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Assessment of Thinking Styles Inventory, Academic Achievement and Student Teacher's Characteristics

Düşünme Stilleri Ölçeğinin Güvenirliği ve Geçerliği, Akademik Başarı ve Öğretmen Adayları Özellikleri

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Abstract

This study was designed to achieve three objectives. The first was to investigate the validity of the Thinking Styles Inventory (TSI) which is based on the Sternberg's theory of mental self-government in a sample of student teachers. The second was to examine the relationship between thinking styles and academic achievement. The third objective was to investigate the relationships between thinking styles as assessed by TSI and a number of student teachers' background characteristics including gender, grade, department and perceived parenting style. A total of 649 first (291) and fourth (358) grade student teachers (245 male and 403 female) studying in different departments of the Faculty of Education at Pamukkale University, Denizli, participated in the study. The results of the study showed that the TSI is a reliable and valid instrument for assessing the thinking styles of student teachers in Turkey. It was also found that only two (anarchic and conservative) of 13 thinking styles were (negatively) related to academic achievement. Moreover, the findings indicated significant relationships between certain thinking styles and examined student teachers' characteristics. The results and their implications for teaching, learning and assessment in and outside the classroom were discussed.

Key words: Thinking styles, Academic achievement and Student teachers' characteristics

Öz

Bu çalışma ile üç amaca ulaşılmaya çalışılmıştır. Bunlardan birincisi, Sternberg'in zihinsel benlik yönetimi kuramına dayanılarak geliştirilen Düşünme Stilleri Ölçeği'nin (DSÖ) bir grup öğretmen adayı üzerinde geçerliğini araştırmaktır. İkincisi, düşünme stilleri ile akademik başarı ilişkisini incelemektir. Üçüncüsü ise öğretmen adaylarına ilişkin cinsiyet, sınıf, bölüm ve algılanan ebeveyn stilleri gibi özellikler ile düşünme stilleri arasındaki ilişkiyi test etmektir. Araştırmaya Pamukkale Üniversitesi Eğitim Fakültesi'nde çeşitli bölümlerde öğrenim gören 649 birinci (291) ve dördüncü (358) sınıf öğrencisi (245 erkek ve 403 kız) katılmıştır. Çalışma sonuçları, DSÖ'nün Türkiye'de, öğretmen adaylarında düşünme stillerini ölçmede kullanılabilecek güvenilir ve geçerli bir araç olduğunu göstermiştir. Ayrıca, 13 düşünme stilinden sadece ikisinin (anarşik ve muhafazakâr) akademik başarı ile ilişkili (negative) olduğu bulunmuştur. Bunlara ek olarak, araştırmada belirli düşünme stillerinin incelenen öğrenci özellikleri ile anlamlı düzeyde ilişkili olduğu da görülmüştür. Çalışmada, elde edilen bulgular ve doğurguları öğretim, öğrenme ve değerlendirme açısından tartışılmıştır.

Anahtar Sözcükler: Düşünme stilleri, akademik başarı ve öğretmen adayları özellikleri

Students' behaviour depends on many crucial characteristics. Among them, "style" construct takes an important role since all educational psychologists believe that being able to identify and understand students' preference modes with which they do their everyday activities provides excellent opportunities to enhance learners' performances in every aspect, especially academic performance and consequently school productivity.

Therefore, as an individual-difference variable, the "styles" construct has received considerable attention in recent years. As indicated by Zhang (2000a) this interest has been manifested through two types of work. The first type is conceptual integration of previous work on

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styles. The second type is empirical research aimed at investigating the relationships among the different labels for the style construct. In relation to conceptual integration, three works have attracted the most attention. The first is Curry's (1983) three-layer 'onion' model of style measures. The second is Riding and Cheema's (1991) model of two style dimensions and one family of learning strategies. The third, also the most recent, is Sternberg's conceptualization of three approaches to the study of styles – cognition-centered, personality-centered and activity-centered.

There have been many empirical research and theorizations which aimed to clarify the style construct labels and their relationships based on the theories and models briefly identified above but not yet, unfortunately, about a more recent and more general theory of styles, Sternberg's (1988, 1990, 1994a, 1997) theory of mental self-government which has received increasing interest among psychologists and educators.

The theory of mental self-government is a general theory of styles not only because this theory is designed to be used with different populations, but also because it embraces all three approaches to the study of styles. The styles in this theory are cognitive in their way of looking at things and correspond to preferences in the use of abilities (Zhang, 2000a). So, a style, according to Sternberg (1994b), is not in itself an ability but rather a preferred way of using one's abilities. He pointed out that all people have a style profile, meaning all show varying amounts of each style, and vary their styles to suit different tasks and situations.

Theory of Mental Self-Government

The basic precept of Sternberg's (1988, 1994a, 1997) theory is that, like governments, people manage their everyday activities in different ways with which they feel comfortable. These non-ability forms are labelled as thinking styles and are learned through life-span development specifically by the effects of culture, parenting styles, schooling and occupation. Thus, people come to have not just a single style but a profile of styles, which are teachable, measurable and variable across tasks and situations. Still, people differ in their stylistic flexibility because no one has the luxury of being in an environment that always supports his or her preferred styles. The more flexible people can be, the better they are likely to adjust to a variety of situations. Moreover, people differ in the strength of their preferences (styles) and this can vary across their life span. It is important to be cognizant of the fact that the way one thinks now may not be the way one will think in the future. Because thinking styles are in part socialized meaning that they can, to some extent, be changed by the effects of the environmental factors in which people live. Therefore, it can be said that everyone does not change in the same way, but many people change with age in their styles of thinking. Thus styles, like abilities, become fluid rather than static entities (Sternberg, 1997).

