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Is There a Developmental Slump in Creativity in China? The Relationship Between Organizational Climate and Creativity Development in Chinese Adolescents

ABSTRACT

The major objectives of this study were to determine the characteristics of creativity development of Chinese children, the creative organizational climate of Chinese schools, and the relations among them. The results provided evidence that the creativity scores of children in elementary school were significantly higher than those of children in middle school. The teachers' evaluation of the creative organizational climate of the elementary school was significantly higher than that of the middle school. When the two variables were analyzed together, both the creative organizational climate of schools and the creative thinking development of children decreased during the children's development. Moreover, the creativity and climate scores were highly correlated, and the results from a path analysis suggested that a school's creative organizational climate has a significant impact on all seven dimensions of creativity measured in this study.

Keywords: creative organizational climate, creativity development, the Beijing test of creative thinking.

Research on children's creativity development shows a common set of general trends: Creativity rises steadily from around grade 1 to grade 3, with a sharp decrease in grades 3 and 4 — the so-called "fourth grade slump" (Torrance, 1967) — and some recovery in grades 5 and 6. After another drop in grades 6 and 7, creativity again rises steadily through high school.

This trend was first established in the 1950s, with the development and use of perhaps the best-known test of general creativity and divergent thinking, the Torrance Test of Creative Thinking (TTCT, Torrance, 1990, 1998, 2008; see Plucker & Makel, 2010). This pencil-and-paper test, which scores learners' divergent thinking skills, focuses on fluency, flexibility, originality, and elaboration (Cramond,

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Matthews-Morgan, Bandalos & Zuo, 2005; Torrance, 1988). The Union College Character Research Project (Ligon, 1957, cited in Torrance, 1962) reported complementary findings concerning age-level creativity, and several longitudinal studies designed to help re-norm the TTCT have further underscored its validity and reliability in predicting learners' creativity (Kim, 2006; Plucker, 1999). Further, re-analyses of the TTCT provide evidence of the value of this test as a strong predictor of adult creative productivity (Plucker, 1999) and as a measure for identifying gifted learners (Kim, 2006).

None of these foundational studies, however, have thoroughly considered the relationship between children's creativity development and the effect of school climate on creativity. Certainly, a great deal of research in education, psychology, sociology, and business has focused on the role of organizational climate in fostering or inhibiting creativity, but this work is generally reported separately from work focusing on creativity development in children. The present study builds on both fields of research by examining the relationship between the creative organizational climate of schools and the creativity development of children between the ages of 10 and 16. Our findings suggest that when these factors are considered together, creativity development is a much more complicated affair than past studies on divergent thinking suggest. In fact, our results suggest that Chinese children's divergent thinking scores *do not increase* between the ages of 10 and 16, and that while organizational climate plays a strong role in influencing creativity development in children at this age, Chinese schools that serve adolescent learners also evince a sort of "slump" in creativity. Further, our findings suggest a creativity "slump" in Chinese students similar to the American "fourth grade slump"—but much later, between 14 and 16 years of age.

RESEARCH ON CREATIVITY DEVELOPMENT OF CHILDREN

One of the oldest tensions in developmental theory is that between theories claiming that development is a process of passive transmission to the child (either from the environment or from adult instruction) and those who theorize that development is an active process in which the child transforms information from the external world. Transformationist theories view development as a creative process (Lawrence & Valsiner, 1993). Both Piaget and Vygotsky view development as some form of transformation. Piaget called his theory "constructivist," emphasizing that the child *constructs* rather than discovers new ideas. Moreover, according to Piaget the structure of each stage determines the structure of the following stage (Gruber & Vonèche, 1977).

However, Vygotsky conceived of developmental and creative processes as internalization or appropriation of cultural tools and social interaction. Moran and John-Steiner (2005) found that what is usually referred to as creativity in Western psychology involves what Vygotsky and his followers refer to as *externalization*—the construction and synthesis of emotion-based meaning and cognitive symbols. When these meanings and symbols are expressed they are embodied in cultural artifacts—creative products—that endure over time to be used by future generations.

The dynamic constructions that result from externalization are materialized meanings, composed of shared ideas, beliefs, knowledge, emotions, and culture. Just from this meaning, Vygotsky thought that the two social processes, internalization and externalization, and the two symbol-based forms, personality and culture, are in dialectical tension with each other. This tension provides fertile ground for the growth of new ideas and creative products (Sawyer, 2005a,b, p. 63). So this internal–external movement becomes cyclical, connecting past to future, and the results of these processes over time contribute to a community's history and culture. Creativity and development, then, are interdependent.

Vygotsky paid more attention to the context of the outgrowth of creativity and he thought that children first learn to create, manipulate, and give meaning to signs and symbols through play. Play also allows them to tease out relationships, try on and practice different roles, and exercise their growing capabilities (cited from Moran & John-Steiner, 2005). Other researchers also support Vygotsky's notion that play is associated with later creativity, especially with divergent thinking (Russ, Robins & Christiano, 1999). So a life environment of a child with enough opportunities to play seems to be necessary for the creativity development of a child. On one hand, children should have time and freedom to play, and on the other hand, they should have place and atmosphere to play.

