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How inquiry based learning supports creative problem solving skills in elementary art education

Matthew Robert Carlson
Bethel University

HOW INQUIRY BASED LEARNING SUPPORTS CREATIVE PROBLEM SOLVING SKILLS IN ELEMENTARY ART EDUCATION

A MASTER'S THESIS

SUBMITTED TO THE FACULTY

OF BETHEL UNIVERSITY

BY

MATTHEW R. CARLSON

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THESIS ADVISOR: KARIN FARRINGTON, M.A.

PROGRAM DIRECTOR: MOLLY WICKAM, PH.D.

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ABSTRACT:

Inquiry-based teaching is a fundamental method in the innovations that leads to creative problem solving. In this thesis, the research supports how asking facilitated inquiry-based questions can prompt curiosity and discussion for K-5 grade Art students to gather new perspectives and information. Based on the literature review, critical thinking skills are applied through inquiry-based teaching. Facilitating students through the engagement of inquiry-based teaching gathers vital clues to be gathered in the application of creative problem solving. As the need for creativity is highly appraised in our workforce; guiding students with skills to think curiously and critically to gather new knowledge through inquiry-based teaching is age appropriate and can be applied in primary education to lead creative problem solvers.

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CHAPTER I: INTRODUCTION

HOW INQUIRY BASED LEARNING SUPPORTS CREATIVE PROBLEM SOLVING SKILLS IN ELEMENTARY ART EDUCATION

Creativity and innovation does not come out by itself. Understanding through curiosity, interests, experiences, perspectives can be the welcome pad of creative solutions. To engage in our curiosities applying an inquiry-based approach can have substantial benefits to understanding more of the problem at hand, and how to solve with a creative solution.

Inquiry based learning allows students to evaluate their knowledge with alternative or previously accepted explanations (Miri et al., 2007). Inquiry based learning applies students' curiosity toward questions for more understanding. Benefits to inquiry based learning is an experience for students to be more engaged in their learning. Making connections to content through open-ended questions, and being reflective of choices made makes learning a rich experience for students. Students are applying questions to topics and connecting their personal experiences while learning new information. Students may also learn from one-another through the discussions of peers. “Research on cognition has strongly confirmed the importance of prior knowledge for all aspects of thinking and learning. One reason prior knowledge is important is almost self-evident: new knowledge is built on what learners already know” (Gollub, 2002, p.160). Inquiry based learning engages students to reflect on new knowledge in contrasting their own perspectives through open-ended questions and topics. Analyzing and leaning into more questions can lead to new ideas for innovation and a powerful learning experience for young students to gain impactful skills.

Inquiry based learning also supports critical thinking skills for students. This is a powerful skill to be practiced for young students as critical thinking and innovation is essential for aiding advancements to problem solving. When students are slowing down their inclinations and analyzing their choices this helps them formulate new understanding. “We know that students who possess good thinking skills develop deeper understandings within and across content disciplines and become self-regulated learners” (Cognitive Skills Group, 1998).

The art room is an especially special place to flow creative ideas and should not be a neglected place to make creative connections. “New associations and fresh ideas are more likely to come out of a varied store of memories and experience than out of a collection that is all of one kind (Taylor, 1948). When it comes to inquiry-based learning the sciences seem to

take the lead in education. Today the arts should be more prioritized as innovation and creativity is a leading request in the workforce. Still true stated by Bloom, “Making connections between subjects is not a priority. Over-specialization, neglecting subjects, and neglecting the connections between subjects is making a society of young people unprepared for a dynamic real world” (Bloom, 1987). Creativity is a key component to the solutions that are required for innovation.

> “More than ever, the sheer magnitude of human knowledge renders its coverage by education an impossibility; rather, the goal of education is better conceived as helping students develop the intellectual tools and learning strategies needed to acquire the knowledge that allows people to think productively about history, science and technology, social phenomena, mathematics, and the arts” (Bransford et al., 2000, p. 5).

The art room can greatly benefit students with the usage of inquiry based learning to gain important tools.

- **How is inquiry-based learning implemented in Art education?**

Inquiry based learning helps students gain critical thinking skills. Students who are thinking critically will make choices that are thoughtful and aid purposeful connection to the surrounding knowledge of the artwork. Students will gain confidence for applying new ideas through implemented inquiry which will boost creativity and innovation.

In the art classroom a teacher can facilitate open-ended questions to engage students for more solutions. Once students have gathered a collection of ideas, students will then apply their understanding through experimentation in the creative process.

Here are several activity examples to aid this learning process: the challenge is the problem that students are faced to solve through inquiry:

- *Assemblage Challenge:* Students are given a fixed amount of materials and are challenged to construct an assemblage. Inquiry based questions could be connecting to other artists who create assemblage types of work such as Louise Nevelsen or landscape artist Andy Goldsworthy. Reflecting on other artists' work could inspire students for new ideas in their challenge. Inquiry questions might include: What do you see? What materials are used? How is space used? How is

the artist organizing these objects together? Referencing artwork can be an inspiring way to connect art appreciation and new innovations.

