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Creative Giftedness and Educational Opportunities

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ABSTRACT

In contrast to intellectual giftedness, reflected in high academic performance and often measured by IQ tests, there is growing recognition that other forms of giftedness exist. This paper focuses on creative giftedness, defined as high potential to produce work that is original and context appropriate. After a brief introduction to the psychological basis of creative giftedness, the role of school context in the development of creativity is highlighted. Then an empirical study suggesting that creative potential is influenced by educational context is presented; pupils attending traditional and Montessori schools in France were compared on a set of creativity tasks in both the graphic and verbal domains. Cross-sectional and longitudinal analyses were conducted as children were seen at two moments, with approximately one year between testing occasions. Results indicated greater scores on measures of creative potential for children in the Montessori context. The discussion situates the results in a broader context of issues concerning the development of creative giftedness through education.

Key words: Creativity, development, children, education

INTRODUCTION

Creativity is increasingly recognized as a valuable ability that contributes to personal and societal development. It refers to the ability to produce work that is both novel-original and different from commonplace productions--and contextually relevant and valuable (Lubart, Mouchiroud, Tordjman & Zenasni, 2004, Sternberg & Lubart, 1995). It is useful to distinguish three concepts: creative potential, creative accomplishment and creative talent. Creative potential is a latent ability to produce original, adaptive work. This potential may be more or less high and it can be measured. Creative accomplishment refers to a case of actual production, in which creative potential has been transformed into real-world work, that has been recognized as creative by some audience. In comparison, creative talent refers to the tendency to produce creative work on repeated occasions. Thus, a person who has a high level of creative potential, who activates this potential and produces creative work on repeated occasions can be said to have creative talent. Be it children or adults, those with a high level of creative potential are often called the creatively gifted.

Creative giftedness can be contrasted with intellectual giftedness, or "schoolhouse" giftedness (Besançon, Lubart & Zenasni, 2010; Lubart, Georgsdottir & Besaançon, 2009; Renzulli, 1986, 2002; Sternberg & Lubart, 1993). The intellectually gifted have high levels of "academic" cognitive abilities, such as verbal, mathematical, and reasoning abilities. They have high potential to succeed in academic tasks, to acquire and process knowledge, to show expertise. Many, but not all, will be successful at school and later in their careers. Intellectual potential is often measured through intelligence tests, such as the WISC (Wechsler 2005). Traditionally, individuals showing test scores at or beyond two standard deviations above the mean score – in general ≥ 130 -for their population reference group have been labeled gifted. Creativity relies in part on the same cognitive abilities that are solicited in intelligence tests. However, these are only part of the cognitive abilities that are relevant to creativity and they are not necessarily the most important ones. A large number of studies over the past century have identified specific aspects of cognition, such as divergent thinking, mental flexibility, ability to encode, link and combine information in unusual ways which contribute to creative potential (Bink & Marsh, 2000). Empirically, scores on traditional

intelligence tests (IQ tests) tend to predict creative performance, only very moderately, with correlations typically in the .20 range. Children and adults who have creative potential and/or creative talent do not necessarily have high intellectual ability, and those who are intellectually gifted are not necessarily creatively gifted.

In addition to cognitive abilities, and domain-related or task-related knowledge, personality, motivational and emotional factors play also an important role (see Besançon, Lubart, Zenasni, 2010; Lubart, Georgsdottir & Besançon, 2009; Lubart, Mouchiroud, Tordjman & Zenasni, 2003; Sternberg & Lubart, 1995). A person must have, for example, a personality profile oriented toward risk-taking, openness to new ideas and experiences, and be tolerant of ambiguity, which is inherently linked to solving open-ended, unexplored problems. Each of these traits is involved in creative work, which by nature goes against common, well-accepted, traditional, comfortable ideas. Creative people dare to propose something new, which is a necessary behavioral repertoire that can be distinguished from the cognitive ability underlying the generation of the new idea itself. Another aspect of conation is motivation, and numerous studies show the value of intrinsic motivation (such as the motivation to explore new things, or curiosity drive). In terms of affective resources, research has shown that positive and negative moods are relevant to creative work (at certain moments in the productive process), and a rich emotional life may contribute to original thinking. According to the multivariate approach to creativity (Sternberg & Lubart, 1995), the presence of each of these components and their interaction allows the emergence of creativity. Thus, the differences observed between individuals result from a combination of factors (Lubart, 1999; Sternberg & Lubart, 1995).