As Sawyer et al. (2005a) outline in their book, the connections between creativity and development are rarely studied, because the fields of creativity research and developmental psychology research have proceeded independently and have different research foci. For example, studies on children or with a developmental focus are rarely published in the *Creative Research Journal*, and the biggest academic conferences on child development — e.g., the 1999 and 2001 Society for Research in Child Development (SRCD) meetings — included only a handful of papers about creativity (Sawyer et al., 2005). The present study focuses on the connections between creativity and development, specifically, creativity development of children and its influences of creative organizational climate of school.

RESEARCH ON CREATIVITY DEVELOPMENT

As noted above, the most prominent and oft-used test of divergent thinking is the Torrance Test of Creative Thinking (Kaufman, Plucker & Baer, 2008). In addition to this test's role in establishing a general upward trend (with the exception of the "fourth-grade slump") in creativity development, this test set the groundwork both for research considering qualitative differences in creativity development based on race, gender, and similar demographics, and for research that extended notions of general creativity into specific domains.

The Union College Character Research Project (Ligon, 1957, cited in Torrance, 1962), in its focus on studying and supporting character development, explored shifts in creative activity throughout childhood. Ligon notes that between the ages of 6 and 8 the creative imagination of the child takes a turn toward realism, to the extent that the child tries to reproduce details even in play. The child between 8 and 10 is increasingly able to use a variety of skills in being creative and can discover

new ways to use these abilities creatively. Between ages 10 and 12, children's activity focuses on exploration and tends to split along gender lines, girls preferring to explore in books and in pretend play and boys through firsthand experiences. Children at this age become less restless and can read or think for long periods, and artistic and musical aptitudes develop rapidly at this time. Children between 12 and 14 begin to be concerned with the activities of the moment and rarely plan for the future; during this stage, gifted children may produce high level performance in imaginative, artistic, musical, and mechanical fields. Children between 14 and 16 engage in high levels of imaginative activity and begin to focus on vocational or career concerns. From 16 to 18, children begin to develop the ability to channel emotional energy into creative activity; at this stage, aesthetic interests and skills should be encouraged.

Hu and his colleagues (Hu, 2001), in their comparative study of English and Chinese adolescents, found that age differences in adolescents' scientific creativity are significant, and with a tendency to increase, but with a decrease at 14; and the key periods for the rapid development of adolescents' scientific creativity are from 11 to 13 and from 14 to 16 years old. They also found evidence of marked differences in scientific creativity between Chinese and English adolescents, suggesting that traditional Western research on children's creativity may not generalize to Asian settings.

CREATIVE ORGANIZATIONAL CLIMATE

The classroom environment has been identified as a likely influence on students' creative development. The social psychological perspective focuses on creativity as an individual behavior influenced by others. Many studies have investigated how others, in the context of social situations, can affect creative performance by affecting motivation. In the componential model of creativity (Amabile, 1983, 1996), task motivation is one of the three major components of creativity, along with domain-relevant skills and creativity-relevant processes. Amabile (1993) proposed that individuals are intrinsically motivated when they seek enjoyment, interest, satisfaction of curiosity, self-expression, or personal challenge in their work. Tighe, Picariello and Amabile (2003) also demonstrated that teachers' attitudes, perceptions, beliefs, and behaviors can have an important influence on children's intrinsic motivation and creativity. The teacher can serve as an important model of intrinsic motivation. The students of teachers who believe in the importance of student autonomy tend to be curious, prefer challenging work, and desire to master work independently. When children perceive that their teachers have relatively high internal motivation toward work, the children themselves are more intrinsically motivated and perceive themselves as more competent and more creative. Furthermore, when children perceive greater warmth from their teachers, the children appear to be more intrinsically motivated and more creative than children who do not perceive their teacher to be warm. In addition, researchers found some important personality traits of teachers whose students showed higher creative expression: interested in children, satisfied, enthusiastic, courteous, and professional (Tighe et al., 2003).

Many subjective and objective variables can influence teachers' motivations, attitudes, perceptions, beliefs, and behaviors. Because generally teachers spend a great deal of time in their schools or own departments and they have many interactions with their administrators, colleagues, and other workers, the variable of organizational climate could be a significant one. Especially the creative organizational climate could be a core variable that can influence teachers' mental situation and behaviors, and then influence the creativity development of their students.

