Thinking Styles

Thinking Styles:

Identity, Value, and Malleability

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To Christopher, my beloved son

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PREFACE

Thinking styles, one of the latest theories in the field of intellectual styles, are defined as one's preferred way of using abilities. Fifteen years ago, I was so excited when I first learned the concept of thinking styles in a lecture. It has been claimed that the construct of thinking styles is an additional factor that can explain individual differences in performance beyond ability and personality. Furthermore, unlike ability and personality which are at least half determined by genetic factors, thinking styles were considered to be more modifiable by environments and experience. Based on these contentions, it seemed very likely that one can successfully improve students' performance by cultivating their thinking styles. It has also been argued that thinking styles are value free, which means that there are no good or bad styles and that only "style match" matters. This argument is also tempting.

A few years later, I began my doctoral study and chose thinking styles as my research area. I was so surprised when I found out that the above contentions were mostly conceptual arguments rather than evidence-based conclusions. Likewise, many arguments with regard to other style models in the field of intellectual styles were also widely disseminated to educational practitioners before being fully examined. The hasty dissemination of the concept of styles combined with the myriad of style models in the field inevitably attracted plenty of criticism and doubts, which, at one time, made the field stagnate.

Fortunately, scholars have made tremendous efforts to integrate the field of styles in recent years. Moreover, many measurement tools for styles have improved their psychometric properties. Meanwhile, the methodologies have become more sophisticated. The time is ripe to examine fundamental assumptions about styles both systematically and rigorously. This book reviews the relevant literature and introduces empirical evidence addressing the three major controversial issues in the field: 1) whether thinking styles are distinct from or a part of personality traits; 2) whether thinking styles can be changed; and 3) whether thinking styles are value-laden. Based on solid research findings, this book discusses why thinking styles are important, which thinking styles should be cultivated, and how to cultivate them. Furthermore, the hotly-debated issues of style identity, malleability,

and value are revisited and discussed in more detail. In doing so, this book helps researchers and educators to have a deeper understanding of the nature of styles and their role in student development; it also provides practical suggestions for parents, teachers, and other educational practitioners. Hopefully, this book will contribute to the advancement of the field of styles and facilitate the application of style theories and research in educational practice.

This book is aimed at academics and graduate students who wish to research styles and its relevant fields, such as educational psychology, school psychology, higher education, student development, curriculum design and instruction, and career counselling. Educators, teachers, counsellors, and other practitioners in schools, universities, and other institutions will also be interested in this book because it discusses the practical implications of research findings on cultivating adaptive thinking styles and promoting student development.

It should be noted that this book's major work is rooted in my PhD research project and partially draws on some of my recent research articles. Many people have provided generous help and support during the research process and the publication of this book. I would like to take this opportunity to express my appreciation to them. First and foremost, my deepest gratitude goes to my PhD supervisor, Professor Li-fang Zhang. She possesses all the attributes required for a fantastic supervisor. Professor Zhang has provided me with prompt guidance and unconditional help whenever I needed it. Her feedback and comments on my work are always constructive and insightful. I am also deeply grateful to Professor Zhang for her constant encouragement and trust in my abilities. Without her, I would not have made such tremendous progress. Furthermore, Professor Zhang's excellent academic abilities, as well as her conscientious, persistent, and dedicated attitude to work, have deeply influenced me and will definitely continue to inspire me throughout my entire academic career.

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Finally, I would like to express heartfelt appreciation to my family, especially my little son, without whom this book would have been completed much earlier. It was also my son who have succeeded in changing my style preference from the hierarchical style to the anarchic style.

