Zebras and Jaguars, Oh My! Integrating Science and Engineering Standards with Art during Prekindergarten Block Time

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Abstract

This study considered how arts integration impacted preschoolers concerning the students' acquisition, understanding, and retention of information about animal habitats. This current investigation used control and experimental conditions to determine the effects of art integration during students' block building of animal habitats and their subsequent recollections of their work; this activity also incorporated the Next Generation Science Standards (NGSS) and National Core Art Standards. The two NGSS standards utilized in the study are K-2-ETSI-1 and K-2-ETST-2. Overall, combined child-reported correct animal and habitat characteristics gain scores on the posttest and distal posttest showed significant differences between the two conditions, favoring the experimental arts-integrated condition with a medium effect size in both cases. These promising results from this study showed the increase not only in knowledge about animals and their habitats, but in creativity as the students integrated art materials into a traditional block center to create their animal habitats.

Key Words

Art integration, animal habitats, block center, creativity, preschool, early childhood, play.

Introduction

How to best prepare our students for life beyond their primary and secondary schooling is a topic of constant question and debate among educators and educational leaders (Spring, 2016). For several years, a specific national focus on the Science, Technology, Engineering, and Math (STEM) fields has moved students towards curriculum and activities that can provide the skills needed for careers in these fields (Breiner, Harkness, Johnson, & Koehler, 2012). More recent research has shown integrating the arts into the STEM fields has substantial benefits (Land, 2013; Root-Bernstein & Root-Bernstein, 2013) as students pursue careers in the STEM fields. The addition of the arts changes the acronym STEM to STEAM. The integration of STEM standards into curriculum has occurred in most states, but the integration of the arts into these STEM activities is a relatively new concept (Piro, 2010).

Every educator hopes to prepare students for not only what comes next in their school career, but ultimately to be a successful lifelong learner. No Child Left Behind Legislation has been questioned as to whether education is truly meeting this goal (Zhoa, 2009). Promising research

indicates that the expansion to STEAM has impacted students, increasing their enthusiasm and interest in the STEM fields, prompting life-long learning skills they can later use in their lives, and showing a great retention for content learned through arts integration into the STEM curriculum.

The study reported here considered how arts integration impacts preschoolers in the students' acquisition, understanding, and retention of information about animal habitats. This current investigation utilized control and experimental conditions to determine the effects of art integration during students' block building of animal habitats and their subsequent recollections of their work. The following literature review shows how art integration into curricular subjects can provide extra student motivation while creating greater long-range retention of the topics taught with the integration. Additionally, the review discusses the current trends with art integration in early childhood classrooms.

Literature Review

Arts integration in the STEM curricular areas can be very beneficial for knowledge retention and student motivation (Rinne, Gregory, Yarmolinskay, & Hardiman, 2011). Topics that may seem trivial to students become pertinent and come to life for students (Emdin, 2010). Art integration helps children become lifelong learners, which can be attributed to gearing learning modes to individual students' strengths through the arts. However, there is little research on the specific impact arts integration has on the early childhood population, pointing to the need for work in this area.

The Arts and Student Motivation

In a world of standards, testing, and assuring every minute of the day is goal-oriented, teachers can be challenged to keep students' interest while still staying on topic. Scholars examining this issue (Nevanen, Juvonen, & Ruismaki, 2014) say the arts help "task orientation and motivation increase" as each child can see "him or herself to be skillful at the task" (p. 74). The arts are active rather than passive and allow the topic to come to life through the child's imagination and creation. Another group of researchers (Rinne et al., 2011) suggested that through tasks such as oral production, elaboration, rehearsal, enactment, and generation, curriculum content is enhanced through the arts piquing a child's interest and helping the child remember the topics covered longer.

A review of multiple studies (Poldberg, Tranin, & Andrezejczak, 2013) further showed how the arts "provide a heightened level of engagement that generalizes to an improved attitude toward school affecting behavior and achievement" (p. 5). When expanding the curriculum through art integration, teachers challenge students to consider a topic from multiple perspectives and with varied senses. This examination heightens student's senses, in return, creating added excitement. This heightened sense of excitement and sensory input can help account for the positive impact of the arts on behaviors and ultimately on cognitive achievement.