In his theory of mental self-government, Sternberg (1988, 1997) postulated 13 thinking styles that fall along five dimensions of mental self-government: functions, forms, levels, scopes and leanings.

Functions

As exist in all governments, there are three functions in people's mental self-government: legislative, executive and judicial. People with a legislative thinking style like to do things their own way. They like creating, formulating, and planning things. Legislative students tend to be critical of the schooling they receive, often justly so. They may not want to do things the ways their teachers want them to. People with the executive style are implementers in that they like to do, and generally prefer to be given guidelines about what needs to be done. An executive student prefers problems that are given to them or structured for them. People with the judicial thinking style like to evaluate rules, procedures and things. They prefer problems in which they can analyze and evaluate things and ideas.

Forms

As styles of government come in different forms, so do the styles of people's mental self-government. Four of these forms are the monarchic, the hierarchic, the oligarchic, and the anarchic. People who exhibit a predominantly monarchic style, tend to be single-minded and motivated by a single goal at a time. They often attempt to solve problems, full speed ahead,

regardless of the obstacles. People with a hierarchic style prefer working towards several goals within a given period of time and being engaged in tasks that allow them to prioritise the tasks. They tend to be systematic and organized in their solutions to problems and in their decision-making. Individuals with the oligarchic style prefer working towards several goals within a given period of time, but have trouble deciding which goals to give priority to. People with an anarchic style tend to be motivated by a wide assortment of needs and goals that are often difficult for others, as well as for themselves, to sort out. They tend to take a random approach to problems and often have a certain potential for creativity that is rare in others.

Levels

Like governments, human beings' mental self-government operates at two different levels: Global and local. People with a global thinking style prefer to deal with relatively larger and often abstract issues. They tend to focus on the forest, sometimes at the expense of the trees. Local people prefer to deal with details, sometimes minute ones, and often ones surrounding concrete issues. They tend to focus on the trees, sometimes at the expense of the forest.

Scopes

Governments need to deal both with internal and external affairs. Similarly, mental self-governments need to deal with both internal and external issues, as people find out every day in their personal lives and at work. People with an internal style tend to be introverted, task-oriented, and socially less sensitive then other people. They lack interpersonal awareness, because they do not focus on it. People with an external style, in contrast, tend to be more extrovorted, people-oriented, outgoing, socially more sensitive, and interpersonally more aware.

Leanings

In governance, generally there are two types of political orientations ranging from the most conservative to the most liberal. Like this, in mental self-government, there are two types of leanings: Liberal and conservative. The liberal individual likes to go beyond existing rules and procedures, to maximize change, and to seek situations that are somewhat ambiguous. The conservative individual likes to adhere to existing rules and procedures, minimize change, avoid ambiguous situations where possible, and stick with familiar situations in work and professional life (Sternberg, 1997).

Since the publication of the Sternberg theory, some important research using the TSI has been done in the USA and Hong Kong. The results of these researches showed the validity of the theory and generated many crucial implications for teaching, learning and assessment in school situations. In one such study, Sternberg and Grigorenko (1995) reported significant relationships between thinking styles and grade, length of teaching experience, subject area taught, socio-economic status (SES) and birth order. In this study, students of higher SES scored higher on the legislative style than did students of lower SES. Likewise, students who were later-borns scored higher on the legislative style than did students who were born earlier. They also found that students tended to match their teachers in style. In another study, Grigorenko and Sternberg (1997) found that certain styles of thinking (judicial, executive and legislative) significantly contribute to prediction of academic performance and equally able thinkers of different styles tend to do better in different assessment settings. In general, these studies suggested that in order for students to benefit maximally from instruction and assessment, teachers need to use a variety of methods in their educational activities.

Besides these studies, thinking styles of non-Western students have been studied in detail only by Li-Fang Zhang and her colleagues in Hong-Kong and China.

In two of these studies Zhang and Sachs (1997) and Zhang (1999) assessed the validity of the theory of mental self-government and indicated that the TSI scales were reasonably reliable and valid for Hong-Kong students. The second set of findings showed significant relationships between certain thinking styles and age, college class, sex, subject area taught, college major, work experience and travel experience. These results supported the theory's underlying assumptions that thinking styles are socialized and change developmentally.

In other studies, thinking styles based on the theory of mental self-government were examined in relation to learning approaches (Zhang, 2000b; Zhang & Sternberg, 2000), learning styles (Cona-Garcia & Hewitt Hughes, 2000), personality types (Zhang, 2000a, 2001a), teaching approaches (Zhang, 2001b), self-esteem and extracurricular experiences (Zhang, 2001c), academic achievement (Zhang & Sternberg, 1998; Zhang, 2001d; Bernardo, Zhang & Callueng, 2002), personality traits (Zhang, 2002a), cognitive developmental levels (Zhang, 2002b), self esteem and SES (Zhang & Postiglione, 2001), modes of thinking (Zhang, 2002c) and teachers' characteristics (Zhang & Sternberg, 2002).

