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The Relationships between Creativity, Drawing Ability, and Visual/ Spatial Intelligence: A Study of Taiwan's Third-Grade Children

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The purpose of this study was to examine the relationships between the qualities of creativity, drawing ability, and visual/spatial intelligence of selected third-grade students in the Hsinchu area of Taiwan, Republic of China. The population for this study included approximately 11,653 third-grade students from 99 public elementary schools. Subjects were randomly selected from 16 out of 99 elementary schools. The *Milne-Kasen Story Pictures* (A Test for Creativity), the *Young Visual Artist's Checklist*, the *Portfolio Review Measurement*, the classroom teacher's nomination of *Milne-Kasen Visual/Spatial Intelligence Checklist* were given to 427 selected students. Data were processed, analyzed, and reported using descriptive and inferential statistics. The findings revealed that positive relationships exist between a child's creativity potential and self-image of artistic ability and local art educators' observations of students' artwork and classroom teachers' observations of student's art-related behaviors. There were significant differences in responses based upon the demographic factors of gender, community, age, and time of test taking. These findings should impact the delivery of art education to children at the elementary school level. In addition, it might influence the development of the art education curriculum in Taiwan.

Key words: creativity, drawing ability, visual/spatial intelligence, art education

Introduction

There has always been an uneasy relationship between the definitions of creativity and drawing ability. Researchers have been concerned about the early appearance of creative ability in young children and then the apparent decline in both interest and ability over the later elementary school years. The *Art of Children's Drawings* was a research project that examined the loss of aesthetic sensibility during the elementary school years (Rosenblatt & Winner, 1989). In Gardner's 1980 study of the significance of children's drawings, he argued that "the age of artistic expressiveness, or at least its original flowering, seemed at an end" sometime around age seven or eight (as cited in Baer, 1996, p. 927).

The implementation of the Gifted and Talented Children Act of 1978 in the United States greatly improved state and federal support for artistically talented students. Nevertheless, school leaders have been concerned about what might be done to help children develop their artistic abilities.

In the literature, theories have been developed in the areas of creativity, drawing ability, and visual/spatial intelligence (Torrance, 1970, 1988; Clark & Zimmerman, 1984; Gardner, 1983, 1994, 2006). One or two of these

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theories have been studied with elementary school students, mainly in western countries (Baer, 1996; Carroll & Howieson, 1991; Clark & Zimmerman, 1984). However, there have no studies that applied and examined the integration of all three theories for elementary school students. The main contribution of this paper is that it examines the relationships between creativity, drawing ability, and visual/spatial intelligence for elementary school students in the Hsinchu area of Taiwan.

In Taiwan, education has been emphasized strongly throughout history. For the majority of children, mainstream elementary school education is the first formal education that they receive. Art is one of the subjects that is emphasized by the government. Beginning in third grade and continuing through senior high school, talented art students can attend "talented" classes to get a head start in the highly competitive system (ROC Yearbook, 2000).

Beginning in 1995, the Ministry of Education undertook education reforms with a vision to realize the fundamental concepts of creativity, helping all students to fully express their ability in a new knowledge-based learning environment. In 1996, the central government of Taiwan proclaimed that diversity and innovation were to be the focus of modern education (ROC White Paper on Creative Education, 2004).

For the purpose of understanding the current art educational system operating in Taiwan's elementary schools, interviews with classroom teachers and local art educators were conducted. These experienced teachers and educators referred to the following conditions in Taiwan's elementary educational system:

1. In most schools, classroom teachers who often taught arts related subjects, such as art, music, dance, and physical education, desired an increased amount of expertise to improve their skills, rather than additional funding or time.

2. Many classroom teachers have seen creative children everyday in class; however, the classroom teachers do not always recognize them as creative: These creative children may be the quirky ones who never follow directions in class, the quiet ones who never speak up in class, or the day-dreaming ones who never pay attention in class.

3. Currently, private art lessons have become very popular for elementary school-age children. It has become more challenging to identify those who are artistically talented students when so many have had extra lessons.

4. Local art educators do understand and recognize children's creative potential and artistic ability when they review the children's artwork.

Research Questions

Research Question 1: What are the relationships between scores of third-grade students on the *Milne-Kasen Story Pictures* (A Test for Creativity), the *Young Visual Artist's Checklist*, the *Portfolio Review Measurement*, the classroom teacher's nomination of *Milne-Kasen Visual/ Spatial Intelligence Checklist*?

