THE EFFECT OF DIFFERENT TEACHING STYLES ON CRITICAL THINKING AND ACHIEVEMENT GOALS OF PROSPECTIVE TEACHERS*

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Abstract: Learning environment enriched with diverse teaching styles can be effective in fostering critical thinking (CT) and achievement goals (AG) for preparing prospective teachers to cope with challenges of twenty-first century. To examine the effect of diverse teaching styles on prospective teachers' CT and AG; guided discovery, convergent discovery and divergent production styles (Mosston & Ashworth, 2002) were used in teaching of badminton during fourteen weeks. Voluntary participants were forty prospective classroom teachers (treatment group n=20; comparison group n=20) from a Teacher Education Program at a public university in central Turkey. California Critical Thinking Skills Test-Form 2000 (CCTST), The California Critical Thinking Disposition Inventory (CCTDI) and Trichotomous Achievement Goal Scale (TAGS) were administered as pre-post test. The results showed that diverse teaching styles had positive effect on CT skills, CT dispositions, AG of performance approach and performance avoidance, but negative effect on mastery AG of prospective teachers.

Key Words: Prospective teacher, critical thinking, achievement goal, teaching style, teacher education

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INTRODUCTION

Critical thinking is one of the most important skills that are necessary for tackling the fundamental challenges and difficulties of the 21st century. Critical thinking involves the ability to reason effectively, to consider different points of view, to ask questions, to create solutions when confronting problems, and to evaluate and reconsider one's own decisions (Pacific Policy Research Center-PPRC, 2010; The Partnership for 21st Century Skills-P21, 2011). Paul (1995) suggested that critical thinking was the essential foundation for all education levels and a crucial ability for individuals to be able to adapt to the demands of everyday life. Various definitions of critical thinking have been offered by researchers. Ennis (1989; 1993) defined critical thinking as the process of reasonable and reflective thinking that is focused on deciding what to believe or do. Similarly, Halpern (1998) defined critical thinking as cognitive skills and strategies that increase the likelihood of a desired outcome… thinking that is purposeful, reasoned, and goal-directed - the kind of thinking involved in solving problems, formulating inferences, calculating likelihoods, and making decisions. Facione (2013) formulated critical thinking as "purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, or conceptual considerations upon which that judgment is based". Although critical thinking was defined in different ways, prominent researchers in this field described critical thinking abilities in terms of skills and dispositions. The skills commonly represent the cognitive component while, the dispositions represent affective component (Ennis, 1993; Facione, 2013; Halpern,

1998). As a cognitive component, critical thinking skills include of analyzing arguments, making inferences using deductive or inductive reasoning, judging or evaluating, and making decisions or solving problems. On the other hand, as an affective component, critical thinking dispositions can be seen as attitudes or habits of mind. These dispositions include open-and fair-mindedness, inquisitiveness, flexibility, a propensity to seek reason, a desire to be well- informed, and a respect for and willingness to entertain diverse viewpoints. American Philosophical Association (1990)'s consensus portrait of the ideal critical thinker as someone who is inquisitive in nature, open-minded, flexible, fair-minded, has a desire to be well-informed, understands diverse viewpoints, and is willing to both suspend judgment and to consider other perspectives.

The strong relationship between psychomotor and cognitive domain in physical education is due to the fact that physical education combines physical activity and cognitive challenges. As a result of this relationship, physical education and sport-related environments play an important role in the use and development of critical thinking abilities (Gabbard & McBride, 1990; McBride & Cleland, 1998). McBride (1992) defined critical thinking in physical education as a "reflective form of thinking used for making defensible and rational decisions regarding movement tasks and challenges." To ensure that physical education activities allow students to acquire basic movement skills, to internalize aspects and values such as strategy, technique, tactics, sportsmanship, honesty and cooperation, and to display a willingness towards learning; teachers must be able to use critical thinking and employ different teaching approaches, methods and techniques in class (Pelana, 2014).