The results of these studies showed clear and consistent associations between particular thinking styles and learning approaches (deep and surface), learning styles (concrete experience, abstract conceptualisation, reflective observation, active experimentation), personality types (conventional, artistic, social and enterprising), teaching approaches (student-focused/conceptual change and teacher-focused/information transmission), self esteem, SES, academic achievement, personality traits (openness, neuroticism, extraversion and agreeableness), cognitive developmental levels (dualistic, relativistic), modes of thinking (analytic, holistic and integrative) and teachers' characteristics (gender, professional work experience outside school settings, the degree of enjoying adopting new teaching materials, tendency to use group projects in assessing student achievement, perceived autonomy for determining their teaching contents and their rating of the quality of their students).

Since thinking styles as an individual difference variable are so important for education as indicated by the researchers, I aimed with this study, to test a cross-cultural validity of the theory of mental self-government for a Turkish sample and hope that the results will make new contributions to the usefulness of the Sternberg theory, because it has only been assessed in such cultures as the USA, Hong Kong, China and Philippines and has not been studied in Turkey.

Also, because of rigid cultural orientations in parenting styles and stereotyped, monotonous approaches in teacher training, the effects of individual differences to students' school behaviours are not taken, sufficiently, into consideration in education almost across all levels in Turkey. I believe that this is another reason that makes this study necessary.

In this study, my first objective was to investigate the validity of the Thinking Styles Inventory (TSI; Sternberg & Wagner, 1992) which is based on the theory of mental self-government (Sternberg, 1988, 1997) and formulate a new short form of the test for practical reasons. Secondly, I intended to determine whether thinking styles are related to academic achievement among Turkish student teachers. Third, I aimed to examine the relationships between thinking styles as assessed by TSI and certain student teacher characteristics, including gender, grade, department and perceived parenting style.

In the study, I made three predictions. First, because thinking styles are measurable (Sternberg, 1997), the TSI can be used to identify the thinking styles of Turkish university students. I predicted that each of the 13 scales will have an acceptable, at least .50 alpha coefficient, and factor analysis procedures will extract five factors corresponding to the five dimensions explored in the theory of mental self-government. Second, certain thinking styles will statistically correlate with academic achievement and there will be cross-cultural differences in these relationships. Third, student teachers will be significantly different in their thinking styles based on such background variables as gender, grade, department and perceived parenting style. The predicted individual-differences between the relationships identified above are based on the argument that thinking styles are in part socialized in that some cultures are likely to be more rewarding of certain styles than of others (Sternberg, 1997).

Method

Sample

A total of 649 first (291) and fourth (358) grade student teachers at Pamukkale University, Denizli, participated in the study. The sample included 245 males and 403 females whose ages ranged from 17 to 33 years (mean age = 21.2 years). The students were enrolled in different undergraduate programs of the faculty of education: 184 were in the department of early

childhood education, 249 in elementary, 40 in social studies, 54 in science studies, 64 in Turkish, 27 in art and 31 in physical education.

Measures

Thinking Styles Inventory (TSI)

The TSI (Sternberg & Wagner, 1992) is a self-report test including 104 items with 13 subscales, each containing eight statements and measuring one thinking style defined in the theory of mental self-government. For each item, the participants were asked to rate themselves on a 7 point Likert-type scale ranging from 1 indicating that the item did not describe them at all to 7 indicating that the item described them extremely well.

Sternberg and Wagner (1992) collected normative data for various age groups on the long version of the TSI. For their college sample, scale reliabilities ranged from .42 (monarchic) to .88 (external), with a median of .78. In another study with the TSI, Sternberg found a five-factor model fitting the five dimensions of mental self-government described in Sternberg's (1988) theory of thinking styles. These five factors accounted for 77% of the variance in their data.

In this study, the TSI was translated to Turkish by the researcher and controlled and validated by four other experts in the field of educational psychology. The validated short form of the TSI consisting of 65 statements (five items per scale) was used to examine the relationships in the current study. The Appendix contains sample items, one for each of the 13 scales.

Personal Information Form

In addition to the TSI, an information form was used to collect data about student teachers' characteristics. This form included questions related to participants' families, educational experiences, and basic demographics. The subjects were also asked to report their GPA (Grade Point Average) as an indicator of academic achievement.

Data Analysis

First, the Turkish long version of the TSI was administered to 236 senior student teachers to examine reliability and to 291 freshmen and 358 senior (N = 649) students to examine the relationships. Then, the responses of the subjects were coded to the SPSS (Statistical Packages for Social Sciences) computer program. After this, for reliability and validity of the TSI, item-total correlations, internal consistency of each subscales using Cronbach alpha, principal component analysis followed by varimax rotation to determine the eigenvalues and variances and the intercorrelations for subscales were calculated. For relationships, depending on the type of data groups, required descriptive statistics, t test, one-way ANOVA and Bivariate correlations were computed.

Results

Item Analysis

In the study, first, I calculated item-scale correlations to determine the suitability of the items. By means of these results, the lowest item-scale correlations were identified and three of these items, for each 13 subscales, were omitted from the TSI. Thus, the remaining item-scale correlations ranged from .31 to .84 (Table 1) and 65 items five for each subscales constitute the new short form of the TSI.

Scale Reliabilities

The internal consistency of the 13 subscales was carried out on the data of the remaining 65 items. The alpha coefficients for 13 scales, given in Table 2, ranged from .66 (anarchic) to .93 (monarchic) with a median of .81. These results are very similar to those reported by Sternberg & Wagner (1992), Sternberg (1994a, 1997), Zhang & Sachs (1997), Zhang (1999) and Bernardo, Zhang & Callueng (2002) and suggest adequate reliability of the instrument.