Research Question 2: What are the relationships between scores of third-grade students on the *Milne-Kasen Story Pictures* (A Test for Creativity) of fluency, flexibility, originality, elaboration, and self-image?

Research Question 3: What are the differences between scores of third-grade students on the *Milne-Kasen Story Pictures* (A Test for Creativity) based upon the selected demographic factors of gender, community, age, and time of test-taking?

Review of Selected Literature and Research

In *Effect of Expected Rewards on Children's Creativity*, Joussemet and Koestner (1999) wrote that "creativity is a highly valued behavior that is perceived to be rare" (p. 231). Milne (1972) believed that "creativity is a state of mine, and it is most widely expressed by very young children" (p. 11). These and other researchers have pointed out that creative children can be considered among our most valuable resources. These creative children provide interpretations through which crucial elements of the world can be intellectually expressed and understood.

Today, creativity is recognized as a very complex concept due to lack of agreement concerning the definition of terms, even among those individuals most often cited in a review of creativity (Davis, 1998; Gowan, 1972; Khatena, 1992; Roweton, 1973; Torda, 1970; Torrance, 1974, 1988). According to Davis (1998), "definitions sometimes are considered theories, and theories sometime are definitions." The following are some of the descriptions of creativity in

classic theoretical approaches and contemporary theories that have led to measures of creativity.

Theories of Creativity

In *The Structure of Intellect* (Guilford, 1950, 1967), Guilford focused his study of creativity upon divergent production abilities that expanded the theories of general mental ability from a concentration solely upon high intelligence to a multifaceted phenomenon. In the classic research work, *Creativity and Intelligence: Explorations with Gifted Students*, Getzels and Jackson found only a modest correlation between creativity and IQ (Getzels & Jackson, 1962). Following up on this study,

Carroll and Howieson (1991) investigated creativity and intelligence from the perspective of divergent production as being improved with training.

In 1968, Freeman, Butcher, and Christie concluded that there is no unified psychological theory of creativity. In addition, Davis (1998) suggested that terms such as imagination, ingenuity, innovation, intuition, invention, discovery, and originality were often interchangeable with creativity.

Gowan (1972) built upon the studies of Parnes, Osborn, and Guilford that emphasized creativity as a component of intellect. To him, creativity was cognitive, rational, and semantic. Creativity was a reaction to both personal potential and environmental influences relative to child development. The theories of Torrance emphasized that creativity is composed of originality, energy, and self-concept. Following studies by Maslow and Rogers, Gowan expressed disagreement with the theory of creativity as being synonymous with a high degree of mental health. On the other hand, Gowan believed creativity to be the source of artistic activity, unconsciousness, compensation and cultural energy (Khatena, 1992).

In Torrance's theory of creative thinking, he provided five norm-referenced components of fluency, originality, abstractness of titles, elaboration, and resistance to premature closure. In addition, Torrance attempted to measure creative thinking through a natural process and strong human needs (Khatena, 1992).

Today, researchers in medical and cognitive sciences have different beliefs on how complex the brain works in creative thinking. For example, Howard Gardner and his colleagues at Harvard University have viewed creativity as multiple intelligences which may include linguistic, logical-mathematical, visual/spatial, bodily kinesthetic, musical, interpersonal, intrapersonal, naturalist, spiritual, existential, and moral intelligence (Gardner, 1983, 1994, 2006).

By closely examining the giftedness' development in the "grue-bleen" task, Sternberg (2004) suggested that creative people were those who can think flexibly or who can easily communicate conceptual ideas back and forth. In addition, during the phase of sophisticated information processing in the brain, emotion and cognition were combined to form a complex relationship (Dai & Sternberg, 2004).

Measurements of Creativity

Since creativity involves very complex concepts, creativity-testing instruments are the reflection of the ambiguity and difficulties of all theories. Richert (1982) and others recommended the following selected tests and instruments for identifying students with high creative abilities: the *Torrance Test of Creative Thinking* (1966-1984), the sub-tests of the *Structure of the Intellect Learning Ability Test* (1975-1985), the Guilford's *Creativity test for Children* (1971-1976). Other related instruments recommended were the *Khatena-Torrance Creative Prescription Inventory* (1976), the Renaulli-Hartment *Scales for Rating the Behavioral Characteristics of Superior Students* (1976), and the *Biographical Inventory Form U* (1976-1978). It was also suggested that many other instruments could be useful tools when identifying and selected creative students.

