Developing Creative Thinking with Intentional Teaching Practices in Academic Subjects for Early Childhood Classrooms

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Abstract

This action research was conducted in an early childhood Montessori Primary classroom using intentional teaching practices with core curriculum materials to engage students in creative thinking. In the form of questions or suggestions, an open-ended inquiry was given to the ten participants, aged three to six years old, as they worked with Montessori materials in academic areas, including science, math, and language. The research utilized mixed methods of collection in the forms of quantitative and qualitative data and demonstrated successful intervention with a steady increase in work times of the students. A longitudinal study would contribute to this theory and provide further information regarding the increase of student understanding through creative thinking endeavors. This study provided evidence that intentional teaching practices can engage children in creative thinking, problem-solving, and collaborative learning while extending working times with materials, which contribute to a deeper level of comprehension of the direct curricular aims.

Keywords: creative thinking, intentional teaching, early childhood, intellectual development, Montessori, absorbent mind, planes of development

Creativity has long been considered an inherent aspect of early childhood. Many adults believe that children will spontaneously create novel products without guidance or suggestions from a role model when given the freedom and materials to use. However, creativity stems from the creative thinking process and is a skill that can be learned, practiced, and sharpened (Jalongo, 2003). Artists, composers, architects, mathematicians, scientists, and linguists have a common thread of refined creative thinking finesse. When considering the evolution of the creative mind, the visual and performing arts are typically the first activities that come to mind. Yet Leggett (2017) asserted that creativity, when incorporated throughout the environment, encourages creative thinking and problem-solving in unconventional spaces and subject areas. Creative thinking and teacher lead exploration are adaptable to all areas of academics and provide children the ability to construct new knowledge (Drew & Rankin, 2004). This action research project explores the purposeful development of creative thinking skills to further understand science, mathematics, and language development within the classroom. While many educators use this intentional approach to teaching, they may not realize its utilization can teach towards a specific academic or achievement goal.

As a Montessori educator, this researcher consistently uses variations and extensions with the classroom materials that make up the academic curricula. Examples of variations and extensions include using the material in a manner other than the initial presentation by the teacher, interpreting the material through creative means, or combining materials to enhance comprehension of the curricular aims (such as one-to-one correspondence or life cycles of plants and animals). Implementing and suggesting variations or extensions with materials is a form of intentional teaching that Montessori educators utilize to further engage a child with academic

material. Intentional teaching is synchronous with how authentic Montessori teachers conduct their classrooms while allowing children to choose and direct their learning.

This action research was conducted in a private and accredited Montessori school that services students ages 18 months through sixth grade in the North Chicago suburbs. This research study aims to contribute to the research involving teaching creative thinking in core academic areas. Due to the scarcity of research in this area, this researcher focused on science, math, and language materials to encourage exploration and further engagement through variations and extensions to create novel designs, replications, or combinations of materials to deepen core competencies. This research provides necessary information on intentional teaching practices that educators can use in multiple settings to encourage the development of creative thinking skills that support problem-solving and collaboration in early childhood classroom communities.

Theoretical Framework

The grounding theoretical framework for this action research project is Montessori's theory of intellectual development, including Montessori's planes of development and theory of the absorbent mind. Also for consideration is Montessori's theories of spontaneous activity and liberty for the development of human potential.

Planes of Development and the Absorbent Mind

Dr. Montessori's innovative and original work in childhood education defined the planes of development and consolidation as a series of developmental stages through which children move as they grow into adulthood (Montessori, 1964). According to Montessori (1964), the first plane is the period of birth to age six. It is the plane in which the child constructs individuality and the time of the absorbent mind, which Montessori defined as a period of intense knowledge

construction through absorption of the environment, culture, and language. "It is the child's way of learning. This is the path he follows" (Montessori, 1995, p. 26). Montessori (1995) stated that during this period of the absorbent mind, children learn unconsciously, with a joyful spirit. By encouraging children to explore their classroom environment with open inquiry, teachers can inspire unconscious creativity, instilling in children the capability of creative thinking, problem-solving, and creative collaboration. Capitalizing on this period of development within young children, educators prepare the learning environment so children can construct their knowledge and independence.

Spontaneity and Liberty within Limits

Montessori environments are structurally prepared to provide many freedoms to the students, described as freedom within limits. “The concept of *liberty*…must be understood as demanding those conditions adapted to the most favourable *development* of his entire individuality” (Montessori, 1964, p. 104). Children can choose which manipulatives to use, where to use them, and with whom they would like to work. The term “work” is utilized in Montessori classrooms to give significance and validity to the construction of knowledge that each child is formulating (Lillard, 2005). Long periods for working with materials are essential in Montessori environments, providing students with opportunities for open-ended exploration, spontaneous creativity, and collaboration with peers (Lillard, 2005). During this work time, educators utilize observational methods to determine each student's social, emotional, and academic needs.

Montessori Theory for Action Research

Observation is critical to the Montessori philosophy and scaffolding of children’s learning. Through many hours of observation, Dr. Montessori, trained as a medical doctor,

theorized that children have the capacity for complete independence when given the appropriate environment (Lillard, 2005; Montessori, 1964). The primary use of observation to advance children's learning correlates with action research, which utilizes observation as a data collecting method. Similarly, Montessori created environments with child-sized furniture, small rugs, and low shelving in conjunction with specially crafted manipulatives that each have a unique purpose and direct aim. Direct aims are the concrete, measurable outcomes of a manipulative material (Lillard, 2005). These aims include concentration, independence, order, coordination, and numeracy or literacy through quantity or sound related to an abstract symbol (e.g., number or letter). The intentional learning outcomes of these materials provide a baseline for creative thinking potential to be observed through action research in the classroom. The Montessori classroom environment, including academic materials, manipulatives, and the prepared setting, establishes a strong foundation for an observational study of young children, including this current research into applying intentional teaching practices to develop creative thinking. Absorption of the concrete aims of the educational materials comes through repetition, and repetition is more likely when alternate uses and creative exploration are encouraged by the educator. The Montessori environment provides children the freedom to choose work according to their interests and allows for research and interaction with the materials.

Review of Literature

Creativity, imagination, and playfulness are traditionally associated with early childhood. Many young children inhabit spaces that cater to the flourishing of imaginative qualities of the real world, yet there are distinct differences between fostering imagination and developing creative thinking (Jalongo, 2003). The early childhood period of development is customarily categorized as the period from birth to age eight; however, according to Dr. Maria Montessori's Planes of Development theory, early childhood represents the first plane of development which

is birth to age six. Montessori contended that there are four distinct phases of human development, which are called the Planes of Development. The first plane of development is described as the period when children are adaptable to alternative ways of thinking, amenable to suggestions, and responsive to creative ideas (Lillard, 2005). Children in the first plane of development are in a period of the absorbent mind, which Montessori (1964) defined as a period of intense construction of knowledge, able to absorb their environment, culture, and language like a sponge. It is beneficial for educators to take advantage of early childhood to develop creative thinking and problem-solving skills in young children, establishing a foundation for future creative endeavors (Jalongo, 2003; Lillard, 2013; Montessori, 1995; Savoie, 2017).

Investigating the encouragement of creative thinking in young children has the potential for positive impacts across multiple educational and societal outcomes (Robinson as cited in Azzam, 2009; Eisner, 1971; Pica, 2009; Savoie, 2017). While there appears to be limited research regarding teaching outcomes for creativity, advancement of creative thinking is possible as children learn to work collaboratively and create valuable solutions for their classroom community, contributing to the overall environment (Jalongo, 2003; Leggett, 2017). There is a paucity of research regarding the development of creativity and teaching strategies that enhance creative potential, demonstrating a need for further research of teaching approaches within the classroom. While teaching strategies are essential for implementing creative thinking, assessing a child's creativity is a subjective endeavor and researchers have found assessing creative aptitude to be complicated in early childhood environments (Besancon & Lubart, 2008; Fleming et al., 2019). Nevertheless, to develop creative thinking skills, children require encouragement, guidance, and open-ended inquiry from teachers willing to engage in the creative process alongside the children through intentional teaching (Jalongo, 2003; Lampert, 2006; Leggett,

2017; McClure, 2011). Much of the literature on understanding and fostering creativity provides valuable guidance on the importance of creativity and how to adapt a learning environment for its cultivation (Eisner, 1971; Cremin et.al, 2006; Jalongo, 2003; Sawyer, 2003). Intentional teaching practices and guiding students in creative thinking processes can inspire student's creative exploration, contribute to constructing critical thinking and problem-solving skills, and formulate an increased comprehension of the direct aims of the classroom materials.