Scale Intercorrelations

Intercorrelations for the 13 subscales are given in Table 3. The absolute values of the interscale correlations ranged from .01 to .58 and were almost in the same direction predicted by the theory of mental self-government. Some examples are legislative versus liberal (r = .44), executive versus conservative (r = .28), liberal versus judicial (r = .58), hierarchic versus judicial (r = .29), internal versus external (r = -.21) and conservative versus liberal (r = -.40). All of these correlations are significant at the .01 level.

Table 1.

Item-Total Correlations and Factor Loadings for Thinking Styles Inventory

Items	M	SD	Item-Total Correlations	Factor Loadings
2	4.8	1.3	.46	.45
5	5.0	1.5	.51	.52
6	5.5	1.4	.43	.38
7	6.0	1.2	.50	.64
8	5.5	1.3	.50	.72
12	5.6	1.4	.48	.59
14	5.6	1.5	.50	.59
15	4.8	1.5	.64	.79
16	4.4	1.8	.58	.71
17	3.9	1.7	.58	.68
19	5.0	1.4	.50	.65
20	4.8	1.5	.65	.72
22	4.9	1.4	.65	.75
23	4.8	1.5	.71	.81
24	4.9	1.4	.56	.62
26	4.4	1.4	.82	.87
27	4.5	1.6	.82	.84
31	5.2	1.6	.84	.84
32	4.9	1.6	.83	.85
33	5.0	1.6	.81	.83
34	5.7	1.4	.69	.77
35	5.6	1.4	.71	.74
37	4.9	1.4	.60	.70
38	5.1	1.4	.59	.62
39	5.4	1.5	.69	.74
42	4.3	1.6	.56	.74
43	4.1	1.7	.69	.83
44	4.2	1.6	.62	.75
45	3.3	1.7	.39	.46
49	4.1	1.6	.47	.58
52	3.4	1.8	.43	.59
54	4.1	1.6	.33	.45
55	4.9	1.5	.47	.61
56	4.3	1.8	.37	.57
57	4.3	1.7	.48	.70
58	3.7	1.9	.63	.70
59	4.0	1.7	.72	.78
62	4.0	1.6	.60	.76
64	3.1	1.8	.69	.75
65	4.0	1.7	.67	.75
66	3.5	1.6	.31	.50
68	3.3	1.5	.40	.64
70	3.6	1.7	.55	.56
71	3.1	1.4	.53	.67
72	3.5	1.7	.54	.64
76	4.3	1.7	.67	.73
77	3.3	1.6	.64	.74
78	4.6	1.7	.75	.77
80	4.3	1.7	.77	.83
81	4.2	1.7	.69	.76
83	3.6	1.6	.42	.48
84	4.4	1.7	.75	.87
85	4.0	1.6	.78	.88
86	4.2	1.6	.78	.85
88	4.7	1.3	.52	.55
90	4.9	1.3	.68	.45
91	4.6	1.5	.80	.59
92	4.8	1.4	.72	.53
93	4.8	1.4	.79	.56
94	4.9	1.4	.79	.59
99	2.7	1.5	.76	.80
101	2.7	1.5	.81	.84
102	2.5	1.4	.78	.80
103	2.4	1.4	.82	.87
104	2.4	1.3	.80	.80

Table 2.

Thinking Styles Inventory Scales: Means, Standard Deviations and α (N = 236)

Scale	Items	M	SS	α
Legislative	2,5,6,7,8	5.44	.96	.72
Executive	12,14,15,16,17	4.89	1.19	.78
Judicial	19,20,22,23,24	4.93	1.13	.82
Monarchic	26,27,31,32,33	4.84	1.43	.93
Hierarchic	34,35,37,38,39	5.38	1.16	.85
Oligarchic	42,43,44,45,49	4.04	1.20	.77
Anarchic	52,54,55,56,57	4.25	1.13	.66
Global	58,59,62,64,65	3.78	1.41	.85
Local	66,68,70,71,72	3.45	1.11	.71
Internal	76,77,78,80,81	4.20	1.42	.87
External	83,84,85,86,88	4.20	1.28	.84
Liberal	90,91,92,93,94	4.85	1.23	.90
Conservative	99,101,102,103,104	2.59	1.29	.92

However, one of the significant correlations was not in the direction predicted by Sternberg's theory as found by Zhang (1999) too. That is, the correlation between hierarchic and monarchic was .42 ($p < .01$).

All these obtained interscale correlations are consistent with those reported by Zhang and Sachs (1997), Zhang (1999) and Bernardo, Zhang and Callueng (2002).

Scale Intercorrelations

Intercorrelations for the 13 subscales are given in Table 3. The absolute values of the interscale correlations ranged from .01 to .58 and were almost in the same direction predicted by the theory of mental self-government. Some examples are legislative versus liberal ($r = .44$), executive versus conservative ($r = .28$), liberal versus judicial ($r = .58$), hierarchic versus judicial ($r = .29$), internal versus external ($r = -.21$) and conservative versus liberal ($r = -.40$). All of these correlations are significant at the .01 level.

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Table 3.