Using different teaching approaches in fostering critical thinking can be linked directly to Mosston's spectrum of teaching styles (Mosston & Ashworth, 2002) which is a theoretical framework of different instructional approaches derived from the chain of decision making occurring in each steps of planning, implementation, and evaluation process in teaching and learning. There are mainly two clusters in this spectrum based on whether the teacher or the students make the decisions. The styles at first cluster -command, practice, reciprocal, self-check, and inclusion- are called "reproductive", while the styles at second cluster -guided discovery, convergent discovery, divergent discovery, and learner-designed individual program, learner-initiated, and self-teaching- are called "productive". Reproductive styles represent teaching options that foster reproduction of existing information and knowledge, on the other hand production styles represent options that invite production or discovery of new knowledge to the learner, teacher, or to society. Productive styles in which students make most of the decisions in learning process are relatively and progressively more indirect in comparison to the reproductive styles in which teachers tend to make most of the decisions.

The discovery threshold identifies the cognitive boundaries of each cluster. Each style takes part in both cluster has different developmental effects on students in terms of psychomotor, affective and cognitive domain (Mosston & Ashworth, 2002). In this context, it is clear that the teachers should make changes on their own roles from as the controller of information to that as the facilitator of information in fostering critical thinking. Although critical thinking was considered as one of the most important ability

in education and a necessity in daily life, an evaluation of studies performed in general education (Alper, 2010; Beşoluk & Önder, 2010; Çubukçu, 2006; Dutoğlu & Tuncel, 2008; Emir, 2009; Genç, 2008; Grosser & Lombard, 2008; Güven & Kurum, 2008; Korkmaz, 2009; Türnüklü & Yeşildere, 2005; Yang & Chou, 2008; Yeşildere & Türnüklü, 2007) and physical education area (Certel, Çatıkkaş & Yalçınkaya, 2011; McBride, Xiang & Wittenburg, 2002; McBride, Xiang, Wittenburg & Shen, 2002; Saçlı, 2013; Saçlı & Demirhan, 2008; 2011) revealed that this ability in teachers and prospective teachers were inadequate, and needed to be developed.

Researchers have identified several teaching models and techniques that can be implemented into a classroom to encourage the development of critical thinking ability. Studies in physical education and sports have demonstrated that teachers using diverse productive teaching styles -which are all student-centered teaching styles- such as guided discovery, convergent discovery and divergent production described by Mosston and Ashworth (2002) were more effective in allowing students to improve their critical thinking regarding the development of different movement patterns. Similarly, these studies have noted that teaching styles such as guided discovery, convergent discovery and divergent production were effective in contributing to the development of critical thinking and in creating inquisitive atmospheres (Cleland, Donnelly, Helion & Fry, 1999). McBride, Xiang and Wittenburg (2002) have also reported that physical education teachers who took part in the "Teaching Methods for Physical Education" course demonstrated an increased use of critical thinking. In addition, Kamla & Lindauer (2002) described that, through the roles they assign to the students and teachers, physical education activities can contribute to the development of critical thinking ability among these groups. Certain studies have also demonstrated that creative drama activities are effective in ensuring the development of critical thinking skills among prospective physical education teachers (Saçlı, 2013). Whatever techniques teacher uses, it should be considered to make students become active learners rather than passive recipients of information. Teachers should enable students take their own responsibility for their thinking and learning.

Critical thinking is so far conceptualized as having the two dimensions of cognitive skills and affective dispositions (Ennis, 1993; Facione, Sanchez, Facione & Gainen, 1995). According to Ennis (1993), affective dispositions are required for cognitive skills. For example, prospective teachers who are able to use critical thinking skills but not willing to use these skills are not likely to be critical thinkers. From this perspective, critical thinking is generally being closely related with the affective characteristics, the motivational orientation and the associated achievement goals of individuals. Similarly, the cognitive, affective and behavioral responses of individuals are described as motivational elements that affect their achievement goals (Duda & Nicholls, 1992; Dweck & Legget, 1988). According to Nicholls (1989), the "achievement goal theory" describes the effort demonstrated by individuals in order to demonstrate their skills in the best possible way. As described by Nicholls, this theory consists of mastery and performance goals. According to certain researchers (Elliot, 1999; Elliot & Church, 1997; Elliot & Harackiewicz, 1996), performance goals are further subdivided into performance approach goals and performance avoidance goals. The emphasis of individuals in learning new skills, in becoming proficient in the activities they perform, and in achieving personal development is described with the concept of mastery goal

orientation. According to Morgan & Carpenter (2002), performance goal orientation refers to the emphasis of individuals on improving their social status by winning against others with minimum effort. On the other hand; according to Elliot & Church (1997) and Elliot & Harackiewicz (1996), performance approach refers to individuals' willingness to become more skilled than others, while performance avoidance refers to individuals' willingness to avoid failure or being less skilled than others.

