

Thinking Styles: University Students' Preferred Teaching Styles and Their Conceptions of Effective Teachers

LI-FANG ZHANG
Faculty of Education
The University of Hong Kong

ABSTRACT. In the present study, the author investigated the role of thinking styles in university students' preferences for teaching styles and their conceptions of effective teachers. Students (121 men and 134 women) from the University of Hong Kong responded to 3 self-report tests: the Thinking Styles Inventory–Revised (R. J. Sternberg, R. K. Wagner, & L-F. Zhang, 2003), the Preferred Thinking Styles in Teaching Inventory (L-F. Zhang, 2003c), and the Effective Teacher Inventory (L-F. Zhang, 2003b). Results indicated that even after age, gender, and academic discipline were controlled, particular thinking styles predisposed students to particular teaching styles. Moreover, as expected, students were open to more than just teaching styles that precisely matched their own thinking styles. Results also indicated that students' thinking styles made a difference in their conceptions of effective teachers. Discussions are focused on the study's contributions to both the style literature and the growing body of knowledge on characteristics of effective teachers.

Key words: effective teachers, preferred teaching styles, thinking styles

STYLES refer to our preferred ways of using the abilities that we have (Sternberg, 1997). After decades of theorizing and researching on styles, many style labels have been postulated (see Jones, 1997; Riding & Cheema, 1991). The three most commonly used terms are cognitive style, learning style, and thinking style. Scholars also adopt the term *teaching style* to refer to teachers' cognitive, learning, and thinking styles in teaching, and they use the term *learning style* in describing students' cognitive, learning, and thinking styles in learning.

Much research has suggested that teachers' teaching styles and students' learning styles interact to affect student learning (e.g., Saracho, 1990; Saracho &

I am grateful to the Committee on Research and Conference Grants as administered by The University of Hong Kong for supporting this research.

Address correspondence to Li-fang Zhang, Faculty of Education, The University of Hong Kong, Pokfulam Road, Hong Kong: lfzhang@hkucc.hku.hk (e-mail).

Spodek, 1994; Taylor, 1994; Wentura, 1985). Furthermore, many studies can be identified in the literature that investigated the relationships of students' learning styles to their learning environment preferences. The learning environments that these studies examined varied from an actual physical learning environment (e.g., Dunn, 1987; Orifici, 1997; Shaver, 2001) to an instructional method (e.g., Hunt, 1999; Sadler-Smith, 1997, 2001; Sadler-Smith & Riding, 1999; Seidel & England, 1999; Zampogna, Gentile, Papalia, & Silber, 1976), to teaching media (e.g., Campbell, 2000; Liu & Reed, 1994; Sadler-Smith & Riding), and to assessment methods (Nganwa-Bagumah & Mwamwenda, 1991; Sadler-Smith & Riding; Seidel & England).

However, what is lacking in this literature on the relationships between learning styles and learning environment preferences is the study of the relationships between students' learning styles and their preferred teaching styles. There is also no research on the relationships between individual differences in learning styles and their conceptions of an effective teacher. In the present study, I investigated the role of university students' thinking styles in their preferences for teachers' thinking styles in teaching (i.e., teaching styles) and in their conceptions of the characteristics of an effective teacher.

The Theory of Mental Self-Government

In 1988, Sternberg proposed a theory of thinking styles termed *the theory of mental self-government*. Using the word "government" metaphorically, Sternberg (1988, 1997) contended that just as there are many ways of governing a society, there are many ways of governing or managing our activities. These different ways can be construed as our *thinking styles*. In managing our activities, we choose styles with which we feel comfortable. Moreover, we use different thinking styles depending on the stylistic demands of a given situation. One of the important features of thinking styles, according to Sternberg, is that they are at least partially socialized, suggesting that thinking styles can be cultivated and modified.

The theory of mental self-government describes 13 thinking styles that fall along 5 dimensions. There are three functions (legislative, executive, and judicial styles), four forms (hierarchical, oligarchic, monarchic, and anarchic styles), two levels (global and local styles), two scopes (internal and external styles), and two leanings (liberal and conservative styles) of the mental self-government. Appendix A contains a brief description of each of the thinking styles.

These thinking styles are, in principle, value free, for the same thinking style can serve one person beautifully in one situation, but may fail the same person miserably in another situation. However, in their repeated studies, Zhang and her colleagues (e.g., Zhang, 2000, 2001d, 2002a, 2002b, 2002c, 2002d, 2002e; Zhang & Huang, 2001; Zhang & Postiglione, 2001; Zhang & Sternberg, 2000) found that the thinking styles in Sternberg's theory can be classified into three groups. The

first group, known as Type 1, is composed of thinking styles that are more creativity generating and that denote higher levels of cognitive complexity, including such styles as the legislative, judicial, hierarchical, global, and liberal styles. The second group, known as Type 2, consists of thinking styles that suggest a norm-favoring tendency and that denote lower levels of cognitive complexity, including such styles as the executive, local, monarchic, and conservative styles.

The remaining four thinking styles (i.e., anarchic, oligarchic, internal, and external) belong to neither the Type 1 group nor the Type 2 group. However, they may manifest the characteristics of the styles from both groups, depending on the stylistic demand of the specific task. For example, whether one prefers to work alone (internal style) or with others (external style), one can work on tasks that require either Type 1 or Type 2 thinking styles. Also for instance, one could use the anarchic style in a sophisticated way, such as dealing with different tasks as they arise but not losing one's sight of the central issue. Under this circumstance, the anarchic style manifests the characteristics of Type 1. On the contrary, one also could use the anarchic style in a simple-minded way, such as dealing with tasks as they come along without knowing how each task contributes to the ultimate goal. Under this circumstance, the anarchic style manifests the characteristics of Type 2 thinking styles. These four thinking styles have recently been labeled Type 3 thinking styles (Zhang, 2003a).