Life-long Learners and Multiple Modalities of Learning through the Arts

People learn through many different modalities that do not always support a "one size fits all" curriculum (Dewey, 1938; Gardner, 1993). Some people learn best through social interactions, while others prefer to work independently. One student may acquire information through reading materials, another by physically dramatizing something, and yet another through verbally reciting the same material. Teacher education programs prepare candidates to use multiple modalities of learning and effective pedagogical methods for reaching the broadest base of learners. Arts integration allows for multiple modalities of learning, making it an effective pedagogical strategy. When a student is motivated and allowed to learn in a way that is most meaningful to the student, there is greater permanent transfer of knowledge (Rinne et al., 2011).

Researchers (Root-Bernstein & Root-Bernstein, 2013) found students that coupled science classes with arts or music classes had an average 100 point advantage on their SAT scores compared to students taking science classes only. The arts help build skills vital to the STEM fields such as visualization skills, enhanced manipulative abilities, strong backgrounds in recognizing and forming patterns, and keen observation skills. Albert Einstein "attributed many of his scientific insights to musical thinking" (Root-Bernstein & Root-Bernstein, 2013, p. 16), having grown up playing both the

violin and piano. An analysis of other great names in the STEM field, such as Nobel Prize winners, leads to similar conclusions (Root-Bernstein & Root-Bernstein, 2013).

Arts Integration in Early Childhood

Research examining the benefits of early childhood arts integration is often conducted to determine effects in school preparedness. Although sparse, the existing literature shows similar promise to studies conducted with older students. Enhanced growth in student enthusiasm for a project and the ability for educators to gear learning specifically to each student through arts integration have been identified as benefits (Nevanen, Juvonen, & Ruismaki, 2014). The integration of arts in the early childhood classroom is often approached differently than in a traditional primary class. Early childhood classrooms frequently integrate arts throughout the day, coming in the form of songs, craft projects, and dramatic play, among others (Gravis, 2013). Although the early childhood day is highly immersed in the arts, there is little research to document the benefits and impact on student learning. What is known about much of the art integration is that it lacks the crucial element that Runco and Jaeger (2012) consider critical for true creativity. These authors point to the need for originality in truly creative activities. Often, the arts integration in early childhood programs does not allow children to instill their own creativity into projects, rather, the art projects come in the form of predetermined craft projects and songs, which represent a creative act only for the persons who originally devised or wrote them.

Evidence of how intensely art and creativity immersion impacts children was shown through a recent study (Brown & Sax, 2013), which produced notable findings as it compared the social-emotional states of Head Start children over a long term study. The experimental group in this study was deliberately provided with art integration throughout the lesson in various forms; the control group utilized traditional play materials of blocks with no specific enhancement. The experimental group in this study showed significant growth in not only social-emotional regulation, but a higher attitude of happiness and interest in the school day as compared to the control group.

One of the most notable exemplars to arts integration in early childhood programing is the Reggio Emilia approach. A child-centered approach is taken in all aspects of the approach, from a deliberate, welcoming, child-focused environment to an emergent curriculum based on the interest of the children. Imagination, creativity and infusion of art is fully integrated into all classrooms of a Reggio center, including an atelier or a specific space, sometimes accompanied with an additional teacher, utilized to promote imagination, creativity and exploration of art production (Edwards, Gandin, & Forman, 2012).

Reflecting on the paucity of research in early childhood arts integration, the authors decided to conduct a small study with four-year-old preschool students constructing animal habitats using blocks with and without arts integration. The authors considered the research suggesting student motivation and retention of knowledge will be positively enhanced in creating the framework for this study. The framework also reflected the research suggesting multiple modalities of learning enhance student performance, notably the Head Start and Reggio Emilia work. National standards addressed by the lesson activities are discussed in the next section, followed by the study methodology, study results, and conclusions.