Theories of Drawing Ability

Horowitz (1967) claimed that most children experience the stage of drawing ability in a developmental sequence. Moreover, Shatil (1995) suggested that children both in pre-school and elementary school utilize seven stages in the production of a complex composition. These stages are the motoric drawing, the circle, the square, the diagonal and the cross, the triangle, mounting of forms, and the game of forms.

Eng (1931) conducted a longitudinal study of children's

development drawing and pointed out that those children from approximately age four until age nine draw to a formula that she called "formalized drawing." Children use an image of their own earlier drawings and the previous memory of the subjects to make a start on the new drawing. Although Eng's theoretical approach has used "mentalistic concepts in an exploration of the role of cognitive development in children's drawings." Selfe (1983) argued that "Eng fails to substantiate her claims by a thorough analysis of evidence from research studies" (pp. 13-14).

Generally speaking, all psychoanalytical sources emphasize the essential relationship between children's drawings and cognitive development. Harris (1963) produced a more empiricical model and identified the three following major theoretical approaches to the field of children's drawing: (1) the empirical approach, (2) the holistic or gestalt approach, and (3) the emotional and expressive approach to drawing. Di Leo (1983) felt that the development of drawing as related to Piaget's stages of cognitive development had a different classification. These stages are (1) the Sensorimotor stage from approximate age zero to four, (2) the Preoperational stage from approximate age four to seven, (3) the Concrete Operations stage from approximate age seven to twelve, and (4) the Formal Operations stage from approximate age twelve and above.

In her recent work on artistic development research, *Patterns of Artistic Development in Children*, Milbrath (1998) reviewed three integrated models of drawing development. These models are (1) conceptual development, (2) the perceptual factor, and (3) production difficulties. In addition, Milbrath (1998) wrote that "individual differences in artistic development arise as a function of the different underlying contributions of conceptual, figurative, and sensory-motor processes during development" (p. 364). The message is clear; differences in the degree of coordination between the three integrated models appeared in children's drawing development. Therefore, children's talent in art will determine the complexity of their drawing.

Normal third-grade students are drawing at the realistic stage of art development. According to Piagetian cognitive development, these children have reached the stage of concrete operations (Papalia, Olds, & Feldman, 1999). In this stage, most children's drawing reflects the awareness of sexual characteristics and visual appearances. In addition, Golomb (1992) suggested that when third graders draw human figures, "the drawings display the symmetrically attached arms, an indication of children's reluctance to relinquish the frontal orientation" (p.72). Side-by-side arrangement, such as figures that stoop and kneel in the act of planting, may also demonstrate this spatial awareness of third graders (Golomb, 1992).

Measurements of Drawing Ability

There are many ways to measure children's drawing ability. Clark and Zimmerman (1984) have categorized all current procedures into three groups" (1) standardized tests, (2) informal instruments, and (3) non-test methods.

Cronbach (1969) defined standardized tests as measurements "in which the procedure, apparatus, and scoring have been fixed so that precisely the same test can be given at different times and places" (p. 22). Standardized tests include the *Clark's Drawing Abilities Test* (1989), *Silver Drawing Test* (1983), *Narrative Drawing Assessment and Visual Memory Assessment* (1982), *Non-Verbal Ability Test* (1979), and others. Informal instruments are portfolio reviews, local art tests, structured nominations, behavior checklists, self-interest and biographical inventories (Clark & Zimmerman, 1984).

Methodology

The purpose of this study was to examine the relationships between the qualities of creativity, drawing ability, and visual/spatial intelligence. Those who participated in this study were third-grade students who attended public schools in the Hsinchu area of Taiwanese, Republic of China. Participant selection was based on the results of the following measures; the *Milne-Kasen Story Pictures* (A Test for Creativity) test, the *Young Visual Artist's Checklist*, the *Portfolio Review Measurement*, and the classroom teacher's nomination of *Milne-Kasen Visual/Spatial Intelligence Checklist*. The *Milne-Kasen Story Pictures* test (A Test for Creativity) (Milne & Kasen, 1993), and the *Milne-Kasen Visual/Spatial Intelligence Checklist* (Milne & Kasen, adaptation of Armstrong, 1996) were both adapted with prior permission for use in examining the relationships between the qualities of

creativity, drawing ability, and visual/spatial intelligence. The participants' responses to *Milne-Kasen Story Pictures* test (A Test for Creativity) were scored to determine their creative skills in the subdivisions of fluency, flexibility, originality, elaboration and self-image.