The theory of mental self-government has been operationalized through a number of inventories, including the most frequently used Thinking Styles Inventory (Sternberg & Wagner, 1992). The internal validity of the theory has been demonstrated in many studies (e.g., Bernardo, Zhang, & Callueng, 2002; Dai & Feldhusen, 1999; Zhang, 2001d; Zhang & Sternberg, 1998) conducted among students and teachers from a number of different cultures, including Hong Kong, mainland China, the Philippines, and the United States.

The external validity of the theory has been obtained by examining the nature of thinking styles not only against a number of constructs that belong to the family of works on styles but also against a few constructs that are perceived to be significantly related to the thinking style construct. Type 1 thinking styles have been, in general, positively correlated with human attributes that are traditionally perceived as being positive, including a deep approach to learning (Zhang, 2000; Zhang & Sternberg, 2000), higher self-esteem (Zhang 2001d; Zhang & Postiglione, 2001), higher cognitive developmental levels (Zhang, 2002c), the holistic mode of thinking (Zhang, 2002c, 2002d), and the openness personality trait (Zhang, 2002a, 2002b; Zhang & Huang, 2001). Likewise, Type 2 thinking styles have been, in general, significantly correlated with human attributes that are traditionally considered negative, including a surface approach to learning, lower self-esteem, lower cognitive developmental levels, the analytic mode of thinking, and the neuroticism personality trait.

The contribution of thinking styles to academic achievement has also been examined among both secondary school students and university students. All

existing studies have suggested that thinking styles contributed to academic achievement beyond students' abilities (e.g., Grigorenko & Sternberg, 1997; Sternberg & Grigorenko, 1993; Zhang, 2001b, 2001c; Zhang & Sternberg, 1998).

In most of the aforementioned works on the relationships between thinking styles and academic achievement, it has been repeatedly argued that teachers' instructional styles should be diversified so that students with different thinking styles could benefit from teachers' instructions. However, to what extent should teachers diversify their teaching styles? Are there teaching styles that could accommodate the learning styles of the majority of students? To answer these questions, research efforts must be made to identify students' individual differences in their preferred teaching styles based on their own thinking styles.

Therefore, the first goal of the present study was to examine the role of students' thinking styles in their preferred teaching styles. On the basis of the matching hypothesis, I predicted that students' thinking styles would be congruent with their preferred teaching styles. This congruence may be identified at two levels. At a general level, students with Type 1 thinking styles prefer Type 1 teaching styles (i.e., Type 1 thinking styles used in teaching); students with Type 2 thinking styles prefer Type 2 teaching styles; and students with Type 3 thinking styles prefer Type 3 teaching styles. At a more specific level, this congruence can be identified in the match between a particular thinking style and its corresponding preferred teaching style. For example, students with the legislative thinking style would prefer the legislative teaching style, whereas students with the executive thinking style would prefer the executive teaching style.

In literature, studies on conceptions of effective teachers are abundant (e.g., Beckman, 1994; Crawford & Bradshaw, 1968; Eckert, 1973; Funderburk, 1994; Sheehan & DuPrey, 1999; Subkoviak & Levin, 1974; Weinerman, 1998; Witcher, Onwuegbuzie, & Minor, 2001). However, little attention has been directed toward specifying the nature of the relationship between students' individual differences in thinking styles and their conceptions of effective teachers. Although there is no basis on which one can predict exactly how students' thinking styles are related to their conceptions of effective teachers, it is reasonable to predict that, in general, students' thinking styles affect their conceptions of effective teachers. Therefore, a second, and equally important, goal of the present study was to explore the role of students' thinking styles in their conceptions of effective teachers.

METHOD

Participants

Two hundred fifty-five (121 men and 134 women) students at the University of Hong Kong volunteered to participate in the present research. Their ages ranged from 18 to 48 years old (with the average age of 23). The participants

were enrolled in three different classes. The first class included 40 second-year students working toward their bachelor's degree in education. The second class was composed of 25 students working toward their post-graduate certificates in education. The remaining students were studying in a broadening course entitled Critical Thinking that was open to students of all majors at the university. The participants were from the following academic disciplines: architecture, chemistry, dentistry, engineering, law, mathematics, medicine, and social sciences. Across the three classes, the participants were at the following university class levels: 10 first-year students, 131 second-year students, 89 third-year students, and 25 post-graduate students.

Measures

Apart from providing demographic information, all the participants responded to three self-report inventories: The Thinking Styles Inventory–Revised (TSI–R), the Preferred Thinking Styles in Teaching Inventory (PTSTI), and the Effective Teacher Inventory (ETI).

The TSI–R (Sternberg, Wagner, & Zhang, 2003) is a revised version of Sternberg and Wagner's (1992) Thinking Styles Inventory (TSI). The TSI has its theoretical foundation in the theory of mental self-government. The inventory measures the 13 thinking styles described in the theory using 65 statements, with each 5 statements falling into one of the thinking styles. For each statement, the participants rated themselves on a 7-point Likert-type scale, with 1 indicating that the statement does not at all represent the way they normally carry out tasks and 7 suggesting that the statement characterizes extremely well the way they normally carry out tasks. Here are three sample items: "I like tasks that allow me to do things my own way" (legislative style); "I like situations in which it is clear what role I must play or in what way I should participate" (executive style); and "I like to evaluate and compare different points of view on issues that interest me" (judicial style). The TSI was translated and back-translated between Chinese and English in 1996. Both the Chinese and English versions of the inventory have been used in numerous studies. Reasonable reliability and good validity data have been demonstrated in all the existing studies.