Interscale Pearson Correlation Matrix for 13 Scales of the Thinking Styles Inventory (N = 236)

Scale	1	2	3	4	5	6	7	8	9	10	11	12	13
Legislative	-												
Executive	.26	-											
Judicial	.34	.14	-										
Monarchic	.19	.30	.07	-									
Hierarchic	.41	.36	.29	.42	-								
Oligarchic	.26	.13	.23	.01	.14	-							
Anarchic	.20	.18	.34	.07	.11	.34	-						
Global	.14	.05	-.05	.28	.06	.05	.06	-					
Local	.09	.19	.18	-.03	.04	.25	.25	-.31	-				
Internal	.39	.01	.24	.11	.12	.26	.21	.14	.16	-			
External	.02	.14	.14	.03	.07	.17	.24	.09	.17	-.21	-		
Liberal	.44	-.01	.58	.09	.24	.26	.32	-.02	.18	.39	.14	-	
Conservative	-.12	.28	-.18	.26	.09	.04	.04	.28	-.01	.04	.09	-.40	-

Factor Analysis

The factor structure of the TSI was computed by principal-components analysis using a varimax rotation and summarized in Table 1 and 4. The five factor analysis yielded eigenvalues larger than 1 and they accounted for 68.3% of the variance (Table 4). The 13 factor analysis showed eigenvalues between 1.1 and 9.6 and they accounted for 65.7 of the variance. The results indicated factor loadings higher than .38 for each item and all items loaded on their components (Table 1). These results are consistent with the five-factor model corresponding to the five dimensions of mental self-government as reported by Sternberg (1994a) and are almost identical to the results obtained by Zhang (1999).

Factor 1 received the highest positive loadings from the legislative, judicial, hierarchic and liberal scales and the highest negative loading from the conservative scale. Factor 2 was dominated by legislative, executive, monarchic, hierarchic and conservative styles. Factor 3 showed high loadings on oligarchic, anarchic, local,

Table 4.

Varimax-Rotated Five Factor Model For Thinking Styles Inventory

Scale	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Legislative	.51	.42			
Executive		.73			
Judicial	.67				
Monarchic		.71			
Hierarchic	.31	.77			
Oligarchic			.71		
Anarchic			.70		
Global				.85	
Local			.50	-.67	
Internal			.44		.73
External			.38		-.78
Liberal	.83				
Conservative	-.70	.37			
% of Variance	24.18	15.18	11.38	9.11	8.52
Cum. % of Var.	24.18	39.36	50.74	59.85	68.37
Eigenvalues	3.14	1.97	1.47	1.18	1.10

Note._ Variables with factor loadings of less than .30 have been omitted.

internal and external styles. For factor 4, the highest positive loading was from the global scale and the highest negative loading was from the local scale. Finally, the highest positive score on internal and negative score on external scales defined Factor 5.

Relationship Between Thinking Styles and Academic Achievement

The relationship between thinking styles and academic achievement was examined with Bivariate correlations using TSI and GPA scores. Only two scales were significantly but negatively correlated with GPA (M = 71.7): anarchic (M = 21.3; sd. = 5.5; r = -.089, p < .05) and conservative (M = 13.3; sd. = 6.3; r = -.087, p < .05).

These results, when compared, are not consistent with earlier findings reported by Grigorenko and Sternberg (1997), Zhang and Sternberg (1998), Zhang (2002c), Bernardo, Zhang and Callueng (2002). In their study, with American students, Grigorenko and Sternberg (1997) found that the judicial and legislative styles were positively, and executive style was negatively, correlated with CGPA. In Zhang and Sternberg's study (1998) involving Hong Kong students, conservative, hierarchic and internal styles were found to be positively associated with academic achievement. The thinking styles that Zhang (2002c) found correlated significantly with achievement were liberal, global and conservative. Finally, Bernardo, Zhang and Callueng (2002) reported important relationships between executive, judicial, conservative, hierarchic, anarchic and internal styles and GPA in their study conducted on Filipino students.

Group Differences and Relationships Between Thinking Styles and Background Characteristics

The results of Pearson correlations, ANOVA procedures and t test analyses showed that the participants' thinking styles were significantly different in terms of gender, grade, department and perceived parenting styles.

Specifically, male participants scored higher on judicial (M = 25.2; 24.2; t = 2.135; p < .05), anarchic (M = 22.3; 20.7; t = 3.447; p< .01), global (M = 20.5; 18.4; t = 4.056; p < .001), internal (M = 21.2; 19.9; t = 2.188; p < .05) and liberal (M = 26; 23.7; t = 4.783; p < .001) scales than females. These results are not consistent with the findings reported by Grigorenko and Sternberg (1997) and Zhang (1999). They found no statistically significant differences between group means. But, in another study, Zhang and Sachs (1997) found that male students scored significantly higher on the global scale than their female peers. The present study indicated that student teachers' thinking styles differ across sex.

The results related to group differences in thinking styles by grade (freshmen and senior) indicated significant differences between group means in internal (M = 19.8; 20.9; t = 2.065; p < .05), external (M = 23.1; 21.1; t = 4.230; p < .001) and conservative (M = 13.9; 12.9; t = 2.000; .05) scales. This means that the increase in the level of education causes high internal and low conservative tendencies.