LIST OF ABBREVIATIONS

CDSE: Career decision self-efficacy

FDI: Field-dependence/independence

ISPLE: Inventory of students' perceived learning environment

KAI: Kirton's adaption-innovation styles

LE: Learning environments

PS: Parenting styles

SCCT: Social cognitive career theory

SES: Socioeconomic status

SWB: Subjective well-being

TS: Thinking styles

TSI: Thinking style inventory

CHAPTER ONE

AN INTRODUCTION TO THINKING STYLES

Some people have an excellent performance in school but then fail in their career. A person could be judged as less intelligent in one setting, but may also be judged as having better abilities in another. A person may not have excellent performance when he is as an athlete, but he could be a brilliant coach. In our society, students have to go through fierce competitions in order to enter the next stage in the educational system: primary school, junior school, high school, and university. Some students, even though they have a great performance at the beginning, do increasingly badly in these successive stages. This is not surprising as the schools in each stage are highly selective when recruiting students. It is very possible that one person will become confronted with people in successive stages who have stronger abilities than those in the last stage. Therefore, it is very difficult for them to outperform other people every time. However, students can still improve at every point. Robert Sternberg, who proposed the theory of thinking styles, was one of them. Like many other scholars, he noticed that the above phenomena could not be simply explained by abilities or personality. For decades, researchers, educators, psychologists, and philosophers have been trying to solve this mystery. During this process, the construct of styles emerged. After the concept of styles was firstly introduced by Gordon Allport (1937), various style constructs and theories proliferated (Zhang & Sternberg, 2006). Style theorists believe that people who have identical abilities may have different styles, which leads to different performances contingent to their environment.

The Field of Styles: An Overview

In the growing body of literature on styles, there are too many different style labels. Among them, three high-order terms, which encompass many style constructs, are frequently used.

One is cognitive styles, which refers to the ways in which people prefer to process information (Armstrong, Peterson, & Rayner, 2012). Typical examples of cognitive styles are field-dependent/independent (Witkin, 1954), intuitive-thinking (Myers, 1962), reflective-impulsive (Jerome

Kagan, 1965), serialist-holist (Pask & Scott, 1972), and activist-reflector (Kolb, 1976).

Another term is learning styles, which refers to the ways in which people prefer to respond to learning tasks (Armstrong et al., 2012). Typical constructs that are classified into learning styles include instructional preference (Friedman & Stritter, 1976), learning preference (Rezler & Rezmovic, 1974), study process (Biggs, 1979), and approach to study (Entwistle & Ramsden, 1983).

The third term is thinking styles, which was proposed by Sternberg (1988, 1997). Compared with the previous two, thinking styles refer to the ways that people prefer to think about the information as they are learning it or after they already know it. In recent studies, thinking styles are considered to be more general than cognitive or learning styles, because they include all three traditions (cognition-centered, personality-centered, and activity-centered) in the field of styles (Zhang & Fan, 2011).

However, the relationships between the various style labels are still puzzling for many scholars. For example, after a careful review, Zhang and Sternberg (2006) found cognitive styles and learning styles have much in common, and some scholars have used them interchangeably (e.g., Campbell, 1991; Tennant, 1997). In addition, there are still disputes over some style constructs, such as Kolb's (1976) learning style (Zhang & Sternberg, 2006). Aiming to further clarify the relationships between styles, scholars have made endeavors beyond the aforementioned three terms, which significantly contribute to the integration of the existing studies in the field.

Among all considerable endeavors to clarify the relationships between styles, six integrative models of styles particularly stand out. They are Curry's (1983) model, Miller's (1987) model, Riding and Cheema's (1991) model, Grigorenko and Sternberg's (1995) model, Sadler-Smith's (2009) model, and Zhang and Sternberg's (2005) model.

Taking "onion" as a metaphor, Curry's (1983) model claimed that there are three layers of styles. The innermost layer involves personality dimensions, the middle layer involves information processing, and the outermost layer involves instructional preferences. Miller (1987) proposed a model of cognitive processes and styles where cognitive styles are seen as individual differences in three types of cognitive processes: perception, memory, and thought. He also suggested that all cognitive styles can be analyzed by one bipolar dimension: analytic-holistic. Riding and Cheema (1991) adopted

two bipolar dimensions to classify cognitive styles: wholistic-analytic and verbal-imagery. According to Grigorenko and Sternberg's (1995) model, all existing style constructs fall into three traditions: cognition-centered, personality-centered, and activity-centered. The styles that can be seen as representatives in these three traditions are Witkin's (1962) theory of field dependence/independence (cognition-centered), Myers and McCaulley's (1988) theory of personality types (personality-centered), and Biggs's (1978) theory of learning approaches (activity-centered). Grigorenko and Sternberg (1995; Sternberg, 1997) also pointed out that the studies on the styles in each of these three traditions all have their own limitations. With the purpose of overcoming the limitations in previous studies, Sternberg (1988, 1997) proposed a theory of thinking styles—the theory of mental self-government—which covers all of these three traditions. Sadler-Smith (2009) proposed a duplex model of cognitive style where he classified two basic modes of processing information: intuitive and analytic. He argued that some people have relatively stable preference for one of the two modes while some people are more flexible and are able to use either mode.