- *Standing Sculpture Challenge:* Students are given a fixed amount of materials and are challenged to construct a standing sculpture. As a group students plan how they want their sculpture to look. Students are encouraged to experiment, and discuss design elements that are going to be planned as a group. Inquiry questions may be: Are you planning a tall or wide sculpture? What do you want it to remind you of? What do you want to see on your sculpture? Where would your sculpture be built? What do other buildings in that place look like or remind you of? What will be important in keeping your sculpture standing and well-balanced? These are all questions to help students think through and make critical decisions in design.
- *Table Centers Challenge:* Students are assigned a challenge with a task or question to be answered. At each table center discussion topics are brainstormed. Small groups allow more students to be heard. After brainstorming time is up it is time to gather students' perspectives and ideas, there will be a time to come together and discuss as a larger group.
- *Drawing Challenge:* Students are given specific directions to create their own drawing outcome. This could be a monster or robot. Beforehand as a classroom students will be asked questions such as; what are some things we notice about robots/monsters? What do they do? How do they move? Is your robot/monster kind? What is their job? Are robots/monsters big or can they be small? Where are robots/monsters colorful? Do robots/monsters have arms and legs? Etc.

Allowing students to be engaged with inquiry questions before creating time provides an experience for students to expand their ideas with deeper self-evaluation. Making critical thinking choices that can be motivated through their awareness can result in new discovery and outcomes from it. Inquiry based learning can offer students an opportunity to include their experiences and selfs to the questions which can be a very engaging way for students to take ownership of their learning.

Definition of terms:

Inquiry-based instruction: Inquiry-based instruction is the development of understanding through investigation - that is, asking questions, determining appropriate methods, gathering data, thinking critically about relationships between evidence and explanations, and formulating and communicating logical arguments. (adapted from the National Science Education Standards, National Research Council [NRC], 1996, p. 105.

Although stated by Llewellyn, **"**Ask a roomful of science teachers to explain the meaning of inquiry, and you will probably get a roomful of different answers. And for that, we should not be surprised, because each one would answer the question according to his or her prior knowledge and experience in inquiry-based instruction (Llewellyn, 2002, p.1).

Creative Problem Solving - is a new way to solve a problem that leads with innovation to overcome a challenge.

Need for this research?

Supporting the process of inquiry-based teaching for students in starting young as creative thinkers using critical thinking skills to problem solve is fondamental. Creative thinking, creative problem solving should be best supported through art education. The question's purpose is to better understand factors behind innovation and creativity that are in high demand in the workforce. The following questions to be answered include:

What questions are you trying to answer?

1) *Why is Inquiry-based learning important?*
2) *How does curiosity play an important role in inquiry-based learning & How does interest support curiosity?*
3) *How does inquiry-based learning fit in the classroom?*
4) *How does inquiry-based learning encourage critical thinking and problem solving skills for students?*
5) *How to scaffold inquiry-based learning in the classroom?*
6) *What is the role of divergent vs. convergent thinking? How do these critical thinking skills play in inquiry and creative outcome?*
7) *Where does inquiry-based approach fit within the creative problem solving process?*
8) *Is problem solving the same as creative problem solving?*
9) *What is creative problem solving?*
10) *What can hinder creativity from solving new solutions?*

CHAPTER II: LITERATURE REVIEW

Research Procedures

The research conducted for this thesis are from Educational Articles, Journals, RefWorks and Google Scholar. The key words that are used are “inquiry-based learning”, “inquiry questioning”, “intercultural inquiry”, “creative inquiry”, “aesthetic inquiry”, “critical inquiry”, “creative problem solving”, “critical thinking skills”, “brainstorming”, ”open-ended problems”, “discussion starters”, “fluency”, “flexibility”, originality”, “elaboration”, “divergent thinking”, “convergent thinking”.

This literature review will focus on 10 delving questions that make connections to inquiry and its important attributes that lead to critically thinking skills and creative outcomes.. It will also address creativity and how decisions can be developed through inquiry based approach. This literature review will also focus on how inquiry based learning and creative problem solving can be implemented and enhance a K-5 Art classroom.

The literature review of this thesis is organized in two sections and addresses the following questions.