Participants from elementary (M = 25.2), social studies (M = 25.7), science studies (M = 25.6) and physical education (M = 26,7) scored significantly higher (p = .001) on executive scale than those in art education (M = 21.4). Physical education student teachers (M = 24.9) scored significantly higher (p = .008) on anarchic scale than early childhood (M = 20.8), elementary (M = 21.2) and Turkish (M = 20.5) education student teachers. Participants from social studies education (M = 21.6) scored significantly higher (p = .026) on global scale than those from early childhood education (M = 18). Finally, participants from physical education (M = 24.4) scored significantly higher (p = .043) on external scale than those from art education (M = 19.7).

Finally, four parenting styles were measured to examine their relationships to thinking styles. Student teachers who described their parents as "permissive" (M = 27.8) scored significantly higher (F = 2.986; p = .031 < .05) on judicial scale than those describing their parents as "protective" (M = 24). Participants with "authoritarian" parents (M = 25.2) scored significantly higher (F = 4.222; p = .006 < .01) on monarchic scale than participants with "democratic" parents (M = 21.7). Participants who described their parents as "authoritarian" (M = 26.3) scored significantly higher (F = 6.128; p = .000 < .001) on anarchic scale than those perceiving their parents as "permissive" (M = 18.8), "democratic" (M = 21.1) and "protective" (M = 21.5). Finally, student teachers with "permissive" parents (M =

23.6) scored significantly higher on global scale than student teachers with "democratic" parents (M = 18.7) and student teachers with "authoritarian" parents (M = 24) scored higher on global scale ($F = 5.905$; $p = .001 < .01$) than those with "democratic" and "protective" (M = 19.3) parents.

Discussion

In this study, I investigated the validation of the Thinking Styles Inventory and tried to show its usability in a sample of Turkish student teachers. I also examined the individual differences, based on certain personal background characteristics and academic achievement, in the participants' thinking styles.

The results of the study, in general, confirmed the first prediction in the sense that the TSI is a reliable and valid instrument to identify the thinking styles of this sample of student teachers in Turkey. The internal consistency reliabilities of the 13 TSI scales were almost similar and when compared many were greater in magnitude to those reported by Sternberg (1988, 1994a, 1997) Zhang and Sachs (1997), Zhang (1999) and Bernardo, Zhang and Callueng (2002). In the current study, the weak scale was anarchic (a = .66) and the strong one was monarchic (a = .93). The intercorrelations for the 13 subscales (except the correlation between hierarchic and monarchic) were almost in the same direction predicted by Sternberg's theory, but were not as high as those reported by Sternberg (1994a), Zhang and Sachs (1997) and Zhang (1999). The results of the analysis for factor structure of the test were almost in line with the theory of mental self-government and yielded five factors which accounted for 68.3 % of the variance. The factor loadings for each item were above .38 and the 13 factor analysis showed a fit to the theory of mental self government. These results were remarkably similar to the findings in Sternberg's (1994a) and Zhang's (1999) studies in which they reported a five-factor model accounted for 77 % and 78.4 % of the variance respectively.

For the second prediction, the results were not so obvious and strong to say that certain thinking styles could contribute to academic achievement for this Turkish sample. In the study, only two weak negatively significant correlations were found. They were the relationships with anarchic and conservative styles. In the light of these results, it can be said that the high level of anarchic and the low level of conservative thinking tendencies contribute less to academic achievement in Turkish student teachers. Although this study is the first one assessing Turkish students' thinking styles and therefore the results are preliminary, they can only be attributed to the orientations in cultural and educational systems. Since in the Turkish educational system, at almost all levels, generally, the emphasis is on giving more and more knowledge, the classroom management approach is teacher-oriented, and the parents are mostly conservative especially with regard to religion, the students are being trained as implementers. Thus, in Turkey, the formal and informal educational systems value and encourage the executive, local, monarchic and the conservative thinking styles in students over others. Although these styles of thinking were not significantly correlated with academic achievement in the current study, their means were higher than that of the others. Specifically, these results imply that the Turkish educational system does not reward the anarchic thinking style. Therefore, the student teachers' tendency towards an anarchic thinking style contradicts the understanding and assessment methods which value conservative thinking style, used in the educational system, and this results in low academic achievement in student teachers. However, I can not be definite in my argument and so the results need to be verified by future studies.

Finally, I examined the relationship between thinking styles and some demographic variables such as gender, grade, department and perceived parenting styles and predicted that student teachers will be significantly different in their thinking styles based on these characteristics. Many of the results confirmed the expectations.

Firstly, male participants tended to score as more judicial, anarchic, global, internal and liberal in their styles of thinking than their female counterparts. These results suggest that, compared with the female student teachers, males may be more likely to use, as conceptualised by Zhang and Sternberg (2000) and Zhang (2001c), more complex, creativity-generating,

norm questioning and meaning seeking thinking styles. This may mean, in other words, that female student teachers tend to be more simplistic, norm-favouring, traditional and task oriented. These results of sex differences are in line with the existing Turkish cultural sex role orientations and are supportive of the characteristics of thinking styles explored in the theory of mental self-government which illustrates that styles are socialized. Males and females are brought up and educated in Turkey differently from the time they are born, in that females are perceived as more cautious, dependent, fault-finding, shy and submissive and males as more adventurous, enterprising, individualistic, intentive, independent and progressive. Therefore, these gender differences in thinking styles are within the expectations.