Performance approach goals involve positive learning outputs such as increased willingness to assume tasks, increased belief in one's sport-related skills, lower anxiety levels, and higher performance (Elliot & Church, 1997; Elliot & Moller, 2003; Harackiewicz et al., 2002; Kaplan & Middleton, 2002). On the other hand, performance approach goals are also associated with negative outputs such as the reduced ability to recall learned knowledge (Midgley et al., 2001), the learning of information in a superficial manner (Elliot et al., 1999), and the tendency to avoid asking for help in class (Newman, 1998; Ryan & Pintrich, 1997). Performance avoidance goals are known to be associated with negative learning outputs such as the tendency to avoid asking for assistance, higher anxiety levels, low performance and low inner motivation (Elliot & Church, 1997; Elliot & Harackiewicz, 1996; Skaalvik, 1997; Urdan & Giancarlo, 2001). In addition to this, performance avoidance goals lead students to focus on strategies based on demonstrating their skills rather than achieving actual learning. As a result of this, performance avoidance goals may not ensure any deep learning among students, despite any contributions they might make to the students' grades (Midgley et al., 2001). As described by Ommundsen (2006), results from different studies regarding the effects of performance approach and avoidance goals on the cognitive outputs of students indicate a need for further studies on this subject.

Previous studies have demonstrated that different teaching styles can positively affect the motivational orientation of students (Mosston & Ashworth, 2002; Papaioannou & Kouli, 1999). For example, it has been demonstrated that classes performed based on participation-related methods (Goudas et al., 1995), learning experiences based on cooperation (Ntoumanis, 2001), and physical education classes based on cooperation and orientation-related learning methods (Morgan, Kingston & Sproule, 2005) can, in comparison to habituation style teaching approaches, induce a more positive change on the achievement goals and inner motivation of the students.

Ames (1992) described that teachers who are knowledgeable on different teaching styles can effectively support student behavior that contributes to development of mastery goals. In addition, to ensure that students can acquire critical thinking skills that are necessary for advanced reasoning and decision-making within the context of physical education classes, teachers must endeavor to induce cognitive dissonance among students; to provide them the opportunity to question and interrogate; and to encourage them to cooperate with one another. During class, teachers must also make effective use of teaching methods that enable students to assume an active and effective role; to participate in various activities according to their personal level; to feel confident in their own abilities; to take their own decisions and perform their own assessments; and to suggest solutions to the problems they encounter (Loughran, 2002; McBride, 1992; McBride & Cleland, 1998; Mosston & Ashworth, 2002). In light of the relevant studies from the literature, it is possible to state that teaching styles based on

different productive methods have an important effect on critical thinking and goal orientation. According Mosston & Ashworth (2002); by taking into account those responsible for decisions regarding the planning, teaching and evaluation of physical education classes, and by considering the discovery threshold of the students, it possible to contribute to the development of critical thinking and achievement goals among prospective teachers through the implementation of productive teaching styles such as the guided discovery, convergent discovery and divergent production. These teaching styles all focus on having students form/produce their own knowledge by themselves or with the assistance of their teachers. These methods are likely to contribute to the development of critical thinking and achievement goals to a greater extent than reproductive teaching styles such as command and practice.

Within the scope of the "Special Teaching Methods" course provided in programs regarding physical education teaching; prospective teachers are provided the opportunity to acquire knowledge regarding the teaching styles described by Mosston & Ashworth (2002). Classroom teachers in Turkish Elementary Schools are responsible for the conduct of physical education activities during the first four grades within the scope of the "Games and Physical Activities" class. For this reason, ensuring that prospective classroom teachers also take part in the "Special Teaching Methods" course will allow an overall coherence and consistency in Turkey with regards to the implementation of practices relating to physical education.

In this context, the aim of this study was to investigate whether different teaching styles had any effect on critical thinking skills, critical thinking dispositions and the achievement goals of prospective classroom teachers.