All of the five models mentioned above have made significant contributions to the integration of the field's massive style constructs. However, there are still some limitations in these five models, such as the lack of empirical support (apart from Riding and Cheema's model), and the fact they place too much emphasis on cognitive processes (e.g., Miller's model, Riding and Cheema's model, and Sadler-Smith's model). Furthermore, it has to be pointed out that none of them explicitly provided reliable answers to the major controversial issues in the field, such as the ones concerning style malleability and the value of styles.

The sixth model that integrated works on styles is Zhang and Sternberg's (2005) threefold model of intellectual styles. It overcomes all of the limitations mentioned in the previous five models. Therefore, Zhang and Sternberg's (2005) threefold model was selected to be the integrative style model on which the present research is based.

The threefold model of intellectual styles (Zhang & Sternberg, 2005) was established based on ten influential theories of styles: Biggs's (1978) learning approaches, Holland's (1973) career personality types, Torrance's (1988) modes of thinking, Myers and McCaulley's (1988) personality types based on Jung's (1923) work, Gregorc's (1979) mind styles, Kirton's (1961, 1976) adaption-innovation decision making and problem solving styles, Kagan and his colleagues' (1964) reflective-impulsive styles, Guilford's (1950) divergent-convergent thinking, Witkin's (1962)

field-dependence/independence, and Sternberg's (1997) thinking styles. In this model, intellectual styles, which are defined as people's preference for processing information and undertaking tasks, are used as an encompassing term that includes various style constructs, such as cognitive styles, learning styles, and thinking styles. Based on a meticulous review of various style theories and their relevant empirical evidence, Zhang and Sternberg (2005) found that style constructs included in the model of intellectual styles can be generally reconceptualized into three types. Type I intellectual styles are normally characterized by cognitive complexity, nonconformity, autonomy, and low degrees of structure. Examples include the deep learning approach, field independence, divergent thinking, reflectivity, innovation, holistic thinking, and the legislative thinking style. In contrast, Type II intellectual styles normally feature cognitive simplicity, conformity, authority, and high degrees of structure. Examples include the surface learning approach, field dependence, convergent thinking, impulsivity, adaptation, analytic thinking, and the executive thinking style. Type III intellectual styles "manifest the characteristics of both Type I and II styles, depending on the stylistic demands of a specific task and on an individual's level of interest in the task" (Zhang & Sternberg, 2005, p. 36). Examples include the achieving learning approach, integrative thinking, and the anarchic thinking style. More details can be found in *Appendix 1*.

The Theory of Thinking Styles: Mental Self-Government

Among various models of styles, the model of thinking styles (Sternberg, 1988, 1997) (also known as the theory of mental self-government) is seen as the most general one that adopts all of the three traditions (cognition-centered, personality-centered, and activity-centered) (Zhang & Fan, 2011). Furthermore, it is also the starting point for the establishment of the threefold model of intellectual styles (Zhang & Sternberg, 2005). Therefore, it is believed that great progress in clarifying the major controversial issues in the field of intellectual styles can be made by studying thinking styles. For this reason, this book selects the theory of mental self-government as its theoretical foundation.

Taking "government management" as a metaphor, Sternberg (1988, 1997) pointed out that, just as the government adopts various ways to manage the society, people also have various ways to govern or manage their everyday activities. These ways can be seen as their thinking styles. Sternberg (1988, 1997) proposed 13 thinking styles that fall along five dimensions: functions, forms, levels, scopes, and leanings. The description of each thinking style is presented in Table 1.1.

