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Critical Thinking Disposition of Pre-Service Teachers

Öğretmen Adaylarının Eleştirel Düşünme Eğilimleri

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Abstract

Critical thinking has received increasing attention as an educational goal. Critical thinking refers to the use of cognitive skills or strategies that increase the probability of a desirable outcome (Halpern,1999). The desire or inclination to use critical thinking is reflected in a number of personal attributes, known as critical thinking dispositions (Jin, G., Bierma, T. J., Broadbear, J.T., 2004). This paper explores the critical thinking disposition of freshman and senior students from the Faculty of Educational Sciences of Ankara University.

The Turkish version of the California Critical Thinking Disposition Inventory (CCTDI) was used to sample collage students. Factor analytic research grounded in the analysis of critical thinking describes seven aspects of the overall disposition toward Critical Thinking: truth seeking, open-mindedness, analycity, systematicity, self confidence and inquisitiveness and maturity.

Entering freshman students and fourth year senior students' disposition scores in all subcategories except for truth-seeking are consistently above 40. It means that they are not weak; however since their disposition scores are between 40 and 50, they are not enough strong either. The truth- seeking disposition is weak in all four departments.

Keywords: Ciritical Thinking Disposition, self confidence, truth-seeking, open-mindedness, analycity, systematicity, inquisitiveness and maturity.

Öz

Günümüzde eleştirel düşünme, bir eğitim hedefi olarak giderek önem kazanmaktadır. Eleştirel düşünme, öğrenme çıktılarının oranını artıran metabilişsel becerileri kullanabilmektir (Halpern,1999). Eleştirel düşünmeye istekli olma hali, birtakım kişisel özellikleri yansıtan eleştirel düşünme eğilimi olarak tanımlanmaktadır (Jin, G., Bierma, T. J., Broadbear, J.T., 2004). Eğitim Bilimleri Fakültesi'nde okuyan birinci ve dördüncü sınıf öğretmen adaylarının eleştirel düşünmeye yönelik eğilimlerini belirlemek amacıyla bu çalışma gerçekleştirilmiştir.

California Eleştirel Düşünme Eğilimi Ölçeği'nin Türkçeye uyarlanmış hali öğrencilere uygulanmıştır. Faktör analiziyle incelenen eleştirel düşünme yedi alt başlıkta toplanmıştır: Doğruyu Arama, Açık Fikirlilik, Analitiklik, Sistematiklik, Kendine Güven, Meraklılık ve Olgunluk.

Birinci sınıf ve dördüncü sınıf öğretmen adaylarının eğilim puanları "doğruyu arama" hariç 40 puanın üzerindedir. Bu durum onların eleştirel düşünme eğilimlerinin çok zayıf olmadığını, ancak ortalama puanlarının 40 ile 50 arasında olması nedeniyle yeterince güçlü olmadığını göstermektedir. "Doğruyu Arama" eğilimi ise genel olarak tüm bölümlerde düşük çıkmıştır.

Anahtar Sözcükler: Eleştirel düşünme eğilimi, doğruyu arama, açık fikirlilik, analitiklik, sistematiklik, kendine güven, meraklılık ve olgunluk.

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Introduction

Critical thinking is one of the most important attributes for success in the 21st century (Huitt, 1998). Meyers (1986) argued that for students to reach their fullest potential in today's society, they must learn to think and reason critically. Paul (1995) contended "in a world of accelerating change, intensifying complexity and increasing interdependence, critical thinking is now a requirement for economic and social survival".

Although a variety of definitions have been offered in the intervening decades, most include the same underlying principles. The definition of Halpern (1999) is that the critical thinking refers to 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. Critical thinkers use these skills appropriately, without prompting, and usually with conscious intent, in a variety of settings. That is, they are predisposed to think critically. When we think critically, we are valuating the outcomes of our thought processes—how good a decision is or how well a problem is solved (Halpern, 1996, 1998). This definition is broad enough to encompass a variety of viewpoints so critical thinking can be taught as argument analysis (see, for example, Kahane, 1997), problem solving (Mayer, 1992), decision making (Dawes, 1988), or cognitive process (Rabinowitz, 1993). Regardless of the academic background of the instructor or the language used to describe critical thinking, all of these approaches share a set of common assumptions: there are identifiable critical thinking skills that can be taught and learned, and when students learn these skills and apply them appropriately, they become better thinkers.