Standards Addressed by the Study

Two of the Next Generation Science Standards (Achieve, 2013) were utilized in the instructional unit that formed a basis for the study. The first standard was the K-2-ETSI-1 “Ask questions, make observation, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.” The students were requested to improve the pretend habitats of the prescribed animals they were assigned. They made these changes after gathering information from photos and texts provided to them as well as asking questions to their teachers and peers about how these habitats might be improved. The second National Generation Science Standards utilized was K-2-ETST-2, “Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as need to solve a given problem.” In the experimental condition, the

students were asked to draw a simple sketch of the habitat to illustrate how they were improving the habitat of the animal they were assigned. Students in the experimental condition were also given a variety of craft items to enhance the habitat of the animals.

Additionally, four of the National Core Art Standards (National Coalition for Core Arts Standards, 2014) were applied to the lessons. The first was Pre-K Visual Art: Create 1.1. Pre-K Standard A, "Engage in self-directed play with materials." The students were allowed to independently create their habitats in the block center of their classroom. During the experimental condition, this center was enhanced with other art materials to allow students to expand their ideas. The standard PreKVA: Cr1.2.Pka, "Engage in self-directed creative making" was supported as the students were given a variety of arts materials and asked to create an animal habitat. There were no prescribed directions defining how this habitat should appear; students were encouraged to create the habitat independently with arts materials. Standard PreKVA: Cr2.2.Pka, "Share materials with others" became necessary as the arts materials and blocks were in limited supply and the students had to share and ask peers for materials as needed. Finally, standard PreKVA: Cr3.1.Pka, "Share and talk about personal artwork" was implemented as each student individually spoke about the habitat he or she created.

Method

The current investigation involved an experiment with a class of preschool four-year-old students learning about animals and their habitats. The main idea was to investigate whether adding the arts during block construction of animal habitats resulted in greater motivation to learn and greater recall of science habitat information about the specific animals. The more specific research questions are shown below:

1. Was a simple sketch of a planned habitat superior to a verbally stated plan in number of aspects of the problem attended to? This was determined by counting the number of solution features of the habitat mentioned in the verbal plan and comparing to the number of solution features shown in the drawing.
2. Did the amount of extra art items a student chose to add to his/her block structure promote a larger number of positive considerations/ solutions/ features of the habitat? This was determined by interviewing the student and asking him/her to explain the features of the habitat that was created, then counting the different features of the habitat and number of art items added.
3. Which condition did the students perceive they enjoyed more, were more creative in, and were more effective at solving the problem in? This was measured by the four attitude survey questions.
4. Were the animal habitats made with arts integration (sketching and extra artsy materials) be more memorable than those made without? This was determined by counting the remembered features of animal enclosures made with arts integration compared to those made without arts integration.
5. Which condition prompted students to show more creative characteristics in their work?

Research Design

This was a pretest-posttest counterbalanced design study in which the class was divided into two groups. Each group alternated between the experimental and the control condition for the last part of the animal habitat lesson unit. The study was a repeated measure study in which each group experienced both conditions but in a different order (hence, counterbalanced) and at different times. An advantage of the repeated measure study is it can be done with a small number of individuals, which was the case in this classroom (Girden, 1992). Because of limited space and blocks at the block center, each of the groups was divided into an earlier group and a later group working at the block center. For example on Day 1 Group 1 students were divided into two groups of five and were given the control activities in these separate groups. Table 1 shows the study design. Groups in the experimental condition received the following craft and recycled materials: colored tissue paper, colored pompons, green, white, and brown chenille sticks, pieces of craft foam, colorful plastic lids, and plastic tubs.

Table 1. *Design of the Study*

Day	Animal	Group1	Group 2
1	Zebra and habitat card	Control Condition. Student verbally tells how he/she plans to make enclosure and then builds it.	Not working on this today
2	Zebra and habitat card	Not working on this today	Experimental Condition. Student chooses some craft or recycled material enhancements for habitat. Student draws a sketch showing how he/she plans to make enclosure and then builds it.
3	Jaguar and habitat card	Experimental Condition. Student chooses some craft or recycled material enhancements for habitat. Student draws a sketch showing how he/she plans to make enclosure and then builds it.	Not working on this today
4	Jaguar and habitat card	Not working on this today	Control Condition: Student verbally tells how he/she plans to make enclosure and then builds it.