However, previous research indicated that lower scale reliabilities were usually obtained in three of the 13 styles: local, monarchic, and anarchic. Thus, an effort was made to revise some of the items in these three styles. A careful examination of the item–scale reliabilities from previous data sets indicated that 7 items needed to be rewritten—two from the local, three from the monarchic, and two from the anarchic style.

In the present study, I used a Chinese version of the TSI–R. Results from the three revised scales indicated that the Cronbach alphas for the Local and the Monarchic scales were improved dramatically. The alpha coefficients increased from the previously low to mid .50s to low .70s. The alpha coefficient for the

Anarchic scale did not show obvious improvement. Detailed statistics for the TSI-R are contained in Table 1.

The PTSTI (Zhang, 2003c) was particularly designed for the present study. Like the TSI-R, the PTSTI consists of 65 statements, with each 5 statements contributing to the measurement of one of the 13 thinking styles. For each statement, the participants rated themselves on a 7-point Likert-type scale, with 1 indicating absolute disagreement that the statement describes the way that they prefer their teachers to carry out tasks in their educational practice and 7 denoting that they absolutely agree that the statement describes the way that they prefer their teachers to carry out tasks in their educational practice. Here are three examples: "It is important that teachers allow students to develop their own ways of solving problems" (legislative style); "A good teacher always gives clear directions" (executive style); and "One of the most important things teachers do is to compare various students' progress" (judicial style).

The alpha estimates of internal consistency for the 13 scales (see Table 1) ranged from .55 to .76, with a median of .65. Given the heterogeneity of the items within each scale, these estimates are acceptable.

I used an exploratory factor analysis followed by an oblique rotation to assess the validity of the PTSTI. The results of this factor analysis are summarized in Table 2. Substantive considerations and interpretability, along with Horn's (1965) method, were the criteria used in deciding the number of factors to retain. Horn's method essentially involves generating random data and comparing the eigenvalues of the random data correlation matrix with those of the correlation matrix for the real data. In the case of the present data, only the first three eigenvalues were larger than those from the random data. In addition, the three-factor model was more readily interpretable than the four- and five-factor models I examined. Finally, this three-factor model is consistent with findings from the previously described three types of thinking styles. Therefore, three factors were retained.

These three factors accounted for 65.4% of the variance. Scores on Type 2 thinking styles (e.g., executive, local, and conservative) had the highest loadings on the first factor, whereas scores on Type 1 thinking styles (e.g., legislative, global, and liberal) defined Factor 2. The third factor was dominated by Type 3 styles (e.g., oligarchic, anarchic, and internal).

The third self-report inventory was the ETI (Zhang, 2003b), also especially constructed for the present study. A thorough examination of the literature revealed that there are six essential dimensions to students' conceptions of an effective teacher (e.g., Beckman, 1994; Crawford & Bradshaw, 1968; Witcher et al., 2001):

1. academic qualification and scholarship;
2. preparedness and subject knowledge;
3. personality trait and personal style;

TABLE 1. Scale Statistics for TSI-R, PTSTI, and ETI: *M*, *SD*s, and Cronbach Alphas (*N* = 255)

Scale	<i>M</i>	<i>SD</i>	α
<i>TSI-R</i>			
Legislative	4.95	.89	.80
Executive	4.93	.83	.69
Judicial	4.52	1.00	.83
Global	4.27	.79	.61
Local	4.03	.91	.72
Liberal	4.24	1.06	.88
Conservative	4.56	.94	.79
Hierarchical	4.89	.90	.77
Monarchic	4.60	.91	.70
Oligarchic	4.69	.83	.72
Anarchic	4.34	.80	.52
Internal	4.48	1.09	.83
External	4.62	1.04	.82
<i>PTSTI</i>			
Legislative	5.17	.76	.68
Executive	4.45	.83	.61
Judicial	4.54	.80	.55
Global	5.10	.74	.60
Local	4.64	.76	.58
Liberal	5.14	.75	.65
Conservative	4.03	.84	.62
Hierarchical	5.01	.77	.70
Monarchic	3.97	.84	.67
Oligarchic	3.93	.78	.76
Anarchic	3.97	.82	.58
Internal	3.91	.95	.74
External	5.19	.76	.72
<i>ETI</i>			
AQ&S	4.39	1.04	.67
PS&K	5.80	.74	.65
PT&PS	5.55	.76	.79
CS	5.75	.76	.81
M&E	5.52	.83	.83
CO	5.68	.71	.82

Note. TSI-R = Thinking Style Inventory-Revised. PTSTI = Preferred Thinking Styles in Teaching Inventory. ETI = Effective Teaching Inventory. AQ&S = Academic Qualification and Scholarship. P&SK = Preparedness and Subject Knowledge. PT&PS = Personality Trait and Personal Style. CS = Connectedness With Students. M&E = Motivation and Enthusiasm. CO = Classroom Operation.

4. connectedness with students;
5. motivation and enthusiasm; and
6. classroom operation.

For each of the first two dimensions, 4 items were written. For each of the last four dimensions, 6 items were written. Therefore, there are 32 items in the ETI.

As a preliminary validity check procedure, the items for each dimension (scale) were mixed and presented to two individuals—one a post-graduate research student in the field of educational psychology and the other an undergraduate student majoring in mathematics education. The two students were asked to categorize the items and to provide a descriptor for each resulting category. Results from both individuals supported the validity of the items for assessing each of the ETI scales.