Another major point about critical thinking is the recognition that critical thinking instruction must also address student dispositions. It is not enough to teach college students the skills of critical thinking if they are not inclined to use them. Critical thinking is more than the successful use of the right skill in an appropriate context. It is also an attitude or disposition to recognize when a skill is needed and the willingness to exert the mental effort needed to apply it (Halpern, 1999). People behave more or less intelligently governed not only by skills but also by predilections or tendencies. This additional aspect of critical thinking has been termed disposition by a number of educational researchers and philosophers (Baron, 1985; Bereiter, 1995; Ennis, 1986).

Sears and Parsons (1991) call these dispositions the *ethic* of a critical thinker. Lazy or sloppy thinkers may have a large repertoire of critical thinking skills but not be inclined to use any of them. No one can develop expertise in any area without engaging in the effortful processes of thinking (see Wagner, 1997). Thus we need to find ways to make students value good thinking and the work that is needed to achieve that goal (Halpern, 1999).

Seven constructs of critical thinking have been identified, and consist of: 1) analyticity, 2) self-confidence, 3) inquisitiveness, 4) maturity, 5) open-mindedness, 6) systematicity, and 7) truth-seeking (Facione, 1998). These constructs can function both as dispositions, which individuals can possess to a greater or lesser degree, as well as skills, which can be refined and developed as a result of educational experience. It has been hypothesized that there is a link between the disposition to think critically and critical thinking skills (Facione, 1998).

Disposition	Definition	Component	Example of Statement
Truth-seeking	A courageous desire for the best knowledge, even if such knowledge fails to support or undermine one's preconceptions, beliefs, or self-interests	Seek the truth; courageous about asking questions; honest and objective about pursuing inquiry	It's never easy to decide between competing points of view.
Open-mindedness	Tolerance to divergent views; self-monitoring for possible bias	Tolerant of divergent views; sensitive to the possibility of one's own biases; respect the right of others to hold different opinions	It concerns me that I might have biases of which I'm not aware.
Analyticity	Demanding the application of reason and evidence; alert to problematic situations; inclined to anticipate consequences	Alert to potentially problematic situations; anticipate possible results or consequences; prize the application of reason; use of evidence	It bothers me when people rely on weak arguments to defend good ideas.
Systematicity	Valuing organization, focus, and diligence to approach problems of all levels of complexity	Organized; focused; diligent in inquiry	I always focus the uestion before I attempt to answer it.
Self-confidence	Trusting one's reasoning skills and seeing oneself as a good thinker	Trust in own reasoning processes	I'm proud that I can think with great precision.
Inquisitiveness	Curious and eager to acquire knowledge and learn explanations even when the applications of the knowledge are not immediately apparent	Have intellectual curiosity; value being informed; eager to know how things work; value learning for learning's sake	When faced with a big decision, I first seek all the information I can.
Maturity	Prudence in making, suspending, or revising judgment; an awareness that multiple solutions can be acceptable; an appreciation of the need to reach closure even in the absence of complete knowledge	Reflective in own judgments; possess cognitive maturity; strive for epistemic development	Things are as they appear to be.

SOURCE: P. A. Facione and Facione (1992); May, Edell, Butell, Doughty, Langford (1999, p. 104).

Facione (1990), define these critical thinking dispositions as follows:

• Analyticity targets the disposition of being alert to potentially problematic situations, anticipating possible results or consequences, and prizing the application of reason and the use of evidence, even if the problem at hand turns out to be challenging or difficult. The analytically inclined person is alert to potential difficulties, either conceptual or behavioral, and consistently looks to anticipatory intervention, reason giving, and fact-finding as effective ways to resolve matters.

• Self-confidence refers to the level of trust one places in one's own reasoning process. Critically thinking self-confident persons trust themselves to make good judgements and believe that others trust them as well, since they believe that others to resolve problems, decide what to do, and bring reasonable closure to inquiry.

• The inquisitive person is the one who values being well informed, wants to know how things work, and values learning even if the immediate payoff is not directly evident. This person seeks knowledge without provocation for the intrinsic benefit of knowing.

• Open-mindedness is a construct that targets the disposition of being tolerant of divergent views with sensitivity to the possibility of one's own bias. The open-minded person respects the rights of others to differing opinions.

• Systematicity targets the disposition to being organized, orderly, focused, and diligent in inquiry. No particular kind of organization (i.e. linear or nonlinear) is given priority. The systematic person strives to approach specific issues, questions or problems in an orderly, focused, and diligent way.

