Comparing Montessori Education and Conventional Education on Aspects of Creativity

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Abstract

My Honors Thesis compares creativity in children taught in a Montessori classroom with students taught in a conventional classroom. I tested 58 children at Belle Valley Elementary School in Erie Pennsylvania, half in the Montessori program, half in traditional classrooms. Their ages ranged from 5-9, from kindergarten to 3rd grade. I hypothesized that the independence allowed in Montessori classrooms would help foster creativity in its students. The project uses two forms of evaluation to test the concept of creativity, the Torrance Test of Creative Thinking and consensual assessment to score a creative collage. Significant developmental differences were found; older children scored higher on the creativity tests. There was, however, no significant difference between Montessori and conventionally taught children. The conclusion is that in young children creativity develops over time, but that the type of schooling does not moderate this development.
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Introduction

The research question

Creativity can be defined as a behavior, thought, or product that is intentionally novel and appropriate (Amabile, 1989, p. 25). All children will develop creative minds to different degrees and in different ways. It is likely, however, that the environment in which the child grows up plays a role in this development. Certain environments might encourage creativity more than others. Theresa Amabile, a leading researcher in the field of creativity, states that three things are necessary in order for a child to be creative, “skill in the domain, creative working and thinking skills, and intrinsic motivation,” (p. 34). Intrinsic motivation is highly dependent on one’s social environment. Amabile explains the “Intrinsic Motivation Principle of Creativity” by saying, “People will be most creative when they feel motivated primarily by the interest, enjoyment, satisfaction, and challenge of the work itself- and not by external pressures.” (p. 51).

In this thesis, I tried to operationalize this motivating role of the environment by investigating creative development in young children (kindergarten to 3rd grade) who are being schooled either in a traditional curriculum or a Montessori program.

The reason to investigate Montessori education is that Montessori classrooms have a very distinct approach to learning and the presentation of the environment to the student than does conventional education (examples below provided by Jones, personal communication), one that directly fosters intrinsic
motivation. For instance, in Montessori education students in kindergarten and older design their own work plans where they decide which work they will do and when. Students chose one work from each of the following subject areas to complete each day: language, math and cultures which include art, science, geography, and sensorial work. The role of the teacher, or Directress as she is called in the Montessori classroom, is to help the children finish the work they had planned for themselves for each day, not to give assignments or reward or punish the students. The Directress uses the work plans as a tool to encourage the students to stay on task. Montessori teachers will often ask students how they feel after they have completed an assignment in order to highlight the internal rewards of their accomplishments, and encourage the students’ intrinsic motivation.

This is made explicit in Maria Montessori’s teaching philosophy. The goal of Montessori education is, “the development of a complete human being, oriented to the environment, and adapted to his or her time, place and culture.” (quoted in Lillard, 1996, p. 3) Maria Montessori believed in a balance between freedom and responsibility, and designed the structure of her classroom to be free, and the materials to teach responsibility. The Bill of Rights in a Montessori elementary classroom is as follows: “to act by oneself and for oneself, to act without unnecessary help or interruption, to work and to concentrate, to act within the limits that are determined by the environment and the group, to construct one’s own potential by ones own efforts.” (Lillard, 1996, p. 98)

Another major difference between Montessori education and conventional education is the role of discipline in the classroom. Maria Montessori (1997) asks
“How can one attain discipline in a class where the children are free to move about?” (74). She answers her question by explaining that a child is truly disciplined when he becomes a “master of himself.” (Montessori, 1997, p.74) Montessori thought that conventional classrooms where children were required to sit at desks complete their work quietly on their own was not helpful for the children, nor is it real discipline. She explains that, “The discipline we are looking for is active. We do not believe that one is disciplined only when he is artificially made to be silent as a mute and as motionless as a paralytic,” (Montessori, 1997, p. 74).

Taking these differences between traditional and Montessori classrooms into account, it seems reasonable to expect that students in the Montessori classroom would be more creative because, as part of their environment, they are allowed much more freedom and choice than children in typical classrooms. In a Montessori classroom, it is the students who make the important decisions about their education, and therefore the motivation must come from within the students themselves. Conversely, one might expect that conventional students would be more successful at tasks rewarded in their classroom, such as neatness and organization.