Hypotheses:
1. There is a significant difference between the treatment and comparison groups with respect to the mean scores of their critical thinking skills.
2. There is a significant difference between the treatment and comparison groups with respect to the mean scores of their critical thinking dispositions.
3. There is a significant difference between the treatment and comparison groups with respect to the mean scores of their achievement goals.

METHOD

Participants

The study was conducted during the fall and spring semesters of the 2009-2010 academic year with 40 sophomores (M_{Age}=19.70±0.68) from the Elementary Teacher Education (ETE) Program at a public university in central Turkey. Among the participants, 27 were female (M_{Age}=19.66±0.67), and 13 were male (M_{Age}=19.76±0.72). Participation in this study was based on voluntariness of the students. In accordance with the purpose of the study, the students were randomly allocated to two equal groups, which were the treatment and the comparison group. The treatment group consisted of 20 students M_{Age}=19.70±0.65); 14 of these students were female, while 6 were male. The comparison group also consisted of 20 students (M_{Age}=19.70±0.73); 13 of these students were female, while 7 were male. However, all questionnaires as pre-post test were completed fully only by 19 prospective teachers in the study. Therefore, the analysis was conducted for these participants. Prior to the study, permissions were

attained from the university institutional review board, department review board and all participants. Students attending at "Physical education and Sports Culture" course during the third semester of their undergraduate education randomly selected as treatment and comparison group. As none of those students had received any badminton education or training before, badminton was used for the groups in this study.

The equivalence between the treatment and comparison groups was determined by the Turkish version of the 51-item "California Critical Thinking Disposition Inventory" (CCTDI) (Facione, Facione & Giancarlo, 1998), previously adapted by Kökdemir (2003), and the "Trichotomous Achievement Goal Scale" (TAGS). These two scales were utilized as preliminary tests for the students. The Independent-Samples t-test was used in order to determine whether there was any significant difference between the mean scores of these scales and of their sub-scales. Statistical analyses identified no significant differences in the mean scores of the treatment and comparison groups [(CCTDI ($t_{disposition}$= -0.831, p= 0.411), (TAGS ($t_{mastery}$= 0.652, p= 0.518; $t_{per.app.}$= -0.941, p= 0.353; $t_{per.avo.}$= -1.555, p= 0.128)]. Based on the obtained data, it is possible to state that the treatment and comparison groups were equal with respect to their scores in these preliminary tests.

Measurement

California Critical Thinking Skills Test (CCTST). The CCTST – Form 2000 is a discipline neutral, domain nonspecific measure of critical thinking ability developed by Facione, Facione, Blohm & Giancarlo (2002) widely used for assessment of college students' critical thinking. The test focuses on cognitive dimension of critical thinking and consists of 34 multiple-choice questions designed to measure one's overall critical thinking skill plus five subscales with specific areas: analysis, evaluation, inference, deductive reasoning, and inductive reasoning. As these cognitive skills of critical thinking do not act as independent factors, the total test scores were taken into consideration in this study. The maximum possible score on the skills test is 34. Prior to study, the scale was first adapted to Turkish. Before performing this adaptation, the necessary permission was officially requested from the "California Insight Assessment" which has the right of use for this test. The test was first translated from English to Turkish, and a back-translation was then performed from Turkish to English. Following this, a comparison was performed between the final Turkish version of the test and its original English version. Based on the analysis that was performed on this test, the percentage of linguistic correspondence between these two documents was calculated, and a consistency of 97.02% was identified. To obtain the validity and reliability of the CCTST, the adapted scale was administered to 620 prospective teaches attending the PETE and ETE programs. The obtained data were then forwarded to California Insight Assessment. The reliability coefficient of 0.60 was determined for that population and the suitability of the scale for use on Turkish university students was officially confirmed by California Insight Assessment and Facione (2009). Based on this assessment, the scale was used in data collection for this study. *California Critical Thinking Disposition Inventory (CCTDI).* The scale focuses on the affective dimension of critical thinking and it is used to measure the extent to which a person possesses the characteristics of the critical thinker. This scale was selected because of its grounding in the APA Delphi Report (American Philosophical Association, 1990), which has