Table 1.1: Descriptions of the 13 Thinking Styles in the Theory of Mental Self-Government

Dimension	Thinking Styles	Key Characteristics
Function	Legislative (I)	One prefers to work on tasks that require creative strategies; one prefers to choose one's own activities.
	Executive (II)	One prefers to work on tasks with clear instructions and structures; one prefers to implement tasks with established guidelines.
	Judicial (I)	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 (I)	One prefers to distribute attention to several tasks prioritized according to one's valuing of the tasks.
	Monarchic (II)	One prefers to work on tasks that allow complete focus on one thing at a time.
	Oligarchic (III)	One prefers to work on multiple tasks in the service of multiple objectives, without setting priorities.
	Anarchic (III)	One prefers to work on tasks that allow flexibility as to what, where, when, and how one works.
Level	Global (I)	One prefers to pay more attention to the overall picture of an issue and to abstract ideas.
	Local (II)	One prefers to work on tasks that require working with concrete details.
Scope	Internal (III)	One prefers to work on tasks that allow one to work as an independent unit.
	External (III)	One refers to work on tasks that allow for collaborative ventures with other people.
Leaning	Liberal (I)	One prefers to work on tasks that involve novelty and ambiguity.
	Conservative (II)	One prefers to work on tasks that allow one to adhere to the existing rules and procedures in performing tasks.

Note. Extracted from Zhang, 2003, p. 630; I = Type I thinking style; II = Type II thinking style; and III = Type III thinking style

Based on solid empirical evidence, Zhang (2002b) reconceptualized these 13 styles into three types, which later became the foundation for the threefold model of intellectual styles. Similarly, Type I thinking styles are

characterized by creativity-generating and high levels of cognitive complexity, including the legislative, judicial, hierarchical, global, and liberal styles. Type II thinking styles denote a norm-favoring tendency and low levels of cognitive complexity, including the executive, local, monarchic, and conservative styles. Type III thinking styles are circumstantially characterized by the features of either Type I styles or Type II styles, including the anarchic, oligarchic, internal, and external styles.

The theory of thinking styles has been selected to be the theoretical foundation of the present research because of the following five strengths. First and most importantly, the styles in this theory cover all three traditions (cognition-centered, personality-centered, and activity-centered) (Grigorenko & Sternberg, 1995) in the study of styles (Sternberg, 1997; Zhang & Sternberg, 2005, 2006). Second, thinking styles can be applied to both academic and non-academic settings (Sternberg, 1988, 1997). Third, the theory classifies styles based on five dimensions rather than merely the one bipolar dimension references in most of the other style theories (Zhang & Sternberg, 2005). Fourth, a profile of styles can be described for each individual according to the theory of thinking styles, rather than merely a delineation of a single style (Zhang & Sternberg, 2005). Fifth, as the foundation for the threefold model of intellectual styles, this theory of thinking styles provides a desirable window through which a deep understanding of the nature of intellectual styles can be achieved.

Controversial Issues in the Field of Styles

Despite of the extensive theories of styles, the idea of styles per se seems to intuitively appeal teachers, educators, and other practitioners. However, it is surprising that many assumptions have not been fully examined by empirical research. When teachers and other educational practitioners want to enhance students' performance by improving students' styles, they are confronted with three questions: 1) "Is it necessary to pay attention to styles?"; 2) "Can styles be cultivated?"; and 3) "Is it more worthwhile to cultivate some styles than others?". These three questions pertain to the three major controversial issues in the field of styles. The first one is about the uniqueness of styles compared with other salient constructs in individual psychology, such as personality. The second is whether styles can be socialized/changed. The third one is whether styles are value-laden.

Is it necessary to pay attention to styles?

The field of styles has been criticized for the lack of reliable and valid empirical evidence (Coffield, Moseley, Hall, & Ecclestone, 2004). Despite the fact that the empirical evidence has been accumulating in recent decades, there are still some obstacles when demonstrating the identity of styles in the broader context of education and psychology. One of them is distinguishing styles from other existing constructs of individual differences, such as personality (Zhang, 2013). The debate over the relationship between personality and styles began with the rise of style theories and is still ongoing. Grigorenko and Sternberg (1995) contended that style is the interface between intelligence and personality. Messick (1994) claimed that styles are manifestations of personality. Some scholars also argue that styles are subordinate constructs of personality (e.g., Furnham, Jackson, & Miller, 1999; Jackson & Lawty-Jones, 1996), while others insist that personality and styles are distinct constructs and that each one makes unique contributions to the understanding of individuality (e.g., Busato, Prins, Elshout, & Hamaker, 1999; Larson, Rottinghaus, & Borgen, 2002; Riding & Wigley, 1997; Zhang, 2003c, 2006b). However, some scholars are still skeptical about the uniqueness of styles beyond personality (e.g., Daniel von Wittich, 2011). The controversy of the relationship between personality and styles is partially due to the large number of style constructs without a consensus for their definition, and also due to the lack of rigorous studies that examine this issue. Empirically, the relationship between personality and styles can be systematically examined from three perspectives.