Measure creativity

In order to go about examining creativity, I needed tests that I could rely on to get as complete a picture of creativity as I could. Two tests were used, the first was the Torrance Test of Creative Thinking (TTCT), Thinking Creatively with Pictures (Torrance, 1992), and the second was the consensual assessment
technique designed by Theresa Amabile (e.g., 1989). The TTCT was chosen because it is an established test, with clear rules for testing, standardized administration and scoring techniques. Torrance operationalizes creativity as consisting of four types of behavior: fluency, flexibility, originality and elaboration. Fluency is the sheer number of valid ideas. Torrance’s and Haensly’s rationale for using this kind of rating was that the more ideas one could produce, the more likely one is to come to an original solution (2003, 588).

Flexibility focuses on the divergent thinking characteristics of a test response, originality is the statistical infrequency of a response, and elaboration is the extent to which one followed through with their idea, (Torrance & Haensly, 2003, 588)

The consensual assessment technique was chosen because it takes a different approach to the assessment of creativity. In this technique, the research participant is asked to make a creative product, and a group of independent judges scores this product based on their own subjective definitions of creativity. In order for this technique to work well, the task must be open-ended, so that it allows for original responses to be made, and the task must not require special skills, such as proficiency in drawing or high vocabulary, so that creativity can be assessed, rather than technical know-how (Amabile, 1996, p. 41). I chose to ask the children to make a collage. Because the consensual assessment technique depends on the judges’ subjective experience of a product, it might tap into a more complex and more common-sense view of creativity. I used many of the scoring criteria proposed by Amabile. These include an overall assessment of creativity, novel use of materials, novel idea, variation in shapes, organization,
effort evident, complexity, neatness, and aesthetic appeal. An additional reason to use this technique lies in its open-endedness. One of the premises of Montessori education is that children should be free to express themselves and to act spontaneously (Montessori, 1997). It is possible that a relatively constricted test like the TTCT fits less well with the classroom experience of Montessori students than the much less restrictive activity of making a collage. If this is the case, the consensual assessment technique could reveal differences between the two types of education that the TTCT might not.

Together, these two tests give a more complete perspective on creativity, one (the TTCT) based on an explicit theory of the psychology of creative product, the other (consensual assessment technique) on the judges’ common-sense understanding of what creativity is.

Methods

Participants

Students from Montessori classrooms and conventional classrooms from Belle Valley Elementary School were chosen to participate in this study. The children ranged from age 5 to 9, kindergarten to grade 3. Students were selected randomly from the pool of those who returned their consent form. An equal number of girls and boys from each regular grade level were chosen, based on the comparable number of girls and boys who were in the Montessori classrooms.

Materials

Two tests were administered to the students. The first is the Torrance Test of Creative Thinking. In this standardized test, children are presented with simple
ambiguous shapes, and are asked to use this shape as the starting point for a
drawing. Each of the three subtests was scored individually on the following
scales: *Fluency, Originality, Elaboration, Abstractness of Titles, and Resistance
to Closure*, (Torrance, 1992). The *Fluency* score is simply the number of
different ideas that the student conveys in “interpretable responses,” (Torrance,
1992, p. 6). Students receive *Originality* points based on how uncommon their
response is. The scoring manual lists the statistically most frequent responses;
these receive zero points for originality. One point is awarded for each response
not on this list. Students can obtain bonus points for originality by using more
than one stimulus in their responses. Figure 1, shown below, received a bonus
point for using two stimuli. *Abstractness of titles* is broken down into four
categories. The first category receives zero points and includes obvious and
generic titles, usually consisting of one word or idea. A student earns one point if
their titled included a modifier such as “tall man.” Two points are awarded for
students who incorporated an “imaginative, descriptive title in which the modifier
goes beyond a concrete, physical description,” (Torrance, 1992, p. 11). Abstract
titles that are appropriate to the drawings receive the full three points. Examples
include “Time of Your Life,” and “Unwanted,” (Torrance, 1992, p. 11). Figure 2,
shown below, received the full 3 points. Credit for *Elaboration* is given for each
piece of information included in each drawing. Details that give indication of
what the drawing is beyond the minimum needed to understand the drawing are
given one point each. The final score on the TTCT is *Resistance to Premature
Closure*. A student receives zero points for closing the figure in the quickest,
simplest way possible, usually with a straight or almost straight line. One point is awarded when the student adds details around a closed figure. If closure is never completed, or if the figure is closed with irregular shapes or lines, the student receives 2 points per stimulus. For example, if a student drew a straight line to complete a shape of a banana, no points would be awarded. If a student were to use the same line as part of a landscape, two points would be added.