• Truth-seeking thinkers are those eager to seek the truth, who are courageous about asking questions, and honest and objective about pursuing inquiry even if the findings do not support one's interests or one's preconceived opinions. The truth-seeker would rather pursue the truth than win the argument.

• Maturity addresses cognitive maturity and epistemic development. Mature thinkers are disposed to approach problems, inquiry, and decision making with a sense that some problems are ill-structured, some situations have more than one plausible option. Mature thinkers also realize that judgments based on standards, contexts, and evidence often must be made without having the benefit of knowing all information about the situation.

The effect of critical thinking dispositions has been analysed through different studies. Philips and others (2004) administered California Critical Thinking Skills Test (CCTST) and Disposition to Pharmacy students. Scores findings of this study were compared with a national referent group and evaluated for changes across the curriculum and between classes. Students had a consistent disposition towards CT and compared favorably to national norms. Both disposition and skills improved across the curriculum. Scores in all subcategories except for truth-seeking were consistently above 40.

Miller (2003) described using the CCTST and the CCTDI to track changes in critical thinking scores over the 4 years of the professional pharmacy curriculum. Early findings suggested that students at that school increased their ability to think critically over the course of the program. Later findings showed no statistical change in total disposition scores, but a 2.64 point (14%) increase in overall skills score.

Both McCarthy et al (1999) and Colucciello (1997) evaluated the Critical Thinking skills and dispositions among nursing students. Their research revealed higher scores among nursing students at varying points in the curriculum. However, they were not able to show improvement in scores over the course of a curriculum since both used cross-sectional designs where students at each class level were independent groups. Later, Colucciello revisited Critical Thinking disposition for senior nursing students. In that work, senior students had weak scores on Critical Thinking self-confidence, analyticity, systematicity, and inquisitiveness, while their scores on maturity and truth-seeking were relatively strong. In a similar study, Smith-Blair and Neighbors (2000) also evaluated Critical Thinking disposition among nurses entering critical care orientation programs. They noted that measuring disposition subscales could help identify areas for improvement using personalized orientation programs.

Akbıyık and Seferoğlu (2006) described the difference between academic achievements of students who have high critical thinking dispositions and of students who have low critical thinking dispositions. A significant difference was found between two groups in favor of the first group in terms of general achievement, Mathematics, science group (Physics, Chemistry, and Biology), and social group (History and Geography) lessons academic achievements.

Teachers should design their learning environment in order to develop critical thinkers. It means that pre-service teachers should be eager to learn how to train critical thinkers and to exert the mental effort needed to apply it. Whats more, they should know when and how a skill is needed. The aim of this study is to determine the critical thinking disposition of first and fourth year preservice teachers in four different departments of Faculty of Educational Sciences at Ankara University.

Method

Subjects: CCDI-T inventory was conducted to 308 students, 156 freshman students and 152 senior students, attending Department of Computer Education and Instructional Technology (CEIT), Department of Guidance and Psychological Counselling (GPC), Department of Primary School Education (PSE) and Department of Special Education (SE) in Faculty of Educational Sciences at Ankara University.

Materials:

Turkish Version of The California Critical Thinking Disposition Inventory CCTDI-T (Kökdemir, 2003) has been administered to identify preservice teachers' attitudes. The original English version of The California Critical Thinking Disposition Inventory CCTDI (Facione, Facione, and Giancarlo, 1998) measures a student's propensity to think critically. The index is comprised of 75 questions that represent 7 categories or scales: truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, and cognitive maturity. These 7 "habits of mind" can be thought of as the elements in our character that impel us toward using critical thinking skills.

The Turkish version of the original scale contains 51 items and has 6 factors, Analyticity, Open-mindedness, Inquisitiveness, Self-confidence, Truth-seeking, Systematicity (Kokdemir, D, 2003). The internal consistency of the scale was ,75; ,75; ,78;,77;,61 and ,63 respectively.

Procedure:

The Turkish version of the California Critical Thinking Dispositions Inventory (CCTDI-T) was administered to all participants during the first week of spring semester (2008) to be used in measuring critical thinking disposition.

Analysis:

Descriptive analyses was used to characterize the baseline data for both freshman and senior students at each department. Multivariate Analysis of Varience (MANOVA) was used to understand the influence of students' departments as well as their being freshman or senior on students' critical thinking disposition points interms of six different subscales.

