05). When CTD sub-domain scores were compared it was observed that analyticity and open-mindedness mean scores differ significantly in favour of the fourth graders. On the other hand, Inquisitiveness, Self-confidence, Truth-seeking and Systematicty sub-domain scores differed significantly in favour of second graders.

Furthermore, paired sample t-test was conducted to evaluate whether pre-service science teachers' mean CGPA scores changes over time and the results of the analysis were presented in Table 2.

Table 2. A pair sample t- test results regarding CTD scores

	Grade	N	$\overline{X}$	SD	df	t	p
CGPA	2th 4th	60	2.13 2.65	0.69 0.46	59	-4.66	0.00

There was a statistically significant difference between the total mean CGPA scores of pre-service science teachers in favour of fourth graders ($t_{(59)}$=-4.66, p<.05). The senior pre-service science teachers' mean CGPA scores ($\overline{X}$ = 2.65) were higher than the sophomore pre-service science teachers' mean CGPA scores ($\overline{X}$ = 2.13).

DISCUSSION AND CONCLUSION

This study explored whether pre-service science teachers' CCTDI and CGPA scores changed over time. The results showed that while the pre-service science teachers' critical thinking disposition scores decreased, their CGPA scores increased over time.

The students at the beginning of their university education face with several challenges such as adapting to new conditions that result from transition from high school to university and in that transition they are generally under more stress. Students make necessary adjustments following

years of their university education and therefore their CGPA scores may improve (Beşoluk & Önder, 2011). In this study students CGPA scores were higher when they were senior than they were sophomore. The period of two years university education may explain the increase in CGPA scores, however observing lower CTD scores of fourth grades are thought-provoking. Nisbett, Lehman, Fong & Cheng (1993) indicated that university education itself has a strong effect on the improvement of critical thinking. Therefore, one should expect an increase in the CDTI scores after a well qualified university education. However, an opposite result was obtained in this study. Therefore, this unexpected result should be questioned and needs further investigation.

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