Creativity in Montessori Adolescent Programs

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BACKGROUND

Creativity is essential to success both in school and in the workplace in the 21st century (Lucas, Claxton, & Spencer, 2012). The ongoing shift to a knowledge-based economy means that employees who can develop new and different approaches to problem-solving are in high demand (Plucker, Kaufman, & Beghetto, n.d.). Divergent thinking and creative problem-solving will be key to the success of entrepreneurial endeavors in this new economy (Florida, 2004). Schools are being called upon to meet this need for workers and citizens who can think creatively (Lucas et al., 2012).

Creativity has also been shown to lead to positive outcomes in the classroom. Students who view themselves as creative are more involved in school and have more positive academic beliefs (Beghetto, 2006). The literature on creativity and education suggests that creative school environments promote academic achievement (Davies et al., 2012; Lucas et al., 2012). Cardarello (2014) argues that creativity is a particularly important aspect of scientific thinking. Besançon, Lubart, and Barbot (2013) identify two aspects of creative potential: divergent thinking, which involves generating multiple ideas from a single stimulus, and convergent thinking, which involves integrating diverse stimuli into a coherent whole.

RESEARCH QUESTION

How do Montessori adolescent students perform on measures of creativity compared to their non-Montessori peers?

LITERATURE REVIEW

Research indicates that creativity is not a fixed quality and can be fostered through educational interventions (Cardarello, 2014; Csikszentmihalyi, 1996; Davies et al., 2012). Classrooms that promote creativity typically exhibit flexible use of space and time, respectful teacher-student relationships, independent work, acceptance of non-conformity, and a balance of structure and freedom (Davies et al., 2012; Runco, 1993; West, 2002). The Montessori Method is a pedagogy that incorporates all of these elements (Lillard, 2005). A comparative study of Montessori and traditional school environments in France found that Montessori elementary students exhibited significantly greater creative aptitude than their peers in traditional school environments (Besançon et al., 2013). Montessori has also been shown to foster executive functions (Diamond & Lee, 2011; Lillard, 2012; Lillard & Else-Quest, 2006), which have been linked to the development of creativity (Carlson, 2010; Diamond & Lee, 2011). Thus, the Montessori Method holds significant promise as a model of education for creativity in the 21st-century, knowledge-based economy.

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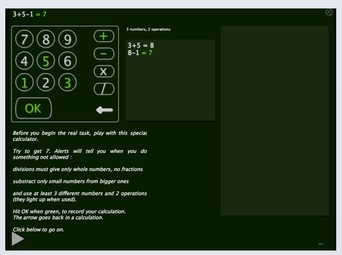
METHODS

This study was conducted to examine creativity in public school Montessori environments. This work is part of a larger international study of creativity and critical thinking being conducted in 11 different countries by the Organization for Economic Cooperation and Development (OECD). Researchers administered student assessments to measure creativity in January 2016.

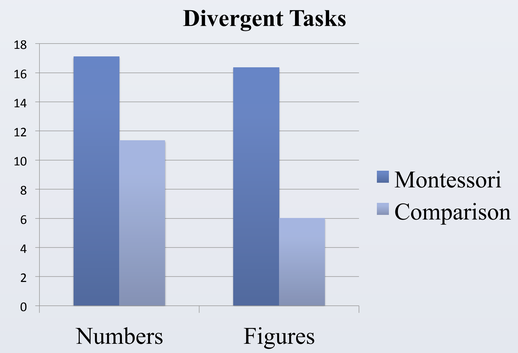
Creativity was assessed using the Evaluation of Creative Potential (EPoC), mathematic edition, a tool to measure students' capacity for convergent and divergent thinking through mathematical and geometric tasks. Divergent and convergent thinking are assessed using both numbers and geometric figures. Thus, each assessment yields a score on four individual subtests: divergent numbers, divergent figures, convergent numbers, and convergent figures. Convergent subtests are scored using an algorithm to evaluate originality; divergent scores reflect the number of different combinations each student was able to produce within the given time.