Results

Table 1
The Number of Students in Each Department and in Each Years.

DEPARTMENTS				Grade		Total
				First Year	Fourth Year	
CEIT	GENDER	F	N	25	14	39
			%	64.1%	35.9%	100.0%
		M	N	23	18	41
			%	56.1%	43.9%	100.0%
	Total		N	48	33	81
			%	59.3%	40.7%	100.0%
GPC	GENDER	F	N	30	20	50
			%	60.0%	40.0%	100.0%
		M	N	19	34	53
			%	35.8%	64.2%	100.0%
	Total		N	50	54	104
			%	48.1%	51.9%	100.0%
PSE	GENDER	F	N	16	29	45
			%	35.6%	64.4%	100.0%
		M	N	8	13	21
			%	38.1%	61.9%	100.0%
	Total		N	24	42	66
			%	36.4%	63.6%	100.0%
SE	GENDER	F	N	26	16	42
			%	61.9%	38.1%	100.0%
		M	N	8	7	15
			%	53.3%	46.7%	100.0%
	Total		N	34	23	57
			%	59.6%	40.4%	100.0%

CEIT: Department of Computer Education and Instructional Technology; GPC:Department of Guidance and Psychological Counselling; PSE :Department of Primary School Education; and SE :Department of Special Education.

In order to observe the normal distribution for first and fourth year students from each departments, the data were analyzed by descriptive statistics. The mean of first year students' inventory points that is the avarage value of the distribution, or, the sum of all values divided by the number of values is 196.59.The median of first year students' inventory points that is the middle value of the distribution is 197. The varience is 234.21 and the standart deviation that is the positive square root of variance is 15.30. Both kurtosis and skewness values between –1.0 and +1.0 are considered exellent for most psychometric purposes (George and Mallery, 2001).The kurtosis value of first year students' inventory points is –0.05.The skewness of measurement is 0.007 and the standart error of skewness is 0.194. The mean of fourth year students' inventory points is 195.88 and its median is 196. The standart deviation of measurement is 18.77. Additionally its skewness is 0.17, its standart error of skewness is 0.19 and its kurtosis is 0.64. (Table 2).

Table 2

The Distribution of First Year and Fouth Year Students

		1st year	4th year
N	Valid	156	152
	Missing	0	0
Mean		196,59	195,88
Std. Error of Mean		1,225	1,523
Median		197,00	196,00
Mode		193(a)	185(a)
Std. Deviation		15,304	18,771
Variance		234,218	352,349
Skewness		,007	,172
Std. Error of Skewness		,194	,197
Kurtosis		-,053	,647
Std. Error of Kurtosis		,386	,391
Range		86	118
Minimum		157	138
Maximum		243	256
Sum		30668	29773

The mean of the inventory points of CEIT department students is 195.74 and its median is 196. The standart deviation of measurement is 15.67. Additionally its skewness value is -0.151, its standart error of skewness is 0.26 and its kurtosis value is -0.480.

The mean of the inventory points of GPC department students is 191.31 and its median is 193. The standart deviation of measurement is 15.80. Additionally its skewness value is -0.151, its standart error of skewness is 0.237 and its kurtosis value is 0.71.

The mean of the inventory points of PSE department students is 198.81 and its median is 201. The standart deviation of measurement is 17.37. Additionally its skewness value is -0.69, its standart error of skewness is 0.295 and its kurtosis value is 0.40.

The mean of the inventory points of SE department students is 202 and its median is 200. The standart deviation of measurement is 18.41. Additionally its skewness value is 0.80, its standart error of skewness is 0.31 and its kurtosis value is 0.56.

The descriptive statisitcs results show that the distributions of data are acceptable as a normal.

Table 3

MANOVA Results of Interaction between Departments and Grades for Analicity

Subscales	Department	Grade	n	Mean	Std. Deviation	df	F	Sig.
ANALYTICITY	CEIT	1	48	49.2708	4.9238	7-300	1.660	0.175
		4	33	49.6970	3.8201			
		Total	81	49.4444	4.4861			
	GPC	1	50	49.4800	5.2692			
		4	54	46.6852	5.0910			
		Total	104	48.0288	5.3398			
	PSE	1	24	51.3333	5.1217			
		4	42	49.4762	5.0279			
		Total	66	50.1515	5.1028			
	SE	1	34	51.1765	4.2603			
		4	23	48.6957	7.2201			
		Total	57	50.1754	5.7169			
	Total	1	156	50.0705	4.9710			
		4	152	48.4145	5.3295			
		Total	308	49.2532	5.2091			