Defining Creativity and Creative Learning

Definitions of creativity and creative thinking vary depending upon the context in which they are being studied (Jalongo, 2003; Leggett, 2017). Often, creativity is defined as a recombining of previously existing elements in a new way for a new purpose (Cossentino & Brown; 2015; Jalongo, 2003). Leggett (2017) took an alternate perspective and postulated that children contribute to their classroom communities through collaborative efforts and creative problem-solving. For this study in an early childhood learning environment, the definition and language of creative thought, as posed by Leggett (2017), is used throughout, as will the concept that children inhabit personal spaces and communities to which they can contribute creative thinking and problem-solving for the benefit of their society.

Community, society, relationships, and collaboration play a role in the creative process, allowing for problem-solving and creative solutions in multiple stages across time and space (Drew & Rankin, 2004; Lillard, 2013; Pica, 2009). There is potential for childhood creativity to pave the way for future divergent thinking, also referred to as lateral thinking, indicating the importance of developing creativity throughout childhood (Leggett, 2017; Sawyer; 2003; Robinson as cited in Azzam, 2009). Drew and Rankin (2004) asserted that creative thinking, problem-solving, and open-ended exploration with teacher guidance provide children the ability

to construct new knowledge. Creative studies provide skills beyond the visual arts, including free-thinking, imagining multiple possibilities, and visualizing multiple perspectives (Eisner, 1998). The effectiveness of teaching for creativity remains unknown, despite its potential positive impacts. This gap in the literature demonstrates the need for research regarding teaching practices that encourage creative thinking.

The Natural State of Learning in Young Children

A variety and range of creative opportunities through various mediums are necessary to develop creative thinking (Eisner, 1998; Lampert, 2006; Leggett, 2017; Lillard, 2013). Playful learning, defined by Lillard (2013) as the "span between free and guided play" where children construct knowledge through hands-on experiences, is a natural space for children to thrive (p.157). In their natural state of playful learning, children are guided to choose meaningful work that is supportive of their sensitive periods, allowing for a state of focus, concentration, and creative learning (Savoie, 2017; Lillard, 2013). Sensitive periods are defined as critical points in child development when personal interests are biologically guided (Lillard, 2005). The term sensitive period implies that a child may be interested in a particular area of study, such as numeracy and order, and if that need is addressed, the child will quickly acquire the necessary skills. On the other hand, if that need goes unattended to, such as language development, it will be increasingly challenging to develop the necessary skills. Integral to playful learning and creative development, creative thinking is a necessary component to every classroom area (Eisner, 1971; Jalongo, 2003). Yildiz and Yildiz (2021) established a relationship between creative thought and scientific processing in young children. Multiple environmental factors, such as preschool options, economics, and home culture, as well as a variety of data collection methods incorporated within this research, formulated a thoughtful and valid research study

which found there is a positive correlation between creative thinking and scientific processing skills (Yildiz & Yildiz, 2021). Literature research conducted by Leggett (2017) determined that evidence suggests that children of early childhood age are in a "critical period for creative thinking forming the foundations for later creative potential" (p. 847). The research conducted by Leggett and those cited in the study correlate to earlier research and theories developed by Montessori regarding the planes of development and period of the absorbent mind. Throughout this crucial time of the absorbent mind, it is beneficial that educators implement intentional teaching practices to encourage creative thinking throughout the classroom curriculum.

Contradictions of Creative Thinking in Young Children

Adults often presume that children are naturally creative and, therefore, children do not require nurturing or meaningful guidance to develop creative thought, critical thinking, and problem-solving (Jalongo, 2003; McClure, 2011). This continuing misconception that young children are inherently creative poses a threat to the development of creative thinking, as many educators continue to ignore the necessity of teaching for creative thinking (Eisner, 1971; Jalongo, 2003; McClure, 2011; Savoie, 2017). Instead, research asserts that it beneficial to offer children guidance, encouragement, and suggestions to initiate and develop creative processes (Eisner, 1971; Jalongo, 2003; McClure, 2011). The evidence in a study by Leggett (2017) concluded that teachers continue to attribute creativity to an inherent ability within children. This belief undervalues the role of educators to encourage and facilitate students' ideas with intentional teaching to support children in their creative endeavors (Leggett, 2017). Educators were found to adopt the role of "cheerleader" in response to the creative attempts by the students, as opposed to supporting, encouraging, and provoking deeper understanding and creative thinking (Leggett, 2017, p. 850). In labeling creativity as inherent in childhood, this ultimately

implies that children will outgrow their creativity as they age, taking away something that they potentially never possessed or developed to its potential (McClure, 2011). The development of creativity fosters critical thinking, encouraging children to understand that there can be multiple solutions for the problems they experience, developing confidence by validating their ideas, encouraging them to take risks and think creatively about problem-solving (Lampert, 2006; Jalongo, 2003; Pica, 2009). Adversely, children may become discouraged if their ideas, answers, or creative solutions are disputed or disregarded (Pica, 2009). There remains a lack of research and awareness surrounding ideas of childhood, absorbed perspectives, and open-mindedness that garners continued study.

Based on curriculum standards that many educators need to implement, creativity often remains restricted to the classical arts, such as visual or performing arts, negating the possibilities of creative thinking for problem-solving in other areas of the classroom (Leggett, 2017; Pica, 2009). These standards are not to diminish the value of the arts, as Eisner (1988) argued for the benefit of creative education. Eisner (1988) explained by stating that the arts provide educational value beyond traditional art practices, because the outcomes of artistic education offer skills that can transfer to other academic endeavors. In 2003, Eisner continued to write about the benefits of art education, naming three main functions of creative arts and thinking to everyday life: (a) to represent that which cannot be put into words, (b) to provide opportunities to develop creative thinking in "distinctive" ways, (c) to have an aesthetic, intrinsically rewarding experience (p. 343). Therefore, each area and subject of study in the classroom is worthy of creative thinking and problem-solving (Eisner, 1971; Lillard, 2005; Jalongo, 2003). The ideology of a core curriculum has diminished the arts and creative activities throughout the classroom, as they have become relegated to extracurricular components to academics (Eisner, 2003). It is best to

promote creativity by incorporating intentional practices throughout the classroom, including unconventional spaces and subject areas (Leggett, 2017). Besançon & Lubart (2008) postulated that alternative pedagogical practices encourage creative thinking not only in areas considered creative, such as art or music but in all areas of the curriculum. The teaching of creative thinking skills across multiple academic areas is beneficial to young children and provides students the knowledge to transfer and promote creativity on multiple levels.

Intentional Teachers as Active Partners

There are multiple strategies for implementing creative and intentional teaching methods to engage students in creative thinking processes. Intentional teaching and nurturing of creative practices encourage the students to develop creative thinking and problem-solving abilities (Denervaud et al., 2019). Bietz (2010) defined intentional teaching as acting purposefully with specific goals in mind for the children in their care and setting up the environment accordingly. Additionally, a distinction must be made between *teaching creatively*, which is the act of teaching in a novel and practical way that promotes student growth related to the development of original thought and action, and *teaching for creativity*, also known as developing creative learning, is a form of intentional teaching to foster creativity in students (Robinson as cited in Azzam, 2009; Zhou, 2017). Educators who utilize their creative thinking skills to develop pedagogy into an inviting, engaging endeavor for students exemplify teaching creatively by encouraging students to find the answers, providing needed tools, suggestions, and investigative inquiry to propel them to the next level (Azzam, 2009; Jalongo, 2003).

Prepared classroom environments, outfitted with manipulative materials and art supplies, may not be enough to promote creativity; therefore, teachers can extend lessons by offering suggestions or asking open-ended questions to encourage further interactions with the materials

(Cremin et al., 2006). In Montessori environments, these elaborated lessons and interactions are referred to as variations and extensions and allow the children to follow their interests, guiding children to creative thinking (Cremin et al., 2006; Leggett, 2017; Lillard, 2013). Educators have identified common themes of acquisition of student independence when students have the flexibility of time, space, and materials for working (Cremin et al., 2006; Drew & Rankin, 2004). Eisner (1971) stated that teachers are responsible for planning and changing the environment based upon demographics, needs of the community, and priorities of the environment. Teachers must be sensitive to the students, observing when they are concentrated and focused, taking special care not to disturb them, as this is when the children are developing their enthusiasm for learning (Lillard, 2005; Montessori, 1995). As social beings, children enhance creative potential when working collaboratively, listening to each other's ideas, and problem-solving with creative solutions (Drew & Rankin, 2004). Montessori classrooms typically hum with the sounds of children working, either independently or in small groups. Children are often encouraged to work collaboratively, discuss the work, problem-solve, and collectively brainstorm to increase the opportunity for creative potential (Jalongo, 2003; Lillard, 2005). Providing academic materials and supplies for creative propagation alone may not offer children the stimulation necessary for creative thinking. Teachers can offer open ended inquiry and suggestions that encourage extended use of the academic materials to augment comprehension through creative design.