SECTION I- EDUCATIONAL CONNECTIONS TO INQUIRY-BASED LEARNING AND CREATIVE PROBLEM SOLVING

I. *Why is Inquiry-based learning important?*
II. *How does curiosity play an important role in inquiry-based learning & How does interest support curiosity?*
III. *How does inquiry-based learning fit in the classroom?*
IV. *How does inquiry-based learning encourage critical thinking and problem solving skills for students?*
V. *How to scaffold inquiry-based learning in the classroom?*
VI. *What is the role of divergent vs. convergent thinking? How do these critical thinking skills play in inquiry and creative outcome?*
VII. *Where does inquiry-based approach fit within the creative problem solving process?*
VIII. *Is problem solving the same as creative problem solving?*
IX. *What is creative problem solving?*

X. *What can hinder creativity from solving new solutions?*

SECTION II- HOW INQUIRY BASED LEARNING AND CREATIVE PROBLEM SOLVING ENHANCES THE K-5 ART CLASSROOM

I. *How to create an Art classroom community that supports that inquiry-based learning and creative problem solving.*
II. *How does inquiry-based learning and creative problem solving align with the different stages of child development of students?*
III. *How does implementing inquiry-based learning and creative problem solving enhance art curriculum and art teaching methods and strategies?*

SECTION I- EDUCATIONAL CONNECTIONS TO INQUIRY-BASED LEARNING AND CREATIVE PROBLEM SOLVING

I. Why is inquiry-based learning important?

Inquiry-based learning is a way in education to include student-centered learning. A formal definition of inquiry:

Inquiry-based instruction is the development of understanding through investigation - that is, asking questions, determining appropriate methods, gathering data, thinking critically about relationships between evidence and explanations, and formulating and communicating logical arguments. (adapted from the National Science Education Standards, National Research Council [NRC], 1996, p. 105.

Although stated by Llewellyn (2002):

“Ask a roomful of science teachers to explain the meaning of inquiry, and you will probably get a roomful of different answers. And for that, we should not be surprised, because each one would answer the question according to his or her prior knowledge and experience in inquiry-based instruction” (Llewellyn, 2002, p. 1).

Students are bringing innovation to new solutions through gathering information. Inquiry engages students by asking, trying new tests, diving deeper, and working with others. When students are engaged and empowered through inquiry it can bring new ways for innovation and

critical skills practiced in the school settings to better prepare students for their future paths. Indeed impactful learning comes when the learning is authentic to students. Later stated; “Regardless of the discipline and the instructional type, the idea behind IBL is to create better, more impactful teaching and learning environments by making teaching and learning more authentic, more meaningful, and more purposeful” (Carfora, 2014, p. 6-7).

As Pitri, (2013) noted, often children are naturally curious as stated by (Pitri, p. 42). Children's reasoning can be a factor to inquiry questions, (Pitri, p. 42). Problem finding, investigation, planning, commitment, imagination and flexibility as stated from Pitri are virtues of successful young problem solvers, (Pitri, p. 43). This can all begin in the inquiry process. With an open-ended problem this can be beneficial allowing students the choice to discover new outcomes to solutions, (Pitri, p. 45). Students making choices is an essential part to inquiry based learning. Allowing students to explain their reason for their choice can challenge the student toward deeper reflection. Students can practice skills linked to creative problem solving by working in groups developing interaction, communication, and negotiated learning, (Pitri, p. 45).

As later supported by Carfora and Blesinger,

> “Inquiry-based learning: (IBL) encourages more self-regulated learning because the primary responsibility is on the learners to determine the issues and research questions and the resources they need to address the questions. In this way, learning occurs across all learning domains (affective, cognitive, and social) because different types of knowledge are acquired through experience with complex, real-life problems” Carfora & Blessinger, 2014, p. 7.

II. How does curiosity play an important role in inquiry-based learning & How does interest support curiosity?

> “Research is formalized curiosity. It is poking and prying with a purpose”
> ~ Zora Neale Hurston, in Dust Tracks on a Road, 1942

Art is all around us, and taking a closer look and asking questions to further solve a problem or understand it can be a helpful way to engage student learning through inquiry. Engaging students with questions that apply to their own curiosity can open up the possibilities of positive learning outcomes. Gaining new knowledge can grant new perspectives to a solution

that might not have been considered before. As students engage together through inquiry topics their experiences, knowledge, and observations can bring new interpretations and problem solving skills. As curiosity is fundamentally human(National Research Council) (NRC, 2000).

Artwork can be interpreted differently in different contexts. This can be a discussion with art students through inquiry questions, (Davenport, (2003), p. 17). Davenport made the connection that artwork can connect with students by emotion, experience or audience of a group. Culture is shown through creative problem solving as Davenport shares, (Davenport, p. 15). No need to recreate the wheel, as no idea is often new nowadays and building upon ideas through student interest can be a great way to build skills of innovation, and discover new approaches to solve a problem that can benefit from new solutions to questions through curiosity of inquiry.

Curiosity and making connections to information through applying inquiry approach questioning can support critical thinking for students. This can result in outcomes of innovation through gathering information to solve a problem in a creative way. Inquiry can be a very curious and investigating process for students. Moore wrote about the importance of having a classroom where students can share their ideas of interest. To understand this more let's dive into how “Graham and Moore“ use this approach to build motivation for learning through interest;

> In Dan’s class, student interests are valued. A crucial question he considers with every student is: How do we create openings; how might we connect your interests with other things? If a student says, “I really love dragons,” a teacher doesn’t say, “No, you can’t do that.” Instead, the response is, “Oh, that is interesting, who else is using dragons, and how?” The idea is to get them actively engaged in wide conversations about what is possible. But what about the basics, what about technical skills? Dan asserts, “Yes, we teach them basics. Yes, we teach them technical skills. And, yes, we teach them conceptual approaches.” (Moore, 2018, p. 10).