First, how do styles and personality overlap? With regard to this aspect, many studies have been undertaken to examine the correlations between personality and styles or the percentages of the variance in styles that can be explained by personality (e.g., Chamorro-Premuzic & Furnham, 2009; Kwang & Rodrigues, 2002; Larson et al., 2002; Zhang, 2006b). The extent of the overlap between personality and styles found in these studies vary depending on the different personality constructs and style models adopted. However, apart from several dimensions, such as the extraversion-introversion dimension in Myers and McCaulley's (1988) personality types (one model of intellectual styles), the correlations found between personality and styles are moderate at most (see Chapter 2 for more detail), which means that the overlap of personality and styles is limited.

Second, do styles have a unique explanatory power for individual outcomes beyond personality? In this research area, there are also a few studies that predicted a third variable for both personality and styles simultaneously

(e.g., Chamorro-Premuzic & Furnham, 2008; Chamorro-Premuzic, Furnham, & Lewis, 2007; Furnham, Crump, Batey, & Chamorro-Premuzic, 2009). Most of these studies indicated that intellectual styles had made unique contributions to individual outcomes beyond personality to different degrees (see Chapter 2). However, the style constructs and outcome variables covered in this part of research are limited; therefore, more research is needed to consolidate the findings on the unique contributions of styles beyond personality.

Third, another difference between styles and personality that scholars argue about is the question of malleability. Some scholars believe that styles are more changeable than personality (e.g., Chamorro-Premuzic & Furnham, 2009; Zhang & Sternberg, 2005). However, there is a lack of empirical studies that directly examine this argument.

In summary, as Armstrong and his colleagues (2012) pointed out, the clarification of the relationships between styles and other individual constructs, such as personality, would be beneficial to the advancement of the field of styles. However, the consensus about whether styles are distinct from personality has not been reached. Based on the above limitations, an examination of the relationship between styles and personality from the three perspectives (i.e., overlap, their unique contributions to other variables, and a comparison of the malleability) simultaneously is needed to help to draw a more compelling conclusion. Therefore, in the research introduced in this book, all of the three perspectives have been adopted so that the relationship between personality traits and thinking styles can be examined in a more comprehensive manner.

Can styles be cultivated?

Nature versus nurture is a classic controversy in the field of developmental psychology. It also seems to be an unavoidable issue when examining the development of styles, which has caused many heated debates. Can styles be socialized or modified? If so, how? If the answers to these questions can be provided with convincing evidence, it will undoubtedly greatly contribute to the optimization of people's style development, and thus enhancing their performances. In contrast, if styles are not malleable, efforts to study them would be pointless for educational practice (Zhang, 2013).

However, the issue of style socialization is still one of the most controversial in the field (Zhang & Sternberg, 2006). Some scholars consider styles to be a product of nature. For example, Riding and Rayner (1998) argue that

styles are inborn characteristics and relatively static. However, more scholars believe that styles are a joint function of nature and nurture, and that they can be socialized. For example, Sternberg (1997) pointed out that styles are malleable to some extent. Mandelman and Grigorenko (2012) also inferred from the effect of genes on intelligence and personality that its effect on styles is likely to be much less than 50%, which implies that the effect of socialization on styles might be even larger than that of genetic factors. The results from empirical studies have also been inconsistent. Nevertheless, after a careful review of previous empirical evidence, it was found that the view that styles can be socialized seems to be much stronger.

There are three main lines of research that have contributed to the socialization issue of styles. The first line examines style differences based on certain personal factors (e.g., age, gender, socioeconomic status, and personal experience, etc.). The second line explores the relationships between certain environmental factors (e.g., disciplines, culture, and work environment, etc.) and styles. The third line consists of longitudinal studies that mostly examine the effects of training (e.g., program, course, and therapy, etc.) on styles. The details of these studies are described below.