Assessing Creativity

Determining best teacher practices of creative thinking remains to be a challenge. Researchers Cheung and Leung (2013) developed a specialized survey, named the Early Childhood Creative Pedagogy Questionnaire (ECCPQ), to research the creative practices of 564

early childhood teachers across Hong Kong. The study revealed that early childhood teachers are often more focused on controlling classroom behavior and transmitting knowledge than providing an environment conducive to creative thinking. In conjunction with these teaching beliefs, traditional educational classroom practices can also hinder creative development. Environmental attributes such as (a) inflexible schedules, (b) intense competition, (c) extrinsic rewards, and (d) lack of free time repress creative thinking (Jalongo, 2003, p. 224). Likewise, teachers who only offer predesigned arts and crafts projects with an expected product diminished the ability of the children to think creatively and outside the parameters of the teachers' expectations (Jalongo, 2003). Leggett's (2017) study included three early childhood centers, focusing on teacher implemented creative activities to determine the level of interest from the children. Interviews of the teachers were conducted to gauge the level of creative involvement of the children in which the teachers addressed *how* the children acted creatively instead of *why* their work was labeled creative, demonstrating the continuing gap in assessing creativity. Critical concepts of creative thinking continued to emerge throughout the interview process, such as (a) imagination, (b) intrinsic motivators, (c) play, and (d) value (Leggett, 2017). Leggett (2017) affirmed the importance of intentional educational practices, and noted that it is imperative to creative development, combined with students' freedom for creative exploration.

Assessing Childhood Creative Thinking

The many differences between traditional schooling and alternative pedagogies, such as uninterrupted time, free choice, collaborative efforts, and teachers who establish relationships over multiple years, allow for the varying degrees of creative thinking among young children to be studied and observed (Besancon & Lubart, 2008). However, variation of pedagogy implementation, the caliber of the teacher's training, classroom materials, and levels of creative

thinking that are encouraged within the environment can impact the results of assessments. Besancon & Lubart (2008) conducted a study in Paris of 211 children, grades first through fourth in the first year of the study, and the same children the following year, in grades second through fifth. Roughly half of these students attended traditional public schools, while the other half attended alternative schools, either Montessori or Freinet. For two consecutive years, each child had their creative endeavors in drawing and story writing evaluated by five judges for each subject. This study demonstrated that alternative schooling might increase the student's capacity for creative thinking, which aligned with findings of studies conducted by Cremin et al. (2006), Robson (2014), and Fleming et al. (2019). Besancon & Lubart (2008) concerted that multi-age class groupings with peers (a feature of Montessori classrooms) may positively influence the ability of students to take risks, collaborate, and brainstorm, as the children learn together over multiple years, remaining in the same cohort with the same teachers.

Fleming, Culclasure, & Zhang (2019) conducted a study of 77 Montessori public school students and 71 non-Montessori public school students. The students, all of whom were in third grade, took the graphic arts portion of the Evaluation of Potential Creativity (EPoC), a specialized assessment to measure creative potential to compare results in creative thinking processes. Researchers noted that the results of the EPoC might vary based on the levels of authentic implementation of Montessori in public school settings. Authenticity in Montessori schools depends on many factors, such as a Montessori-trained teacher, multi-age groupings, large blocks of free time, and free choice (Lillard, 2005). Researchers have found a possibility of a selection bias when assessing creativity in Montessori or alternative schooling versus traditional schooling environments. This bias is possibly due to the varying differences of home culture, such as creative thinkers, socioeconomic status, or language barriers. Nevertheless,

research agreed that when parents are more involved with their children, encouraging problem-solving in creative ways, the children may demonstrate this through assessment at their respective schools (Besancon & Lubart, 2008; Fleming et al., 2019; Denervaud et al., 2019). With teachers acting as a creative guide, building upon prior experiences, creative thinking will flourish as a "living curriculum" (McClure, 2011, p. 135). Therefore, while alternative pedagogies may offer children more opportunity for creative thinking skill development, the gap may be attributed to factors such as parent involvement, tuition requirements, or differences of culture and communication.

Conclusions

Recent literature and research suggest that most studies of young children's creative thinking are traditionally limited to visual, musical, and storytelling arts. Based on a literature review conducted in 2013, Cheung and Leung determined that despite similar beliefs and practices of creativity worldwide, there remains a gap in pedagogical practices in the early childhood curriculum. The most recent study conducted by Yildiz & Yildiz (2021) pertained to creative thinking and scientific processing skills, pushing the boundaries of educator's views on creativity. Further research into creative thinking in otherwise traditional academic classroom areas, such as science, math, and language, will add much-needed information to the conversation of early childhood creative thinking development. There appears to be a lack of cognizance or interest in assessing how creative thinking flows throughout the classroom curriculum and extends beyond the traditional visual, musical, and movement arts. Research of creative thinking development through intentional teaching practices, incorporated throughout the classroom curriculum, will provide necessary information on young children's creative and

cognitive development, and better define intentional teaching practices that encourage creative thinking in early childhood.

The purpose of the Montessori theory of education is to develop the human potential by adhering to the philosophy of the absorbent mind.

> "…education is not something which the teacher does, but that it is a natural process which develops spontaneously in the human being. It is not acquired by listening to words, but in virtue of experiences in which the child acts on his environment…We [teachers] then become witnesses to the development of the human soul…who will become able to direct and to mold the future of mankind" (Montessori, 1995, p. 8-9).

Cossentino and Brown (2015) wrote that creative potential and human potential are, in essence, the same; therefore, creativity is at the center of Montessori philosophy. Many researchers agreed that teaching for creativity includes classroom spaces that incorporate both structure and freedom within limits, allowing the children to problem solve and work collaboratively, offering a safe space to develop creative thinking skills (Cossentino & Brown, 2015; Fleming et al., 2019; Jalongo, 2003). By incorporating intentional teaching practices, teachers can guide children to see creative potential in educational materials by suggesting variations and extensions throughout the classroom learning environment. Environmental factors such as availability of materials, supportive teachers who encourage investigation, and the opportunity for open-ended work converge to provide a creative learning atmosphere (Leggett, 2017). Classroom environments that promote creative thinking contain many similar curricula, content, and teaching traits that Montessori philosophy dictates as appropriate best practices, including independent work choices, a balance of structure and freedom, intrinsic motivation, and opportunities for collaboration (Cossentino & Brown, 2015; Eisner, 1998; Jalongo, 2003).

Creative potential and ability are acquired through many years of training, nurtured into adulthood, with creative thinking, collaboration, and problem-solving from early childhood (Eisner, 1971). Intentional teaching practices to inspire creative thinking are areas of study that require research to clarify which methods are best suited to meet the needs of these young students and develop creative thinking potential.

Methodology

Intervention

The research was conducted for four weeks during September 2021 to answer the following question: How do intentional teaching practices inspire creative thinking skills in core academic subjects for early childhood education? The study took place at an accredited primary Montessori classroom in a private, suburban Montessori school. The student population consisted of three three-year-olds, three four-year-olds, three five-year-olds, and one six-year-old. The research began at the start of a new school year, following the Covid-19 pandemic school year. The participants were all new students in this school and in the Montessori classroom environment.

Overview

During the first three days of the research, a Teacher-Student Conference, based on a pre-determined set of five questions, was conducted to establish a baseline of communication capabilities, openness with the teacher-researcher, and thinking possibilities. The teacher sat beside each child individually and asked if they were willing to answer a few questions. The teacher proceeded to ask the five questions, discretely taking notes, and answering based on a predetermined rubric, so as not to alert the child to the survey or answers being recorded. Each day, the researcher began recording the field notes, such as the weather, number of students

present, teachers in the classroom, and any pertinent information that may affect a regular classroom routine. Day four and five of week one and every school day of weeks two through four, the researcher presented materials, suggested options for creative output, and recorded observations. The Daily Data Form, which consists of five statements and questions formatted to a predetermined rubric, recorded the data. An Observational Log was attached to each of these forms to record the students' steps to choosing the work, having a lesson, suggestions posed by the researcher, and how the student proceeded. During this research period, the teacher gave options to present novel creations to classmates, explaining the purpose of the created product. This data was recorded on the Student Presentation Data Form and provided insight into the students' understanding of the material and an overall comprehension of direct aims. The study concluded with a repeat of the Teacher-Student Conference to compare the initial responsiveness with the concluding responsiveness four weeks later.

Data Collection

This action research used mixed methods of qualitative and quantitative data to ensure triangulation of data collection. Scientific methods of observation, a foundation of Montessori philosophy, was utilized to gather objective data on each student involvement with the materials. Based on Montessori's theory of liberty and spontaneity in the classroom, each child was able to choose the material with which they wanted to work. Quantitative data included predetermined questions and assessments of work, completed by the researcher. During the first week of the study, baseline data collection used Data Tool 1: Teacher-Student Conference (See Appendix A). This information provided quantitative baseline data for each student, comprised of short one-on-one conversations during days one, two, and three of the study. The purpose of the conference was to offer insight into the students' openness with the researcher. The researcher recorded the

students' responses on the questionnaire with Dismissive, Minimally Responsive, Responsive, or Highly Responsive. The level of openness of the participants was based on a predetermined rubric (see Appendix A) and provided initial and concluding data for the study.