Allowing self-interest in learning has great benefits in the art space through choice. This can open up opportunities for collaboration, processing of ideas, refinement, and progressing creative solutions. Having topics of interest can motivate and give framework to students who might not have the divergent thinking skill to create something completely new too. Sharing common interests can build teams that work together and share perspectives. It can also be

very fun for the students to work together, and that motivation will lead to a successful work process and outcome. Moore added,

> Steve emphasizes the important benefits to be gained when students work together. They are inspired by each other's efforts; they recognize that all members share a common goal and recognize that each one's performance is connected to others within the team. They have a sense of pride when they jointly celebrate their achievement. It is not surprising that the more experience students have working together, the more successful they become. He uses a two-step approach: first, set up a process that allows plenty of room for improvisation; second, help negotiate conflicts and challenges (Moore, 2018, p. 9).

Allowing space for students to make improvisions along with supporting conflicts can benefit student group work. Conflict and differences of opinions can benefit group creativity and curiosity through challenging perspectives and applying critical thinking to support students' viewpoints. Applying interest and allowing choice for students to be curious about their innovations and discussion that may follow can be a rewarding experience.

III. *How does inquiry-based learning fit in the classroom?*

Inquiry-based learning is a student centered approach that empowers students to be curious, ask questions and solve problems. Students gain ownership of their learning from the openness of possibilities which inquiry-based learning offers. This learning style strives for collaboration with peers and teachers while bridging student interest, and investigation for innovation through thinking skills. Inquiry-based learning can apply scenarios to its knowledge, where students get hands-on experience in a low risk manner and that encourages them to test out and try for new creative solutions.

Activities of inquiry-based learning can be promoted by questions through observation and first inclinations. In a classroom students could play a game called Art Face-Off. Students would see two images on a smartboard and need to choose one art piece that they are more drawn towards. After students silently vote they would engage in questions of inquiry. Some questions might include: What are elements of art you see in this artwork? What are the subjects you notice in this artwork? Why did you vote for this artwork? This process of art appreciation through inquiry based learning can engage the students to take a moment and

think more about their inclinations and interests and later apply them to the direction of their own artwork.

IV. How does inquiry-based learning encourage critical thinking and problem solving skills in students?

Student engagement is encouraged and applied throughout the learning process in inquiry-based learning. The cooperation by students helps to achieve learning that is meaningful and critical for future global problem solvers through tackling unanswered topics or problems. Students question content or topics from a discussional approach and apply information they have been given to solve together. Students are able to search for reasonable solutions by blending the provided information in their own creative way.

Lampert's research (2006) supports that having students engaged in activities can stimulate critical thinking skills,(Lampert, p. 46). Having more than one possible resolution can stimulate learning and support thinking skills, (Lampert, p. 46). The openness allows students the flexibility to apply creativity to a problem along with the choices to think critically. This simulation as Lampert wrote seems to be important in the inquiry process. As later described:

> Inquiry-based classroom activities require students to solve problems and answer questions that have more than one possible resolution. These types of activities stimulate critical thinking skills and dispositions in students (Burton et al., 1999; 2000; Housen, 2001; King, 1990; 1992; 1994; 1995; 2002; King et al., 1998; (Lampert, 2006, p. 46).

Lampert also described the benefits of critical thinking as an example in a classroom setting. In discussing together what is observable, relatable to engage to surface these aesthetic, critical and creative questions. When teachers ask students to openly share what they see and believe, or what it means, students can connect with each other which supports higher order thinking and group collaboration (Lampert, p. 50). As described later,

> Students' critical thinking as well as their understandings of visual communication can be deepened by classroom inquiry into aesthetic, critical and creative questions. When teachers facilitate artmaking and student discussions about artwork in ways which enable young people to openly express what they see and believe, and what it means,

> students learn from each other about art and how it relates to individual life experiences, and they engage in activities which stimulate higher order thinking.These activities enhance students' abilities to approach both art and life with a disposition for accepting that when confronting complex problems and issues there are many possible solutions which must be carefully reflected upon and resolved (Lampert, p. 50).

Lampert wrote on how inquiry activities can deepen the students' understanding to apply new perspectives to the considerations when determining an outcome. Lampert later shared that making evaluations of various alternatives has been described as critical thinking by many theorists, (Lampert, p. 46). As stated:

> Many researchers and theorists have defined critical thinking, and although each describes the construct in a slightly different way, most include language in their definitions that describes it as thinking which is focused on the evaluation of various alternatives (Jones, Hoffman, Moore, Ratcliff, Tibbits, & Click, 1995; Paul, Elder, & Bartell, 1997; Perry, 1999; Ennis, 2002) (Lampert, p. 46).