Setting and Participants

This investigation was conducted at a PK- Grade 6 elementary school in the Midwestern United States with a state funded preschool program. The school has 276 students with a 46% free and reduced lunch rate and is identified as a school-wide Title 1 building. The school has a student body of 11% minority students and 89% Caucasian students, with no identified English as Second Language Learners and 16% of students on an Individual Education Plans (IEP). The current study took place in a class of nineteen preschool four-year-old students that had a licensed Lead Teacher and a full-time Teacher Associate.

This study was approved by the Internal Review Board Human Subjects Committee of the overseeing university and the school principal of the building in which the study took place. All students and their parents were fully informed about the study and provided signed consent to participate.

Data Collection and Instrumentation

Data for the current study were collected through observation prior to, during, and after the implementation of animal habitat lessons. The observations were recorded on a series of structured observation instruments as shown in Table 2. These instruments allowed the evaluator to quickly document each student's work. Additionally, there was a pretest given prior to the lesson, a posttest given after both the control and experimental group, and a distal posttest given to each student to record how many features of an animal habitat the students could verbally recall. The distal posttest was given several weeks after the initial study period to account for long-term retention of information. For this portion of the data collection, the students were asked, "Name as many features of an animal habitat as you can think of." Answers were tabulated on a pre-prepared data collection tool that had many possible habitat features listed so the observer could quickly circle the responses.

Because of the limited reading ability of the four-year-old participants, a 5 point pictorial scale was utilized to record the students' reactions to aspects of the project. The

scale showed a deeply frowning face, a slightly frowning face, a neutral face, a slightly smiling face, and a widely smiling face. For this portion of the data collection, the evaluator individually asked each student to point to the face on the scale that most closely represented his/her response and verbally respond to the questions after they were done creating their animal habitat each day. The questions asked were grouped and asked in the following order: "Did the new habitat make the animal happy? Why do you feel this way?" "Was the habitat making activity today fun? Why do you feel this way?" "How creative were you today? Why do you feel this way?" and "How well did you solve the problem of the animal's habitat today? Why do you feel this way?" These student responses were recorded in writing by the observer.

Table 2. *Sampling of Observation Tool*

Student Name: Name of Construction: Student explanation:	Control Condition Jaguar or Zebra (circle one) Circle features present: • Large enclosure • Cave • Doorway • Bend in enclosure • Body of water • Climbing rock • Place for food • Tree • Place to hide, sleep • Toys or place to play • Other_____	Experimental Condition Jaguar or Zebra (circle one) Number of art items chosen: Circle features present: • Large Enclosure • Cave • Doorway • Bend in enclosure • Body of water • Climbing rock • Place for food • Tree • Place to hide, sleep • Toys or place to play • Other_____

Data Analysis

The data from the pretest-posttest-distal posttest were tabulated by looking at the number of responses each student gave each time they were asked the feature question ("Name as many features of an animal habitat as you can think of."). These numbers were then entered onto a spreadsheet and simple descriptive statistics were determined. The attitude surveys were scored as follows: "1" for deeply frowning face, "2" for slightly frowning, "3" for neutral, ""4" for slightly smiling, and "5" for widely smiling. These scores were also entered onto a spreadsheet and simple descriptive statistics were determined. Table 3 provides the scoring protocols used to score other aspects of students' work.

The detail of the animal habitat block construction products the students created were analyzed using the observer's notes and photographs taken during the observation periods. The observer specifically tallied the

exact number of features the students added as it corresponded to the predetermined features on the observation tool as noted in Table 2 and this data was recorded into a spreadsheet for comparison measures. The observer also considered other features the students added to their habitat that were not on the pre-determined list and made note of those additions. These additions were recorded on a separate data collection list with brief explanations about the student's additions.