Climate has been defined in different ways by different investigators (Rousseau, 1988). Climate is commonly held to be reflected in peoples' perceptions of, or beliefs about, environmental attributes shaping expectations about outcomes, contingencies, requirements, and interactions in the work environment (James, James & Ashe, 1990; Parker et al., 2003). Climate is also, however, a domain-referenced phenomenon, as Hunter, Bedell and Mumford (2007) explain in discussing typical questions targeting employees' perceptions of organizational climate:

> [These questions] ask whether "employees feel free to express their ideas to bosses" or whether "people are not afraid to take risks around here." As indicated by these questions, climate is held to be a domain referenced phenomenon (e.g., climate for creativity, climate for service) in which multiple variables, or dimensions, act to shape performance in the domain under consideration. (p. 70)

Several theoretical frames have been developed to assess climate variables. Amabile and Conti (1999) developed a measure they called KEYS to Creativity and Innovation; KEYS is an instrument to assess the work environment for creativity, together with several other variables, including perceived uncertainty and chaos, job satisfaction, morale, and feelings. Six of the ten KEYS scales—organizational encouragement, supervisory encouragement, work group support, sufficient resources, challenging work, and freedom—are hypothesized to encourage creativity; two scales, Organizational Impediments and Workload Pressure, were hypothesized to relate negatively to creativity, and two criterion scales assess perception of the organization's actual creativity and productivity.

A research group at the Frankfurt University (Preiser, 2007) developed questionnaires in order to assess the quality of the learning and working environment in various organizations, such as kindergartens, schools, businesses, and administrations: KIK (Kreativitäts- und Innovationsfreundliches Klima, or Creative and Innovative Climate). These questionnaires focused on four main aspects concerning organizational support for creativity: (a) activation of curiosity, thinking, and action through stimulating learning and working environments, (b) goal-oriented and intrinsic motivating settings, (c) an open and trusting atmosphere, and (d) fostering personal freedom and nonconformity (Preiser, 2006). Other research groups in Germany obtained similar results concerning the relevance of leadership and atmosphere for innovative processes: Perceived press for change, expected changeability of the work processes, and professional stimulation proved to enhance innovations (Krause, 2004).

Chiou (2006) developed a Creative Organizational Climate Inventory (COCI) to assess the degree of organizational climates that may facilitate or inhibit employee's creativity. He found that there were seven main categories/factors of influencing the organizational creativity, including "organizational idea," "working style," "resource availability," "teamwork operation," "leadership efficacy," "learning and progress," and "environmental atmosphere."

Mathisen and Einaren (2004) reviewed available instruments for measuring work environments conducive to creativity and innovation, and they concluded that the instruments reviewed demonstrated acceptable criterion validity, indicating that it is in fact meaningful to assess the work environment to predict the potential for creativity or innovation in organizations or groups. In a similar vein, Hunter et al. (2007) conducted a meta-analysis of 42 studies in which the relationships between climate dimensions, such as support and autonomy, and various indices of creative performance were examined. These climate dimensions were found to be effective predictors of creative performance across criteria, samples, and settings. It was found, moreover, that these dimensions were especially effective predictors of creative performance in turbulent, high-pressure, competitive environments.

THE PRESENT STUDY

The aim of the present study is to examine the relationship between the creative organizational climate of schools and the creativity development of children from 10 to 16 years old. Based on the reviews mentioned above, we hypothesize that: (a) students' creativity scores will increase from 10 to 16 years, and therefore, (b) the creativity scores of middle school students will be significantly higher than those in elementary school. We also hypothesize that (c) students' creativity scores and climate scores will have a significantly large correlation, and the school climate variable will have significant influence on the creativity of children.

METHOD

PARTICIPANTS

Researchers recruited 110 teachers (31 males, 76 females and 3 unidentified) and 562 students (193 females, 366 males and 3 unidentified) from one elementary school and one middle school in Jiangsu Province of China. The mean ages for the teachers and the students were 26.57 ($SD = 7.38$) and 12.81 ($SD = 1.72$), respectively. Participants included 331 students and 91 teachers from the elementary school and 231 students and 19 teachers from the middle school. By age, the participants included 34 10-year-olds, 111 11-year-olds, 160 12-year-olds, 69 13-year-olds, 86 14-year-olds, 63 15-year-olds, and 39 16-year-olds. The average class size was 56 students per class across both schools, with the largest class totaling 70 students. Participants were recruited on a voluntary basis, and forms were completed during class periods.

Of these teachers, 35 teach Chinese, 34 teach Math, 15 teach English, and 24 teach Science (the other 2 were unidentified). Regarding teaching experience, 27 teachers had 1 year of experience, 33 had 2 years of experience, 12 had been teaching for 3 years, 10 for 4 years, and 15 for five or more years. Regarding educational

background, 19 of the teachers held bachelor's degrees, 63 graduated from junior colleges of higher education, 22 finished their study in pedagogical secondary schools, and the educational backgrounds of the other 6 teachers were unidentified.

MATERIALS

Beijing Test of Creative Thinking (BTCT)

Given the lack of current Chinese national norms for the Torrance Test of Creative Thinking and the lack of a Chinese version of the TTCT, the Beijing Test of Creative Thinking (Appendix A) was created (Yi, 2008). Test administration takes about 20 minutes, and the BTCT has both verbal and figural forms. The BTCT produces seven scores related to divergent thinking: Verbal Fluency, Flexibility, and Originality and Figural Fluency, Flexibility, Originality and Elaboration. For each form, a scoring handbook was developed based on a norming sampling of 562 students.