achieved cross consensus on the conceptualization of critical thinking. Based on the critical thinking experts in the Delphi study, there were seven affective dispositions in the scale as follows: Analyticity, open-mindedness, inquisitiveness, CT self-confidence, truth-seeking, systematicity and maturity. To determine the CT disposition of individuals, a scoring system based on the total of all these sub-scales was used (Facione, Facione & Giancarlo, 1998). In our study, the scale was considered as a whole, and the CT dispositions of the participants were determined based on the total scale scores – without taking into consideration the score of the individual sub-scales. The original version of this scale consists of 75 items. The Turkish adaptation and the validity-reliability study of this scale were performed by Kökdemir (2003). This Turkish adaptation consists of 51 items (29 positive, 22 negative) and six sub-scales, which are analyticity, open-mindedness, inquisitiveness, CT self-confidence, truth-seeking and systematicity. The scale has six-point Likert-type items (1: *Completely Disagree*, 6: *Completely Agree*). Following its adaption, the Cronbach's Alpha coefficient of the scale was determined as 0.88, while the total variance of the scale was determined as 36.13%. Based on an evaluation of the CCTDI; individuals with scores less than 240 (40 x 6) are considered as having a low general disposition to think critically, while individuals with scores greater than 240 (50 x 6) are considered as having a higher disposition to think critically.

In the context of this current study, the scale was administered twice at 20 day intervals to 92 students (79 females, 13 males) from ETE Program. The Intra-class Correlation Coefficient calculated in order to determine the relationship between the first and second administrations was determined as R= 0.75. The Dependent Samples t-test was used to evaluate whether there was any difference between the total scores of these two assessments performed at different times. According to this test, no significant difference was identified between the two assessments (p=0.98, p>0.05). Based on the Intra-class Correlation Coefficient of 0.75 that was identified for this scale, and based on the lack of differences between the two assessments performed at different times; it is possible to state that the data obtained from this population was consistent by time. The reliability of the scale in terms of internal consistency was determined by using the Cronbach's Alpha, which was calculated as α= 0.86. This consistency coefficient for CCTDI demonstrated that the measurement from this scale provided fairly reliable results (Kalaycı, 2006; Alpar, 2001).

Trichotomous Achievement Goal Scale (TAGS). This scale was developed and adapted to Turkish by Ağbuğa & Xiang (2008) based on items from previous scales developed by Duda & Nicholls (1992), Elliot (1999), Elliot & Church (1997). The scale was tested with eight and eleventh grade students. The TAGS is a 18-item, seven-point Likert-type scale (1: *Completely Disagree*, 7: *Completely Agree*). The scale has three sub-dimensions, which are "mastery," "performance approach" and "performance avoidance." The "mastery," "performance approach" and "performance avoidance" sub-dimensions are each assessed by six statements. All statements in the scale begin with the phrase "In my physical education classes…", and the students then select the corresponding statement/answer by considering their own performance in physical education classes. The scores of the scale are interpreted based on the arithmetic mean of each sub-dimension. In the seven-point Likert-type scale, four is considered as the mid-point, and individuals with an arithmetic mean greater than four are considered as

having a disposition in the respective sub-dimension (in other words, they are considered as having selected a relevant sub-dimension as part of their achievement goals) (Ağbuğa & Xiang, 2008).

The test-retest reliability and internal consistency of the TAGS to be used in the study was determined within the scope of another study conducted on university students. The scale was administered twice at 20 day intervals to 92 students (79 females, 13 males) from ETE program. The Intra-class Correlation Coefficients for the "mastery," "performance approach" and "performance avoidance" sub-dimensions of the scale were determined as 0.73, 0.77 and 0.70, respectively. The Dependent Samples t-test was used to evaluate whether there was any difference between the total scores of these two assessments performed at different times. According to this test, no significant difference was identified between the two assessments ($p_{mas.}$= 0.244, $p_{per.app.}$= 0.328, $p_{per.avo.}$= 0.337). Based on the administration of the test to the university students (n=127), the Cronbach's Alpha coefficients for the "mastery," "performance approach" and "performance avoidance" sub-dimensions were determined as $\alpha_{mas.}$= 0.80, $\alpha_{per.app.}$= 0.74 and $\alpha_{per.avo.}$= 0.83. According to Kalaycı (2006) and Alpar (2001) these results can be accepted as high reliable.