Table 3. *Scoring Protocols for Creative Aspects of the Work*

Aspect of Work	Score Range	Characteristic
Elaboration	0-6	1 point each distinct part of habitat
Resistance to premature closure	0-4	0 point = fully enclosed 1 point = enclosed all sides but has doors or gates 2 points = 3 walls 3 points =1 or 2 walls 4 points – no walls at all
Storytelling articulateness	0-4	0 point = no participation 1 point =participation without task completion 2 points = minimal building without play 3 points = minimal building and playing 4 points = highly enthusiastic building and playing
Fluency	0-1	0 point = small construction with few blocks/ items 1 point = large construction with many blocks/ items
Flexibility	0-5-	1 point for each type of different material used
Originality	0-7	1 point for each unusual feature seen in only a few constructions such as tall tower, tree made of blocks or paper cylinder, stairs, arch, cave, or overhead branches

Results

Teacher Observations of Students during Block Construction

Significant differences between the experimental arts integration condition and the control condition were found when considering two of the research questions. First, regarding the research question about student preferences, in general, the students in this classroom were eager to participate in this project and eagerly contributed and built constructions for both the control and experimental condition. However, as noted in Table 4, there was a significant difference between the control and experimental group in the degree of participation, 2.16 for the control group and 3.67 for the experimental group, calculated as *t*-test value of <.001 with Cohen's *d* of 2.2, a very large effect size. During the control condition, the students built their structures and then were content to take the structure down and turn to another task. While a few played with their completed structure in the control group, the majority simply built and then were finished. However, in the experimental group, the majority not only enthusiastically built their structure but then wanted to play and continue to add to the habitat. The sophistication of the habitats continued to grow through this play time. Figure 1 shows a child who did not engage in the control condition opportunity, but was highly enthused and engrossed during the experimental condition.

More notable was the actual construction of the habitats, as considered in the research question addressing if the amount of art items a student chooses to add to his/her block structure promote a larger number of positive considerations/ solutions/ features of the habitat? As shown in Table 3 there was significant difference in the control versus the experimental condition habitat constructions when considering the degree of openness to the structure, the number of parts included in the habitat, and the size of the structure. The children included many more parts of the habitats in the experimental condition compared to the control condition. The mean score for number of child-identified parts in the experimental condition was 5.06 compared to 2.44 in the control condition. The mean score for size of the enclosure in which a small structure was scored "0" and a

large structure was rated "1," was .82 for the experimental condition versus .22 for the control condition, resulting in a very large effect size. Most significant was the degree of openness of the enclosure in which constructions were scored as "0" if completely closed; "1" if the structure was completely enclosed except for closed doors or gates; "2" for an open side or open doorways; "3" if there were just one or two walls, and "4" if the construction was completely open. The control group's mean score was .71 whereas the experimental group was 3.61 producing a *t*-test *p*-value of <.001 and a very large effect size. Figure 2 shows a student who constructed an imaginative and open habitat in the experimental group.

Figure 3 shows the constructions of three children under both conditions. Each row of photos shows the same child's constructions under the control condition (left side; 3a, 3c, and 3e) and the experimental condition (right side; 3b, 3d, and 3f). The first student in 3a created a closed structure and the student could not identify any part of the structure created; in contrast, in photo 3b, his structure was completely open and he identified five parts of the habitat. The second student could identify four parts in the control condition (3c) as compared to six parts in the experimental condition (3d.). This student, in the control conditional, created an almost completely enclosed structure while her work in the experimental condition was completely open. The last student's control condition structure (3e) was almost completely enclosed. She could identify three parts in this structure opposed to the completely open habitat and four identified parts during the experimental condition (3f).

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Table 4. *Creative Characteristics of Block Constructions*

Characteristic	Creative Trait Name	Control Condition Mean Score	Experimental Condition Mean Score	*t*-Test *p*-Value	Significant Difference?	Cohen's *d*	Effect Size Interpretation
Child-reported parts of the animal habitat (1 point each distinct part)	Elaboration	2.44 (1.0)	5.06 (1.2)	<.001	yes	2.4	very large
Degree of enclosure (0 = fully enclosed – no door; 4 = completely open)	Resistance to Premature Closure	0.71 (0.7)	3.61 (1.0)	<.001	yes	3.4	very large
Degree of participation (0= no participation; 4= highly enthusiastic building and playing)	Storytelling Articulateness	2.16 (0.7)	3.67 (0.7)	<.001	yes	2.2	very large
Size of construction (0=small; 1 = large)	Fluency	0.22 (0.4)	0.82 (0.4)	<.001	yes	1.5	very large
Number of Different Types of Materials Used	Flexibility	1.89 (1.0)	4.33 (1.5)	<.001	yes	1.9	very large
Unusual Features not used by others	Originality	2.06 (1.1)	3.22 (2.2)	0.02	yes	0.67	medium

* Standard deviations in parentheses

Figure 1. A child highly enthused and engrossed in the arts integration of habitat building.