Subsequent school days of the study period included Data Tools 2-5 (See Appendix B, C, D, E). Each day of the data collection began with Data Tool 2: Field Notes Form (See Appendix B). This form recorded the date, weather, number of children present, absent children, teachers in the classroom, and special events or schedule variations. Consistent recording of this information supported the data analysis and observations of creative thinking development within the classroom pertaining to any teacher or schedule changes.

Each day of the study period utilized Data Tool 3: The Daily Data Form and Rubric (See Appendix C). This tool provided quantitative data by collecting information on each student in the study, once in week one and two times per week in weeks two through four, providing seven Daily Data Forms for each subject. This data form was necessary to record the time students spent on their work, if they accepted and utilized an offered suggestion, and what they did with that suggestion. Following Montessori's Theory of the Absorbent Mind, this collection offered insight into how a student was absorbing the information and disseminating it in their own, unique creations. The data collection period of creative thinking utilized suggestions and questions posed by the researcher. The suggestions and questions were as follows: "I wonder how you could make your own," "What do you think comes next?" "What do you think you can do with that?" "I wonder if those can be combined," "Those look very similar. Do you think they are the same?" "I wonder if there is another way to do that."

Data Tool 4: The Observational Log (See Appendix D) provided qualitative data by the researcher and was attached to each Daily Data Form. The researcher recorded information about

suggestions or questions which sparked a student lead creative endeavor. The Observational Log included information about the students' involvement in the work cycle and if they chose to put the work away without extending the lesson. The use of the Observational Log provided the opportunity to record how each student chose work, how long they worked with the material, the suggestion or question posed by the researcher, and if the student participated in peer collaboration.

The researcher offered students the opportunity to present work to a small group of classmates utilizing Data Tool 5: Student Presentation Data Form (See Appendix E). This form was utilized minimally during weeks one through three, as the students were all new to the classroom and hesitant to talk in a public forum. However, during week four, there was an increase in the number of students willing to present their work. Data was recorded about the students' grasp of the material concerning the creative design or idea. The statements for consideration were as follows: The child can demonstrate or present the material to another student; the child demonstrates reasoning to develop a logical conclusion; the child's understanding and descriptions match the direct aims of the material; the child explains a novel product or idea; the child can demonstrate how the product or idea relates to the initial material. The researcher reflected on the presentations and answered with Not Evident, Partially Evident, or Fully Evident. A repeat of the Teacher-Student Conference (See Appendix A) concluded the study. The conference gauged the openness of answers after four weeks of lessons, intervention, and time in school.

Data Analysis

The time frame of this study provided a novel set of data due to the unique circumstances of inaugurating a new school year with students unfamiliar with both schools and the Montessori

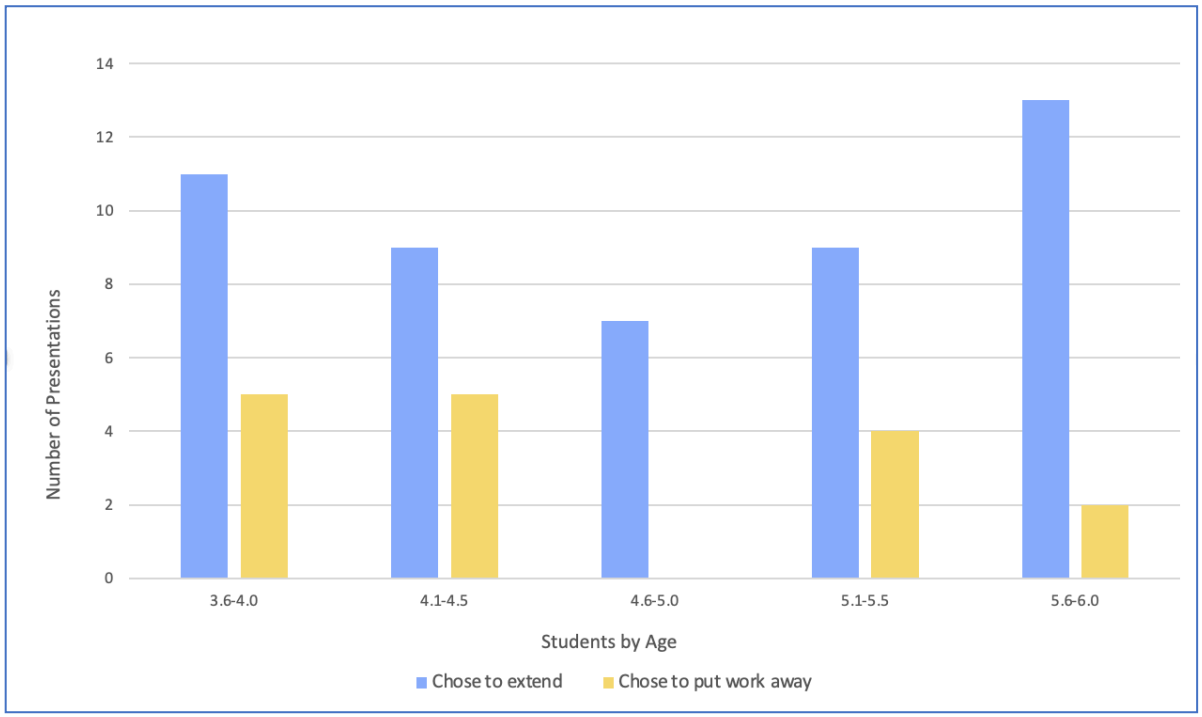
environment, following the Covid-19 pandemic. This study established a baseline for continual action research of creative thinking in young children pertaining to core curricular areas of science, math, and language. To determine the readiness and willingness of the students to engage with the teacher, the researcher administered the Teacher-Student Conference (Appendix A). The researcher responded to five questions based on the predetermined rubric of responsiveness of each student. Five questions were asked to each student, and the researcher answered on a scale of 1 to 4, 1 being dismissive and 4 being highly responsive. Based on the information collected, students in the younger age range of 3.6 – 4.5 were equally responsive to the researcher, at an average response rate of 2.39 compared with students in the 4.6 – 6.0 bracket, with an average response rate of 2.4. Possibly, the younger population of students came to their first days of school with an unencumbered psyche, hesitant but willing to engage. However, the older students may have experienced a deviation in social development due to the lack of social communication from the prior 18 months of distancing and remote learning due to the Covid-19 pandemic. During this initial process, the researcher excluded two bilingual learners. These two students were three years old and had little to no experience communicating in English, the researcher's native language. Because the children were still adjusting to the transition and finding comfort in an unfamiliar environment, they were not yet ready to engage fully with teachers, students, or the classroom environment. As the researcher could not communicate in the children's first languages, full participation in the study was impractical.

Student populations within the study extended in the age range from 3.6 – 6.0, yet it is essential to note that only one student was in the 4.6 - 5 age category. The lower number of lessons, or presentations, offered within that age group reflects this exception. Also of note is that this one student chose to accept the teacher's suggestion 100% of the time. Reasons could be

that the student was inspired to work, the student aimed to please the teacher, or the student enjoyed the material. Figure 1 represents the number of lessons given as recorded data in each age grouping and how often the students chose to extend their work beyond the baseline of the teacher-given presentation.