Second, the results showed that the freshmen and the senior student teachers differ significantly in internal, external and conservative thinking styles. Specifically, freshmen student teachers were more likely to employ external and conservative styles than did senior students and the latter scored higher on the internal style. The high conservative tendency in the freshmen students can be explained, as emphasized by Zhang and Sachs (1997) too, by the fact that freshmen student teachers were still in the process of adjusting to university life, and because of the effects of education in Turkey during high school life, these students had been trained as to like (prefer) adhering to existing rules and procedures in performing tasks. On the other hand, the high external tendency in the freshmen students when compared with senior students' thinking styles was not expected because a high level of externality is in the same direction as age and level of education developmentally. Also, in reality, during formal and informal education, younger students are not allowed to be more social than older ones in Turkey. Therefore, it is claimed that the freshmen student teachers could not be generally more extrovorted, people-oriented, socially sensitive and interpersonally aware than senior student teachers. However, the actual result, the high external tendency in freshmen students' thinking styles, may be due to the extroverted orientations existing in their ideal self. Another reason for high externality may be their preconceptions about university life in the sense that being in university requires extrovortedness and sociability. Finally, this result may be due to the difficulty students faced during testing in giving meanings to the items in TSI and differentiating them correctly in order to identify themselves because of the effects of one dimensional and teacher-focused approaches in Turkish educational training. Additionally, the higher internal tendency in senior students thinking style may be due to their high level of concentration on academic tasks during this last term, at the end of which they will graduate. However, this is the first study that identified such a difference in thinking styles between lower and higher university classes. Therefore, these results can only be viewed as tentative and should be verified by further investigations.

Third, student teachers from social studies, science studies, and physical education employed a significantly more executive thinking style than those in the area of art, participants from the field of physical education tended to score as more anarchic in their style of thinking than the ones from early childhood, elementary and Turkish education; and more external than those from art education. Lastly, I found that student teachers from social studies education were more likely to employ global thinking style than did students in the field of early childhood education. These results can be explained, in general, by the fact that different fields of study value and reward different styles. Therefore, students from different fields are exposed to different learning environments. Thus, this process leads, in certain ways, to different thinking styles in student teachers. In detail, student teachers from social studies, science studies and physical education, generally, prefer to be given guidelines about what needs to done and structured problems to study on rather than art students who like to create, formulate and do things in their own way. When discussed in relation to personality types, these results are in line with the fact that social studies, science studies and physical education students employ more realistic and investigative personality types which resemble to and require the characteristics in executive thinking style whereas art students show an artistic type which shares similar characteristics with the legislative and opposite characteristics with the executive styles in functions. The result that indicated student teachers

from social studies education employed more global thinking style than did the students in early childhood education is in expectation. Because social studies require the investigation of realities with a larger point of view rather than early childhood education in which the developmental behaviours of the child have to be examined in detail. Finally, because knowledge in physical education tends to be more related to the human body and its activity, students in this area show a tendency to identify themselves by focusing on social relationships using their bodies. This leads to a realistic and extroverted personality in the student teachers from the field of physical education. On the other hand, task-oriented activities in the field of art value an artistic personality and internal thinking in art education student teachers. Therefore, the result that showed more external thinking in physical education students than art students is expected.

Finally, I found that participants who identified their parents as permissive employed a significantly more judicial thinking style than those of protective parents and global thinking style than those of democratic parents, participants with authoritarian parents were likely more monarchic than those with democratic ones, more anarchic than the students of permissive, democratic and protective parents and also more global than the students of democratic and protective parents.

The effects of family environment and parenting style on child development have been extensively investigated by means of observations of parent-child interaction and empirical researches (Petit, Bates & Dodge, 1997; 1990; Olson, Bates & Bayles, 1990; Reynolds, 1992; Pianta, Nimetz & Bennett, 1997; Amato & Olchiltree, 1986; Cohen, Dibble & Grawe, 1997; Anderson & Hughes, 1989; Warash & Markstrom, 2001; Neal & Frick-Horbury, 2001; Gonzalez, Greenwood & WenHsu, 2001). The results of these and many other studies, in short, show that families or in other words family personalities (Field, 1988) can facilitate or inhibit the child's development and shape its personality. Also, in his theory of mental self-government, Sternberg (1997) suggests that one of the more important variables in a child's intellectual development is the parent's ways of dealing with questions that children pose. Over the course of their childhoods, children may ask thousands of questions. Parents react to these questions in a variety of ways, and the ways they react can influence the styles of thinking that their children develop. Therefore, I believe that parental behaviours are more important factors affecting the child's preferred way of doing things, thus I examined their relationships with thinking styles. Although I did not find any empirical research in the literature, for making comparisons, reporting the relationships between thinking styles and parenting styles except the conceptual explanations about the effects of parents' thinking styles, suggested by Sternberg (1997) some of the results obtained in this study were not expected. In my opinion, student behaviours associated with democratic parenting are related with legislative, judicial, hierarchic, global, external and liberal thinking styles. Students from authoritarian homes employ more executive, monarchic, local, internal and conservative thinking styles. A protective parenting style may lead to executive, oligarchic, local, external and conservative and permissive parenting could correlate with legislative, judicial, oligarchic, anarchic, external, global and liberal thinking styles. Three may be significant findings; higher judicial tendency in the students coming from permissive families than those of protective ones and higher monarchic tendency in the students of authoritarian parents than those of democratic ones, and more global thinking in the students of permissive parents (maybe because of the effects of low limits) than those of democratic ones, and are in line with my claims mentioned above. Permissive parents behave in a nonpunitive, acceptable, and affirmative manner towards the child's impulses and actions, use little control over them but rather offer inconsistent, unclear limits for their children's behaviour and allow them to make their own decisions, so the child becomes creative, original but possibly confused. Protective parents, on the other hand, are always looking out for their children, provide broad guidelines for their activities and do not let them make their own decisions. Those raised in protective families are usually well-trained socially, capable of openness and strong interpersonal relationships, and show respect and conform in social and school situations but worry about how to care for