The Cronbach α value based upon scores of 148 middle school students for the verbal subtest was .88 and for the figural was .81. Scores for 20 randomly-selected students were rated independently by four scorers. One was the main researcher, and the others were not associated with the research project. The reliability coefficients among the four sets of raters ranged from .88 to 1.00, providing evidence of inter-rater reliability.[1]

Creative Organizational Climate Inventory (COCI)

Creative organizational climate was measured by a 35-item Creative Organizational Climate Inventory administered to teachers in the two schools. COCI was developed by Chiou (2006) to assess the degree of organizational climate that may facilitate or inhibit employee's creativity (e.g., item 34: "Our school emphasizes the values of freedom, openness, innovation, and exploration"). Since the COCI was developed to assess creative organizational climate in the research and development departments in the business sector, we made small changes to adapt the items for school settings. The COCI is composed of seven subscales like mentioned above on a 7-point scale ranging from 1 (absolutely right) to 7 (absolutely wrong). Cronbach's α was .82 to .95 for the seven subscales. A series of examinations of scale validation was also done, indicating a relevant relationship with criterion measures.

RESULTS

DEMOGRAPHIC DIFFERENCES IN COCI SCORES OF TEACHERS

Initially, an ANOVA was conducted to examine the gender, age, teaching subject, school and teaching duration differences of teachers in creative organizational climate. Gender was taken as the covariate variable. Statistically and practically significant teaching duration differences were found, $F\ (4, 86) = 3.92$, $p < .01$, $\eta^2 = .16$, suggesting that the longer the teaching duration, the higher the teacher-reported creative organizational climate. Concretely, the COCI scores of the teachers who

[1] Verbal fluency, r = .99; verbal flexibility, r = .99; verbal originality, r = .98; figural fluency, r = 1.00; figural flexibility, r = .99; figural originality, r = .99; and figural elaboration = .88.

have 1–5 years of teaching duration were 3.84, 4.42, 4.76, 4.45 and 4.97, respectively. Moreover, a two-way school × teaching subject interaction appears to be significant, F (2, 86) = 4.99, $p < .05$, although associated with a small effect size ($\eta^2 = .05$). The results suggest that the school differences of COCI scores were affected by the different teaching subjects. In elementary school the teachers who teach foreign language gained the highest COCI scores (mean = 4.70), however, in middle school the highest COCI scores were obtained by science teachers (mean = 4.81). The science teachers' COCI scores of elementary school (mean = 4.42) were the lowest and the Chinese-teaching teachers' COCI scores of middle school (mean = 4.36) were the lowest.

DEMOGRAPHIC DIFFERENCES IN DIVERGENT THINKING SCORES OF STUDENTS

A MANOVA was conducted to test gender, age, and school differences in seven dimensions of two creative thinking tests. Significant school differences were found, F (7, 497) = 17.15, $p < .001$, with mean difference effect size estimates ranging from .2 to 1.8 (Figure 1 and Table 1). These results suggest that the elementary school students obtained significantly higher scores than the middle school students of middle school. There were also no statistically significant gender differences, F (7, 497) = .52, p = .82, $\eta^2 = .001$.

Concerning age differences, because there were seven age groups, a Post Hoc test (LSD) was used to check the age differences among different age groups. The results demonstrated that on five dimensions of creativity (verbal fluency, figural fluency, verbal flexibility, figural flexibility, and figural originality), the 10, 11, 12 and

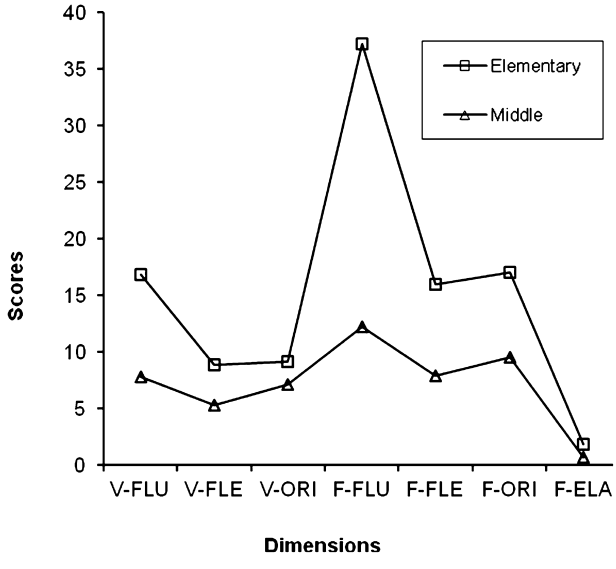

FIGURE 1. Divergent thinking scores of students by school level.