Creative potential is not a fixed ability and each of the person-centered psychological resources underlying creative potential mentioned before may develop and evolve over time, through interactions with home or school or work contexts. However, the environmental context, be it the home, school, professional context, or cultural-societal setting, all contribute to creative potential by providing the stage on which the psychological, person-centered resources will be brought into play. Thus, some contexts are assumed to favor creativity more than others, and invite individuals to express their cognitive, conative and affective resources that form the basis of creative potential. For example, a child who has the ability to engage in divergent, non-standard ways of thinking and is willing to take the social risk to express his or her idea, may not do so if the classroom teacher has made it clear that only “correct” answers are valued

and given time constraints. If a climate of criticism and normative behavior dominates in a classroom, children will quickly learn that creativity is not part of the "program", will not be rewarded, and may even be seen as disruptive. Thus the context may foster or hinder creative behavior, and it may facilitate or deter the development of the psychological resources that underlie creative potential.

The impact of school contexts on creativity has been examined in some studies that contrasted traditional school settings with alternative, pedagogy, such as Montessori, Steiner, Freinet, or others with results favoring the alternative pedagogies (Allodi, 2010; Dreyer & Rigler, 1969; Heise, Böhme & Kömer, 2010; Horwitz, 1979; Thomas & Berk, 1981). For example, Rose, Jolley and Charman (2012) examined the influence of British national curriculum, Steiner and Montessori approaches to representational and expressive drawing ability with a positive effect of alternative pedagogy. According to Danvers (2003), traditional pedagogy is characterized by (1) a central role assigned to the teacher: the teacher is in front of the class; (2) an impersonal relation with pupils because there are usually many pupils in a class; and (3) the importance of abstract knowledge, which is not always linked with everyday life.

In France, although traditional schools dominate the educational landscape, diverse scholastic learning contexts exist. In this contribution, we will examine the influence of Montessori pedagogy on different creative tasks compared to traditional French pedagogy. Indeed, if Montessori and traditional school contexts are compared, will performance be similar across various creative thinking tasks, notably divergent-thinking and integrative-thinking tasks in verbal and graphic domains of expression?

Montessori (1918, 1958, 1965) postulated that children want to learn about the world, and are capable of concentrating on an object or topic "to absorb" knowledge about this object. Through active learning situations, the child constructs his or her intelligence and personality. The fundamental principle of Montessori pedagogy is to provide a safe, peaceful environment allowing children to concentrate on topics under study and to construct knowledge actively over time.

How can creative giftedness be assessed?

In order to test the impact of educational contexts, such as traditional or alternative pedagogical approaches, it is essential to have adequate tools to measure creative potential, compare children's potential and identify children who are "creatively gifted". A relatively limited set of instruments exist to evaluate creative potential

(Barbot, Besançon & Lubart, 2011; Kaufman, Plucker & Russel, 2012). Recently, we have developed a measurement approach that combines both divergent-exploratory thinking, and convergent-integrative thinking to assess creative potential in a domain, such as the verbal-literary domain or the visual-graphic domain (see Barbot, Besançon & Lubart, 2011; Lubart, Besançon & Barbot, 2011). In this approach, the extent to which a child is able to put into play the two main kinds of behaviors involved in the creative process (divergent-exploratory, convergent-integrative) is examined. The measure concerns potential rather than achievement or talent because the productions (such as graphic or verbal responses) are not spontaneous, real-world cases of a child's natural creative output. However, the productions provide an indication of the child's potential, which may be put into action at some point in real-life situations that the child may encounter. Thus, in this contribution we have operationalized and measured creative potential with divergent thinking tasks (verbal and graphic) that require children to generate many initial ideas in an exploratory mode based on a stimulus and convergent-integrative tasks (verbal and graphic) that require children to synthesize several ideas into a new global production. The creative process is conceived as a dynamic cyclic movement between divergence-exploratory thinking and convergence-integrative synthesis. Measures are collected by domain (verbal-literary, and graphic-artistic) because research has shown that there may be specificities in divergent and convergent operations that depend on the domain, and children, as well as adults show moderate degrees of correlations between measures across content domains (for example, a correlation of .30 between graphic divergent and verbal divergent thinking scores) (Baer, 1999; Lubart & Guignard, 2004; Plucker, 1998).