Procedure

The study was based on pretest-posttest quasi-experimental design with comparison group. The study was performed during the fall and spring semesters of the 2009-2010 academic years at the gymnasium of the School of Sport Sciences and Technology at a public university in central Turkey. In order to assess the teaching plan, the relevant course was performed with both groups once a week – and for 40 minutes a week – within the context of the pilot study. The teaching of this course was recorded with a video camera. Following the conduct and recording of these courses, three specialists in the field evaluated whether the courses were performed in a manner consistent with the teaching plans. These specialists unanimously reached the conclusion that the courses properly followed the teaching plan. Prior to the experimental procedures; the CCTST, the CCTDI and the TAGS were administered to the prospective teachers. For a period of 14 weeks, the students randomly assigned to the treatment and comparison groups participated to courses conducted by an instructor from the School of Sport Sciences and Technology. The courses were performed for 40 minutes a week, for a total of 560 weeks during the entire 14-week period, and badminton was covered in each one of these courses.

Guided discovery, convergent discovery and divergent production styles were applied to the treatment group, while the command and practice styles were applied to the comparison group. As explained by Mosston and Ashworth (2002), in command style, the teacher made all the decisions, demonstrated or explained a task for the students to emulate, then directed their practice by giving commands. In practice style, the teacher demonstrated or described a task and the students practiced the task at their own pace. The teacher provided feedback while the students were doing practice. On the other hand, in guided discovery style the role of the teacher was to make all subject matter decisions, including the target concept to be discovered and the sequential questions that lead to the target answer. The role of the learner was to accept guidance to discover the answer. In this process, the learner made decisions about segments of the subject matter

within the topic. This sequential process invited the learner to make meaningful cognitive connections that lead to the discovery of new content, including a concept, principle, relationship or rule. In the convergent discovery style, the role of the teacher was to design the single question delivered to the learner. The role of the learner was to engage in reasoning, questioning, and logic to sequentially make connections about the content to discover the answer. In divergent discovery style, the teacher made all subject matter decisions including the design of the single or series of questions/situations/problems that seek multiple solutions to the stimuli. The stimuli was new and unfamiliar to the student, therefore each student was invited to discover new possibilities, as they produce multiple (divergent) responses to the specific problem. The teacher acknowledged the production of multiple ideas rather than any singular idea. At the end of the semester, three questionnaires were re-administered to the groups. All of the courses were recorded by a video camera, and three specialists in the field evaluated whether the courses were performed in a manner consistent with the teaching plans.

Data Analysis

The data collected with the scales employed during the study were analyzed using descriptive statistics (arithmetic mean, standard deviation), the Wilcoxon Signed-Rank Test and the Dependent Samples t-test. Within the scope of statistical calculations, 0.05 was considered as the level of statistical significance.

To determine the scores for the CCTST, the data were sent electronically to California Insight Assessment; the calculation of the total test scores was then performed by this organization.

RESULTS

Results of the California Critical Thinking Skills Test (CCTST). The mean scores of pretest and posttest on CCTST for prospective teachers are provided in Table 1.

Table 1. The Pretest and Posttest Scores for the CCTST

		Pretest	**Posttest**
Group	***n***	***(M±SD)***	***(M±SD)***
Treatment	8	9.75±3.41	14.75±4.02*
Comparison	11	10.63±3.52	11.36±4.34

*($p<0.05$)

According to Table 1, the mean CT skills score of students in the treatment group displayed a greater increase than the mean score of students in the comparison group ($\bar{x}_{posttest\text{-}treat}$= 5.00±5.60; $\bar{x}_{posttest\text{-}comp}$= 0.72±2.10). The results of the Wilcoxon Signed-Rank Test indicated a significant difference between the mean pretest and posttest CCTST scores of students in the treatment group (Z_{Treat}= -2.201; p=0.028), while the difference between the mean pretest and posttest CCTST scores of students in the comparison group was not found to be significant (Z_{Comp}= -1.186; p= 0.236). Based on these findings, it is possible to state that the diverse teaching methods applied to the

treatment group, as well as the courses received by this group, had a positive effect on the development of CT skills.

Results of the California Critical Thinking Disposition Scale (CCTDI). The mean scores of pretest and posttest on CCTDI for prospective teachers are provided in Table 2.