Figure 2. Demonstration of high imaginative and open structure building during the experimental group.

Pretest, Posttest, and Distal Posttest Results

Table 5 shows the pretest posttest and distal posttest results. The children knew significantly more about zebras than jaguars on the pretest as evidenced by the one-point difference between means (.22 points for jaguars compared to 1.22 points for zebras) and the results of a paired t-test with a *p*-value of less than .001. On the posttest, children showed no significant difference in their knowledge of facts about jaguars versus zebras, indicating that at the end of the lessons, they could tell similar numbers of facts about both animals. Gain scores for knowledge of the animals were significantly different with children exhibiting higher gains in learning about jaguars. On the pretest, children knew very little about habitats for either animal. On the posttest, they exhibited similar levels of knowledge of the habitats of both animals. Students gained similar amounts of information about the specific animal habitats under both conditions. When considering the scores overall, there was a significant difference in the pretest scores and also a significant difference in gain scores. This indicates that overall, on the posttest, students' knowledge was similar, but they made much greater gains in the experimental condition, probably because the jaguar was so unfamiliar to them compared to the zebra.

Several children (about a third of the class) remembered more about the animals on the distal posttest than on the posttest. This occurred for information learned under both conditions. The distal posttest yielded similar results when considering the children's ability to report the overall characteristics of the zebra and jaguar and that animal's habitat. The distal posttest showed medium gain score with Cohen's *d* effect size of .50 which was comparable to the posttest with a Cohen's *d* effect size of .52 (both medium effect sizes). Although there was no significant difference in gain scores when considering just the animal characteristics, there was a small improvement in the children's ability to report characteristics of animal habitats with a gain score Cohen's *d* of .31, compared to no significant difference in the posttest. This finding was likely caused by greater familiarity with the researcher on her return visit for the distal posttest and enthusiasm of children wanting to show

what they had learned. In support of this, the researcher observed children showing off and acting silly for her. .

Figure 3. Animal Habitats Constructed by the Same Child under the Two Conditions: Control (Left Column) and Experimental (Right Column).

Discussion

Science Aspects

From this project the students significantly increased their knowledge about what the word habitat means: on the pretest, no student could identify what the word habitat meant, but the posttest showed 89% of students could identify the meaning and on the distal posttest 72%. During this time, the students learned aspects of NGSS Science Standard K-2-ETST-1 as they were able to "Ask questions, make observations, and gather information about a situation people want to change (improving an animal habitat) to define a simple problem that can be solved through the development of a new or improved object or tool (creation of that habitat)." Additionally, the students worked through the second NGSS standard K-2-ETST-2 to "Develop a physical model to illustrate how the shape of an object helps it function as need to solve a given problem (the model of the animal habitat as a functioning home)."

Creativity

Although these science standards are important, the greatest findings from this research came when considering the addition of the art components and how students in the experimental condition made more natural and scientifically accurate habitats. As Gravis (2013) suggested, often, early childhood classrooms integrate arts throughout the day in the form of songs, craft projects, and dramatic play, among others. While this has some benefit, Runco and Jaeger (2012) suggest for *true* creativity, art integration must harbor *originality*. The study findings show with the integration of art materials, the students' abilities to create open and more accurate habitats was significantly higher than when art materials were not utilized.

Conclusion

Summary of Main Findings

Poldberg, Tranin, and Andrezejczak (2013) talk about the heightened level of engagement and excitement art integration brings to learning. This study found that not only were students more actively engaged when art materials were introduced to creating habitats, but the habitats were more realistic and better representations of the animal's natural habitat as compared to the control condition in which the habitats often resembled cages or fenced in areas. The students learned a great deal about each animal utilized in this experiment, but the learning curve was higher for the animal and its habitat studied under the experimental condition.