Figure 1 “Front of Train, Back of Train”

Figure 2 “Three Heads are better than two”

The scoring of the Torrance test has been criticized. A first criticism is that Originality scores are contaminated with Fluency, that is, students who provide more answers are more likely to also score high on Originality. This is problematic because originality is a key component of creativity. To correct for this bias, I rescored the tests, only counting the three highest scores in the second two subtests. This method was suggested by Dixon, (1979, p. 72) I also made my own scale of originality, using Torrance’s method of statistical infrequency, but instead of comparing the students I tested to a norm, I compared them to each other. A second potential criticism is that objective scoring of tests might miss true creativity altogether. The scores for originality in the TTCT are based only on their statistical infrequency, which does not measure degree of creativity.
Amabile (1996) has argued that consensual assessment, which involves a group of independent judges who rate creative products, is the best way to measure creativity. I implemented the consensual assessment techniques for the first subtest. Graduate student volunteers rated each student’s first subtest in four different areas: creativity, novel idea, elaboration, and aesthetic appeal. Here are three examples of the first subtext of the TTCT that were judged. It is easy to see how difficult scoring these two responses since egg was considered an unoriginal response in the TTCT.

![Figure 4](image1.png) **Figure 4 “The day the egg ate the Mice”**

![Figure 5](image2.png) **Figure 5 “Juggling Doctor Frankenstein Porpoise Egg”**

Students were also asked to make a collage as part of the project. Each student received the same white sheet of 8.5”x11” construction paper, the same assortment of materials including textured paper, construction paper, tissue paper, glue, and patterned scissors, and the same instructions. I asked the students to “make a design you think that no one else will think of.” The only limitation I put
on them was that they had to alter the collage materials before they glued them. I also explained to the children that they had 15 minutes to complete their collages. Consensual assessment was used to evaluate the collages. I used the rating procedures described in Amabile (1996). There were 5 judges, an undergraduate art student, two graduate psychology students, a professor unassociated with the project, and a teacher’s assistant in a Montessori classroom. Each judge rated the collages on ten different dimensions with a ten point scale, as suggested by Theresa Amabile: Creativity, novel use of materials, novel idea, effort evident, variation in shapes, organization, complexity, neatness and aesthetic appeal, (Amabile, 1996, p. 49).

Procedure

Students were selected to participate if they had brought back a consent form signed by their parents. An equal number of girls and boys were chosen randomly from each classroom, and an equal number of student from conventional classrooms were randomly selected to match the number of students in the Montessori. There are many more students in conventional classrooms than in Montessori classrooms, so every Montessori student who brought their consent form participated. Students were taken from their classrooms to complete the tests in one of two separate rooms, depending on availability. I had intended to give each student the test individually so that I could ask the children what their answers were, since many of the student’s handwriting was illegible. I began by testing the first grade. When I found that each student was taking much more time than I had anticipated, I began testing the rest of the students in groups. The
tests were taken in groups with students from the same age level and type of schooling. I read aloud the directions of the TTCT to the students which are as follows:

On the opposite page is a curved shape. Think of a picture or an object which can draw with this shape as a part. Try to think of a picture that no one else will think of. Keep adding new ideas to your first idea to make it tell as interesting and as exciting a story as you can. When you have completed your picture, think up a name or title for it and write it at the bottom of the page in the space provided. Make your titles as clever and unusual as possible. Use it to help tell your story. (Torrance, 1962, p. 2)

I also told them to do the best job they could on spelling out the titles of their drawings. After the students were finished with the TTCT, I asked them what their titles were in case their writing was difficult to read.

Results

The final analyses stated that Montessori children are not significantly different on any aspect on any of the tests except when it came to making less neat collages. To get to this point I had to do a number of auxiliary analyses. First, I examined the extent to which the scales derived from consensual assessment indeed form reliable scales. Second, I tried to reduce the amount of data by performing a factor analysis on the data from the TTCT.

Reliability of consensual assessment

As stated in the Introduction, Consensual Assessment is a technique developed by Theresa Amabile which involves having judges make subjective decisions about a work’s creativity and give a score reflecting their opinion. This technique of using subjective scoring was used twice in this study, first for the
collages, then again when trying to compensate for the flaws in the TTCT as discussed above.