Population and Sample

The subjects for this study included approximately 11,653 third-grade students from 99 public elementary schools in Hsinchu County and Hsinchu City, Taiwan, Republic of China.

In order to ensure that the sample size met the statistical needs of the study, the *Young Visual Artist's Checklist*, the *Portfolio Review Measurement*, and the classroom teacher's nomination of *Milne-Kasen Visual/ Spatial Intelligence Checklist* were given to the randomly selected third-grade students, approximately 427, in those 16 elementary schools before making the final selection of the participating students.

It was students who scored at either end of this continuum who were selected for inclusion in this study: those in the top 16% and those in the lower 16%. The final sample included approximately 134 third-grade students who attended public school in the Hsinchu area.

Data Collection

Due to the time constraint in the data collection, the 134 selected students were each assigned a number from a table of random numbers. In order to answer research question 3 regarding scores of third-grade students on the *Milne-Kasen Story Pictures* test (A Test for Creativity) based upon the selected factors at the time of test-taking, as well as to make the final test constancy, half of those in the top 16% and those in the lower 16 % selected students were placed in the morning group, and other half are in the afternoon group for administration of the *Milne-Kasen Story Pictures* test (A Test for Creativity).

Data Analysis

All eligible students who were selected completed the *Milne-Kasen Story Pictures* test (A Test for Creativity), and all of the selected students' test were coded with a ten-digit number which was then used in this data collection. After initial distribution of the test, the researcher no longer had knowledge of the identity of any students who completed the tests.

Descriptive statistics, including frequencies and percentages, were used to analyze and summarize the preliminary measures that included the *Young Visual Artist's Checklist*, the *Portfolio Review Measurement*, and the classroom teacher's nomination of *Milne-Kasen Visual/Spatial Intelligence Checklist* test. Both descriptive statistics and inferential statistics were used to analyze the data. The Pearson product moment correlation coefficient was adapted to analyze all research questions in order to study the nature of the liner relationship between variables in all reviews and checklists. Then, all data were compiled and described in tabular and narrative form. Although all measurement instruments were of American origin, all test results were scored with the consideration of Taiwan students' educational development and were under the supervision of Dr. Bruce Milne, the author of this creativity test.

Findings

Research Question 1: What are the relationships between the scores of third-grade students on the *Milne-Kasen Story Pictures* test (A Test for Creativity), the *Young Visual Artist's Checklist*, the *Portfolio Review Measurement*, and the classroom teacher's nomination based on the *Milne-Kasen Visual/Spatial Intelligence Checklist*?

Each component of the creativity test (*Milne-Kasen Story Pictures*) was significantly correlated with the *Young Visual Artist's Checklist*: fluency (r=.25, p=.005), flexibility (r=.38, p=.000), originality (r=.30, p=.001), elaboration (r=.38, p=.000), and self-image (r=.50, p=.000). Each of the areas within the creativity test was also significantly correlated with the *Portfolio Review Measurement*: fluency (r=.38, p=.000), flexibility (r=.48, p=.000), originality (r=.60, p=.000), elaboration (r=.55, p=.000), and self-image (r=.41, p=.000); and the *Milne-Kasen Visual/Spatial Intelligence Checklist* was also significantly correlated with fluency (r=.24, p=.007), flexibility (r=.24, p=.008), originality (r=.30, p=.001), elaboration (r=.36, p=.000), and

Table 1
Intercorrelations between All Measurements

Measurement	1	2	3	4	5	6	7	8
Students (n=124)								
1. YVAC	--	.42*	.08	.25*	.38*	.30*	.38*	.50*
2. PRM		--	.17	.38*	.48*	.60*	.55*	.41*
3. V/SI			--	.24*	.24*	.30*	.36*	.23*
4. Fluency				--	.82*	.57*	.58*	.30*
5. Flexibility					--	.65*	.65*	.32*
6. Originality						--	.68*	.23*
7. Elaboration							--	.25*
8. Self-Images								--