Figure 1

Presentations given by the teacher and the student response to extending the work



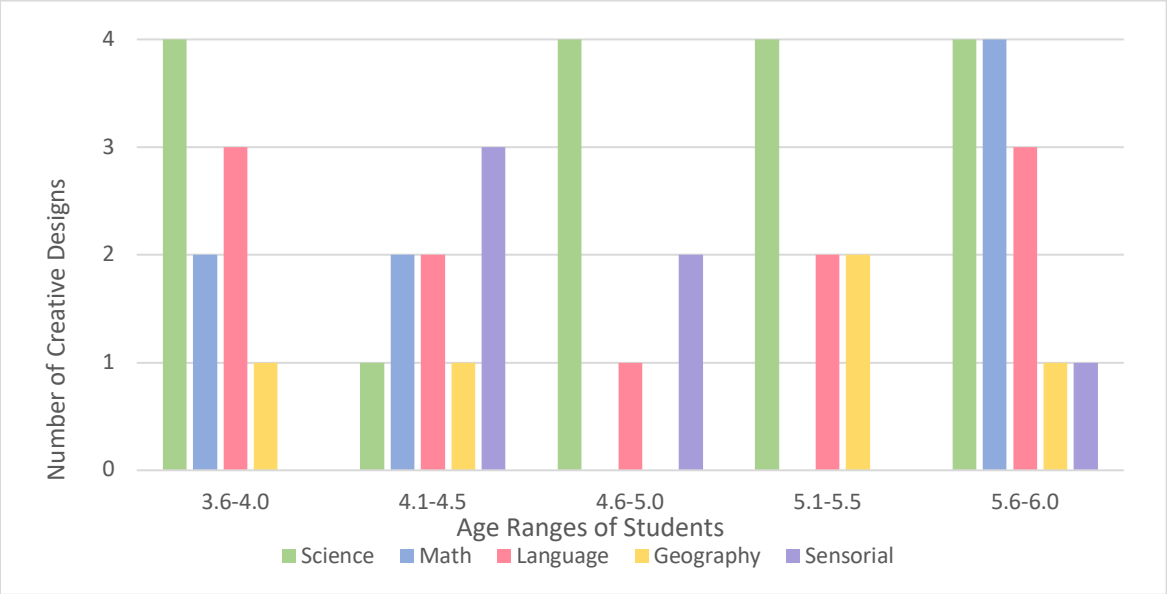
Longitudinally, this information is helpful for continual observation as children progress within the Primary Montessori program. Ideally, this program is a three-year cycle that begins at age three. At the start of the school year, for students new to the Montessori classroom, or school in general, teacher-guided suggestions and questions encourage students to remain engaged with curricular materials for more extended periods. As the year progresses, teacher suggestions may not be necessary, as younger children may desire to mimic what older children create.

Additionally, older students may create more unique designs instead of replications, slowly pushing the boundaries of designs within the classroom.

The collected data demonstrated that materials in science offered the most significant amount of extended work time and appealed to all ages of students, perhaps due to the spiral nature of the Montessori science curriculum. The spiraling curriculum refers to how materials are interrelated, and one lesson leads to many others. Likewise, math materials appealed to most age groups, and the time of the creative period extended with the increased age of the student. Two groups of students explored more materials in each of the curricular areas within the study, as shown in Figure 2.

Figure 2

Number of extensions and designs by age and curricular area of the classroom

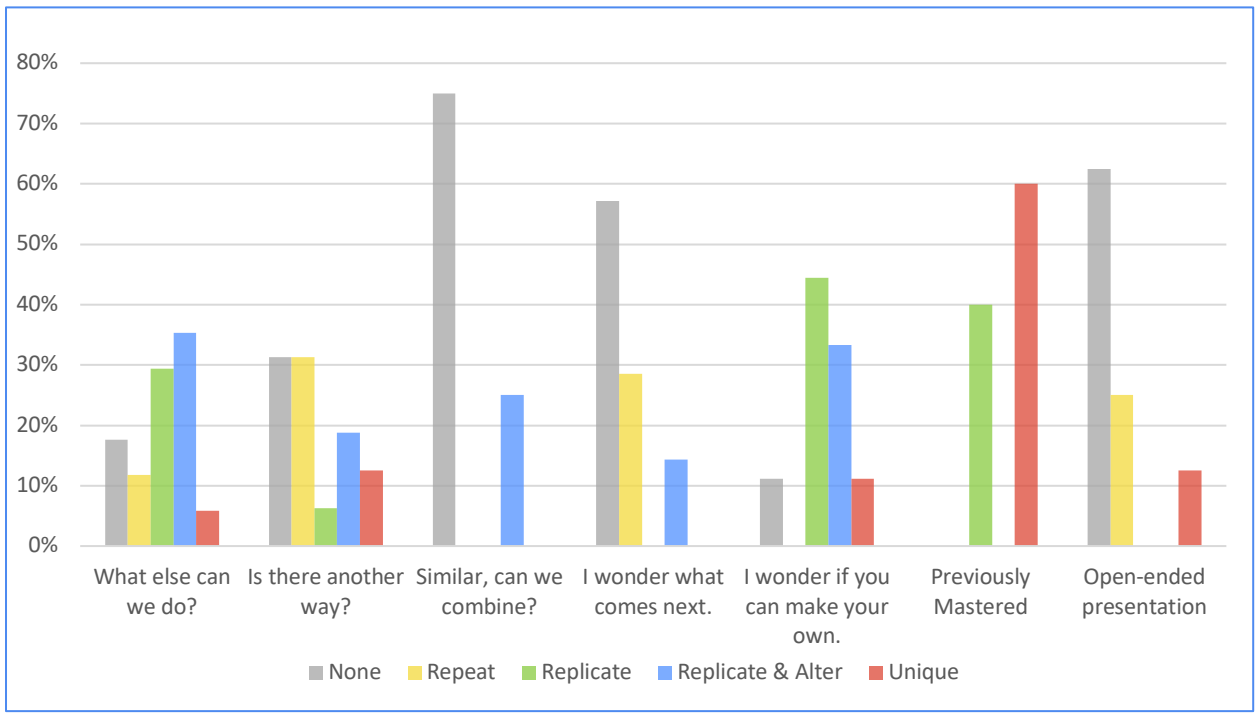


The researcher offered suggestions to encourage creative exploration and thinking, such as: “I wonder how you could make your own?” “What do you think comes next?" "What do you think you can do with that?” “Those look similar, I wonder if they can be combined,” or “I wonder if there is another way to do that.” Data were analyzed to determine the rate of unique

product design, replication, repetition, or no extension related to these teacher suggestions and recorded on Daily Data Forms (Appendix C). Open-ended presentations, in which the teacher presented a material to the student ending with “Now it’s your turn” but did not offer further suggestions or prompts, had fewer results of extended work time and design, with 63% of students choosing to put the work away. However, 25% of students chose to repeat the material, and 13% created a unique product or used the work in a new way. When prompted with suggestions or open-ended questions, students chose to extend the work time, repeat or replicate the work, or create a unique product at an average rate of 15% (all prompts combined).

Each prompt had varying success rates, as illustrated in Figure 3. "I wonder how you can make your own?" had the most substantial impact on extended work time, with 89% of students continuing to interact with the materials after the initial presentation. In contrast, only 11% of students chose to put the work away. The question “What else can we do with that?” had approximal success at a rate of 82% of students choosing to extend the interaction with the material. It is a note of interest that while the open-ended presentations without suggestions had a higher percentage of students who chose to put the material away, it also resulted in a higher number of unique designs than some of the other suggestions from the researcher. “I wonder if there is another way to do that?" and open-ended presentations had identical results in novel design at 13% each. Two students self-initiated work after mastering a lesson and receiving suggestions from the teacher on previous school days. This data is reflected in the Previously Mastered column and provided the most significant result in a unique design. "I wonder how you can make your own?" had the most remarkable result in replicating a material, at 44% of students creating a replica to take home.

Figure 3
Rate of design related to teacher suggestions and prompts

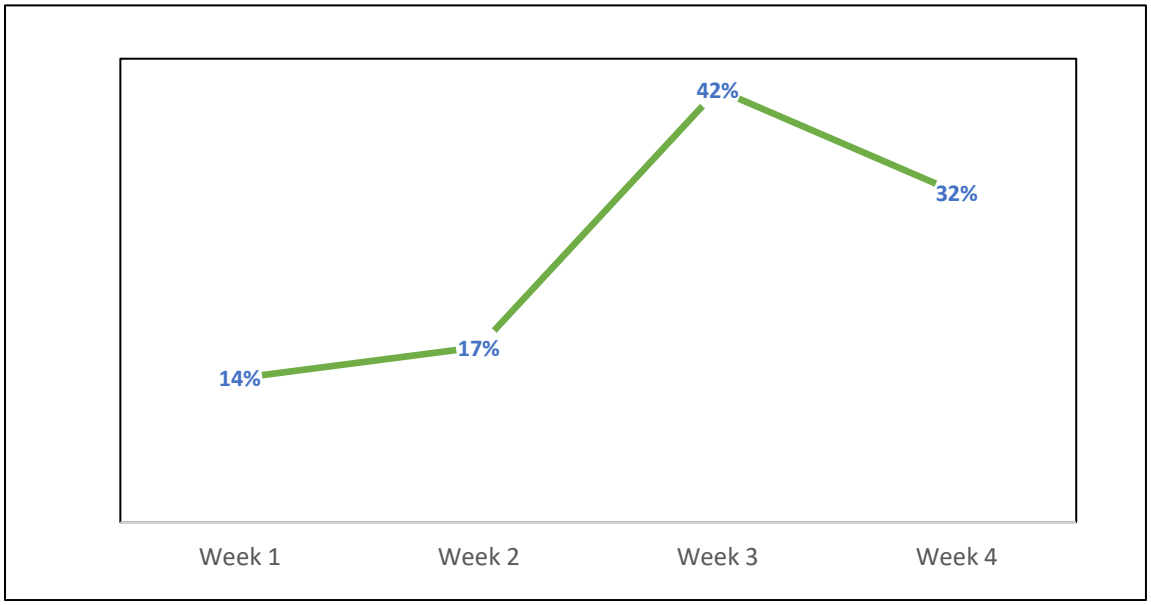


At the start of this school year, these students were new to both the school and the Montessori method. Given these parameters, it is not unusual to observe that students did not collaborate at the beginning of the study. During week two of the study, the classroom assistant teacher was out due to a family emergency, resulting in a substitute teacher. This event may have contributed to the decline in student collaboration, as the students' comfort level within the environment may have changed due to the rotation of substitute teachers. Additionally, the teacher-researcher was absent from school on days four and five during the same week, resulting in limited data collection totals for the week. The missed data was then collected during weeks three and four, respectively. Growth in student collaboration is demonstrated in Figure 4, increasing from 14% of student collaborations recorded in week one to 42% of collaborations in

week three. Week four had a slight decline at a rate of 32% of student collaboration of recorded data.