For each item (a short phrase describing a characteristic of a teacher), the participants rated themselves on a 7-point Likert-type scale, with 1 indicating that the item does not at all describe an important characteristic of an effective teacher and 7 suggesting that the item describes a very important characteristic of an effective teacher. Two sample items from each of the six scales are presented in Appendix B.

Reliability data for the ETI scales were obtained with Cronbach's alphas. The alpha coefficients ranged from .65 to .83. Again, given the heterogeneity within each scale, these scale reliability data are considered good. The detailed statistics on each scale are also shown in Table 1.

TABLE 2. Oblique-Rotated Three-Factor Model for the Preferred Thinking Styles in Teaching Inventory ($N = 255$)

Style	Factor 1	Factor 2	Factor 3
Legislative		.85	
Executive	.83		
Judicial	.37	.37	
Global		.81	
Local	.74		
Liberal		.88	
Conservative	.66		.39
Hierarchical	.45	.46	
Monarchic	.33		.54
Oligarchic			.80
Anarchic			.85
Internal			.75
External	.31	.70	
% variance	35.68	20.73	9.04
Cumulative variance	35.68	56.41	65.45
Eigenvalue	4.64	2.70	1.18

Furthermore, when submitted to an exploratory factor analysis with an oblique rotation, the 32 items clustered into 6 factors. The first factor was dominated by items from Connectedness With Students, the second by items from Academic Qualification and Scholarship, the third by those from Personality Trait and Personal Style, the fourth by those from Preparedness and Subject Knowledge, the fifth by those from Motivation and Enthusiasm, and the sixth by items from Classroom Operation. These six factors accounted for 61% of the variance in the data. Thus, statistical validity data for the Effective Teacher Inventory have been obtained.

Data Analysis

Previous findings have been mixed regarding the effects of student characteristics (such as age, gender, and academic discipline) on thinking styles (e.g., Sternberg & Grigorenko, 1995; Zhang, 2001b, 2001d; Zhang & Postiglione, 2001; Zhang & Sachs, 1997). Therefore, I performed preliminary statistical analyses (using *t* test and multivariate analysis of variance) to identify any possible group differences in thinking styles based on age, gender, and academic discipline. Significant differences were found in several thinking styles based on all three variables. For example, older students scored higher on the executive, hierarchical, and external thinking style scales than did their younger counterparts. Male students were more judicial, global, and liberal than were their female counterparts. Students majoring in social sciences and humanities were more executive and external in thinking styles than were students studying in the natural sciences disciplines. Therefore, in the remaining statistical analyses, age, gender, and academic discipline were put under control.

To test the predictions about the relationships between students' thinking styles and their preferred teaching styles, I conducted hierarchical multiple regression analyses with the preferred teaching style scales as the dependent variables and the thinking style scales as the independent variables, and with the three demographic variables (age, gender, and academic discipline) forced into the regression models first. I also used hierarchical multiple regression procedures to explore the predictive relationships between students' thinking styles and their conceptions of effective teachers. Whereas the ETI scales were the dependent variables, thinking styles were, again, the independent variables, and the demographic variables were forced into the regression models first.

Results and Discussion

Predicting Preferred Teaching Styles From Thinking Styles

Results from the hierarchical multiple regression analyses indicated that after age, gender, and academic discipline were controlled, students' thinking

TABLE 3. Predicting Preferred Teaching Styles From Thinking Styles ($N = 255$)

Pref TS	Leg	Exe	Jud	Global	Local	Lib	Con
R^2_{Total}	.26	.28	.15	.21	.17	.28	.28
R^2_{A+G+AD}	.05	.07	.03	.02	.02	.03	.04
R^2_{Styles}	.21	.21	.12	.19	.15	.25	.24
$\beta_{Style 1}$	.44 ^{Leg ***}	.32 ^{Con ***}	.27 ^{Jud ***}	.44 ^{Leg ***}	.30 ^{Exe ***}	.43 ^{Leg ***}	.22 ^{Mona **}
$\beta_{Style 2}$	-.13 ^{Con *}	-.25 ^{Leg ***}	.19 ^{Mona **}		.27 ^{Exe ***}	.26 ^{Ext ***}	.17 ^{Con *}
$\beta_{Style 3}$	.16 ^{Ext *}	.24 ^{Oli **}			-.17 ^{Inter *}	-.20 ^{Glob **}	-.19 ^{Leg **}
$\beta_{Style 4}$	-.14 ^{Glob *}						.22 ^{Loc **}
$\beta_{Style 5}$							-.23 ^{Hier **}
$\beta_{Style 6}$							.18 ^{Oli *}
F	9.96***	12.70***	6.85***	12.57***	6.53***	12.82***	8.12***
df	7, 194	6, 195	5, 193	4, 194	6, 191	6, 194	9, 189
R^2_{Total}	.23	.08	.11	.11	.11	.21	.21
R^2_{A+G+AD}	.02	.04	.01	.02	.02	.04	.06
R^2_{Styles}	.21	.04	.10	.09	.09	.17	.15
$\beta_{Style 1}$	.13 ^{Leg *}	.20 ^{Oli}	.34 ^{Loc ***}		.28 ^{Loc ***}	.14 ^{inter *}	.19 ^{Leg **}
$\beta_{Style 2}$	.21 ^{Exe **}		-.17 ^{Inter *}		.15 ^{Glob *}	-.21 ^{Hier **}	.20 ^{Ext **}
$\beta_{Style 3}$	.20 ^{Jud **}				-.16 ^{Hier *}	.36 ^{***}	.18 ^{Exe *}
$\beta_{Style 4}$	.16 ^{Oli *}					-.25 ^{Ext ***}	
$\beta_{Style 5}$							
$\beta_{Style 6}$							
F	8.27***	4.45**	4.81***	3.97**	7.04***	7.04***	8.15***
df	7, 191	4, 195	5, 193	6, 192	7, 190	7, 190	6, 190

Note. Pref TS = Preferred Teaching Style. Leg = Legislative. Exe = Executive. Jud = Judicial. Glob = Global. Loc = Local. Lib = Liberal. Con = Conservative. Hier = Hierarchical. Mona = Monarchic. Oli = Oligarchic. Ana = Anarchic. Inter = Internal. Ext = External. A+G+AD = Age + Gender + Academic Discipline.