Note. *Correlation is significant at the .05 level (2-tailed)
1. YVAC: Young Visual Artist's Checklist
2. PRM: Portfolio Review Measurement
3. V/SI: Milne-Kasen Visual/Spatial Intelligence
4. Milne-Kasen Story Pictures Creativity Test – fluency
5. Milne-Kasen Story Pictures Creativity Test – flexibility
6. Milne-Kasen Story Pictures Creativity Test – originality
7. Milne-Kasen Story Pictures Creativity Test – elaboration
8. Milne-Kasen Story Pictures Creativity Test – self-images

self-image (r=.23, p=.012). Table 1 presents the Peason product moment correlation coefficient data of the *Milne-Kasen Story Pictures* test (A Test for Creativity), the *Young Visual Artist's Checklist*, the *Portfolio Review Measurement*, and the classroom teacher's nomination of *Milne-Kasen Visual/Spatial Intelligence Checklist*.

Research Question 2: What are the relationships between scores of third-grade students on the *Milne-Kasen Story Pictures* test (A Test for Creativity) in terms of fluency, flexibility, originality, elaboration, and self-image?

Based on the intercorrelations among scores of fluency, flexibility, originality, elaboration, and self-images, all comparisons in these categories were significantly correlated at $p<.00$; except for originality and self-image (r=.23) which was significantly correlated at p= .012. The variables of fluency and flexibility (r=.82, p=.000), originality and elaboration (r=.68, p=.000), flexibility and originality (r=.65, p=.000) were all significantly correlated. Table 2 presents the Peason product moment correlation coefficient data of the *Milne-Kasen Story Pictures* test (A Test for Creativity).

Research Question 3: What are the differences between scores of third-grade students on the *Milne-Kasen Story Pictures* test (A Test for Creativity) based upon the selected demographic factors of gender, community, age, and time of test-taking?

Table 2
Intercorrelations between Subdivisions of the Milne-Kasen Story Pictures

Measurement	1	2	3	4	5
Students (n=124)					
1. Fluency	--	.82*	.57*	.58*	.30*
2. Flexibility		--	.65*	.65*	.32*
3. Originality			--	.68*	.23*
4. Elaboration				--	.25*
5. Self-Images					--

Note. *Correlation is significant at the .05 level (2-tailed)
1. Milne-Kasen Story Pictures Creativity Test – fluency
2. Milne-Kasen Story Pictures Creativity Test – flexibility
3. Milne-Kasen Story Pictures Creativity Test – originality
4. Milne-Kasen Story Pictures Creativity Test – elaboration
5. Milne-Kasen Story Pictures Creativity Test – self-images

Differences within the Gender Factor of the Third–Grade Students who were Given the Creativity Test

This creativity test included sub-tests of fluency, flexibility, originality, elaboration, and self-image. Of the 124 selected third-grade students who attended schools in the Hsinchu area of Taiwan, Republic of China, girls generally did better than boys in every single category of this creativity test. Girls (M = 1.87) scored significantly higher than boys (M = 1.65) in the area of the originality test $t(122) = -2.25$, p=.026. In addition, there is a significant difference in the test of elaboration, $t(122)$=-1.98, p=.050, girls with M=1.80 and boys M=1.62. Finally, when it comes to the self-image test, $t(122)$=-2.15, p=.034, girls (M = 5.52) again scored significantly higher than did boys (M = 4.88). There were no significant differences between boys and girls regarding the tests of fluency and flexibility. Table 3 illustrates the differences within the gender factor of third-grade students who were given the creativity test.

Table 3

Differences within the Gender Factor of Third-Grade Students who were Given the Creativity Test

Characteristics	*M*	*SD*	*n*	*t*	Sig.
Fluency	52.02 (B)	15.30 (B)	59		
				-1.30	.198
	55.62 (G)	15.30 (G)	65		
Flexibility	24.71 (B)	8.95 (B)	59		
				-1.29	.199
	26.74 (G)	8.54 (G)	65		
Originality	1.65 (B)	.49 (B)	59		
				-2.25	.026*
	1.87 (G)	.56 (G)	65		
Elaboration	1.62 (B)	.45 (B)	59		
				-1.98	.050*
	1.80 (G)	.52 (G)	65		
Self-Image	4.88 (B)	1.75 (B)	59		
				-2.15	.034*
	5.52 (G)	1.57 (G)	65		

Note. B: Boys. G: Girls.