Figure 4

Student percentage of collaboration of total choices by each week

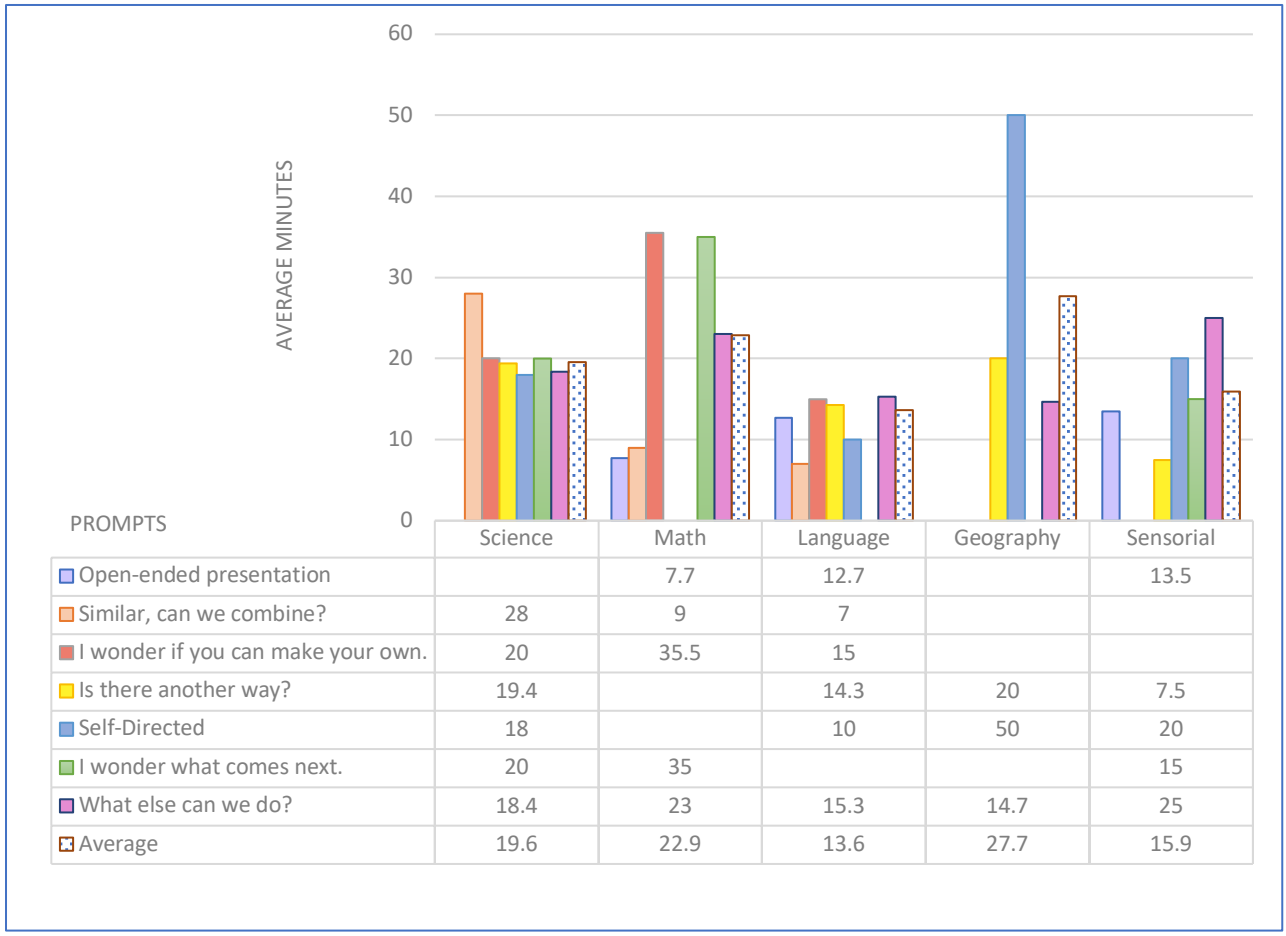


The minutes worked by each student after being given a prompt, such as an open-ended statement or question, were also recorded. The data shows that the average time spent by students after the teacher posed a question or suggestion relating to a specific material was 19.94 minutes. Each curricular area was researched as a separate entity, providing averages of time spent by students working with materials from the science, math, language, geography, and sensorial areas of the classroom. The data shown in Figure 5 suggests that geography had the most significant average time spent on novel creations. However, these findings may be skewed due to two students collaborating for fifty minutes and creating a world map replica. The amount of data collected regarding the exploration of geography and sensorial materials was lower than data collection from science, math, and language, which were the curricular focus of the study.

When considering this, the data conveys that children were most likely to creatively extend their work while using math materials with an average of 22.9 minutes and science materials at an average work time of 19.6 minutes.

Figure 5

Minutes spent working, by academic area, illustrated by suggestions and prompts



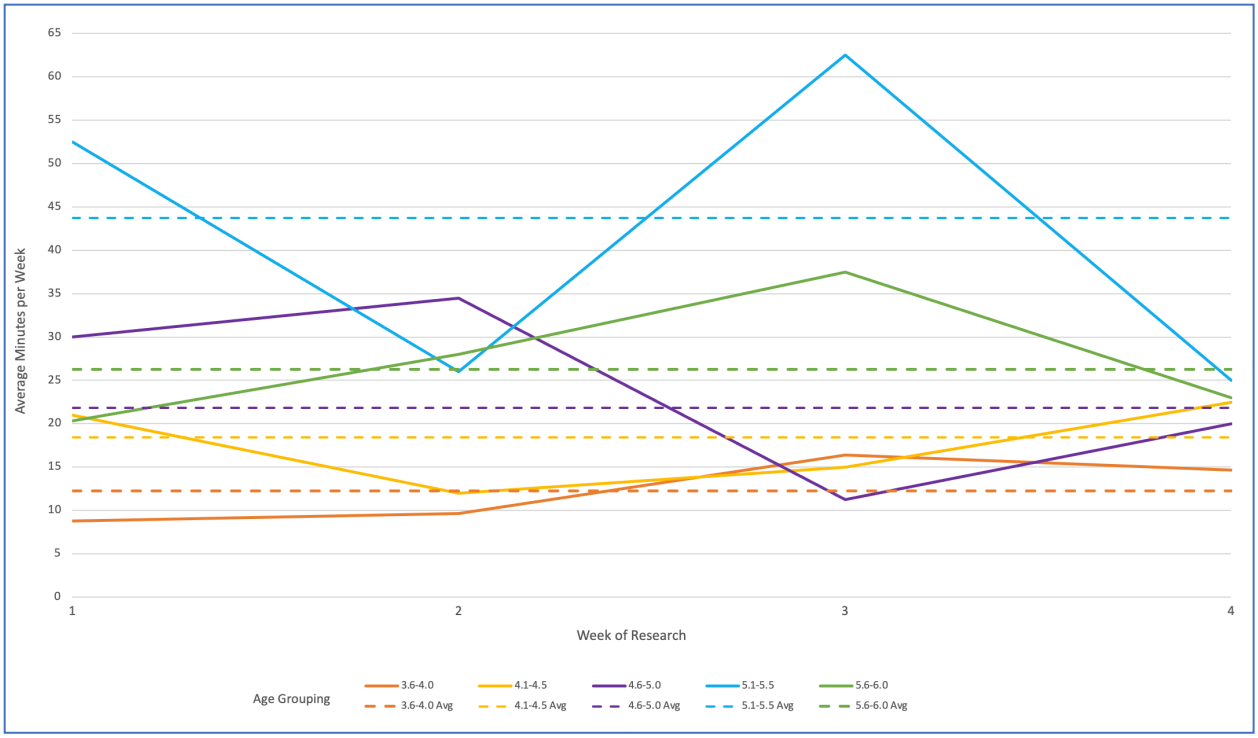
PROMPTS	Science	Math	Language	Geography	Sensorial
Open-ended presentation		7.7	12.7		13.5
Similar, can we combine?	28	9	7		
I wonder if you can make your own.	20	35.5	15		
Is there another way?	19.4		14.3	20	7.5
Self-Directed	18		10	50	20
I wonder what comes next.	20	35			15
What else can we do?	18.4	23	15.3	14.7	25
Average	19.6	22.9	13.6	27.7	15.9

Overall, the time spent engaged with materials for the 3.6 - 4.5-year-olds steadily increased over the four weeks, as shown in Figure 6. However, the 5.1–6.0-year-olds seemed to equalize and slowly decline as they became more accustomed to the classroom. This decline could be due to the familiarity with materials or repetition of works, decreasing the time it takes to complete

the presentation, replicate a material, or create a novel product. Notably, 3.6 -4.0-year-olds expanded their work time, from 8.8 minutes to 14.7 minutes per material over the four-week period.