The first line: Style differences based on personal factors

The most widely examined socialization factors in the field of styles are **age** and **gender**. In Zhang and Sternberg's (2006) and Fer's (2012) reviews, although there are some inconsistent results from empirical studies, they found that most of them had concluded that age and gender play an important role in the development of styles. For example, Jonassen and Grabowski (1993) found the developing curve of field dependence/independence. Style differences based on other theoretical frameworks were also found to be a function of age, such as Biggs's (1978) learning approaches (e.g., Hilliard, 1995; Richardson, 1995; E. Sadler-Smith, 1996), Kirton's (1961,1976) adaption-innovation decision making and problem solving styles (e.g., Hayward & Everett, 1983; C. M. Jacobson, 1993), and Sternberg's (1988, 1997) thinking styles (e.g., Zhang, 1999, 2004d; Zhang & He, 2003). By the same token, gender differences in styles are also found in many kinds of styles (see the review in Zhang and Sternberg, 2006; Fer, 2012). Though there were different findings on the specific relationships between gender and particular styles, it was consistently proved that gender plays an important role in the development of styles. Zhang and Sternberg (2006) even argued that the inconsistent results on the gender differences can also be seen as evidence of socialization, because it reflects the influence of different cultures on gender stereotypes and socialization.

Another important socialization factor is **socioeconomic status**. For example, Cakan (2003) found that students achieved higher scores on field independence if their fathers have a higher education level. Studies on thinking styles also found that a higher socioeconomic status (SES) was positively related to higher cognitive complexity and more creative styles (Ho, 1998; Sternberg & Grigorenko, 1995; Tse, 2003; Yang & Lin, 2004; Zhang & Postiglione, 2001). Zhang and Sternberg (2006) explained that students from higher SES families have more opportunities to experience different issues and situations, and therefore their previous cognitive structures have more opportunities to be chanllenged, which could enable students to develop more complex and creative styles. This argument is supported by empirical studies, which directly examine the relationship between styles and personal experience.

The style studies on **personal experience** include three major aspects. First, style differences related to education or training have already been studied. For example, In Fer's (2012) review of the relationships between educational level and intellectual styles, she found that people with higher levels of education tended to have more creativity-generating styles (Type I) than their counterparts. Lee (2002) conducted a study among teachers and found differences in their thinking styles by comparing teachers with and without professional training. Second, in addition to learning experience, studies on non-academic settings and styles show that work experience plays an important role in the socialization of individuals' styles. Examples include the length of work experience (e.g., P. A. Holland, Bowskill, & Bailey, 1991; Sternberg & Grigorenko, 1995; Zhang & Sachs, 1997), work positions (e.g., R. T. Keller & Holland, 1978a; Zhang & Higgins, 2008), and job functions (e.g., Foxall, Payne, & Walters, 1992; Kirton & Pender, 1982).

All of these studies on the relationship between styles and personal experience indirectly reflect the role of environment in the socialization of styles. In addition, studies that infer the influence of environmental factors more directly have also been conducted.

The second line: Style differences based on environmental factors

The most widely studied factor that has been used to infer environmental effects on styles is people's **disciplines**. Student styles vary based on different majors (e.g., Bin, 2009; Fer, 2007; Jones, Reichard, & Mokhtari, 2003; Skogsberg & Clump, 2003; S. N. Smith & Miller, 2005; Tucker, 1999) or different specialized colleges (e.g., Barnhart, 2003; Mitchell &