According to the table 3 the mean of analyticity disposition of first year and fourth year students of CEIT Department are almost the same. ($\bar{X}$ =49.27 and $\bar{X}$ =49.69). The mean of analyticity disposition of first year students of GPC department is ($\bar{X}$ =49.48) higher than the mean ($\bar{X}$ =46.68) of fourth year students' analyticity disposition of the same GPC department. The mean of analyticity tendency of PSE department's first year students is ($\bar{X}$ =51.33) higher than the mean ($\bar{X}$ = 49.47) of fourth year students'. Similarly, the mean of analyticity disposition of first year students of SE department is ($\bar{X}$ =51.17) higher than that of ($\bar{X}$ =48.69) fourth year students' analyticity disposition of the same SE department. However, these differences are not significant ($F_{(7\text{-}300)}$=1.66, p>.01)

Table 4

MANOVA Results of Interaction between Departments and Grades for Truth-seeking

Subscales	Department	Grade	n	Mean	Std. Deviation	df	F	Sig.
TRUTHSEEKING	CEIT	1	48	34.1964	6.9200	7-300	.582	.627
		4	33	35.2814	6.3736			
		Total	81	34.6384	6.6836			
	GPC	1	50	37.4000	7.5410			
		4	54	38.6508	7.0829			
		Total	104	38.0495	7.2981			
	PSE	1	24	36.4881	6.2764			
		4	42	36.1565	6.9664			
		Total	66	36.2771	6.6766			
	SE	1	34	36.0924	7.6188			
		4	23	34.5342	8.0427			
		Total	57	35.4637	7.7597			
	Total	1	156	35.9890	7.2374			
		4	152	36.6071	7.1699			
		Total	308	36.2941	7.1991			

The mean of truth-seeking disposition of first year students of CEIT Department is ($\overline{X}$ = 34.19) higher than the mean ($\overline{X}$ =35.28) of fourth year students' truth-seeking disposition of the same department. The mean of truth-seeking disposition of first year students of GPC Department is ($\overline{X}$ = 37.40) lower than the mean ($\overline{X}$ =38.65) of fourth year students' truth-seeking disposition. The mean of truth-seeking tendency of first year and fourth students of PSE Department are almost same ($\overline{X}$ = 36.48 and $\overline{X}$ =36.15). The mean of truth-seeking disposition of first year students of SE Department is ($\overline{X}$ = 36.09) higher than the mean ($\overline{X}$ =34.53) of fourth year students' truth-seeking disposition of the same department. But, there is no significant difference ($F_{(7-300)}$=0.58, p>.01).

Table 5

MANOVA Results of Interaction between Departments and Grades for Openmindness

Subscales	Department	Grade	n	Mean	Std. Deviation	df	F	Sig.
OPENMINDNESS	CEIT	1	48	44.6007	5.5729	7-300	1.986	.250
		4	33	46.6667	5.8962			
		Total	81	45.4424	5.7616			
	GPC	1	50	43.6833	5.9263			
		4	54	47.8241	4.7924			
		Total	104	45.8333	5.7313			
	PSE	1	24	45.7292	4.5332			
		4	42	43.9683	7.5659			
		Total	66	44.6086	6.6413			
	SE	1	34	46.6422	5.5372			
		4	23	39.2754	8.6102			
		Total	57	43.6696	7.7774			
	Total	1	156	44.9252	5.6013			
		4	152	45.2138	7.1045			
		Total	308	45.0676	6.3786			

The mean of open-mindedness tendency of first year students of CEIT Department is ($\overline{X}$ = 44.60) lower than the mean ($\overline{X}$ =46.66) of fourth year students' open-mindedness tendency. The mean of open-mindedness tendency of first year students of GPC Department is ($\overline{X}$ = 43.68) lower than the mean ($\overline{X}$ =47.82) of fourth year students' open-mindedness tendency of the same GPC department. The mean of open-mindedness disposition of first year students of PSE Department is ($\overline{X}$ = 45.72) higher than the mean ($\overline{X}$ =43.96) of fourth year students' open-mindedness disposition. The mean of open-mindedness disposition of first year students of SE Department is ($\overline{X}$ = 46.64) higher than the mean ($\overline{X}$ =39.27) of fourth year students' open-mindedness disposition. . Although the means differ with regard to departments and grade levels the differences are not significant (($F_{(7-300)}$=1.98, p>.01).