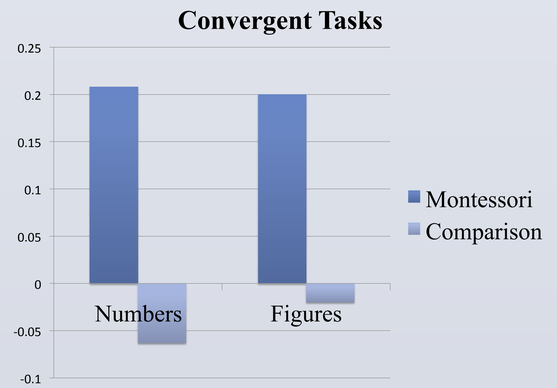
The Montessori group consisted of 94 students at grade 8 in five Montessori adolescent programs in a large, urban district in the Midwest with an established Montessori program. In this group, 37% of students qualified for free for reduced price meals and 51% were identified as students of color, with African American students making up the largest non-White subgroup. The comparison group consisted of 297 students in grade 8 across three middle schools in a mid-size suburban district in the West. Of these students, 60% qualified for free or reduced price meals, while 71% were students of color. Students in this group were predominately Hispanic. Two of these schools are traditional middle schools, while the third is a magnet school with a focus on design thinking. A multivariate analysis of variance (MANOVA) was conducted to check for statistically significant differences in EPoC math subtest scores between Montessori students and students in the comparison group.

RESULTS

A between-subjects MANOVA was performed using SPSS on EPoC math subtest scores, with group as the independent variable with two levels (Montessori and comparison). Using Pillai's trace, the combined dependent variables were significantly affected by group, $F(6, 292)=17.41$, $p<.001$, with a medium effect size (partial $\eta^2=.19$). Planned comparisons were conducted to check for significant differences in reading and math scores between the Montessori group and the comparison group. Univariate analyses revealed statistically significant differences favoring Montessori students across all four subtests. On the divergent numbers subtest, Montessori students scored significantly higher than control students, $F(1, 2126)=21.23$, $p<.001$, with a small effect size (partial $\eta^2=.07$). Montessori students also outperformed the comparison students on divergent figures, $F(1, 6892)=54.70$, $p<.001$; this was also the subtest with the greatest effect size, partial $\eta^2=.16$, representing a medium effect.



The same pattern was evident on the convergent tasks. On convergent numbers, Montessori students also scored higher, $F(1, 4.75)=5.85$, $p=.016$, with a small effect size (partial $\eta^2=.02$). Lastly, Montessori students also scored higher on convergent figures, $F(1, 3.21)=9.91$, $p=.002$, with a small effect size (partial $\eta^2=.03$).



DISCUSSION, LIMITATIONS, & FUTURE RESEARCH

These results suggest that Montessori students exhibit greater creative potential than their peers in traditional school settings in the mathematic/geometric domain. Montessori students were able to generate significantly more and significantly more original mathematical ideas than their counterparts in traditional settings. While more traditional mathematics assessments tend to focus on concepts and calculation, this study suggests that Montessori students may excel on measures of convergent and divergent thinking in math. These capacities may be just as important to students' future success and productivity. Indeed, this capacity for divergent and convergent thinking is especially important for innovation and problem-solving in STEM fields. Montessori may be one way to prepare this important sector of the workforce.

One limitation of this study is that the Montessori and comparison groups were demographically dissimilar; the comparison group was predominately Hispanic and low-income, while the Montessori group had a larger proportion of White and African American students and a smaller proportion of low-income students. Previous international research indicates that socioeconomic status (SES) does not predict creative potential (Besançon et al., 2013), but it is unclear whether SES would be an important factor in American contexts. Previous research on creativity also suggests that creative potential in one domain (e.g., math) may not transfer to others.

While this study does not provide evidence of a causal relationship between Montessori instruction and improved outcomes in creativity, these results suggest that there may be something about the Montessori environment, and perhaps the Montessori math curriculum in particular, that fosters the development of creativity in this domain. Further study of the relationship between Montessori instruction and the development of creative potential is warranted.

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