The judges for the collages were two graduate students, one Montessori teacher’s assistant, one undergraduate art major and a Psychology Professor. To rate the test for agreement within the panel of judges, I ran a reliability analysis. This reliability analysis yields an interrater reliability, or alpha coefficient. This is a score ranging from 0-1. The closer to one the scores are, the more the judges agree. The reliability for the collage judges was .77 for subjective creativity, .80 for novel use of materials, .78 for novel idea, .82 for variation in shapes, .85 for organization, .85 for effort evident, .84 for complexity, .80 for neatness and .64 for overall aesthetic appeal. These alpha coefficients are acceptable so I can conclude that the judges agree on each of the categories.

Consensual assessment was also used on the first subtest of the TTCT. The judges were graduate student volunteers in psychology. The results of the reliability analysis are as follows: .83 for creativity, .77 for novel idea, .92 for elaboration and .87 for aesthetic appeal. These coefficients are acceptable.

Data reduction

Factor analysis was used on the TTCT to reduce the number of scales. I used a two-factor solution with oblique rotation; the two factors explained 55% of the total variance. The two-factor solution was chosen over a three-factor solution because the results of this analysis were easier to interpret. Table 1 shows the results. I interpreted the first factor as fluency, because it included all the originality, elaboration and fluency scores on the second two sections of the test.
The second category, labeled ideas, includes abstraction of titles, resistance to closure, and originality from the first subtest. Two scales were formed by z-transforming each of the original TTCT scales, and adding the z-scores of the appropriate subscales to form a Fluency scale and an Ideas scale. These scales had acceptable internal consistencies (alpha = .89 and .66, resp.).

*Table 1.* Results from the factor analysis on creativity scales (loadings on the pattern matrix obtained from principal component analysis with oblique rotation).

<table>
<thead>
<tr>
<th></th>
<th>Component 1</th>
<th>Component 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluency, item 2</td>
<td>.907</td>
<td>.002</td>
</tr>
<tr>
<td>Originality, item 3</td>
<td>.858</td>
<td>.097</td>
</tr>
<tr>
<td>Originality, item 2</td>
<td>.847</td>
<td>-.077</td>
</tr>
<tr>
<td>Elaboration, item 3</td>
<td>.802</td>
<td>-.145</td>
</tr>
<tr>
<td>Fluency, item 3</td>
<td>.738</td>
<td>.082</td>
</tr>
<tr>
<td>Elaboration, item 2</td>
<td>.404</td>
<td>.259</td>
</tr>
<tr>
<td>Abstraction, item 1</td>
<td>-.113</td>
<td>.733</td>
</tr>
<tr>
<td>Abstraction, item 2</td>
<td>.249</td>
<td>.657</td>
</tr>
<tr>
<td>Elaboration, item 1</td>
<td>.198</td>
<td>.574</td>
</tr>
<tr>
<td>Originality, item 1</td>
<td>-.184</td>
<td>.553</td>
</tr>
<tr>
<td>Resistance to closure, item 2</td>
<td>.238</td>
<td>.543</td>
</tr>
</tbody>
</table>

Inspection of the correlation matrix of all variables suggested that all collage scales, with the exception of neatness, correlated highly. Therefore, I formed a single collage scale by z-transforming all remaining 9 scales and adding them. Internal consistency for this scale was very high, namely .97. Likewise, all of the four consensual assessment scales for the first item of the TTCT had high intercorrelations. I formed a single Drawing scale out of those four by z-transforming the scales and adding the z-scores. This scale had a very high internal consistency, namely .92.

Summarized, the data were reduced to five scales: (a) fluency (from the TTCT), (b) ideas (from the TTCT), (c) collage creativity (from the collages), (d)
drawing creativity (from the first item of the TTCT), and (e) neatness (from the collages). Table 2 shows the correlations between those five scales. Correlations range from .16 to .58, indicating that the scales are related, but are still separate categories.

Table 2. Intercorrelations of the five creativity dimensions (listwise deletion, N = 55).

<table>
<thead>
<tr>
<th></th>
<th>Fluency</th>
<th>Ideas</th>
<th>Collages</th>
<th>Drawing</th>
<th>Neatness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluency</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ideas</td>
<td>.41*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collages</td>
<td>.30*</td>
<td>.31*</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drawing</td>
<td>.16</td>
<td>.55*</td>
<td>.24</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Neatness</td>
<td>.20</td>
<td>.37*</td>
<td>.58*</td>
<td>.35*</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note. *p < .05 (two-tailed).