Table 6

MANOVA Results of Interaction between Departments and Grades for Self-Confidence

Subscales	Department	Grade	n	Mean	Std. Deviation	df	F	Sig.
SELF-CONFIDENCE	CEIT	1	48	38,6905	7,7063	7-300	1.05	.370
		4	33	41.2554	4.8807			
		Total	81	39.7354	6.7843			
	GPC	1	50	40.3143	8.0414			
		4	54	39.8942	6.0217			
		Total	104	40.0962	7.0332			
	PSE	1	24	41.4286	6.4578			
		4	42	42.0408	8.2828			
		Total	66	41.8182	7.6236			
	SE	1	34	40.0840	6.8008			
		4	23	43.2298	8.1066			
		Total	57	41.3534	7.4496			
	Total	1	156	39.9359	7.4405			
		4	152	41.2876	6.8852			
		Total	308	40.6030	7.1921			

The mean of critical thinking self-confidence disposition of first year students of CEIT Department is ($\overline{X}$ = 38.69) lower than the mean ($\overline{X}$ =41.25) of fourth year students' self confidence disposition of the same department. The mean of critical thinking self-confidence tendency of first year students of GPC Department is ($\overline{X}$ = 40.31) higher than the mean ($\overline{X}$ =39.89) of fourth year students' self confidence disposition of the same department. The mean of critical thinking self-confidence disposition of first year students of PSE Department is ($\overline{X}$ = 41.42) lower than the mean ($\overline{X}$ =42.04) of fourth year students' self confidence disposition. The mean of critical thinking self-confidence tendency of first year students of SE Department is ($\overline{X}$ = 40.08) lower than the mean ($\overline{X}$ =43.22) of fourth year students' self confidence disposition. However there is no significant difference between these two freshman and senior students of these four departments ($F_{(7\text{-}300)}$=1.05, p>.01)

Table 7

MANOVA Results of Interaction between Departments and Grades for Inquisitiveness

Subscales	Department	Grade	n	Mean	Std. Deviation	df	F	Sig.
INQUISITIVENESS	CEIT	1	48	43.7269	6.9954	7-300	.850	.468
		4	33	47.1380	6.2115			
		Total	81	45.1166	6.8576			
	GPC	1	50	44.6889	7.2088			
		4	54	45.4321	6.3322			
		Total	104	45.0748	6.7449			
	PSE	1	24	45.4630	7.4205			
		4	42	46.4286	5.5286			
		Total	66	46.0774	6.2436			
	SE	1	34	48.1373	5.9157			
		4	23	48.5024	6.0730			
		Total	57	48.2846	5.9283			
	Total	1	156	45.2635	7.0387			
		4	152	46.5424	6.0852			
		Total	308	45.8947	6.6059			

The mean of inquisitiveness disposition of first year students of CEIT Department is ($\overline{X}$ = 43.72) lower than the mean ($\overline{X}$ =47.13) of fourth year students' inquisitiveness disposition. The mean of inquisitiveness disposition of first year students of GPC Department is ($\overline{X}$ = 44.68) lower than the mean ($\overline{X}$ =45.43) of fourth year students' inquisitiveness disposition of the same department. The mean of inquisitiveness tendency of first year students of PSE Department is ($\overline{X}$ = 43.72) higher than the mean ($\overline{X}$ =47.13) of fourth year students' inquisitiveness disposition. The mean of inquisitiveness disposition of first year students of SE Department is ($\overline{X}$ = 48.13) lower than the mean ($\overline{X}$ =48.50) of fourth year students' inquisitiveness disposition. But, there is also no significant interaction of year by department on inquisitiveness ($F_{(7\text{-}300)}$=.85, p>.01).