Table 2. The Pretest and Posttest scores of the CCTDI

Group		Pretest	Posttest
	n	***(M±SD)***	***(M±SD)***
Treatment	8	190.80±18.51	197.60±21.84
Comparison	11	195.75±19.16	197.20±29.37

Based on an analysis of these results, no significant difference was identified between the mean pretest and posttest CCTDI scores of both the treatment (t= -1.853; p=0.079) and the comparison group (t= -0.351; p=0.730). However, an evaluation of Table 2 reveals that the mean posttest scores of students in the treatment group was higher than the mean posttest scores of students in the comparison group ($\bar{x}_{posttest\text{-}treat}$= 6.80±16.41; $\bar{x}_{posttest\text{-}comp}$= 1.45±18.48).

Results of the Trichomatous Achievement Goal Scale (TAGS). The mean scores of pretest and posttest on TAGS for prospective teachers are provided in Table 3.

Table 3. The Pretest and Posttest Scores of the TAGS

Group	Sub-dimensions		Pretest	Posttest
		n	***(M±SD)***	***(M±SD)***
Treatment	*Mastery*	8	5.99±0.84	5.30±1.01*
	Performance Approach		3.79±1.21	3.57±1.38
	Performance Avoidance		3.84±1.63	3.65±1.53
Comparison	*Mastery*	11	5.80±0.92	5.38±1.00
	Performance Approach		4.15±1.25	4.30±1.05
	Performance Avoidance		4.50±1.00	4.43±1.28

*($p<0.05$)

An evaluation of Table 3 shows that the mean scores for the mastery, performance approach and performance avoidance achievement goals decreased in treatment group. On the other hand, it can be seen that the mean scores for the mastery and performance avoidance achievement goals decreased in the comparison group, while the mean scores for their performance avoidance achievement goal increased. Based on an analysis of

these results, a significant difference was only identified between the mean pretest and posttest scores for the mastery sub-dimension of the treatment group ($t_{treat\text{-}Mastery}$= -3.597; p=0.002).

DISCUSSION

In this study, it was observed that PE classes based on student-centered teaching styles such as guided discovery, convergent discovery and divergent production had a positive effect on the development of CT skills among prospective elementary teachers. The results of this study are consistent with previous studies that demonstrated the positive contribution of courses conducted with student-centered teaching styles that students have an active role in developing of their CT. In a study performed on prospective PE teachers, Sacli (2013) demonstrated that the treatment group which received 30 hours of creative drama education had higher CT skill scores than the comparison group which did not receive drama education. In a 14-week study they performed on university students; Burbach, Matkin and Fritz (2004) determined that courses based on active learning, which placed emphasis on role-playing, student presentations and the evaluation of scenarios and cases, led to a significant increase in the level of CT of the students. Similarly, Yang, Newby and Bill (2008) demonstrated that courses conducted for one semester by using web-based discussion activities improved the CT skills of university students. Furthermore, Quitadamo, Brahler and Crouch (2009) determined that teaching practices in science classes based on teamwork (and with students assuming the lead of these teams) positively affected the CT skills of prospective teachers.

To ensure that teachers can effectively use teaching styles that give active roles to students in classes; it is necessary that these styles are first employed during the education of the prospective teachers themselves, and that these teachers first develop and improve their own CT skills. As McBride, Xiang and Wittenburg (2002) also reported that prospective teachers who took part in the "Teaching Methods for Physical Education" course demonstrated an increased use of critical thinking. In this context, it can be understood that teacher education programs need to employ teaching methods that promote CT during their courses. To this end, it is possible to recommend the use of teaching methods that induce cognitive dissonance among the prospective teachers– such as guided discovery, convergent discovery and divergent production styles. It is known that providing different teaching styles and an inquisitive learning atmosphere to prospective physical education teachers is also an effective approach for contributing to the development of their critical thinking skills, since doing so forms a learning framework for them and also ascribes those learning-related roles (Cleland, Donnelly, Helion & Fry, 1999). Efforts for increasing the levels of critical thinking among prospective teachers are important in that they will also potentially contribute to the levels of critical thinking among their future students.

The study results demonstrated that PE classes based on student-centered styles such as guided discovery, convergent discovery and divergent production did not have a significant effect on CT dispositions of prospective teachers. The study results were similar to the results of another study conducted by Sacli (2013). She had previously determined that 30-hour creative drama education led to an increase in CT dispositions of prospective PE teachers. Both the duration of the education period and the effect of

creative drama are believed to be associated with this difference. However, the currently limited number of studies on this subject raises the need further studies. According to Rink (1993), the reason for the limited number of studies that support the effectiveness of student-centered methods is associated with difficulties regarding the assessment of these methods and of affective area-related outputs (Byra, 2002; Goldberger & Howarth, 1993).