Critical thinking skills are strengthened when Lampert described how this can benefit alternatives and definitions. Looking closer at the aesthetics is also mentioned within Lampert’s research.

Lampert later shared how discussion on aesthetics can overlap styles of inquiry. Aesthetic Inquiry - broad questions value, nature meaning. Critical Inquiry - analysis, exploration and investigation of a specific piece of body of work (Lampert, p. 46). The distinction is that aesthetic inquiry applies more entrance points of discussion whereas critical inquiry is applying the information. As described below:

> Aesthetic inquiry is an exploration into broad questions about the value, nature, meaning and definition of art. Aesthetic inquiry does not focus on analysis of specific artwork, but rather on discussions of art in general. Critical inquiry and analysis is the exploration and investigation of a specific piece or body of artwork (Stewart, 1997). Creative inquiry is artmaking, which entails exploration of expression with visual language. In many art classrooms, there is a great deal of crisscrossing and overlap in these three types of inquiry (Lampert, p. 46).

The distinction of aesthetic and critical inquiry made by Lampert is a great distinction in how students interact and provide purposeful learning. Aesthetic inquiry are observations and connections made. Whereas critical inquiry seems to be a narrowed lens on the artwork at hand. Application of these critical thinking skills provide for a rich discussion of perspectives.

Having group discussions is important for varied perspectives. As Lampert expresses, Burton, Horowitz, and Abeles (2000) found that students with high arts exposure showed clear evidence of an understanding of "multiple or alternative vantage points" (p. 246) (Lampert, p. 47). Students with exposure to art show the beneficial evidence to “multiple or alternative vantage points” (Lampert, p. 47).

It is fair to say that teacher interventions can help support students deepening their understanding to varying degrees with further critical thinking inquiry, Lampert 47. This support can scaffold for students which will be later explained. Lampert shared;

> King (2002) notes the importance of teacher guidance and intervention in inquiry-based activities for students: Without teacher intervention students may revert to seeking just one "right answer" to a problem rather than working to reconcile various and opposing viewpoints and perspectives. Because critical thinking requires the reflective consideration of various solutions and perspectives before deciding on one resolution, it is important for teachers to guide students in resisting early closure when they work to resolve complex, open-ended problems (Lampert, p. 47).

Allowing openness to this process of critical thinking allows students the flexibility to gather and resolve solutions. Below Nancy Lampert delved into strategic ways to apply inquiry in the art content:

Inquiry Strategies

Geahigan (1997) Model of Aesthetic and Critical Inquiry

- Students exchange observations and opinions about a work of art
- Students compare and contrast related works of art
- Students reflect on controversial art

Stewart (1997) Strategies for Fostering Critical and Aesthetic Discussions

• Keep the discussion focused
• Raise questions without providing answers
• Ask participants for clarification and supporting evidence for their opinions
Relate viewpoints to aesthetic theory
• Encourage and suggest alternative viewpoints
• Provide closure by summarizing the opinions that emerge in the discussion

Barrett (1997) Three Critical Inquiry Questions
• What do I see'?
• What is the artwork about?
• How do I know?

Facilitating Creative Inquiry with Artmaking
• When the goal is inquiry, discourage students from imitating existing artwork
• Stimulate inquiry with visual examples showing multiple approaches for solving a creative problem
• Encourage students to develop unique solutions to artistic problems
• Embrace the differences between students' creative solutions
(Lampert, p. 48).

These inquiry questions and activities can be a helpful resource for students to have. Asking students to justify an answer may benefit creative problem solving. Allowing students time to create a plan, predict outcome and explain actions is a supported structure based on research Pitri, 2013, p.45). Facts, Practice, Feedback and Motivation are needed for purposeful learning, (Pitri, p. 46). Pitri and Lampert both acknowledged the importance of student engagement when it comes to problem solving.

Having students gather possibilities other outcomes is important during the inquiry process: (Lampert, p. 6) stated;

> Critical thinking is thought-focused on how to solve a well-defined problem, when several alternative solutions to the problem exist (Ennis, 2002; Paul, Elder, & Bartell, 1997; Perry, 1999). Because critical thinking may help to build tolerance toward others, I believe it is a worthwhile subject to investigate, given that we live in an increasingly multicultural society full of varying viewpoints (Lampert, p. 6).

When students interact with varying society viewpoints, it supports an awareness of possible new outcomes and perspectives as, (Lampert, p. 6) described is a powerful way to formulate alternative solutions and have a better understanding and respect for perspectives and ideas that are not as your own.

Applying inquiry based questions for an open-ended problem can help facilitate the flow of ideas. As later described by Lampert:

> Educational psychologist Alison King has researched the links between inquiry-based instruction and instructional techniques that stimulate critical thinking in both K-12 and college students (King, 1990, 1992,1994, 1995, 2002; King, Staffieri, & Adelgais,1998). Her work has focused on a technique for developing students' critical thinking by utilizing "question stems" as discussion starters. King's research has shown that question stems facilitate higher-order critical thinking by requiring students to reflect upon and reconcile various perspectives and solutions for open-ended problems (Lampert, p. 6).