Figure 6

Average time spent on work by age group over the four-week data collection period

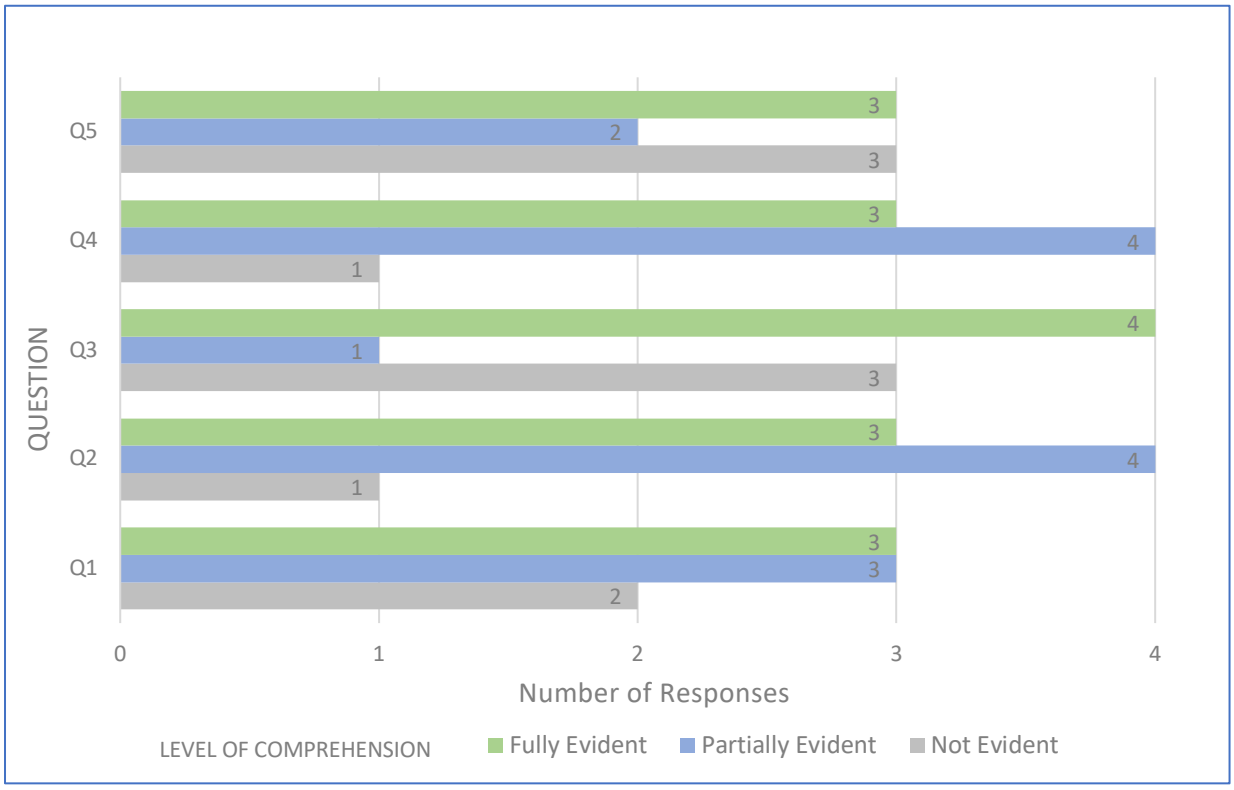


For reinforcement of comprehension, the teacher offered students the opportunity to present their designs to a small group of classmates. This data was collected on the Student Presentation Data Form (Appendix E) and is represented in Figure 7. Limited data were collected regarding student presentations, with a total of eight presentations. Students began volunteering to present their work in the final seven days of data collection, the 16th day of school. The interest in presentations began after three elementary students from another class entered our room to present their current research projects. This event, corresponding with the prompting from the

teacher-researcher, may have impacted the students in the study who then chose to present work to their peers. Questions were as follows: (1) The child can demonstrate how the product or idea relates to the initial material. (2) The child can demonstrate how the product or idea relates to the initial material. (3) The child's understanding and descriptions match the direct aims of the material. (4) The child explains a novel product or idea. (5) The child can demonstrate how the product or idea relates to the initial material.

Figure 7

Total responses to the Student Presentations as recorded by the researcher (Appendix E)

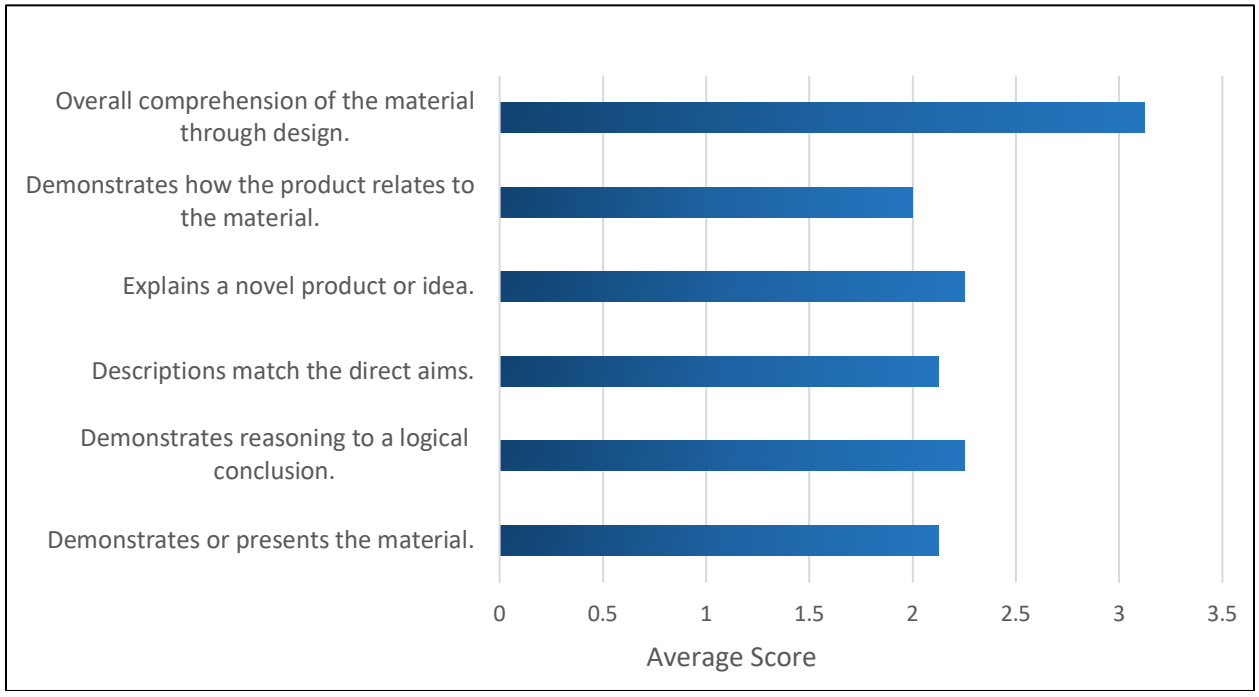


Each student who chose to present work went beyond baseline expectations of time with a material to create a novel product and demonstrated a deeper understanding of the direct curricular aims. In total, students gave eight presentations. One child volunteered to present but then chose not to speak when it was their turn and therefore received a score of 1. The data

suggest that most students who engaged with the teacher's suggestion and became involved in the creative thinking process gained a deeper understanding of the direct aims of the materials. Five participants, all over the age of 4.0, gave the eight presentations. There was a demonstration of understanding at the highest level by 25% of students giving presentations, including repetition of some students using different curricular material. Similar reasoning corresponds to each of the categories represented in Figure 8. Each presentation was evaluated as an individual entity and not based on the student's age or material.