Table 8

MANOVA Results of Interaction between Departments and Grades for Systematicity

Subscales	Department	Grade	n	Mean	Std. Deviation	df	F	Sig.
SYSTEMATICITY	CEIT	1	48	42.9167	6.7766	7-300	.237	.871
		4	33	43.9899	6.7436			
		Total	81	43.3539	6.7417			
	GPC	1	50	42.6000	6.7693			
		4	54	43.1173	5.9791			
		Total	104	42.8686	6.3452			
	PSE	1	24	44.2361	6.8978			
		4	42	44.6429	6.9213			
		Total	66	44.4949	6.8623			
	SE	1	34	43.5294	6.2194			
		4	23	42.6812	6.1902			
		Total	57	43.1871	6.1664			
	Total	1	156	43.1517	6.6359			
		4	152	43.6623	6.4280			
		Total	308	43.4037	6.5285			

The mean of first year students of CEIT department tendency to systematicity is ($\overline{X}$ = 42.91) lower than the mean ($\overline{X}$ =43.98) of fourth year students' systematicity tendency. The mean of systematicity disposition of first year students of GPC Department is ($\overline{X}$ = 42.60) lower than the mean ($\overline{X}$ =43.11) of fourth year students' systematicity disposition. The mean of systematicity disposition of first year students of PSE Department is ($\overline{X}$ = 44.23) lower than the mean ($\overline{X}$ =44.64) of fourth year students' systematicity disposition. The mean of systematicity disposition of first year students of SE Department is ($\overline{X}$ = 43.52) lower than the mean ($\overline{X}$ =42.68) of fourth year students' systematicity disposition. There is also no significant interaction of year by department on systematicity ($F_{(7\text{-}300)}$=.23, p>.01).

For each subscale, a score below the 40 represents a general weakness, while a score above the 50 indicates consistent strength in that area (Facione, Facione, and Giancarlo, 1998). Scores on the six CCTDI-T scales can range from 10 to 60; scores above 40 indicate a positive inclination toward the scale's target disposition. Scores in all subcategories except for truth-seeking are consistently above 40. The truth-seeking disposition was found lower than 40 in all four departments. Most of the departments' analiciticity dispositions are near to 50. Departments' tendency to the openmindness is about 45. Self confidence disposition of departments is around 40. The departments' disposition of inquisitiveness is near to 45. Lastly, the systematicity disposition of departments is around 43.

Conclusion

The seven characteristics of an ideal critical thinker (i.e., critical thinking dispositions) are: (1) open-mindedness – tolerance of divergent views, self-monitoring for possible bias; (2) analycity - demanding the application of reason and evidence, alert to problematic situations, inclined to anticipate consequences; (3) truth-seeking – courageous desire for the best knowledge, even if such knowledge fails to support or undermines one's preconceptions, beliefs or self interests; (4) cognitive maturity – prudence in making, suspending, or revising judgment; (5) systematicity – valuing organization, focus and diligence to approach problems of all levels of complexity; (6) inquisitiveness – curious and eager to acquire knowledge and learn explanations even when the applications of the knowledge are not immediately apparent; and (7) critical thinking self confidence – trusting one's own reasoning skills and seeing oneself as a good thinker. These seven characteristics are featured in the CCTDI as seven factors measuring the degree of critical thinking dispositions. These characteristics were measured by the CCTDI-T inventory applied to first and fourth year students at Faculty of Educational Sciences of Ankara University. The results reveal that there is no significant interaction of department by level on six subscales of inventory.

According to Facione and Facione (1994), scores of 40 or above in any of the seven scales are indicative of a positive tendency towards that disposition. Scores between 50 and 60 suggest a strong positive tendency towards that disposition. In contrast, scores of 30 or below are considered as having a negative tendency towards the disposition. Scores in the mid range of 31 to 39 indicate ambivalence of a mixed tendency on a given scale.

The first and fourth year students' disposition points from four different departments consistently met or exceeded the 40-point cut on all categories except truth-seeking. Considering mean of analicity of all departments are (between 48 and 51) the highest scores than the other scales. In other words the all preservice teachers have strong positive tendency regarding analicity. On the contrary the mean of truth-seeking of all departments are (between 34 and 39) the lowest score indicate that preservice teachers have mixed tendency about truth-seeking.

The low truth-seeking scores observed in this study are consistent with other findings in several published studies of undergraduate students (Korkmaz,Ö, 2009; Güven and Kürüm, 2008; Ip et al., 2000; Walsh&Hardy, 1999;Halpern, 1998). This suggests a potential area for curricular emphasis that could increase the likelihood of students using their truth-seeking abilities. Phillips and others (2004) suggest that experiences or didactic course work that promote the idea of gaining the best knowledge and challenging one's preconceptions may afford improvement on scores in the truth-seeking category.

As with the total disposition scores, there appeared to be little difference in scores on disposition subcategories between those students entering as freshman and those as senior. Likewise, there was little difference on subcategory scores from four departments. However, these differences are not significant.

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