These question stems can come in a matter of questions to prompt discussion. Lampert wrote:

> Stewart and Walker (2005) recommended that art teachers move away from direct instruction to a model of inquiry, or indirect instruction, "guiding students in their own investigations... this often means designing strategies that will guide students to raise [and answer their own] questions" (p. 81). For example, an art teacher might ask a 3rd-grade class to view on a screen two projected landscapes—Starry Night by Van Gogh and Peaceable Kingdom by Edward Hicks. Using question stems, the teacher asks: "What do you see? What colors are used in Starry Night? Why did the artist use these colors? What colors do you see in the Peaceable Kingdom? How are these two landscapes different? How are they the same?" The teacher then asks the class to use

> oil pastels on paper to draw their own landscapes in any way they choose. The class displays the finished landscapes and the students are asked what they see in each drawing. Each child's art looks different because each student has solved the art problem in a slightly different way. In this example, the classroom of children has expanded their notion of landscapes and what they see around them (Lampert, p. 6-7).

Modeled inquiry questions; "What do you see?","What colors are used?","Why did that artist use these colors?","How are these artworks similar; how are they different?" (Lampert, p. 6-7).

Having students interact with varying society viewpoints to support an awareness of possible new outcomes and perspectives, (Lampert, p. 6). Question stems/discussion starters have been linked to support various responses for open-ended problems, (Lampert, P6). Modeled inquiry questions; "What do you see?","What colors are used?","Why did that artist use these colors?","How are these artworks similar; how are they different?", (Lampert, p. 6-7). "To bear the vulnerability" as stated from Lampert, supports a safe place for children to grow in an artistic environment, (Lampert, p. 10).

V. How to scaffold inquiry-based learning in the classroom?

To begin inquiry-based learning, students will start by noticing a problem. They will brainstorm information around the problem, and then explore what are identifiers that could be linked to a possible solution. These steps can be aided by the teacher. The teacher could prepare an activity, considering a framework of questions from possible inclinations students may bring. This obviously cannot be forecasted beforehand, although context clues can benefit learning. Students are then encouraged to gather more information, look at it, and make choices toward a solution. As students are discussing choices; teachers may aid in the information search process. Providing helpful material; visuals, texts, youtubes, and other resources in the classroom may be helpful. After students have gathered, they will then analyze the information using critical thinking choices to create a solution.

Zande's (2014) research listed ways to break down the creative problem process. Applying placement of inquiry through Zande's steps can offer support to scaffolded connections for learning. Ask, investigate, create, discuss and reflect including levels of curiosity throughout the process. Zande, first highlights the importance of defining the problem.

1. The first step is to define the Problem. The process of inquiry can also fit with the framework of problem solving. Zande lists problem solving in a matter of steps. As listed below: Stated from Zande is a listed example to this step format to solve a problem for young adults; During the initial meeting we determined the clients' needs, wish lists, requirements, and limitations. Developing a relationship is critical. It is important to hear the client and yet guide them in making the best choices using your expertise. We cover the questions of who, what, where, when, why, and how. (Zande, p. 22). As elementary students are not of age to typically be involved with clients they can still practice these skills and delve with these questions of inquiry to define the problem. These questions of Who, What, Where, When, Why and How and selecting choices can be as playful and imaginary as "playing house" or "chef" commonly popular for children. The most important part is asking age appropriate questions and identifying the need, or problem to solve.

2. The second is Investigate. Looking into what are the options or opportunities that may solve this problem can make developmental progress, (Zande, p. 22). Investigating what is available and how it can be incorporated with those available factors to solve a problem. This is all information to the final outcome.

3. The third is Research. This is a continuation of the investigation process and determines what are factors that can connect to the context of functionality to solve this problem, or improve it, (Zande, p. 22). For example for children, if students were researching the Little Mermaid and trying to create an underwater home, what materials would make sense in the relationship of available materials?

4. The fourth is Developing the Idea. Zande stated, "The students worked in teams to brainstorm ideas and help each other to see many solutions that consider aesthetics as well as functionality. They created drawings to graphically communicate their ideas in different views, as well as perspective drawings and digital renderings to show top, side, front, bottom, and detailed views of the seating device" (Zande, p. 25). Inquiry questions of both aesthetics and critical functionality can prompt new insight for students.

5. The fifth is making a prototype. Creating and articulating a plan is valued in the creative process for who you are solving the problem for. Sketches, and an explained understanding of choice behind decisions that were made and why is shared in this step (Zande, p. 23).

6. The sixth is creating a Presentation. Students discussing concepts with a mock or real "professional" could help students link more insight to the culmination to what they are trying to solve. Creating a simulated experience could have benefits of process ideas.

7. The seventh and final step is Revaluation and Revision. A reflection sheet could be used for students to articulate their learned outcomes, (Zande, p. 23).