TABLE 1. DT and COCI Means and Standard Deviations by School Level

School Level	V-FLU	V-FLE	V-ORI	F-FLU	F-FLE	F-ORI	F-ELA	COC
Elementary	16.79 (13.54)	8.81 (4.82)	9.14 (10.95)	37.23 (16.62)	15.99 (5.46)	16.98 (12.51)	1.81 (3.46)	4.56 (.78)
Middle	7.76 (5.12)	5.30 (3.02)	7.15 (6.70)	12.23 (7.12)	7.84 (3.71)	9.52 (8.40)	.69 (1.41)	3.94 (.85)
g (95% CI)	.82 (.64–1.00)	.84 (.66–1.01)	.21 (.04–.38)	1.83 (1.63–2.03)	.77 (.58–.97)	.67 (.50–.85)	.40 (.22–.57)	.77 (.59–.94)

Note. V-FLU = the dimension of Fluency of verbal creativity; V-FLE = the dimension of Flexibility of verbal creativity; V-ORI = the dimension of Originality of verbal creativity; F-FLU = the dimension of Fluency of figural creativity; F-FLE = the dimension of Flexibility of figural creativity; F-ORI = the dimension of Originality of figural creativity; F-ELA = the dimension of Elaboration of figural creativity; COC = creative organizational climate. *g* = Hedges' bias-corrected effect size estimate for mean differences, using the pooled standard deviation. The same abbreviations are used in all subsequent figures and tables.

13 year-old students obtained significantly higher scores than the 14, 15 and 16 year-old children. On verbal originality, 11 and 12 year-old students gained significantly higher scores than 13 and 14 year-old students. On figural elaboration, 10 and 11 year-old students gained significantly higher scores than 12–16 year-old students, and 13 year-old students gained significantly higher scores than 14–16 year-old students (see Figure 2 and Table 2).

TEACHER-RATED CREATIVE ORGANIZATIONAL CLIMATE AND STUDENTS' CREATIVE THINKING

An ANOVA was conducted to test school, gender, subject, age, and teaching experience differences of students in COCI. Only a significant school difference was found, $F\ (1, 103) = 5.25$, $p < .05$. It suggested that the COCI score of elementary school is significantly higher than that of the middle school, with a mean-difference effect size estimate of .77.

A teacher-reported COCI score was calculated for each age group of students (see Figure 3 and Table 2), and an ANOVA was conducted to examine age group differences. A significant age group difference was found, $F\ (6, 546) = 217.73$, $p < .001$, associated with a very large effect size estimate ($\eta^2 = .71$). Post hoc tests provide

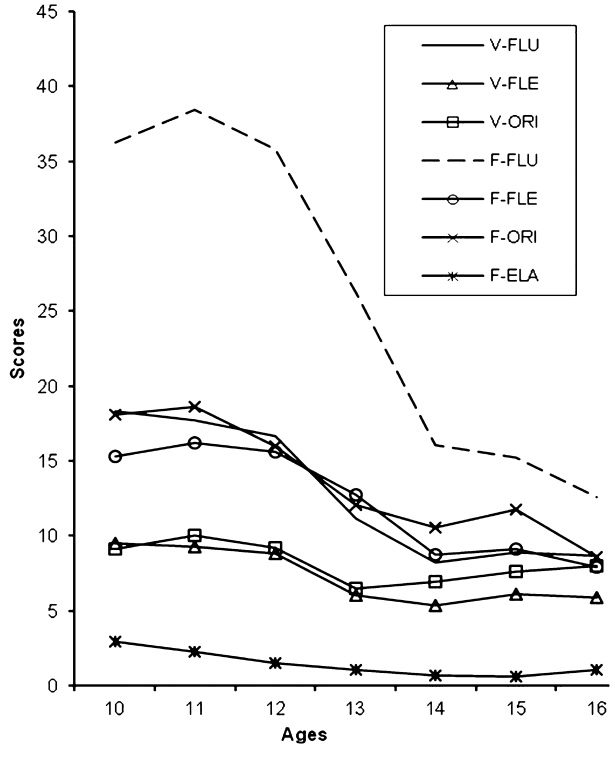

FIGURE 2. Divergent thinking scores of students by age.

TABLE 2. Means and Standard Deviations of Student DT and Teacher COCI Scores by Student Age

Age	10	11	12	13	14	15	16	Mean
V-FLU	18.29 (3.78)	17.74 (1.29)	16.68 (1.08)	11.13 (1.39)	8.25 (.70)	8.94 (.89)	8.71 (1.15)	13.41 (11.98)
V-FLE	9.53 (1.17)	9.25 (.46)	8.82 (.39)	6.07 (.48)	5.36 (.34)	6.10 (.43)	5.87 (.68)	7.50 (4.56)
V-ORI	9.12 (2.81)	10.07 (1.05)	9.19 (.91)	6.46 (.96)	6.98 (.63)	7.65 (.98)	7.97 (1.51)	8.38 (9.63)
F-FLU	36.24 (4.13)	38.43 (1.61)	35.79 (1.37)	26.25 (2.13)	16.07 (1.47)	15.26 (1.49)	12.62 (1.56)	28.41 (18.46)
F-FLE	15.29 (1.22)	16.21 (.54)	15.62 (.45)	12.73 (.74)	8.73 (.52)	9.11 (.62)	7.95 (.75)	13.05 (6.22)
F-ORI	18.06 (3.48)	18.62 (1.31)	16.02 (.96)	12.05 (1.23)	10.54 (1.00)	11.76 (1.31)	8.59 (1.26)	14.30 (11.63)
F-ELA	2.94 (1.24)	2.29 (.41)	1.49 (.23)	1.10 (.27)	.71 (.15)	.61 (.15)	1.10 (.36)	1.45 (2.93)
COC	4.49 (.20)	4.55 (.06)	4.54 (.10)	4.35 (.29)	4.02 (.20)	3.99 (.17)	3.96 (.10)	4.33 (.30)