Analysis of variance: The effects of number of years and type of education on creativity

Figure 6 shows the results for the five scales as a function of the students’ grade year and the type of education (conventional or Montessori). As a formal test, I conducted analysis of variance with grade year and type of education as the between-subject variables. I also analyzed the data substituting years of age for grade year; the results were essentially the same.

For fluency, the main effect of type of education on the collages was not significant, F(1, 48) = 0.54, nor was the interaction of Montessori with grade year, F(3, 48) = 0.19. The main effect of grade year was significant, F(3,48) = 13.45, indicating that older children were more fluent on the TTCT.

For ideas, the main effect of type of education on the collages was not significant, F(1, 49) = 3.98, nor was the interaction of Montessori with grade year,
F(3, 48) = 2.48. The main effect of grade year was significant, F(3, 48) = 11.31, indicating that older children exhibited more ideas on the TTCT.

For collage creativity, the main effect of type of education on the collages was not significant F(1, 48) = 0.02, nor was the interaction of Montessori with grade year, F(3, 48) = 0.87. The main effect of grade year was significant, F(3, 48) = 4.46, indicating that older children made more creative collages.

For drawing creativity, the main effect of type of education on the collages was not significant, F(1, 48) = 0.00, and neither was the main effect of grade year, F(3, 48) = 1.62. The interaction of Montessori with grade year was significant, F(3, 48) = 3.83. The figure shows the complexity of the patterns: Montessori students peak earlier and then decline; traditional students show a monotonic increase in drawing creativity from first grade on.

For neatness, the main effect of type of education on the collages was not significant, F(1, 48) = 0.53, nor was main effect of grade year, F(3, 48) = 2.73, nor the interaction of Montessori with grade year, F(3, 48) = 0.31.
Figure 6. Scores on the five creativity scales as a function of grade and type of education.
Discussion

The main question of this thesis was whether the environment influences creative development. To examine this, I tested two groups of children from the same grades in the same school, one group educated within the traditional system, the other within the Montessori system. The expectation was that the Montessori curriculum fosters intrinsic motivation and thereby enhances creativity. In terms of data analysis, I expected a grade year by type of education interaction: the creativity of Montessori students should increase faster over grade levels. I also expected the opposite interaction for neatness, which would increase faster in traditional students.

This was not what was found: for none of the five creativity scales (fluency, ideas, collages, drawing, neatness) did the interaction become significant in the predicted direction. There were also no main effects for type of education. For three of the measures (fluency, ideas, and collages), a main effect of grade level was found, indicating developmental trends towards increasing creativity in these domains. In sum, I did not find what I expected to find: more creativity in Montessori kids, more adherence to rules with regular kids. I thought creativity might be related to not having set boundaries, which might be reflected in the Montessori children’s lack of neatness, but this did not show up in the creativity measures.

There are a number of reasons for the lack of any difference between Montessori and conventional education. Before I comment on a possible more substantive reason, I would like to point at a few extraneous issues that may have
affected the test results, namely test administration, and the measurement of creativity.

*Issues with test administration*

A first reason for obtaining a null-result might be that both tests were administered in the style that is more common for conventionally taught children. The students were not given a choice as to when they completed the test. Tests are quite common place in conventional education, while they are totally foreign to the Montessori children, as was sitting in one place at the whim of an instructor. The traditional children came into the testing room and were familiar with the idea of using “offices” which are just folders set up to give each child a private work space. This is another aspect of the test taking that the Montessori children were completely new to. Also, as part of administering the test I was required to tell the children that they could stop at any time, which the Montessori children took more literally than the traditional children. The regular kids are used to following directions and completing their work when told. This led to many behavior problems during the test taking period. The Montessori children, especially the kindergarteners had trouble sitting and working when I told them to. Many of them simply chose not to, and disrupted the other student’s quiet working time.

The administration of the collage was slightly more familiar to the Montessori students because they could at least be active and mobile. Also, making a collage is closer to play than the TTCT was, allowing the students to focus easier. The collage was done in groups which presented a problem for the
Montessori children who do most of their work individually and sometimes play with two or three students, not the seven student groups that they were working in. Most of the behavior problems diminished with the age of the students, so the older Montessori classroom had very few problems.