These guidelines could be followed for students to develop their own solutions (Zande, p. 25). Starting with a definition of what is needing to be solved is the beginning of the solution (Zande, p. 22). Looking into what are the options or opportunities that may solve this problem can make developmental progress (Zande, p. 23). These are examples from Zande in how ecstatic solutions were solving the problem (Zande, p. 23). Creating and articulating a plan is valued in the creative process for who you are solving the problem for (Zande, p. 23). Revisions of feedback are a common real-world occurrence that should be practiced for students during a problem solving project (Zande, p. 23). Application of feedback should be a practice skill for problem solving (Zande, p. 24).

Students noticing, discussing, and sharing known knowledge through curiosity of inquiry answering can allow connections to be made to have a deeper understanding that can benefit student learning. Here are listed *The Three-Story Intellect* research from Sally Berman: Example from The Three-Story Intellect: Gathering; scan, select, recite, observe, name, match, list, identify, describe, define, count, complete. Processing; reason, make analogies, synthesize, analyze, sequence, infer, explain (why), distinguish, sort, classify, contrast, compare. Applying; idealize, forecast, hypothesize, apply a principle, if/ then, speculate, predict, judge, imagine, generalize, evaluate. These words are categorized to scaffold higher thinking strategies. Berman later referenced in her research KNL: K - (what do we *K*now?) N - (what do we *N*eed to know?) L - what have we *L*earned? Berman, 2008, p. 93.

Indeed, art appreciation of artwork reflects culture and asking inquiry based questions can result in more understanding of the purpose of the context (Davenport, 13). While also valuing and recognizing students carry their own attitudes, experiences and knowledge that may connect to a piece of input of helpful perspective. Looking closely at any object students can reveal attachments of societal significance (Davenport, p. 13-14).

VI. What is the role of divergent vs. convergent thinking? How do these critical thinking skills play in inquiry and creative outcome?

Divergent and convergent thinking are both very important in the creative problem solving process (Pitri, p. 42). They are both types of cognitive processes. Divergent thinking often is used during a brainstorm and is when someone gathers as much information or ideas as they possibly can that connects to the question, context or topic. These ideas could be imagined on an invisible shelf, gathering lots and lots of ideas that could be picked up or later tried. Divergent thinking has many outcomes whereas convergent thinking is more literal and direct. It is focused on logical answering, and finding the best placed solution through heavily analyzing the data. Divergent thinking is more applicable to creative solutions as more possible outcomes are available. Although convergent thinking can discover powerful innovations too.

Divergent thinking seems to have more dexterity to formulate many outcomes. As Graham and Moore (2018) wrote,

> “When students are involved in a process that invites questions and improvisation, they learn how knowledge is made and how new things can happen. As teachers, we tend to ask, “What are the proper materials, assignments, and assessments?” Perhaps a better question is,“How do I make my students hungry?” (Moore, p. 12).

Reinforcing critical thinking skills can support creative outcomes and motivation for student learning, gathering information and making connections through divergent and critical thinking skills.

VII. Where does inquiry-based approach fit within the creative problem solving process?

Inquiry based approach is based on asking many questions and is an application that can be complementary to creative problem solving. Inquiry based approach focuses on critical thinking which later applies to choices made toward final outcomes. Creative problem solving is

a flexible umbrella term that offers complex innovation to make several solutions to needed problems. Inquiry based approach gathers insight to solidify creative outcomes and works hand in hand for new innovative solutions to happen.

Heid (2008) delved into how surrealism and metaphors can be placed to promote new innovation. She later shares:

> The use of synectics and surrealism may assist children in generating symbols and metaphor in order to promote creative and imaginative ideas for artmaking. According to Levi-Strauss (1962), experience with metaphor enables students to generate ideas for creative expression, rich in meaning and at the center of discursive thought. The use of metaphor may also provide students with cognitive tools for increasing imagination, creativity, and intellectual inventiveness (Egan, 2005); (Heid, p. 40).

These conversations over surrealism and metaphor can be pulled to promote creative ideas activity. This can be an application for thinking of odd combinations and how this can apply to solving a satisfactory result.

The creative problem solving process can also be supported through the stages perceptions of the artists as described by Heid:

> According to Siegesmund (2000) artists work through their ideas for their artwork by engaging in a cycle of visual inquiry. This cycle involves a sequence of stages: perception, conception, expression, and reflection. Important components of the visual cycle of inquiry as it relates to generating ideas are perception and conception. It is through Siegesrnunds' first two stages of perception and conception that students may begin to engage in the creative thinking skills put forward by Torrance and Safter (1999). Ultimately, when students master the creative thinking skills they are likely to complete the next stages of the visual cycle of inquiry-expression and reflection-and thus, solve the artistic problem (Heid, p. 40-41).