To allow PE classes to promote CT, teachers should be willing and capable of creating the cognitive dissonance that is necessary for encouraging and developing CT. At the same time, the teachers should forego the role of merely analyzing, evaluating, and providing feedbacks to the students. They should provide students the opportunity to ask questions, and encourage them to communicate with one another (Loughran, 1996; McBride, 1992; McBride & Cleland, 1998). By following Mosston and Ashworth (2002)'s framework, the teacher in treatment group used productive styles. In the context of these styles, the teacher designed and directed questions to the students to enable them make decisions about the topic, and the students engaged in reasoning, questioning, and logic to sequentially make connections about the content to discover the answer. According to Brookfield (1995) and Smyth (1992); in order to orient students into CT by inducing cognitive dissonance within the context of learning situations, teachers should encourage students to ask themselves "Socratic" questions to such as: "What evidence is there to support this information? What are my thoughts regarding this information? Why do I believe this? Looking from this perspective, which information is missing? Why is this information missing? Who is advantaged by this? Who is disadvantaged by this? What is necessary to bring change, and how can I contribute to change?" (Gillespie & Culpan, 2000). The teacher in treatment group in the study invited students to discover new possibilities by asking questions and acknowledged the production of multiple ideas rather than any singular idea while the students produce multiple responses to the specific problem.

Student-centered styles such as guided discovery, convergent discovery and divergent production have led to decreases in the scores for all three achievement goals in the study. Similar results in previous studies have demonstrated that different teaching styles can positively affect the motivational orientation of students (Mosston & Ashworth, 2002; Papaioannou & Kouli, 1999). For example, it has been demonstrated that classes performed based on students-centered methods (Goudas et al., 1995), learning experiences based on cooperation (Ntoumanis, 2001), and physical education classes based on cooperation and orientation-related learning methods (Morgan, Kingston & Sproule, 2005) have positive change on the achievement goals and intrinsic motivation of the students. Although mastery and performance avoidance achievement goal score decreased with the command style, an increase was observed in the performance approach achievement goal score. We believe that the lack of a significant decrease in the posttest scores for the mastery achievement goals of the treatment group was associated with the fact that the students were not familiar with the guided discovery, convergent discovery and divergent production styles. And also the study ended before sufficient time had passed for them to become familiar with these styles. In contrast to traditional teaching styles performed at school, these styles are student-centered, and place greater emphasis and responsibilities on the students. The reason for the lack of differences between the sub-dimensions performance approach and

performance avoidance goals is believed to be related to the duration of the experiments, which was not long enough to allow changes in the achievement goals of the students. As it cannot be realistically expect for the perception of success and competition of university-level students to easily and rapidly change within a short period; we recommend that future studies conduct their experimental procedures and practices over longer periods.

CONCLUSION AND SUGGESTIONS

This study was significant in that it demonstrated which teaching styles positively affected the development of CT and achievements goals (an aspect of course-related motivation) among students. Although it is possible to encounter studies that demonstrate which learning style affects CT skills, CT disposition or achievement goals within the context of general education and PE; there are no previous studies in the literature that jointly evaluate these learning styles together. In this respect, this study not only contributed significantly to the existing literature, but it also provided important clues and information for instructors on different teaching styles. The results obtained in this study will serve as a guide and reference for instructors working at institutions that educate PE teachers and elementary teachers.

For this study, it is possible to state that the study period represents a limitation, since the study was conducted for 14 weeks, with 40 minutes being allocated per week. In similar studies that will be performed in the future; the study period could be longer, such that there would be sufficient time for the dependent variables to be affected by the study procedures. The fact that the study procedures were performed on a treatment group consisting of 20 prospective teachers can be considered as another limitation. Since the size of the study group also affected how generalizable the study results were, we recommend that future studies are performed with larger study groups. In addition, investigating how the other teaching styles described by Mosston and Ashworth (2002) affect the various cognitive and affective outcomes of teacher candidates will allow the identification, creation and provision of more effective learning environments.

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