themselves without their parents' help and depend upon others. In contrast, the authoritarian parent tries to shape control and evaluate the behaviour and attitudes of the child in accordance with a standard of conduct and emphasizes obedience. An authoritarian family is more task-oriented and structured. Therefore, children in the authoritarian family have trouble discussing a problem, an issue with their parents, are insensitive toward others because they are treated with insensitivity and are independent because they are forced to be so. However, the democratic parent attempts to direct the child's activities in a rational manner that includes verbal give and take but shares with the child the reasoning behind the policy, places less emphasis on strict obedience and is more likely to encourage autonomy. Therefore, children from democratic homes are more willing to engage in exploratory behaviour, are more self-reliant, curious, socially and academically competent. The other unexpected result, that there is more anarchic and global thinking in the students coming from authoritarian families than those coming from permissive, democratic and protective ones, can be attributed to many reasons. One reason is that since parenting style is one of the determinants of students' thinking styles, these results, also, may be due to the effects of other factors such as age, level of education and social environment etc. As children grow older and encounter different experiences, they try to determine their own way independently of their parents and thus the effects of parental behaviours on their way of doing things become less important. Another reason for this unpredicted result; more anarchic and global thinking tendencies in the students raised in authoritarian families, may be the students' reactions to their harsh upbringing. A final reason may be that in the study I did not use a questionnaire to determine students' perceptions of their parenting behaviours. So my measurement of students' perceptions of their parents' parenting styles may not be valid enough. Therefore this may lead students to make biased attributions about their parents' parenting style.

Conclusions and implications

The present study has made certain important contributions to the styles literature. First of all, the results generally support the reliability and validity of the Thinking Styles Inventory and its underlying theory of mental self-government. Second, it was seen that different educational systems, like the Turkish one, value and encourage different styles. Third, in the study I attempted to link some specific pattern of results to Turkish cultural orientations and practices. While doing so, I have drawn from the assumptions of the theory of mental self-government that cultural factors may influence how thinking styles change and relate to personalogical and familial characteristics in a different sociocultural context. Thus, the current research demonstrated that the theory of mental self-government has heuristic value in this different cross-cultural setting.

Generally, the findings of this study indicated a variety of thinking styles among the participants' academic achievement and personalogical characteristics. So, the results present significant implications for practice.

First, the weak negative significant relationships between thinking styles and academic achievement imply that university teachers must re-examine and redesign their instructional models and assessment methods in the direction that allow them to use systematically varying teaching and assessment methods to reach every student. If teachers expand their ways of teaching and assessing students to accommodate virtually all thinking styles, they will observe a powerful increase in students' performance since being allowed for the use of different thinking styles would give students an equal opportunity to benefit from teachers' instructions, methods of assessment and to experience academic success. Here, the key is variety and flexibility – using the full range of instructional and assessment methods, yet most teachers regularly use only a few approaches (Sternberg, 1997).

Furthermore, the finding that thinking styles were related to academic achievement has implications for teacher training. As explained by Zhang (2001d) all teacher-training programs include a component that introduces knowledge on cognitive/thinking/learning styles. Research has indicated that learning in at least partially matched conditions (teaching using instructional styles and materials structured to suit students' thinking and learning styles) is significantly superior to that in mismatched conditions (Ford, 1995;

Grigorenko & Sternberg, 1997; Sternberg, Grigorenko, Ferrari & Clinkenbeard, 1999). Therefore, an understanding of thinking styles could improve teachers' teaching and, thus student learning.

The results about the relationships between thinking styles and academic achievement also indicate that the Turkish educational system does not reward or encourage creativity-generating, norm questioning and meaning seeking thinking styles since the present study did not show a positive relationship between creativity-generating thinking styles and academic achievement.

Secondly, because certain thinking styles were related significantly to parenting styles, parents should know that their parenting behaviours (child rearing behaviours) are important factors for development of thinking styles. By the discussions done in this study, I would like to suggest that using a democratic parenting style could enhance the child's cognitive development and thus leads to the development of the creativity-generating thinking styles.

Finally, it will be useful for student teachers' training, if these research findings and conceptual explanations are taken into consideration by university teachers, counsellors, administrators and policy makers in the educational system as well as by parents and society because it is important to be aware of the fact that our thinking styles affect many of our activities such as how we influence people, make decisions, use our imaginations, handle ideas, solve problems, make plans, communicate and frame the world around us etc.

Last but not least, it should be noted that although the current research has shown the reliability and validity of the TSI for identifying the thinking styles among student teachers in Turkey, two (hierarchic and monarchic) of the 13 scales had a statistically significant correlation that was not predicted by the theory. Therefore, further examination of the TSI is needed. Also, the relationships between thinking styles and academic achievement, grade, department and parenting styles need to be verified by future studies for Turkish student teachers. Additionally, the effects of parenting styles on thinking styles could be examined in other cultural settings too.

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