Figure 8

Averages of student understanding demonstrated through presentations



A review of the literature prior to March 2021 showed limited research regarding creative thinking development in curricular areas of science, math, and language development. The most recently published research studied possible relationships between creative thinking and scientific processing skills in preschool children (Yildiz & Yildiz, 2021). Contrary to this current

research, Yildiz & Yildiz (2021) considered the quality of the home environment and parental education levels with their observations. However, these findings indicated that between the age of 5 – 5.5 years, there is a correlation between creative thinking and scientific processing skill development. In 2006, Lampert wrote of the importance of teacher-guided intervention to develop young students' critical and creative thinking skills. Leggett (2017) continued by stating, "What is missing from teaching is a general lack of understanding of intellectual activities associated with creativity" (p. 847). This research partially aimed to fill this gap in research and is supported by the idea that intentional teaching and open-ended inquiry can lead students to further engage in creative designs, problem-solving, and collaboration within core academic competencies.

Action Plan

This action research project set out to apply intentional teaching practices, employing suggestions and open-ended prompts, to encourage young children to engage in creative thinking activities and solutions with core curriculum materials in a Montessori primary classroom. There was a paucity of literature pertaining directly to creative thinking in academic subject areas when conducting the review in April 2021. Due to the absence of research available, this study was designed to fill a gap of early childhood educational teaching practices as they pertain to creative thinking and core competencies. According to the literature review concerning young children and creative thinking processes, most early childhood teachers limit creativity to visual and performing arts, negating the importance of developing creative thinking skills. Similarly, research suggests that many adults believe that children will naturally develop creativity if supplied with art-making materials and left alone to create. However, this thinking disavows the concept that creative thinking will develop through intentional teaching and inquiry like most

other learned skills. Creative thinking abilities lead to collaboration, problem-solving, and classroom community solutions. Encouraging children to engage creatively with curriculum materials can improve their comprehension of core academic concepts as they seek solutions for creative endeavors.

The researcher hypothesized that open-ended inquiry, prompts, and suggestions would encourage students to extend their engagement with educational materials and develop creative thinking, peer collaboration, and problem-solving while increasing the comprehension of the direct curricular aims. This study utilized quantitative and qualitative data collection methods. The quantitative data tools recorded curricular choices, teacher prompts, time worked, and student comprehension per group presentation. The qualitative collection included observational data to follow students' work cycles, peer collaboration, creative thinking endeavors, and environmental anomalies.

This action research demonstrated that it is beneficial for educators to apply intentional teaching strategies to develop creative thinking skills in young children, as found in the review of the literature. Offering suggestions, prompts, and posing open-ended questions to young students may increase their focus and concentration times, enabling them to absorb the aims of the curriculum materials. Inspiring creative thinking with intention has a high possibility of engaging young children with the manipulative curricular materials within the classroom, deepening comprehension of science, mathematics, and language concepts that are particular to this age group in the period of the absorbent mind. Teachers should encourage unique expression, exploration, and novel design to extend working time with materials to develop an awareness of concrete, foundational concepts.

When students are free to choose the materials and lessons, they are inspired to use their ingenuity and creative processes. If teachers provide a photocopy or worksheet, they impart a disservice to the children by initiating a pre-determined path for them to follow. These actions negate their liberty, diminish their work ethic, set low expectations, and dismiss the importance of creative thinking. Instead, teachers must encourage students to explore, collaborate, and problem-solve to create unique solutions and designs which contribute to their overall learning capacity.

Given the specific parameters of this study, that all the students were new to both school and Montessori environments with a full range of 3–6-year-old students, this study provided reliable baseline data to follow-up research of the same or similar classroom settings. The researcher plans to repeat the study in the spring of 2022 with the same students. Repeating or conducting this study in an established classroom, where positive teacher-student relationships already exist negates the need for the initial Teacher-Student Conference. Based on data and conclusions gleaned from the study, the format and collection methods will remain intact to align with the current findings. The continued repetition of this action research will lead to new results which compare longitudinally to determine best teacher practices for optimal student results. This study attempted to fill a gap in research regarding creative thinking in young children. The literature suggested that providing open-ended inquiry, freedom of choice, and intentional teaching practices can enhance creative thinking opportunities. Engaging students with materials to increase learning capacity is the goal of education. This study demonstrated that intentionally offering suggestions and prompts to promote creative thinking augmented the working time of young children, which contributed to the growth of comprehension.

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Appendix A

Teacher-Student Conference Form

Student Identifier:

Age:

Date:

Dismissive	Minimally Responsive	Responsive	Highly Responsive
The child is hesitant or unwilling to respond to question.	The child provides simple answers with limited details.	The child is talkative and provides a more elaborate response that includes some detail.	The child provides a variety of responses that include many details and at least one example of a unique response.

1. Can you tell me a story about a fun experience in your life?

   1) Dismissive 2) Minimally Responsive 3) Responsive 4) Highly Responsive

   Notes:

2. Do you like to try new things or go new places?

   1) Dismissive 2) Minimally Responsive 3) Responsive 4) Highly Responsive

   Notes:

3. Can you think of something you can do to help someone today?

   1) Dismissive 2) Minimally Responsive 3) Responsive 4) Highly Responsive

   Notes:

4. Looking around the classroom, do you see something that is useful to you for learning?

   1) Dismissive 2) Minimally Responsive 3) Responsive 4) Highly Responsive

   Notes:

5. How do you think you can work with others to make our classroom better?

   1) Dismissive 2) Minimally Responsive 3) Responsive 4) Highly Responsive

   Notes:

Appendix B

Field Notes Form

Date:

Weather:

Number of children:

Absence and reason:

Teachers:

Special events/schedule variation:

Comments:

Appendix C, page 1

Daily Data Form

Student Identifier:

Date:

Time:

Material:

1. The child is extending the work time beyond baseline expectation. Y___ N Time:_____

2. The child is executing the lesson from the teacher without challenge or difficulty.

   1) Strongly Disagree 2) Disagree 3) Neutral 4) Agree 5) Strongly Agree

3. The child is involved in the work process.

   1) Strongly Disagree 2) Disagree 3) Neutral 4) Agree 5) Strongly Agree

4. The child has extended the material and/or created a novel product or solution.

   1) Strongly Disagree 2) Disagree 3) Neutral 4) Agree 5) Strongly Agree

5. Did the child participate in peer collaboration? Y N

   If yes: The child is finding ways to solve challenges through peer collaboration.

   1) Strongly Disagree 2) Disagree 3) Neutral 4) Agree 5) Strongly Agree

Appendix C, page 2

Daily Data Rubric

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1					
2	The child walks away from the work, is not interested or is otherwise not involved.	The child requires multiple prompts in order to complete a lesson.	The child has fulfilled the baseline expectation of time and requires limited additional teacher prompt.	The child remains active with the material and has completed the work.	The child independently utilizes the work and does not require any teacher prompt.
3	The child walks away from the work or is otherwise not involved.	The child is distracted and may require teacher prompt to remain active with the material.	The child is active with the work but does not grasp the direct aim.	The child can emulate the lesson given by the teacher but does not initiate further engagement.	The child asks questions and remains highly involved in the work and remains with the work for an extended time.
4	The child is distracted and does not complete the work and proceeds to put it away.	The child can mimic the lesson but does not seek to extend the work time.	The child looks for extensions to the primary lesson and asks questions.	The child has utilized the work in a way different from teacher's presentation and teacher led extensions.	The child creates a novel product or unique solution related to the direct aims of the material.
5	The child is a passive participant in peer collaboration.	The child provides limited input in peer collaboration.	The child equally shares in peer collaboration.	The child initiates ways to solve challenges within the peer collaboration.	The child demonstrates a mastery of the work and acts as a mentor in peer collaboration.

Appendix D

Observational Log Form

Date:

Time:

Observation: Interpretations •

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Appendix E

Student Presentation Data Form

Student Identifier:

Date:

Time:

1. The child can demonstrate or present the material to another student.

   1) Not Evident 2) Partially Evident 3) Fully Evident

2. The child demonstrates reasoning to develop a logical conclusion.

   1) Not Evident 2) Partially Evident 3) Fully Evident

3. The child's understanding and descriptions match the direct aims of the material.

   1) Not Evident 2) Partially Evident 3) Fully Evident

4. The child explains a novel product or idea.

   1) Not Evident 2) Partially Evident 3) Fully Evident

5. The child can demonstrate how the product or idea relates to the initial material.

   1) Not Evident 2) Partially Evident 3) Fully Evident

Overall Assessment:

1	2	3	4	5
The child is hesitant or unwilling to respond to give a group presentation.	The child provides a simple presentation with limited details.	The child is talkative and provides a more elaborate presentation that includes some detail.	The child provides a variety of information that includes many details. The child demonstrates understanding of the direct aims.	The child demonstrates a mastery of the direct aims and presents an original product/solution to peers that has a logical connection to the direct aims of the material.