* $p < .05$. ** $p < .01$. *** $p < .001$.

styles significantly predicted their preferences in teaching styles. Each of the 13 preferred teaching styles was statistically predicted by at least one particular thinking style. The extent to which thinking styles predicted students' preferred teaching styles beyond what had been explained by age, gender, and academic discipline ranged from 4% to 25%, with the median being 21%. Detailed statistics are presented in Table 3.

These results revealed the following patterns of predictive relationships: First, of the 13 teaching styles, 6 (legislative, judicial, local, conservative, internal, and external) were significantly predicted in such a way that their corresponding thinking styles were the primary predictors. For example, four thinking styles (positively by legislative and external but negatively by conservative and global) significantly contributed to the prediction of the legislative teaching style. Among the four thinking styles, the legislative thinking style was the first predictor that entered the regression model.

Second, among the remaining seven teaching styles, four (executive, global, liberal, and hierarchical) were predicted by particular thinking styles, with a thinking style that is of the same type being the primary predictor. For example, the global teaching style was significantly predicted by the legislative thinking style. Both the global and the legislative styles are Type 1 styles. Third, the oligarchic students indicated a preference for the monarchic teaching style, a teaching style that should be complementary to their learning style (i.e., the oligarchic style). Finally, two of the Type 3 teaching styles (oligarchic and anarchic) were predicted by thinking styles that included neither the corresponding thinking styles nor styles of their own types.

These results indicate that partial support was obtained for the prediction made earlier about the relationships between students' thinking styles and their preferred teaching styles on the specific style level. Whereas six styles were matched at the individual style level, other styles were either matched at the style type level or not matched at all.

A further cross-examination of the results from all regression analyses indicated the following patterns of predictive relationships at the level of style types: First, students with all three types of thinking styles expressed preferences for Type 1 teaching styles (teaching styles that encourage creative thinking and complex information processing). Second, Type 2 teaching styles (teaching styles that encourage rule following and simplistic information processing) were almost exclusively favored by students with Type 2 thinking styles. The only exception was that the oligarchic thinking style (a Type 3 style) was significantly predictive of the executive and monarchic teaching styles (Type 2 styles) as well. Finally, Type 3 teaching styles (teaching styles that encourage either Type 1 or Type II thinking styles, depending on the stylistic demand of a specific task) were preferred almost exclusively by students with both Type 2 and Type 3 thinking styles. The only exception was that students with the global thinking style (a Type 1 style) indicated a strong preference for the anarchic teaching style (a Type 3 style).

These results fully support the prediction made about the relationships between students' thinking styles and their preferred teaching styles on a more general level—the style type level. That is, students with Type 1 thinking styles indicated a strong predilection for Type 1 teaching styles; students with Type 2 thinking styles indicated a strong predilection for Type 2 teaching styles; and students with Type 3 thinking styles indicated a strong predilection for Type 3 teaching styles. However, the findings about the relationships between the two variables examined went beyond the predicted relationships at the style type level. For example, not only did students with Type 1 thinking styles indicate a strong preference for Type 1 teaching styles, but students with Type 2 and Type 3 thinking styles also indicated a strong preference for Type 1 teaching styles. Thus, the present results indicate that the same student could be open to more than one thinking style. Furthermore, there was no single most favored teaching style among students. But rather, as a group, Type 1 styles are the most favored teaching styles.

Predicting Conceptions of Effective Teachers From Thinking Styles

Results from hierarchical multiple regression procedures revealed that after age, gender, and academic discipline were controlled, students' thinking styles significantly contributed to their conceptions of effective teachers. Each of the six ETI scales was statistically predicted by particular thinking styles. Of the 13 thinking styles, 6 styles entered the regression models. These styles included styles of all three types: the judicial, legislative, and liberal styles from Type 1, the executive and monarchic styles from Type 2, and the oligarchic from Type 3. The unique contributions of thinking styles beyond age, gender, and academic discipline ranged from 8% to 18%. Detailed statistics are presented in Table 4.

Apparently, across the six sets of multiple regression results, the judicial thinking style stood out the most, as either the sole predictor or the primary predictor for five of the six ETI scales (all except for the preparedness and subject knowledge dimension). This means that students high on judicial thinking considered five of the six dimensions essential for an effective teacher. The oligarchic style significantly predicted academic qualification and scholarship as well as motivation and enthusiasm. Again, this means that to be perceived as an effective teacher by the oligarchic students, an individual teacher should have good academic qualifications and scholarship as well as a strong motivation and enthusiasm for teaching.

The legislative thinking style contributed significantly negatively to the prediction of academic qualification and scholarship but significantly positively to the prediction of preparedness and subject knowledge. For the executive students, being connected with students as well as being prepared for teaching and being equipped with subject knowledge are essential for a teacher to be perceived as effective. Like the legislative and executive thinking styles, the liberal style also significantly contributed to preparedness and subject knowledge.