Overview of the empirical contribution

In the current study, we compared children's creative potential in a traditional school and a Montessori school, both in Paris France. Creativity was measured with two types of tasks (divergent-exploratory and convergent-integrative ones) across two content domains (verbal and figural), in order to examine the consistency of pedagogical effects on creative performance. We hypothesized that the Montessori school context would favor creativity more than the traditional one. In addition, we examined the extent to which the expected pedagogical effect may vary based on children's grade level, and gender, although we did not have specific expectations for interaction effects.

EMPIRICAL STUDY

Method

Participants

Children (40 from a Montessori school and 40 from a traditional school) participated. This sample (N=80, age range: 6.03 to 11.08 in year 1, see table 1) was a subset of the participants in a larger study, which included additional children in both the Montessori and traditional schools (Besançon & Lubart, 2008). The sample analyzed here was selected to match Montessori and traditional school pupils, as best as possible, on grade level (and age), parents' socioeconomic status, and gender.

Ten university professionals or PhD students who work regularly in the field of creativity participated as judges of creativity. Five judges (M_{age} = 27; SD = 1.73) evaluated story creativity and five other judges assessed drawing creativity (M_{age} = 30.8; SD = 10.8).

Design

The study was conducted during two years with a test-retest design. Children came from two primary schools in Paris, one which proposed Montessori pedagogy and the second which employed a traditional pedagogy (see table 1). Children were enrolled in 1st to 4th grade (from 6 to 10 years old) in the first year of the study and in 2nd to 5th grade in the second year of the study.

In the Montessori school, pupils worked at their own rate on activities, not necessarily on the same activities at the same moment; there were some mixed grade-level groups (2nd and 3rd grade, 4th and 5th grade). In the traditional school, classes were organized by grade level and followed the standard curriculum, with a "regular" structured pedagogical approach. Both schools offered some English as a foreign language, drawing and music classes. The Montessori school also had theatre workshops that were an important activity involving inventing dialogues, staging them, creating costumes and scenery.

The study was authorized by school authorities. Informed consent was obtained from parents and children. Parents' socioeconomic status was assessed by questions concerning parents' professions, based on INSEE procedures (French Institute for social and economic surveys, used in other studies, see Lautrey, 1980).

Insert Table 1 here

Materials: measures of creativity

In order to examine creative potential, we used several measures of creativity which differed on type of task (divergent thinking versus integrative task) and domain of expression (verbal versus figural). In this report, we focus on four selected measures, from a wider set.

Divergent-exploratory thinking tasks

Two measures from the Torrance Tests of Creative Thinking (Torrance, 1976), one verbal and one figural were used. The tasks are scored for fluency, the number of ideas produced, which is highly correlated with the flexibility and originality of the responses ($r > .70$)

Toy improvement: in this task, the child must name, orally, as many different improvements as possible concerning a stuffed toy elephant to make it more amusing (time allowed: three minutes with oral responses).

Parallel lines: This task uses figural material. The child must make as many drawings as possible starting from 30 pairs of parallel lines. The parallel lines must play an integral part in their drawing; several pairs of parallel lines can be used for the same drawing. At the end of the ten minutes allowed for this test or when the child does not have any more ideas, the child is asked to name each drawing.

Convergent - Integrative thinking tasks

We proposed one verbal and one figural task that required participants to integrate several elements in a complete production.