Cahill, 2005); teachers' styles vary based on different academic disciplines or the subjects that they teach (e.g., Lam, 2000; Sternberg & Grigorenko, 1995; Zhang & Sachs, 1997); and people's styles who work in non-academic settings vary based on the type of jobs (e.g., Foxall et al., 1992; Hommerding, 2003; Kaufman, 2001; Kirton & Pender, 1982). For example, students majoring in psychology were found to use the deep learning approach more often than those majoring in biology (Skogsberg & Clump, 2003). Zhang and Sachs (1997) found that teachers who taught science and technology tended to use the global and legislative styles more often than those who taught social sciences and humanities. In addition, Kaufman (2001) also found significant style differences between writers and journalists. Zhang and Sternberg (2005, 2006) believe that these findings support the fact that different environments shape and facilitate the development of different styles. However, besides the environmental effect, it has to be admitted that there is another alternative explaination for these style differences based on disciplines, which is that people tend to choose the disciplines that are in line with their style disposition. Torbit's (1981) study provided further evidence for the former argument. He found that, although students who wanted to be counselors had more divergent learning styles, this tendency became stronger after they entered the counseling discipline. This suggests that the role of environment in shaping people's styles cannot be overlooked.

Furthermore, the style studies on some of the environments that people choose less voluntarily than disciplines (e.g., school bands and residential locations) provided more convincing envidence on the socialization effect of environment on styles. For example, the style differences found between students from different bands of secondary schools (Cheung, 2002) and students from different types of universities (Fer, 2007) implied the role of **school culture** in student development of styles. On a macro level, the styles of people from different residential locations were also compared. For instance, style differences have been found between rural and urban regions (e.g., Verma, 2001; Wu & Zhang, 1999), between different cities (Zhang & Postiglione, 2005), and different countries or nationalities (e.g., Bagley & Mallick, 1998; Foxall, 1990; N. F. Skinner, Hutchinson, Lukenda, Drake, & Boucher, 2003; Tang, 2004; Volet, Renshaw, & Tietzel, 1994; You & Jia, 2008). For example, Skinner and his colleagues (2003) showed that Canadian undergraduates seem to be more adaptive than their American and British peers when Kirton's (1961, 1976) adaption-innovation styles were examined. Similarily, significant differences in learning approaches were also found between Chinese and American pre-service teachers (You & Jia, 2008). Tang's (2004) study also revealed that Chinese Canadians had higher

scores in the legislative, executive, local, and liberal thinking styles than people in Hong Kong. All of these studies supported the important role of **culture** in the socialization of people's intellectual styles.

However, the studies examining environmental effect based on the above factors (e.g., disciplines, schools, and countries) are still providing relatively indirect envidence because they do not reveal what specific features or dimensions of environments were related to the development of styles. Recently, more studies seem to take a much closer look at the role of environmental factors in the socialization of styles, as they directly examine specific features in environments and their roles in the development of specific intellectual styles.

In academic settings, most studies explore the relationship between specific dimensions of **learning environments** and learning approaches. The type of assessment is one of the most examined dimensions in learning environment (e.g., Gijbels & Dochy, 2006; Gordon & Debus, 2002; Gulikers, Kester, Kirschner, & Bastiaens, 2008; Seddon, 2008; Segers, Gijbels, & Thurlings, 2008; S. N. Smith & Miller, 2005; Tian, 2007). However, the results are not consistent, although researchers all predicted that the deep learning approach would be improved by the adopted assessements (see Chapter 3 for more details). Some scholars argue that it is the way that assessment is implemented during students' learning process rather than how it is designed that influences the development of different learning approaches (Segers et al., 2008). Besides the type of assessment, the varying nature of learning environments, such as constructivist, cooperative, problem-based, and action learning based, has also been examined (e.g., Gijbels, Segers, & Struyf, 2008; Groves, 2005; Klinger, 2006; McParland, Noble, & Livingston, 2004; K. Wilson & Fowler, 2005). The results from these studies are as complicated as the ones found in the studies of the relationships between learning approaches and assessments. Some of these studies found that students' learning approaches became deeper, which met the researchers' expectations (e.g., K. Wilson & Fowler, 2005), while some of them found that a more constructivist or problem-based environment led to a more surface learning approach, which was contrary to their predictions (e.g., Gijbels et al., 2008; Groves, 2005) (see Chapter 3 for more details). However, regardless of the different directions of style change in these studies, it has to be admitted that learning approaches can be modified by different learning environments. More details of the empirical research on the relationships between learning environments and intellectual styles can be found in Chapter 3.