TABLE 4. Predicting Conceptions of Effective Teachers From Thinking Styles ($N = 255$)

ETI scale	AQ&S	P&SK	PT&PS	CS	M&E	CO
R^2_{Total}	.20	.18	.10	.16	.13	.13
$R^2_{\text{A+G+AD}}$	.03	.00	.02	.06	.01	.01
R^2_{Styles}	.17	.18	.08	.10	.12	.12
$\beta_{\text{Style 1}}$	.40 _{Jud} ***	.15 _{Leg} **	.29 _{Jud} ***	.28 _{Jud} ***	.30 _{Jud} ***	.28 _{Jud} ***
$\beta_{\text{Style 2}}$	-.25 _{Leg} **	.26 _{Exe} **		.16 _{Exe} *	.14 _{Oli} *	.18 _{Mona} **
$\beta_{\text{Style 3}}$	.22 _{Oli} **	.21 _{Lib} **				
F	7.82***	6.67***	5.50***	7.32***	5.80***	5.84***
df	6, 189	6, 189	4, 193	5, 191	5, 191	5, 192

Note. AQ&S = Academic Qualification and Scholarship. P&SK = Preparedness and Subject Knowledge. PT&PS = Personality Trait and Personal Style. CS = Connectedness With Students. M&E = Motivation and Enthusiasm. CO = Classroom Operation. A+G+AD = Age + Gender + Academic Discipline.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Finally, for the monarchic students, being skilled at classroom operation was essential for a teacher to be perceived as effective.

These findings regarding the predictive relationships of students' thinking styles to their conceptions of effective teachers were not obtained by chance. There are at least three reasons for this assertion. First, the thinking style construct and the construct assessed by the ETI (i.e., teaching effectiveness) are very different. Second, there is no semantic similarity between the items from the two inventories. Third, as in the study of the contributions of students' thinking styles to their preferred teaching styles, in the study of the contributions of students' thinking styles to their conceptions of effective teachers, I used stringent statistical procedures (hierarchical multiple regressions), with age, gender, and academic discipline controlled. For these reasons, the variations in the conceptions of effective teachers accounted for by the thinking styles (8% to 18%) are practically significant.

Limitations and Contributions

In the present study, I examined the role of students' thinking styles in their preferences in two aspects of their learning environment: their preferred teaching styles and their conceptions of effective teachers. No doubt a study such as this has its limitations that render its findings suggestive rather than conclusive. First, although the two newly constructed inventories (the PTSTI and the ETI) have demonstrated reasonably good psychometric properties, they need to be tested further in future studies as this is the first time that they have been used. Second, although students' age, gender, and academic discipline have been put under control in the process of examining the predictive relationships under investigation, the participants were not selected through a strict sampling procedure. However, despite these limitations, the present study has made four major contributions.

The first relates to the revision of the TSI, resulting in a great improvement of the reliability data for the Local and Monarchic scales. Second, the study has tested the psychometric properties of two newly constructed inventories—the PTSTI and the ETI. As discussed earlier, the argument for matching teaching styles to students' learning styles has been going on for decades. However, no study has looked at the kinds of teaching styles that students would like their teachers to use. The PTSTI is the first inventory that has ever been constructed to assess students' preferred teaching styles. Likewise, different published studies have focused on different domains of the characteristics of an effective teacher. As a newly constructed inventory, the ETI captured the various major domains of the characteristics of an effective teacher documented in the literature.

Third, the present study has pioneered the investigation of the role of students' thinking styles in their preferred teaching styles. This investigation is significant because no research has been documented in the literature that examines

students' preferred teaching styles based on their own thinking styles. Yet, it is important to do such research, for without a good understanding of what teaching styles students prefer their teachers to use, based on their own individual differences in thinking styles, teachers' efforts of trying to "match" their teaching styles to their students' thinking styles would become aimless.

In this study I have demonstrated that particular thinking styles predisposed students to particular teaching styles. Furthermore, the results have also revealed that the traditional view of the "matching hypothesis" is far too limited. Results of this study have shown that the "matching hypothesis" could be interpreted in a much broader sense. I have clearly demonstrated that students prefer that their teachers teach in styles that exactly match their own learning styles but are open to teaching styles that are similar to, complementary to, or even completely different from, their own learning styles. This result implies that although teachers should diversify their teaching styles so that students with different learning styles can benefit from their instruction, teachers do not need to be overly concerned about matching their teaching styles to every single learning style among their students. Instead, teachers could accommodate the learning styles of the majority of students by using Type 1 teaching styles.

Previous research results have indicated that Type 1 thinking styles are significantly related to such positive human attributes as a deep approach to learning, higher self-esteem, and higher levels of cognitive complexity. Similarly, Zhang's (2001a) study of teachers' thinking styles in teaching and their teaching approaches identified that teachers who used Type 1 teaching styles tend to be oriented toward and concerned with students' conceptual change, whereas teachers who use Type 2 teaching styles tend to be content oriented and to emphasize the reproduction of information. Therefore, various studies based on the theory of mental self-government have consistently suggested that Type 1 styles (both teaching and learning) are superior to the other two types of styles. Therefore, teachers should use Type 1 teaching styles with great confidence.

The final contribution of the present study lies in its enrichment of the existing literature on the study of the characteristics of effective teachers. As previously noted, much research has been done on the characteristics of effective teachers. However, no researcher has examined the question of whether thinking styles would make a difference in students' conceptions of effective teachers. In the present study, I explored this predictive relationship and found that at least some of the thinking styles mattered in students' conceptions of effective teachers.