Invent a story: In this task, the child must invent a story from a title which is provided. The story must be as original as possible. Two parallel forms were used. The title of the story, proposed to the children for the first year was "the millipede's tennis shoes" and for the second year the title was "the keyhole".

Invent a drawing: In this task, proposed by Urban and Jellen (1996), the child is presented a sheet of paper on which six elements are displayed. Each child must finish

the drawing starting from the six elements (angle, demi-circle, S-form, dashed line, small square and point). The 1st year, form A was used, and in the 2nd year, the form B.

In order to judge creativity of each story and each drawing, we used the consensual assessment technique (Amabile, 1996). For this study, five judges evaluated independently the creativity of each story on a 7-point Likert scale (from 1 = not at all creative to 7 = very creative) and five other judges evaluated drawings' creativity, using the same scoring methodology. A score of 0 was assigned if the child was not able to produce a story or drawing. As Amabile (1996) stipulated, no explicit definition of creativity was proposed to the judges. Moreover, productions were scored against each other. Judges were blind to children's school origins, grade level and gender, and judges' ratings were averaged to yield a creativity score for each work. Inter-judge correlations (r) ranged between .60 and .80, and the mean creativity score for each story and each drawing were used. For the integrative thinking tasks, interjudge reliability was very satisfactory for the two tasks (story task, drawing task: respectively interjudge agreement $\alpha = .93$ and $\alpha = .92$ for the first year and $\alpha = .89$ and $\alpha = .91$ for the second year).

Procedure

The children who took part in this research were seen, each year, with individual testing. The divergent thinking tasks (Toy improvement, Parallel lines) and then the integrative tasks (Invent a story and Invent a drawing) were completed. For each verbal task, responses were tape recorded and later transcribed. Based on previous studies, the value of fluency as a score for divergent thinking, both on theoretical and statistical grounds has been supported as a measure of divergent exploratory thinking (Lubart, Besançon & Barbot, 2011)

Results

There were no significant differences between the two groups on grade (see table 1, $\chi^2(3)=.45$, ns)/age (Montessori: M=7.75, SD=1.32; Traditional: M=8.05, SD=1.21, t(78)=1.05, ns), gender (Montessori: 20 F / 20 M; Traditional 23 F / 17 M, $\chi^2(1)=.45$, ns), and parent's socioeconomic status (Montessori: 11 low SES / 29 high SES; traditional: 14 low SES / 26 high SES, χ^2 (1)=.52, ns)

Analyses of variance were conducted to test for mean differences based on the factors type of school (Montessori vs. traditional), grade level, gender, and interactions involving these variables. First, multivariate analyses (using the four creative thinking tasks as dependent variables) to examine overall effects of school context, then analyses for each creative task were performed for those effects that were significant in the MANOVA analyses. Repeated measures ANOVA based on year 1 and year 2 scores, to examine developmental changes over time, were conducted with creative task performance as the dependant variables and time (year 1, year 2), school, grade and sex as independent variables. Means scores for each school by grade are presented in Table 2.

Insert Table 2 here

A MANOVA with school, grade and sex (between-subject factors) on the four creativity scores (toy improvement fluency, parallel lines fluency, story creativity, drawing creativity) for the year 1 showed that the Montessori group had higher mean performance than the traditional school group ($F(4,61)=6.60$, $p<.001$), and a significant effect of grade-level in favor of more advanced grade levels ($F(12,162)=1.97$, $p<.05$) Similar results were observed for the year 2 (school effect: $F(4,61)=5.76$, $p<.001$; grade effect: $F(12,162)=1.81$, $p=.05$). The analyses did not reveal significant effects of gender, or interaction effects.

Further univariate analyses were calculated for year 1 scores being the first time that children were exposed to the tasks. Results showed a significant effect of pedagogy for each of the measures individually (story task $F(1,64)=11.11$, $p<.01$; toy improvement task $F(1,64)=5.78$, $p<.05$; drawing $F(1,64)=3.19$, $p<.10$; parallel lines $F(1,64)=19.41$, $p<.001$). An effect of grade level with higher scores for more advanced grades was observed for the story, drawing, and toy improvement tasks but not for the parallel lines task (story task $F(3,64)=3.87$, $p<.05$; Toy task $F(3,64)=2.81$, $p<.05$; drawing $F(3,64)=2.38$, $p<.10$; lines $F(3,64)=1.46$, ns).