It is even possible that the test administration itself disrupted the intrinsic motivation for being creative (Amabile, 1989; Hennessey, 2003). “Expected reward, expected evaluation, surveillance, time limits and competition” are considered detrimental to true creativity (Hennessey, 2003, p. 263). The testing situation might be perceived by students to contain some or all of these characteristics. Time was an issue for nearly all the students; I had to pressure most of the students to finish up within the time I was allotted by their teachers. It should be noted that such situations do not by definition lead to negative consequences.

Issues with creativity testing

A second reason why I found null-results might have to do with the measurement of creativity itself. The problem is not associated with low reliability – the test scales I used were internally consistent, there was high interrater reliability for the consensual assessment technique, there were substantial correlations between tests and between scales, and the tests uncovered developmental differences, therefore they must measure something. The question is whether the tests are valid, that is, whether the test is testing creativity. Validity is suggested by the fact that the many different measures of creativity that I implemented were highly correlated, but the test measure might measure only a
small portion of creativity. For instance, it can only be sure to validly test
creativity related to visual art, not to, for instance, verbal or musical creativity.

There are other problems related to the fact that test was tied so closely to
development. Since having a title is an important part of the score on the TTCT, both in the score itself, and for the scorer to understand the drawings, the TTCT is dependent on the child’s ability to write. I did ask the students what each of their titles meant, but they may have picked titles they thought they could write since that was part of the instructions. Also, students with more developed dexterity with a pencil, or with scissors in the collage, would have more time to finish their drawings or collage because they could work faster. It is probably impossible to get around these developmental issues when testing children, but it still questions how valid testing creativity with these measures really is, especially with such young children.

Torrance, the author of the TTCT, and Haensly pointed out some problems in Torrance’s own test. They acknowledge that testing is an artificial situation likely to hamper creativity rather than encourage it, (2003, p. 589). They also explains that the process of “divergent production,” which is a focus of the TTCT, is insufficient for assessing creativity, and tries to compensate for this deficit by including “qualitative” measures: flexibility, originality, and elaboration (Torrance & Haensly, 2003, p. 589). It may be doubtful that Torrance was successful, because scoring the qualitative measures he included still only involves counting the appropriate responses. For example, originality points are awarded only when a response is not on the list of statistically frequent responses.
Consensual assessment is a better method of ascertaining the depth of creativity of a product, which is why I used it together with the TTCT. To combat the lack of depth and qualitative data of the TTCT, I additionally used Amabile’s consensual assessment technique on the first subtest of the TTCT. Psychology graduate student volunteers rated the subtest in four different categories: creativity, novel idea, elaboration, and aesthetic appeal. The results were encouraging for Torrance’s scoring method: There was a high degree of interrater reliability and correlation with original scores, so it would seem that the students received similar scores with both scoring methods.

Another reexamination of the data I did was to try and remove the fluency effect from originality. Each response a student makes is scored for originality, making originality dependent upon fluency – students who come up with a larger number of answers overall are statistically more likely to come up with a larger number of original answers. Dixon explains the problem of connecting fluency and originality by saying, “when a product is truly original and contains unique insights, no adding together of ordinary, run of the mill ideas can equal it,” (1979, p. 72). He proposes to score only the three most original responses in the second and third subtests of the TTCT. I employed this method, which seemed to be only partially successful in rooting out more creative, but less fluent students. Most of the students had at least three responses that were considered creative by the TTCT scoring procedure. This method then seemed to point out only the extremely “uncharted” students, which were usually the ones that chose not to finish their tests. None of the drawings in Figure 7 could be scored because they
did not use the stimulus, which is another reason many students did not receive full originality points in the rescoring procedure. This figure also demonstrates the tough judgment calls that the TTCT requires the scorer to make. One must wonder whether this student is uncreative as her score would suggest, or whether she just doesn’t follow directions (which can be argued is part of being creative).

![Image](image.jpg)

Figure 7 “I like playing, my (word indecipherable), the these aren’t all,” (story continues on next page)

It seems a nearly impossible feat to measure creativity, for some students are bound to be creative in some realm that is not covered by the measurement used. This does not mean that creativity should not be tested, only that the results of such tests need to be carefully examined. Creativity tests should never be used for assessment on an individual basis, for they can never prove the absence of potential (Torrance & Haensly, 2003, p. 590). Since creativity is highly based on motivation, the highly artificial situation under which creativity must be tested is
not a valid atmosphere to draw conclusions for individuals. Torrance and Haensly explain the purpose of creativity testing by expressing that it should be used to “…plan instruction that takes advantage of identified creative potential already bubbling forth, and works to release that potential when it has been inhibited and obstructed in its natural development,” (2003, p. 601).