*Significant difference found, confidence at the .05 level

Differences within the Community Factor of the Third–Grade Students who were Given the Creativity Test

In Taiwan, generally speaking, the socio-economic conditions and status of parents (or family) is highly correlated to where they live. Specifically, upper class families live in the downtown area. Middle and lower class families live in the suburban, rural and remote areas. Therefore, the demographic factor considered in this paper (distance to downtown) has incorporated the the socio-economic conditions and status of parents. When comparing all groups according to the community factor, both the rural and city groups had a higher mean than the suburbs and remote groups. Using one-way analyses of variance (ANOVAs), in the fluency sub-test, F (3,120) = 5.17, p= .002, the rural group (M= 61.26) was rated as the highest, followed by the city group (M= 56.80), the suburbs group (M= 55.50), and the remote group (M= 47.60). The results of Tukey's post-hoc test showed that the rural group had a significantly greater mean than the suburbs group (Tukey $\underline{a}$ =10.76, p =.029). The same result pattern occurred in the flexibility sub-test, F (3, 120) =7.14, p=.000. The rural group (M= 30.15) was rated as the highest, followed by the city group (M= 27.83); the suburbs group (M= 24.38) rated third and the remote group (M= 20.93) rated fourth. Results of the Tukey's post-hoc test showed that the city group had a significantly greater mean than the remote group (Tukey a =6.90, p =.005). A significantly greater mean between the rural group and the suburbs group (Tukey a =5.77, p =.039), as well as a significantly greater mean between the rural group and the remote group (Tukey a =9.21, p =.000) was observed.

Using ANOVAs, in the originality sub-test, F (3, 120) =12.08, p=.000, the city group (M= 2.01) was rated as the highest, followed by the rural group (M=1.97). The suburbs group (M=1.70) was rated third, and the remote group (M=1.37) rated last. The results of the Tukey's post-hoc test showed that the city group had a significantly greater mean than the suburbs group (Tukey a =.31, p =.040). Significantly greater means were also observed between the city group and the remote group (Tukey a =.64, p =.000), between the rural group and the remote group (Tukey a =.33, p =.036), and between the rural group and the remote group (Tukey a =.61, p =.000).

Finally, in the elaboration test, F (3, 120) =8.30,

Table 4

Differences within the Community Factor of Third-Grade Students who were Given the Creativity Test

Characteristics	Groups				*F*	Sig.
	(A)	(B)	(C)	(D)		
Fluency	56.80	50.50 (C)	61.26 (B/D)	47.60 (C)	5.17	.002*
Flexibility	27.83 (D)	24.38 (C)	30.15 (B/D)	20.93 (A/C)	7.14	.000*
Originality	2.01 (B/D)	1.70 (A/D)	1.97 (D)	1.37 (A/B/C)	12.08	.000*
Elaboration	1.78 (D)	1.63 (C)	2.03 (B/D)	1.45 (A/C)	8.30	.000*
Self-Image	5.54	4.84	5.52	4.97	1.49	.222

Note.

A: City group: students who live under 3 mile radius from the downtown art centers, cultural centers, galleries, and art museums.

B: Suburbs group: students who live between 3-9 miles from the downtown art centers, cultural centers, galleries, and art museums.

C: Rural group: students who live over 9 and less than 23 miles from the downtown art centers, cultural centers, galleries, and art museums.

D: Remote group: students who live 23 miles or more from the downtown art centers, cultural centers, galleries, and art museums.

*Significant difference found, confidence at the .05 level

p=.000, the rural group (*M*=2.03) was rated as the highest, followed by the city group (*M*=1.78), the suburbs group (*M*=1.63), and the remote group (*M*=1.45). The results of the Tukey's post-hoc test showed that the city group had a significantly greater mean than the remote group (Tukey *a* =.33, *p* =.022). Significantly greater means were also observed between the rural group and the suburbs group (Tukey *a* =.40, *p* =.005), and between the rural group and the remote group (Tukey *a* =.58, *p* =.000).

There was no significant difference observed between the community factors regarding the test of self-image. Table 4 presents the results of one-way analyses of variance (ANVOAs) in differences within the community factor of third-grade students who were given the creativity test.