Concerning repeated measures analyses for year 1 and year 2 scores, there were no significant effects of time except in the parallel lines task, which showed significantly higher scores in year 2 compared to year 1 ($F(1,64)=12.62$, $p<.001$). There were no significant interactions between time and other variables, such as pedagogy. Thus

differences between Montessori and traditional groups were stable over the two measurement points. The data obtained can also be analyzed in order to identify pupils with high creative potential.

The data obtained can also be analyzed in order to identify pupils with high creative potential; the "two standard deviations above the mean" criterion can be applied to each of the four creativity tasks in the first year of the study. This identification procedure yields five children with high potential for the improving a toy task (4 Montessori pupils, 1 traditional school pupil), 6 children for the parallel lines task (all Montessori pupils), 2 children for the storytelling task (1 in each school), and 1 child for the drawing task (a Montessori pupil). Thus, there is a clear tendency for Montessori pupils to score highest and be most likely to be identified as creatively gifted, with the tasks used in this study.

DISCUSSION

To summarize the main findings, there is an overall advantage for the Montessori school children compared to those in the traditional school. The difference was observed for both years of the study. There were no interactions with school grade level, indicating that the effect of pedagogy was consistent over the grades. Of course, it must be noted that the sample was relatively small, and children were drawn from only one Montessori and one traditional school, thus limiting the potential generalizability of the findings. However, the matched samples for each school allow some biases to be eliminated to the extent possible. In order to generalize these results, the study must be replicated in other Montessori or alternative schools and traditional schools.

The results observed indicate at least that school contexts are associated with variations in creativity (Heise, Böhme & Kömer, 2010; Horwitz, 1979; Thomas & Berk, 1981), suggesting that high potential for creativity may be more compatible with some pedagogical contexts than others. Creative giftedness was more readily associated with divergent thinking than integrative thinking. Given that integrative thinking may play an important role in advanced, real-world forms of creative work, it is possible that an inverse trend favoring integrative forms of creative giftedness through alternative pedagogy could occur in the upper levels (junior high school, high school or university levels).

Although creativity is not taught directly, it is likely that the Montessori school provided a socio-cognitive context, including project work with personal initiative, that helped to build the cognitive, conative or affective resources involved in creativity. In educational settings, one way to foster creative potential and develop creative giftedness is through a global educational context, as illustrated by the Montessori-Traditional school contrast examined here. Another pedagogical approach is to directly teach creative thinking skills. This possibility has been developed to some extent, in particular with divergent thinking exercises and the creative problem solving program (Treffinger, 1995). A number of domain-specific, content-related programs have been developed to introduce creative thinking at elementary and secondary school levels in specific ways (See Lynch & Harris, 2001; Starko, 1995). Programs that seek to foster creativity in visual arts, dance, science and technology, mathematics and other domains exist. The efficacy of these educational activities and their potential to foster creative giftedness in a specific activity domain, or more generally with effects across a range of domains remain to be examined in detail and merit future research.

REFERENCES

Allodi, M. W. (2010). Goals and values in school: A model developed for describing, evaluating and changing the social climate of learning environments. *Social Psychology of Education, 13,* 207-235.

Amabile, T. M. (1996). *Creativity in context*. Boulder, CO, US: Westview Press.

Baer, J. (1999). Domains of creativity. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (pp. 591-596). San Diego, California: Academic Press.

Barbot, B., Besançon, M., & Lubart, T. (2011). Assessing creativity in the classroom. *The Open Education Journal, 4 (Supp 1:M5),* 58-66.

Besançon, M., & Lubart, T. (2008). Differences in the development of creative competencies in children schooled in diverse learning environments. *Learning and Individual Differences, 18,* 381-389.

Besançon, M., Lubart, T. & Zenasni, F. (2010). Le haut potentiel créatif. *Enfance, 62(1),* 77-84.