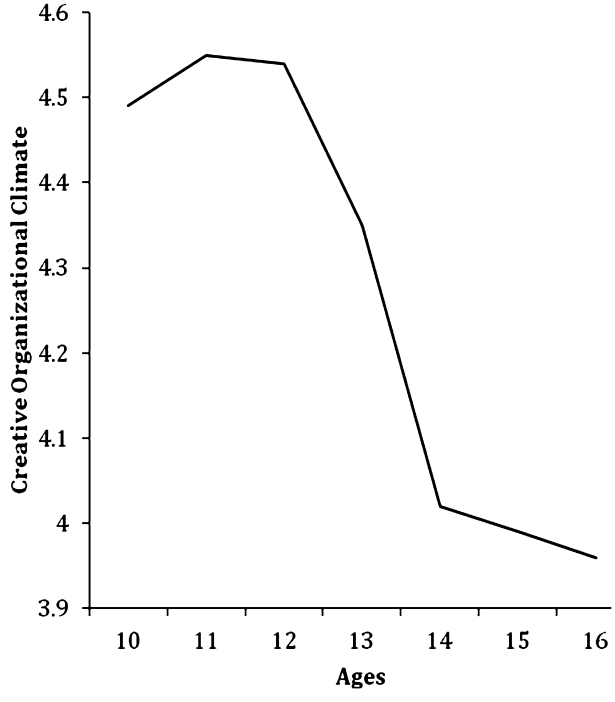

FIGURE 3. Teacher perceptions of creative organizational climate of their school by student age.

evidence that the COCI scores for teachers of the 10, 11 and 12 year-old groups were significantly higher than those for teachers of the 13, 14, 15 and 16 year-old groups, and the COCI scores for teachers of the 13 year-old group were significantly higher than those for teachers of the 14, 15, and 16 year-old groups, and the COCI score for teachers of the 14 year-old group was also significantly higher than that for teachers of the 16 year-old group. The whole trend was that the older the students become, the lower the level of teacher-rated creative organizational climate of school.

The intercorrelations among the seven dimensions of creative thinking and COCI suggest that there were significant correlations not only among seven creative thinking subscales, but also between creative organizational climate and creative thinking (see Appendix B). First, the results imply that general creativity has a stable consistency and structure. Second, the results suggest that the higher the creative organizational climate of a school, the more creative the students in the school.

Path analysis was used to examine the relationships between the creative organizational climate (COC) and the seven dimensions of creative thinking (Figure 4). The path coefficient from COC to Verbal Fluency was .32 ($p < .001$). The path coefficient from COC to Verbal Flexibility was .34 ($p < .001$), and the coefficient COC to Verbal Originality was .08 ($p < .05$). The path coefficient from COC to Figural Fluency was .66 ($p < .001$), to Figural Flexibility was .64 ($p < .001$), and to Figural

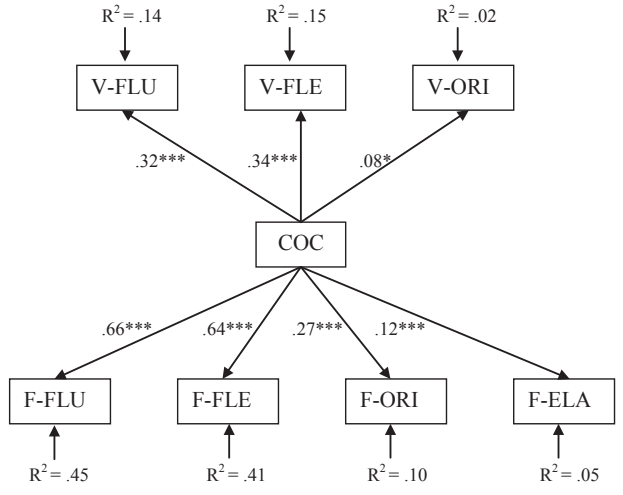

FIGURE 4. Path analysis results for divergent thinking and creative organizational climate scores. Note: *p < .05; **p < .01; ***p < .001.

Originality was .27 (p < .001), all of which are roughly two or more times larger in magnitude than the corresponding coefficients for verbal scores. The coefficient from COC to Figural Elaboration was .12 (p < .001).

All of the effects were calculated by direct effect of COC on divergent thinking. In general, about 14%, 15% and 2% variance of Verbal Fluency, Flexibility and Originality can be explained by the COC, F (3, 527) = 28.97, p < .001, F (3, 527) = 30.59, p < .001 and F (3, 527) = 3.07, p < .05, respectively. In sharp contrast, COC explains 45%, 41%, 10%, and 5% of the variance of Figural Fluency, Flexibility, Originality, and Elaboration scores, F (3, 540) = 143.43, p < .001, F (3, 540) = 123.71, p < .001, F (3, 540) = 19.98, p < .001, and F (3, 540) = 9.63, p < .001, respectively.