Differences within the Age Factor of the Third–Grade Students who were Given the Creativity Test

The age factor reached the level of significance only in the fluency sub-test, *F* (2, 121) =3.31, *p*=.040. The age 9.5 years group (*M*=60.52) had the highest test score, followed by the age 10 years group ((*M*=53.91). The age 9 years group (*M*=51.42) rated last. The results of the Tukey's post-hoc test showed that the age 9.5 years group had a significant greater mean than the age 9 years group (Tukey *a* =9.10, *p* =.027).

There were no significant differences between the age factors regarding the remaining sub-test. There sub-tests included flexibility, originality, elaboration, and self-image. Table 5 presents the results of one-way analyses of variance (ANVOAs) in differences within the age factor of third-grade students who were given the creativity test.

Table 5

Differences within the Age Factor of Third-Grade Students who were Given the Creativity Test

Characteristics	Groups			*F*	Sig.
	(A)	(B)	(C)		
Fluency	51.42 (B)	60.52 (A)	53.91	3.31	.040*
Flexibility	25.61	26.16	25.82	.036	.964
Originality	1.75	1.86	1.73	.515	.599
Elaboration	1.69	1.79	1.72	.435	.648
Self-Image	5.08	5.64	5.18	1.03	.361

Note. A: Age 9. B: Age 9.5. C: Age 10.

*Significant difference found, confidence at the .05 level

Differences within the Time of Test-Taking Factor of the Third–Grade Students who were Given the Creativity Test

The time of test-taking reached the level of significance only in the sub-test of originality. With *t*(122)=-2.45, *p*=.016, the afternoon group (*M*=1.88) was

Table 6
Differences within the Time of Test-Taking Factor of Third-Grade Students who were Given the Creativity Test

Characteristics	*M*	*SD*	*n*	*t*	*Sig.*
Fluency	54.42 (A)	17.71 (A)	62		
				.362	.718
	53.42 (P)	12.67 (P)	62		
Flexibility	25.29 (A)	9.30 (A)	62		
				-6.13	.541
	26.26 (P)	8.23 (P)	62		
Originality	1.65 (A)	.56 (A)	62		
				-2.45	.016*
	1.88 (P)	.49 (P)	62		
Elaboration	1.65 (A)	.45 (A)	62		
				-1.46	.146
	1.78 (P)	.53 (P)	62		
Self-Image	5.35 (A)	1.87 (A)	62		
				.905	.367
	5.08 (P)	1.49 (P)	62		

Note. A: AM-Morning. P: PM-Afternoon.
*Significant difference found, confidence at the .05 level

rated higher than the morning group (*M*=1.65) in this category. There were no significant differences between the times of test-taking factor regarding the remaining sub-tests. There sub-tests included the fluency, flexibility, elaboration, and self-image. Table 6 illustrates the results of the t test in terms of the differences within the time of test-taking factor of third-grade students who were given the creativity test.

Conclusions

As a result of the research examining the relationships among the qualities of creativity, drawing ability, and visual/spatial intelligence of third-grade students in selected elementary schools in the Hsinchu area of Taiwan, Republic of China, the researcher came to the following conclusions:

1. There is a positive relationship between students' self-image as a young artist and their ability to produce high quality artwork as viewed from the perspective of local art educators.

2. There is a positive relationship among components of creativity exhibited by children.

3. There is a positive relationship between a child's creativity potential and their self-image of artistic ability and local art educators' observations of students' artwork and classroom teachers' observation of student's art-related behaviors.

4. A child's self-image as an artist is consistent with the perceptions of local art educators.

5. Girls generally have a better self-image as young artists and, at the same time, also demonstrate more original ideas and apply more elaborate details in artwork than do the boys.

6. Students who live in a rural area generally demonstrate a higher creative potential than the students who live in the city, suburban, or remote areas.

7. Students who live in the city generally have more original ideas than the students who live in rural, suburban, or remote areas.

8. Nine-and half-year-old students generally score higher than their peers in the fluency sub-test.

9. Students generally exhibited more original ideas in the afternoon.

As this study examined the relationships among the qualities of creativity, drawing ability, and visual/spatial intelligence in the artistic expression of third-grade students, an understanding of this relationship should assist parents, teachers, and art education policy makers in the development of an appropriate art education curriculum in Taiwan's talented art classes and the implementation of more effective instructional practices in the regular classroom.