The authors considered the research suggesting student motivation and retention of knowledge will be positively enhanced in creating the framework for this study.

Implications for Practice in Early Childhood Classrooms

The job of an early childhood educator is difficult. The teacher must keep the attention of students with differing abilities, not only academically, but also social-emotionally. As previously mentioned, oftentimes, early childhood educators integrate arts in the form of songs, craft projects, and dramatic play (Gravis, 2013). Although these are ways to engage this young age group in their need for stimulation and movement, this study has shown how providing open ended materials can allow students the prospect for greater manipulation of materials which can prove a more accurate and realistic learning tool. This was shown in this study through the very large effect size that came from considering the aspects of creativity elaboration, resistance to premature-closure, storytelling articulateness, fluency and flexibility when comparing the control group and experimental group.

These findings parallel the motivational benefit found with arts integration in recent research in Head Start classrooms. When arts integration is deliberately considered within a classroom there is correlation to increased motivation (Brown & Sax, 2013). This understanding is clear in the Reggio Emilia approach where all classrooms are designed with deliberate consideration of art integration (Edwards, Gandin, & Forman, 2012).

Table 5. *Pretest, Posttest, and Distal Posttest Scores with Gain Scores Highlighted in Aqua*

Condition	Pretest	Posttest	Posttest Gain	Distal Posttest	Distal Posttest Gain
Number of child-reported correct animal characteristics					
Control - Zebra	1.22 (1.0)	2.11 (1.1)	0.89 (0.8)	3.00 (1.5)	1.78 (0.9)
Experimental - Jaguar	0.22 (0.4)	1.83 (0.8)	1.61 (0.9)	2.39 (0.8)	2.17 (0.9)
t-Test *p*-Value	<.001	0.19	0.02	0.03	0.09
Significant difference between conditions?	Yes, favoring control condition	No	Yes, favoring the experimental condition	Yes, favoring control condition	No
Cohen's *d*	1.3	-	0.85	0.51	-
Effect Size Interpretation	very large	-	large	medium	-

Condition	Pretest	Posttest	Posttest Gain	Distal Posttest	Distal Posttest Gain
Number of child-reported correct characteristics for the animal's habitat					
Control - Zebra	0.72 (0.8)	2.06 (0.7)	1.33 (1.0)	1.83 (1.0)	1.11 (0.9)
Experimental - Jaguar	0.72 (0.8)	2.22 (1.1)	1.5 (1.0)	2.17 (1.2)	1.44 (1.2)
t-Test *p*-Value	1.00	0.17	0.17	0.03	0.03
Significant difference between conditions?	No	No	No	Yes, favoring the experimental condition	Yes
Cohen's *d*	-	-	-	0.31	0.31
Effect Size Interpretation	-	-	-	small	small

Condition	Pretest	Posttest	Posttest Gain	Distal Posttest	Distal Posttest Gain
Overall combined child-reported correct animal and habitat characteristics					
Control - Zebra	1.94 (1.7)	4.17 (1.4)	2.22 (1.5)	4.83 (2.0)	2.89 (1.1)
Experimental - Jaguar	0.94 (1.1)	3.94 (1.6)	3.00 (1.5)	4.56 (1.9)	3.61 (1.7)
t-Test *p*-Value	<.001	0.27	0.03	0.24	0.04
Significant difference between conditions?	Yes, favoring Control Condition	No	Yes, favoring the experimental condition	No	Yes, favoring the experimental condition
Cohen's *d*	0.70	-	0.52	-	0.50
Effect Size Interpretation	medium	-	medium	-	medium

*Standard deviations in parentheses

Recommendations for Future Research

This study had promising findings, but there were two major limitations noted that if corrected might yield more accurate findings. The animals utilized were randomly picked. The pretest yielded the students had some prior knowledge of zebras but no prior knowledge of the jaguar. If replicated, the researcher should strive to find two animals that the majority of the students have no prior knowledge of or a similar level of prior knowledge. A second limitation was due to an error in day two of the study. The researcher mistakenly utilized the jaguar on this day. Due to this error, the zebra was used

for both groups in the control condition and the jaguar used for both groups in the experimental condition. In replication, the control and experimental conditions should each utilize both animals.

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