Bink, M.L., & Marsh, R. L. (2000). Cognitive regularities in creative activity. *Review of General Psychology, 4(1),* 59-78.

Danvers, F. (2003). *500 mots clefs pour l'éducation et la formation*. Villeneuve D'Ascq: Presses Universitaires du Septentrion.

Dreyer, A. S., & Rigler, D. (1969). Cognitive performance in Montessori and nursery school children. *The Journal of Educational Research, 62(9),* 411-416.

Heise, E., Böhme, E., & Kömer, S. B. (2010). Montessori-orientierter und traditioneller grundschulunterricht: Ein vergleich der entwicklung von rechtschreibung, rechnen, intelligenz und kreativität. *Psychologie in Erziehung und Unterricht, 57(4),* 273-289.

Horwitz, R. A. (1979). Psychological effects of the open classroom. *Review of Educational Research, 49(1),* 71-85.

Kaufman, J. C., Plucker, J. A, & Russel, C. M. (2012). Identifying and assessing creativity as a component of giftedness. Journal of Psychoeducational Assessment, 30(1), 60-73.

Lautrey, J. (1980). Classe sociale, milieu familial, intelligence. Paris: PUF.

Lubart, T. I. (1999). Componential models of creativity. In M. A. Runco & S. Pritzer (Eds.) Encyclopedia of creativity (pp. 295-300). New York : Academic Press.

Lubart, T. I., Besançon, M., & Barbot, B. (2011). EPoC : Evaluation du potentiel créatif (Test et manuel). Paris : Hogrefe.

Lubart, T., Georgsdottir, A., & Besançon, M. (2009). The nature of creative giftedness and talent. In T Balchin, B. Hymer, & D. Matthews (Eds). *The Routledge international companion to gifted education* (pp. 42-49). New York: Routledge.

Lubart, T., & Guignard, J-H. (2004). The generality-specificity of creativity: A multivariate approach. In E. L. Grigorenko, & R. J. Sternberg (Eds.), *Creativity: From potential to realization* (pp. 43-56). Washington, DC, US: American Psychological Association.

Lubart, T., Mouchiroud, C., Todjman, S., & Zenasni, F. (2003). *Psychologie de la créativité*. Cahors, France: Armand Colin.

Lubart, T. I., & Zenasni, F. (2010). A new look at creative giftedness. *Gifted and Talented International, 25(1),* 53-57.

Lynch, M. D., & Harris, C. R. (2001). *Fostering creativity in children, K-8: Theory and practice.* Needham Heights, MA: Allyn & Bacon.

Montessori, M. (1918). *The advanced Montessori method.* London: William Heinmann.

Montessori, M. (1958/2004). *Pédagogie scientifique : tome 2, éducation élémentaire*. Genève: Desclée de Brouwer.

Montessori, M. (1965). *Spontaneous activity in education*. New York: Schoken Books.

Plucker, J. A. (1998). Beware of simple conclusions: The case for content generality of creativity. *Creativity-Research-Journal, 11(2),* 179-182.

Renzulli, J. S. (1986). The three-ring conception of giftedness: A developmental model for creative productivity. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness* (pp. 53-92). New York: Cambridge University Press.

Renzulli, J. S. (2002). Emerging conceptions of giftedness: Building a bridge to the new century. *Exceptionality, 10,* 67-75.

Rose, S. E., Jolley, R. P., & Charman, A. (2012). An investigation of the expressive and representational drawing development in national curriculum, Steiner, and Montessori schools. *Psychology of Aesthetics, Creativity and the Arts, 6(1),* 83-95.

Starko, A. J., (1995). *Creativity in the classroom: Schools of curious delight.* New York: Longman.

Sternberg, R. J., & Lubart, T. I. (1993). Creative giftedness: A multivariate investment approach. *Gifted Child Quarterly, 37(1),* 7-15.

Sternberg, R. J., & Lubart, T. I. (1995). *Defying the crowd: Cultivating creativity in a culture of conformity*. New York: Free Press.