Early in 1968, Crawford and Bradshaw argued that characteristics of effective teachers may be quantified and studied scientifically. They cautioned, however, that these characteristics should be interpreted in light of who is doing the judging. I would argue that in the context of the style literature, this "who" should be interpreted in a broad way. It should take people's thinking styles into consideration. That is, people with different thinking styles may have different views about what characteristics contribute to the quality of an effective teacher.

REFERENCES

- Beckman, M. T. (1994). Personality characteristics of effective teachers. *Dissertation Abstracts International (Section A): Humanities and Social Sciences*, 54 (11A): 3933.
- Bernardo, A. B., Zhang, L. F., & Callueng, C. M. (2002). Thinking styles and academic achievement among Filipino students. *The Journal of Genetic Psychology*, 163, 149–163.
- Campbell, K. (2000). Gender and educational technologies: Relational frameworks for learning design. *Journal of Educational Multimedia and Hypermedia*, 9, 131–149.
- Crawford, P. L., & Bradshaw, H. L. (1968). Perception of characteristics of effective university teachers: A scaling analysis. *Educational and Psychological Measurement*, 28, 1079–1085.
- Dai, D. Y., & Feldhusen, J. F. (1999). A validation of the Thinking Styles Inventory: Implications for gifted education. *Roeper Review*, 21, 302–307.
- Dunn, R. (1987). Research on instructional environments: Implications for student achievement and attitudes. *Professional School Psychology*, 2, 43–52.
- Eckert, R. E. (1973). New tasks for teachers: The changing personnel. *New Directions for Higher Education*, 4, 41–57.
- Funderburk, M. W. (1994). Classroom climate in teacher education courses: Students' perceptions. *College Student Journal*, 28, 492–499.
- Grigorenko, E. L., & Sternberg, R. J. (1997). Styles of thinking, abilities, and academic performance. *Exceptional Children*, 63, 295–312.
- Horn, J. L. (1965). A rationale and test for the number of factors in factor analysis. *Psychometrika*, 30, 179–185.
- Hunt, S. K. (1999). Cognition and communication: Students cognitive styles and the argumentation and debate course. *Dissertation Abstracts International (Section A): Humanities and Social Sciences*, 60 (3A): 0592.
- Jones, A. E. (1997). Reflection–impulsivity and wholist–analytic: Two fledglings? Or is R-I a cuckoo? *Educational Psychology*, 17(1 & 2), 65–77.
- Liu, M., & Reed, W. M. (1994). The relationship between the learning strategies and learning styles in a hypermedia environment. *Computers in Human Behavior*, 10, 419–434.
- Nganwa-Bagumah, M., & Mwamwenda, T. S. (1991). Effects on reading comprehension tests of matching and mismatching students' design preferences. *Perceptual and Motor Skills*, 72, 947–951.
- Orifici, K. A. (1997). The relationship between psychological type and the learning style preferences of graduate psychology students: Implications for training. *Dissertation Abstracts International (Section A): Humanities and Social Sciences*, 58 (5A): 1586.
- Riding, R., & Cheema, I. (1991). Cognitive styles—An overview and integration. *Educational Psychology*, 11(3 & 4), 193–215.
- Sadler-Smith, E. (1997). 'Learning style': Frameworks and instruments. *Educational Psychology*, 17(1 & 2), 51–63.
- Sadler-Smith, E. (2001). The relationship between learning style and cognitive style. *Personality and Individual Differences*, 30, 609–616.
- Sadler-Smith, E., & Riding, R. (1999). Cognitive style and instructional preferences. *Instructional Science*, 27, 355–371.
- Saracho, O. N. (1990). The match and mismatch of teachers and students' cognitive styles. *Early Child Development and Care*, 54, 99–109.
- Saracho, O. N., & Spodek, B. (1994). Matching preschool children's and teachers' cognitive styles. *Perceptual and Motor Skills*, 78, 683–689.
- Seidel, L. E., & England, E. M. (1999). Gregorc's cognitive styles: College students' preferences for teaching methods and testing techniques. *Perceptual and Motor Skills*, 88, 859–875.