DISCUSSION

Our study focused on exploring the characteristics of creativity development of Chinese adolescents from 10 to 16 years of age, the creative organizational climate of their schools, and the relationship between these two variables.

As noted above, established research on creativity development in children suggests that creativity increases fairly steadily, with the exception of a fourth grade slump and a slight dip in grades 6–7. Our research, however, found a very different pattern of scores for Chinese students, with a general decline from 10 to 16 years of age that is marked by large decreases from ages 12 to 14. Only a few aspects of divergent thinking appeared to show any increase after the age of 14, and these increases were generally quite small. The results, then, do not appear to support the idea of a fourth grade slump followed by increasing scores through adolescence. In the present study, the slump was found from 12 to 14 years of age—somewhat later

than the American students—and no "rebound effect" was observed. However, it should be mentioned that a gap of more than 40 years separates Torrance's study from the present research.

That said, our results stand in contrast to more recent work with Chinese students (Zhou, Zha & Shi, 1995) as well, in which seventh graders' technical creativity scores were significantly higher than those of fifth grade children, with the scores increasing across 3 years in the longitudinal study. The results of the present study compare more favorably with those of Hu, Adey, Shen and Lin (2004) in their examination of children's scientific creativity, in which they concluded that the key periods for rapid development of adolescents' scientific creativity are from 11 to 13 and 14 to 16 years of age. The contrasting results across the three studies are probably due, at least in part, to the use of different methodologies; longitudinal research following the same students over multiple years is needed to replicate the trends in these recent studies.

In the present study, we found little evidence of gender differences on the seven dimensions of the BTCT, which stands in sharp contrast to the work of Hu et al. (2004), who found that British females' scientific creativity was higher than for males, and Chinese males' scientific creativity was higher than for females, although the differences were generally not large. In a similar vein, Zhou et al. (1995) found evidence that both Chinese and German females obtained higher creativity scores than males, with only highly gifted Chinese males producing higher scores than females.

We were surprised that the divergent thinking scores of middle school students were significantly lower than those of elementary school students, which does not support the findings of Torrance (1962) or Ligon (1957, cited in Torrance, 1962). Torrance (1962) mentioned in his study that at the beginning of high school, the decline of creativity expression may be the result of social pressures inherent in the transition to a new school. It is reasonable to expect that those pressures have moved into earlier grades, which may be due in part to the emphasis in China on college entrance exams taken during high school, which raises expectations for academic performance in middle school.

The creative organizational climate of schools was examined as a potential influence on the creativity development of children. We found differences in teachers' perception of the school climate based on teaching duration; this suggested that the more teaching experience teachers have, the more effectively they can perceive—and perhaps foster—creative organizational climate. Those teachers who have more teaching experience may have more freedom (and more confidence) to design their classrooms, lessons, or teaching styles in ways that foster creative expression. Although teachers' transition from novice to expert is neither simple nor automatic, each has the opportunity to grow in their professional field from novice to proficient, from proficient to expert teacher. Sternberg and Horvath (1995) developed a prototype model of expert teaching, arguing that the prototypical expert is knowledgeable and more effective than a novice, and that experts are more likely to arrive at creative solutions to problems—solutions that are both novel and appropriate. Although the expert teachers do their jobs in the same work place as a novice, they may have a better perception of organizational climate than do novice teachers.

The significant effect of the two-way school × teaching subject interaction suggested that the foreign language teachers of elementary school and the science teachers of middle school likely have greater freedom to organize their work than other teachers in respective schools. On the contrary, science teachers in the elementary school and Chinese teachers in the middle school probably have less freedom to do their teaching than other teachers. The reason could be the characteristics of the subjects, teaching style, and interaction experiences. More study is needed on this topic.

Finally, we hypothesized that students' divergent thinking scores and their teachers' creativity climate evaluations would be highly correlated. The scores of the creative organizational climate of the elementary school were significantly higher than those of the middle school. It is likely that the students were reacting to the testing and teaching pressure of middle school versus that of the elementary school, since as noted above middle school students spend much of their time focusing on tasks and activities unrelated to creativity, but related instead to homework and book knowledge. It is also likely that middle school teachers have to pay more attention to students' test scores than their creativity.

When the two variables were analyzed together, we could see that both the creative organizational climate of school and the creative thinking development of children decreased during the adolescent's development. The creativity and climate scores have a significantly large correlation and the school climate variable showed significant influences on creativity of children. Not surprisingly, the path analysis results suggested that creative organizational climate of schools has a significant impact on all of the seven dimensions of the BTCT.

Of course, this is a correlational and not causal study, and inferences on the directionality of the climate-creativity relationship should be made cautiously. We suspect research will eventually find evidence of a reciprocal, mutually reinforcing relationship, much like that proposed by Barab and Plucker (2002) regarding the broader construct of talent.[2] But the results of this study suggest that there may be a "middle school slump" of creativity development for Chinese students from 10 to 16 years of age, due to a more academic, less creatively supportive environment in middle school compared to earlier grades. We would expect this slump to continue through high school due to the pressure associated with the college entrance examination.