References

Baer, J. (1996). Does artistic creativity decline during elementary school? *Psychological Report, 78,* 927-930.

Carroll, J., & Howieson, N. (1991). Recognizing creative thinking talent in the classroom. *Roeper Review, 14* (2), 68-71.

Clark, G., & Zimmerman, E. (1984). *Educating artistically talented students*. Syracuse, NY: Syracuse University Press.

Cronbach, L. J. (1970). *Essentials of psychological testing*. New York: Harper and Row.

Dai, D. Y., & Sternberg, R. J. (2004). *Motivation, emotion, and cognition: Integrative perspectives on intellectual functioning and development*. Mahwah, NJ: L. Erlbaum Associates.

Davis, G. A. (1998). *Creativity is forever*. Kendall/Hunt Publishing Company.

Di Leo, J. H. (1983). *Interpreting children's drawings*. New York: Brunner/Mazel, Inc.

Eng, H. (1931). *The psychology of children's drawings: From the first stroke to the coloured drawing*. New York: Harcourt Brace.

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.

Gardner, H. (1994). *The arts and human development*. New York: Basic Books.

Gardner, H. (2006). *Multiple intelligences: New horizons.* New York: Basic Books.

Getzels, J. W., & Jackson, P. W. (1962). *Creativity and intelligence: Explorations with gifted students*. New York: Wiley.

Golomb, C. (1992). *The child's creation of a pictorial world*. Berkeley, CA: University of California Press.

Gowan, J. C. (1972). *The development of the creative individual*. San Diego: Robert R. Knapp.

Guilford, J. P. (1950). Creativity. *American Psychologist, 5*, 444-454.

Guilford, J. P. (1967). *The nature of human intelligence*. New York: McGraw-Hill.

Harris, D. B. (1963). *Children's drawings as measures of intellectual maturity*. New York: Harcourt, Brace, and world.

Horowitz, F. D. (1967). *Head start evaluation and research center Report No. XI*. University of Kansas.

Joussemet, M., & Koestner, R. (1999). Effect of expected rewards on children's creativity. *Creativity Research Journal, 12*, 231-239.

Khatena, J. (1992). *Challenge and response for education*. Itasca, IL: F. E. Peacock Publishers, Inc.

Milne, B. G. (1972). *Creative artists in the classroom: Evaluation of the pilot program*. Vermillion, SD: Educational Research and Service Center.

Milbrath, C. (1998). *Patterns of artistic development in children: Comparative students of talent*. New York: Cambridge University Press.

Papalia, D. E., Olds, S. W., & Feldman, R. D. (1999). *A child's world: Infancy through adolescence* (8th ed.). New York: WCB/McGraw-HillCompanies, Inc.

Republic of China Government Information Office. (2000). *The Republic of China Yearbook 2000*. Taipei, Taiwan: Government Information Office.

Republic of China Department of Education (2004). *ROC White Paper on Creative Education*. Taipei, Taiwan: Department of Education.

Rosenblatt, E., & Winner, E. (1989). The art of children's drawings. In Gardner, H. & Perkins, D. N. (Eds.), *Art, mind and education*. Chicago: University of Illinois Press.

Roweton, W. E. (1973). *Creativity: A review of the theory and research*. Buffalo, NY: Creative Educator Foundation.

Richert, G. E. (1982). Policy issues in the education of exceptional children. *B. C. Journal of Special Education, 6*, 11-21.

Selfe, L. (1983). *Normal and anomalous representational drawing ability in children*. London: Academic Press.

Shatil, J. (1995). *The psychograph of the child: Development of the psychographic capacity from drawing to writing and the means for its improvement*. Lanham, MD: University Press of America, Inc.

Sternberg, R. J. (2004). *Definitions and conceptions of giftedness*. Thousand Oaks, CA: Corwin Press.

Torda, C. (1970). Some observations on the creative process. *Perceptual and Motor Skills, 31*, 107-126.

Torrance, E. P. (1974). *Norms and technical manual: Torrance tests of creativity thinking*. Bensenville, IL: Scholastic Testing Service.

Torrance, E. P. (1988). The nature of creativity as manifest in its testing. In Sternberg, R. J. (Ed.), *The nature of creativity* (pp. 43-75). New York: Cambridge University Press.

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