- Shaver, V. E. (2001). Learning styles and student success in radiography education. *Dissertation Abstracts International (Section B): The Sciences and Engineering*, 61 (9B): 4676.
- Sheehan, E. P., & DuPrey, T. (1999). Student evaluations of university teaching. *Journal of Instructional Psychology*, 26, 188–193.
- Sternberg, R. J. (1988). Mental self-government: A theory of intellectual styles and their development. *Human Development*, 31, 197–224.
- Sternberg, R. J. (1997). *Thinking styles*. New York: Cambridge University Press.
- Sternberg, R. J., & Grigorenko, E. L. (1993). Thinking styles and the gifted. *Roeper Review*, 16, 122–130.
- Sternberg, R. J., & Grigorenko, E. L. (1995). Styles of thinking in the school. *European Journal for High Ability*, 6, 201–219.
- Sternberg, R. J., & Wagner, R. K. (1992). *Thinking Styles Inventory*. (Unpublished test, Yale University).
- Sternberg, R. J., Wagner, R. K., & Zhang, L-F. (2003). *Thinking Styles Inventory-Revised*. (Unpublished test, Yale University).
- Subkoviak, M. J., & Levin, J. R. (1974). Determining the characteristics of the ideal professor: An alternative approach. *Journal of Educational Measurement*, 11, 269–276.
- Taylor, A. L. (1994). The relationship between graduate students' growth in learning (self-perceived) and the match between their preferred and experienced methods of teaching. *Dissertation Abstracts International (Section A): Humanities and Social Sciences*, 54 (7A): 2423.
- Weinerman, I. (1998). Creativity in the classroom: An examination of student teacher personality and perceptions of the classroom setting. *Dissertation Abstracts International (Section A): Humanities and Social Sciences*, 58 (9A): 3478.
- Wentura, D. F. (1985). The effects of matching teaching styles and learning styles on student performance in university classes. *Dissertation Abstracts International*, 46 (3A): 605.
- Witcher, A. E., Onwuegbuzie, A. J., & Minor, L. C. (2001). Characteristics of effective teachers: Perceptions of preservice teachers. *Research in the Schools*, 8, 45–57.
- Zampogna, J., Gentile, R. J., Papalia, A., & Silber, G. R. (1976). Relationships between learning styles and learning environments in selected secondary modern language classes. *Modern Language Journal*, 60, 443–447.
- Zhang, L-F. (2000). Relationship between Thinking Styles Inventory and Study Process Questionnaire. *Personality and Individual Differences*, 29, 841–856.
- Zhang, L-F. (2001a). Approaches and thinking styles in teaching. *The Journal of Psychology*, 135, 547–561.
- Zhang, L-F. (2001b). Do styles of thinking matter among Hong Kong secondary school students? *Personality and Individual Differences*, 31, 289–301.
- Zhang, L-F. (2001c). Do thinking styles contribute to academic achievement beyond abilities? *The Journal of Psychology*, 135, 621–637.
- Zhang, L-F. (2001d). Thinking styles, self-esteem, and extracurricular experiences. *International Journal of Psychology*, 36, 100–107.
- Zhang, L-F. (2002a). Measuring thinking styles in addition to measuring personality traits? *Personality and Individual Differences*, 33, 445–458.
- Zhang, L-F. (2002b). Thinking styles and the Big Five Personality Traits. *Educational Psychology*, 22, 17–31.
- Zhang, L-F. (2002c). Thinking styles and cognitive development. *The Journal of Genetic Psychology*, 163, 179–195.
- Zhang, L-F. (2002d). Thinking styles and modes of thinking: Implications for education and research. *The Journal of Psychology*, 136, 245–261.
- Zhang, L-F. (2002e). Thinking styles: Their relationships with modes of thinking and academic performance. *Educational Psychology*, 22, 331–348.

- Zhang, L-F. (2003a). Contributions of thinking styles to critical thinking dispositions. *The Journal of Psychology, 137*, 517–544.
- Zhang, L-F. (2003b). *The Effective Teacher Inventory*. Unpublished test, The University of Hong Kong.
- Zhang, L-F. (2003c). *The Preferred Thinking Styles in Teaching Inventory*. Unpublished test, The University of Hong Kong.
- Zhang, L-F., & Huang, J. F. (2001). Thinking styles and the Five-Factor model of personality. *European Journal of Personality, 15*, 465–476.
- Zhang, L-F., & Postiglione, G. A. (2001). Thinking styles, self-esteem, and socioeconomic status. *Personality and Individual Differences, 31*, 1333–1346.
- Zhang, L-F., & Sachs, J. (1997). Assessing thinking styles in the theory of mental self-government: A Hong Kong validity study. *Psychological Reports, 81*, 915–928.
- Zhang, L-F., & Sternberg, R. J. (1998). Thinking styles, abilities, and academic achievement among Hong Kong university students. *Educational Research Journal, 13*, 41–62.
- Zhang, L-F., & Sternberg, R. J. (2000). Are learning approaches and thinking styles related? A study in two Chinese populations. *The Journal of Psychology, 134*, 469–489.

APPENDIX A
Thinking Styles in the Theory of Mental Self-Government

Dimension	Thinking style	Key characteristics
Function	Legislative	One prefers to work on tasks that require creative strategies; One prefers to choose one's own activities.
	Executive	One prefers to work on tasks with clear instructions and structures; One prefers to implement tasks with established guidelines.
	Judicial	One prefers to work on tasks that allow for one's evaluation; One prefers to evaluate and judge the performance of other people.
Form	Hierarchical	One prefers to distribute attention to several tasks that are prioritized according to one's valuing of the tasks.
	Monarchic	One prefers to work on tasks that allow complete focus on one thing at a time.
	Oligarchic	One prefers to work on multiple tasks in the service of multiple objectives, without setting priorities.
	Anarchic	One prefers to work on tasks that would allow flexibility as to what, where, when, and how one works.
Level	Global	One prefers to pay more attention to the overall picture of an issue and to abstract ideas.
	Local	One prefers to work on tasks that require working with concrete details.

(appendix continues)

APPENDIX A—(Continued)

Scope	Internal	One prefers to work on tasks that allow one to work as an independent unit.
	External	One prefers to work on tasks that allow for collaborative ventures with other people.
Leaning	Liberal	One prefers to work on tasks that involve novelty and ambiguity.
	Conservative	One prefers to work on tasks that allow one to adhere to the existing rules and procedures in performing tasks.

APPENDIX B
Sample Items From the Effective Teacher Inventory

Scale	Sample items
Academic Qualification and Scholarship	Good knowledge of the most updated research in the field Excellent academic publishing record
Preparedness and Subject Knowledge	Masters of the material Well-prepared and well-organized
Personality Trait and Personal Style	Good sense of humor, but sparing with jokes Clear and well-modulated speech
Connectedness with Students	Know their students and their characteristics Firm but reasonable
Motivation and Enthusiasm	Persistent and highly motivated to succeed Enthusiastic about teaching
Classroom Operation	Create positive work environment Ability to stimulate questions from students

Original manuscript received January 31, 2003
Final revision accepted August 12, 2003