Whereas Piaget explained mental schemas by documenting their emergence from individual-environment interaction, Vygotsky used sociological theory to propose that irreducible psychological wholes originate in collective life; he believed in the social origins of higher psychological processes, which were influenced by both Marx and by the Durkheimian school of French sociology (Sawyer, 2005a,b). As a kind of higher psychological process, creativity has both social and individual origins. The creative organizational climate of school appears to be a social contributor toward creativity development. The findings support the claims of Urban (2003) that the environmental conditions of various systems may discourage, inhibit, and suppress or nurture, stimulate, inspire, and cultivate creative processes. Environmental frames

[2] See Plucker and Barab (2005) for a more applied perspective.

influence children's development of creativity, actual creative processes, and finally the acceptance and appreciation of creative products. The creative organizational climate in the elementary schools encourages the children's creativity, but the climate in the middle schools probably inhibits the creativity of children. The results in the present study also support the findings of the meta-analysis by Hunter et al. (2007), which reviewed 42 studies in which the relationships between climate dimensions, such as support and autonomy, and various indices of creative performance were examined. These climate dimensions were found to be effective predictors of creative performance across criteria, samples, and settings.

Niu (2007) thought that with the pressure of the National College Entrance Exam (NCEE), Chinese students are subjected to the drill of preparing for various exams. In the shadow of the traditional educational testing systems and influences of western testing values, students must develop an ability to combat exam-related anxieties, and the endurance developed over years of exam preparation may help Chinese students excel in exams. However, an exam-driven, knowledge-based education may result in the sacrifice of independent intellectual inquiry and creative thinking (Niu & Sternberg, 2001, 2003). At the same time, the organizational climate of schools is likewise influenced by the pressure of preparing for the exams, and teachers have few opportunities to design other kinds of teaching methods or curricula to promote the creative climate in their classrooms. Our results provide some evidence in support of the fact that this struggle begins perhaps in middle school, or even in late elementary school, and the climate of school becomes more and more pressured and test-focused during the latter grades.

From the view of developmental science (e.g., Scheithauer, Niebank & Ittel, 2012), the individual history of each person determines the reaction style of that person to various environmental factors. The personal experiences become part of their continuously developing individuality, and this kind of individuality in turn determines how each person reacts even to stable situations each and every time. So, the climate of Chinese schools probably also promotes homogeneity of students and may diminish students' motivation or activities in everyday life to pursue their own interests rather than exam-related academic work. Because this kind of pressure is somewhat less pronounced in elementary school than in middle school, the creative organizational climate in elementary school may be stronger, and those students may have more motivation and time to pursue their own interests. But when these students begin middle school, the exam-related academic work increases, leading to a decrease in students' creativity. Sooner or later, they or the whole nation will pay the (creativity) price for the NCEE. Results suggest that interventions should promote the creative organizational climate of the school to increase students' creativity. Strategies for enhancing the creative organizational climate of school could be based on the knowledge about the seven dimensions of COCI (Chiou, 2006), that is, organizational ideas, working styles, resource availability, teamwork operation, leadership efficacy, learning and progress, and environmental atmosphere. So it can be imagined that, if we want to improve the creativity level of Chinese students, partly we should have a more creative organizational climate in schools, and before that the

NCEE-centered testing system must be changed and creativity-centered values—or, more to the point, a creativity-centered testing system—should be developed.

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APPENDIX A
BEIJING TEST OF CREATIVE THINKING
VERBAL FORM-UNUSUAL USES (SCOOP)

Many people use scoops only for eating. But scoops have thousands of interesting and unusual uses. In the space below, list as many interesting and unusual uses as you can think of. Do not limit yourself to any one size of scoop. You can use as many scoops as you like. Do not limit yourself to the uses you have seen or heard about; in 10 minutes, think about as many possible new uses as you can.

FIGURAL FORM (CROSS)

In 10 minutes see how many objects or pictures you can make from the crosses below and on the next pages. The crosses should be the main part of whatever you make. With pencil or crayon add lines to the crosses to complete your picture. You can place marks on the crosses or outside the crosses-wherever you want to in order to make your picture. Try to think of things that no one else will think of. Make as many different pictures or objects as you can and put as many ideas as you can in each one. Make them tell as complete and as interesting a story as you can.

APPENDIX B
INTERCORRELATIONS OF DT AND COCI SCORES

	V-FLU	V-FLE	V-ORI	F-FLU	F-FLE	F-ORI	F-ELA
V-FLE	.91	.74	.29	.93	.64	.41	.20
V-ORI	.86	.46	.30	.68	.23	.31	
F-FLU	.45	.49	.48	.30	.63		
F-FLE	.46	.45	.32	.66			
F-ORI	.51	.27	.10				
F-ELA	.33	.37					
COC	.37						

Note. For all correlations, $p < .01$.