**Future Research Directions**

Creativity is a very important issue for schools to address in their curriculum and teaching styles; the topic deserves much more research. There are many ways in which this particular study could be improved upon. One of the most pressing problems of this study was the fact that the Montessori children were forced to take the test in an unfamiliar style, against what their typical environment teaches. I should have administered the test to both groups in both styles. If the test were given in typical Montessori fashion, there would be a table at which the test was set up where students could take turns taking the test at their leisure. It probably would not be presented as a test either; it would be called a work just as everything else is in the classroom.

Another problem was the small number of students tested. Montessori classrooms are typically private and almost never occur in the same school as conventional education, making the situation I was testing in unique. There would usually be a discrepancy in socio-economic status of the students in a Montessori school, but this is not the case at in this setting. But there was only one classroom of each age group, limiting the number of students I could test.
Also, the generalizibility of these results is limited by the homogeneity of the
group of students tested here.

Another extension of my research would be to test older children. In the
school where I tested, there was no Montessori classroom above 3rd grade. I
would particularly be interested to see how the results if the same testing
procedures were used for 4th and 5th grade. The graphs seem to suggest that the
3rd graders in conventional classrooms level off in their creativity, while
Montessori students continue to grow creatively. The results for the later grade
would be necessary to see whether this is the case. It would also be interesting to
examine whether creativity continues to develop, in order to rule out the influence
of developmental issues in the testing of creativity. We could assume that the test
really tested creativity if the scores continued to rise as children mature, but if
there is a plateau, we could infer that the tests might only measure extraneous
aspects of cognitive development, such as vocabulary or motor skills or mind-
hand coordination.

**Conclusion: The creative environment**

Amabile and Hennessey have some strong suggestions about
environmental factors that influence a child’s intrinsic motivation and creativity
for the worse, but not for the better. Amabile and Hennessey agree on the ways
in which intrinsic motivation and creativity can be extinguished: expected
reward, expected evaluation, observation, controlling rules (such as time limits)
and competition, (Hennessey, 2003, p. 263; Amabile, 1989, p. 72). It would seem
at first glance that conventional schooling is structured to discourage creativity, but as this study demonstrates, it is not that simple.

The Intrinsic Motivational Principle of Creativity has gathered a strong body of research, to the point that it has been elevated to the status of an undisputed principle, (Hennessey, 2003, p. 255). Finding things that discourage creativity has been more straightforward, it is more difficult to find ways to encourage it probably because of the diversity of ways that one can be creative (Hennessey, p. 262). Hennessey also discussed some situations when it would seem that intrinsic motivation would be hampered, but it is in fact increased, such as the fact that performance contingent rewards, meaning receiving a reward after achieving a certain level of performance (grades), can augment self efficacy and therefore increase intrinsic task interest, (Hennessey, p. 259). So in some cases, grades can severely hamper creativity, when it is used as evaluative or competitive, when the grades are ‘task-contingent,’ meaning they are rewarded on completion of the task and provide no informative value (Hennessey, p. 263). But if grades are perceived by the student as being for the purpose of giving information, then the student’s intrinsic motivation will not be reduced.

Amabile describes the different way that limits can affect students, and again, it is not as simple that limits are always destructive to creativity. It depends on how the limits are placed, and the perceptions of the students about the limits, (Amabile, 1989, p.80). Amabile also suggests ways to avoid the negative effects of rewards and of evaluation. If one were to give informational criticism instead of just saying “that’s good” or “you did a poor job,” the child’s
intrinsic motivation and creativity would be affected less drastically. Extending this idea to rewards, a child will be less affected by a reward in a situation where they didn’t expect it, (Amabile, 1989, p. 80).

It is not whether one is a student in a Montessori classroom or a conventional classroom that decides whether their creativity will be fostered or not, it is more whether the environment is structured in a way that allows creativity to be explored. Creativity and intrinsic motivation are highly contingent upon the aspects of one’s environment discussed above, but neither Montessori education nor conventional education are necessarily better or worse when it comes to creativity.
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