Besides learning environments, a few features in **work environments** have also been found to be related to one's development of thinking styles. For example, the degrees of freedom teachers perceived in their work environments have been found to be associated with their thinking styles (Zhang & Sternberg, 2002). Lee's (2002) study on kindergarten teachers also confirmed the role of perceptions of work environment in teachers' development of styles. There is less style research on family settings than work enviroments. For example, in terms of thinking styles, there is only one study relevant to the family environment. Zhang's (2003a) study found that parents and students' thinking styles are significantly related. However, to what extent the socialization effect or genetic effect contribute to this relationship needs to be further explored. Therefore, more style studies in a family environment are needed to deepen the understanding of styles' socialization process.

The third line: Longitudinal studies on style malleability

In fact, the most direct and most convincing pathway to examine the issue of style malleability is via a longitudinal study. However, there has been limited attention paid to this type of study.

Among the existing longitudinal studies on styles, two types can be identified. The first type is to examine style differences based entirely on the passage of time, which means that the researchers examine **the natural changes in styles over a certain period of time**. For example, Wilding and Andrews (2006) followed undergraduate students for one year and found that they adopted more surface learning approaches after this time. A ten-year qualitative study on a family (Helwig & Myrin, 1997) also showed that Holland's personality types can be changed as a function of certain familial movement and development. Volet and his colleagues (1994) found that South-east Asian students' learning approaches became similar to Australian students after one semester's study in Australia.

The second type of longitudinal studies examines **style changes after certain interventions** (e.g., programs, courses, training, and therapies). In terms of learning approaches, most longitudinal studies are related to the programs or courses implemented in schools and universities, which were intended to promote the deep learning approach (e.g., Baeten, Dochy, & Struyven, 2008; Balasooriya, Hughes, & Toohey, 2009; Gijbels et al., 2008; Groves, 2005; McParland et al., 2004). Interestingly, many of these studies found that students did not become more deep-oriented as expected (e.g., McParland et al., 2004), and some studies even showed they became more

surface-oriented (e.g., Baeten et al., 2008; Gijbels et al., 2008; Groves, 2005). These unexpected results might be attributable to the way in which these programs and courses were actualized in practice. Despite the inconsistent results, these studies supported the idea that learning approaches can be modified. The longitudinal studies that use other style inventories are more various in terms of their types of interventions. Taking research on field dependence/independence, for example, studies showed that both yoga and meditation could enhance individuals' field independence (Dillbeck, Assimakis, Raimondi, & Orme-Johnson, 1986; Rani & Rao, 2000; Sridevi & Rao, 2003; Sridevi, Sitamma, & Rao, 1995). Moreover, training relevant to spatial tasks, formal operations, coping with stress, and even chess instruction were also proved to lead to more independent styles (Collings, 1985; Lapidus, Shin, & Hutton, 2001; J. P. Smith & Cage, 2000; Stericker & LeVesconte, 1982). O'Leary, Donovan, and Kasner's (1975) study even found that treatment for alcoholics improved the participants' scores on field independence. Besides, as the Matching Familiar Figures Test for reflective-impulsive styles was frequently used as a criterion of attention-deficit hyperactivity disorder and some other psychiatric and cognitive diseases during 1970s and 1980s, abundant studies showed that some therapies or treatments can help patients to be less impulsive (e.g., Brown, 1980, 1986; N. J. Cohen, 1981; Feindler, Ecton, Kingsley, & Dubey, 1986; Holmes, 1981; Kendall & Finch, 1978).

In summary, the research findings identified in the literature so far have provided more support for the argument that styles can be socialized, but they are still not strong enough to provide specific suggestions in practice because many research gaps remain. First, there are not many studies that directly explore what specific features or dimensions of environments are related to the development of styles. Most of the studies simply compared the styles of students from different majors, schools, hometowns, and cultures. Second, even among the limited studies that directly explore specific features or dimensions of environments, the results are still not very consistent, which indicates a need to examine them more closely and carefully in the future. Third, another important socialization setting, the family environment, seems to have been ignored compared with the school and work environments. Fourth, there are also a limited number of studies that that examine different environmental and personal factors simultaneously to compare the extent of these socialization factors' influence. Fifth, though longitudinal studies can be seen as a very effective way to examine the issue of style malleability, only some style constructs have been examined using this method. In other words, longitudinal studies are still sparse with regard to some other style constructs, such as thinking