Thomas, N. G., & Berk, L. E. (1981). Effects of school environments on the development of young children's creativity. *Child-Development, 52(4),* 1153-1162.

Torrance, E. P. (1976). *Les tests de pensée créative*. Paris: Les Editions du Centre de Psychologie Appliquée.

Treffinger, D.J. (1995). Creative Problem Solving: Overview and educational implications. *Educational Psychology Review, 7(3),* 301-312.

Urban, K.K., & Jellen, H.G. (1996). *Test for Creative Thinking-Drawing Production (TCT-DP).* Francfort: Swets Test Services.

Wechsler, D. (2005). *Wechsler Intelligence Scale for Children – 4th edition*. Paris: Editions du Centre de Psychologie Appliquée.

Table 1: Descriptive statistics of sample at start of study

		Girls	Boys	N	Mean Age (SD)
Montessori	1st grade	5	6	11	6.32 (.44)
	2nd grade	4	8	12	7.31 (.43)
	3rd grade	5	2	7	8.20 (.36)
	4th grade	6	4	10	9.56 (.70)
Traditional	1st grade	5	4	9	6.49 (.50)
	2nd grade	5	7	12	7.72 (.76)
	3rd grade	6	3	9	8.61 (.70)
	4th grade	7	3	10	9.34 (.47)

Table 2: Means and Standard deviations by school and grade for creativity tasks

Table 2a: Means and standard deviations by school and grade, toy improvement task

		Mean (SD) Year 1	Mean (SD) Year 2
Montessori	1st grade	6.63 (3.10)	7.90 (4.22)
	2nd grade	8.08 (5.33)	9.08 (3.70)
	3rd grade	8.43 (2.88)	12.28 (7.20)
	4th grade	11.50 (6.16)	12.80 (7.50)
Traditional	1st grade	3.22 (2.86)	5.11 (3.05)
	2nd grade	6.58 (3.60)	7.25 (3.49)
	3rd grade	8.33 (4.61)	6.55 (3.94)
	4th grade	6.20 (1.93)	7.80 (4.18)

Table 2b: Means and standard deviations by school and grade, parallel lines task

		Mean (SD) Year 1	Mean (SD) Year 2
Montessori	1st grade	9.82 (6.24)	9.90 (5.92)
	2nd grade	10.50 (6.58)	13.25 (7.35)
	3rd grade	10.14 (4.56)	15.28 (7.70)
	4th grade	13.80 (8.79)	17.30 (10.01)
Traditional	1st grade	3.33 (2.45)	6.66 (5.09)
	2nd grade	4.42 (4.17)	7.33 (4.21)
	3rd grade	7.22 (4.14)	7.11 (4.16)
	4th grade	7.20 (3.58)	8.00 (5.12)

Table 2c: Means and standard deviations by school and grade, story task

		Mean (SD) Year 1	Mean (SD) Year 2
Montessori	1st grade	3.80 (1.00)	3.51 (1.70)
	2nd grade	3.50 (1.36)	3.48 (1.69)
	3rd grade	4.09 (1.25)	3.91 (1.59)
	4th grade	4.50 (1.48)	4.54 (1.30)
Traditional	1st grade	1.29 (1.15)	1.29 (.78)
	2nd grade	2.97 (1.11)	2.83 (1.33)
	3rd grade	3.82 (1.34)	3.29 (1.28)
	4th grade	3.68 (2.17)	3.82 (1.35)

Table 2d: Means and standard deviations by school and grade, drawing task

		Mean (SD) Year 1	Mean (SD) Year 2
Montessori	1st grade	2.80 (1.42)	2.89 (1.27)
	2nd grade	3.32 (1.41)	3.33 (1.48)
	3rd grade	3.62 (1.79)	4.66 (1.58)
	4th grade	5.06 (.95)	5.10 (1.06)
Traditional	1st grade	2.78 (1.32)	2.69 (1.60)
	2nd grade	2.53 (1.85)	2.73 (1.30)
	3rd grade	3.59 (1.67)	2.98 (1.52)
	4th grade	3.03 (1.49)	3.76 (2.14)