Heid made summarization by working through ideas; perception becomes conception. Later questions are asked through expression and later reflection as a whole as described above Heid, pp. 40-41). Surrealisms odd pairing make for interesting and approachable outcomes for an activity as described by Heid:

> Elementary art teachers often introduce the concepts of surrealism by looking at the images of Dali, Magritte, or Chagall and discussing how dreams, fantasy, and the subconscious mind inspired these artists. Teachers may explain that the surrealists' artworks typically included two or more familiar things that were fit together oddly. For example, the surrealists juxtaposed seemingly familiar objects in order to make the familiar appear strange (Starko, 2004). This mechanism used by many surrealists resulted in dreamlike and fantasy images. The surrealist technique of putting two familiar items into an unfamiliar juxtaposition is called synectics. Using synectics is one approach for developing habits of creative expression in the art classroom. To put it another way, synectics can make the strange seem familiar or the familiar seem strange (Prince, 1968). When an artist combines something recognizable with a familiar condition in order to solve a problem, he or she may be taking the two familiar images and making them strange and surreal. Similarly, the use of synectics may provide grounding for developing the use and understanding of analogy and metaphor (Heid, p. 41).

Creating new surrealistic combinations that fit oddly together can be an activity to solve a problem. Using Starko's (2004) research, Heid later broke down key words when applied with inquiry could have great benefit to new innovation. The following skills to be practiced include the following:

Fluency:
When students are fluent in their thinking, they are able to generate many ideas. When individuals say someone is fluent in a language, they mean to say that the person knows many words, phrases, and concepts, and can converse easily with others. Fluency, as a creative thinking skill, suggests that students can brainstorm easily and can thus generate many ideas.

Flexibility:
The second level of creative thinking is flexibility. Flexibility in creative thought is the ability to move easily from one idea to another. Gymnasts are flexible. This means that they can easily bend and move from one position to another. This request suggests a more complex level of thought than in fluency and a creative shift.

Originality:
The third level of creative thinking is originality. Art teachers can press students to generate many original ideas. Originality is often associated with fluency of thought or the ability to come up with many ideas. Those that brainstorm many original ideas are likely to come up with multiple solutions (Starko, 2004).

Elaboration:
The fourth level of creativity is elaboration. By elaborating an idea or image, the artist extends his or her thoughts. Art teachers often say that they ask students to push the idea. This sort of exercise tends to promote divergent rather than convergent thought (Starko, 2004).

Group engagement is important, as later shared by Burton; Within Lowenfeld's theory of creative and mental growth not all children and adolescents become professional artists, but they all develop flexible and free minds able to construct and express personal meaning (Burton, p. 335). Every able person contributes to meaning and expression.

Lowenfeld's developmental theory is characterized by processes of creative practice exemplifying what he calls creative intelligence at work, rather than the aesthetic products of artistry. It is not that Lowenfeld was unmindful of outcomes or of the needs of the gifted and talented individual. But his emphasis is rather on the continuing need of all young people to make sense of a complex and confusing world, of the need to empower young minds with aliveness and flexibility, and to harness their inherent creative capacities to this end (Burton, p. 35).

Supporting ideas and flexibility to think of new outcomes without comparing the lack of creative capacities is an empowering strategy to implement in the classroom setting. Students applying new insight with thinking activities can be a playful way to engage creativity. This could be creating a scribble into something new or applying art concepts into their own work. Imagination challenges, divergent thinking boxes, or having students design something with a purpose.

VIII. Is problem solving the same as creative problem solving?

Problem solving follows predictable patterns to solve a solution; whereas creative problem solving thinks of something old, and makes it new. A level of innovation, a piece to the puzzle. Looking above the fog to discover a needed question to be resolved with a completely

new perspective that offers many solutions. In creative problem solving you cannot forget the creative, whereas problem solving does not necessarily require as much playful innovation. Creative problem solving can be easily accessible if the solutions can be more flexible in its outcomes of mixing and matching for satisfactory results. This contrasts to the problem solving lens which is a more convergent thinking approach. Both problem solving and creative problem solving can result in a solution. Although, both have different wiring to get there.

IX. What is creative problem solving?

Creative problem solving tackles a challenge with the application of a creative solution. Often creative problem solving is gathering usable information to uniquely assemble an outcome. This could be gathered from context clues, perspectives to name a few. Often new innovation is brought through creativity. There are a variety of ways creative problem solving can be applied. Brainstorming, mind mapping, lateral thinking, collaboration with team members can all be effective outcomes to gather new innovation.

Creative Problem Solving is not defined by Merriam-Websters. Here are terms and ideas that have shown up throughout research on this topic. Brainstorming, Innovators, Possibilities, Improvisation, Creative Thinking. Although Creative Problem Solving is not specifically defined, here are both terms combined from Merriam-Webster definitions. Creative: “Marked by the ability or power to create: given or creating, (Merriam-Webster)”. Problem-Solving: “The process or act of finding a solution to a problem, (Merriam-Webster)”. My personal understanding of the terminology based on these two definitions is that Create Problem Solving is an ability and process to create a solution. From the students' ability, process and solution can come to this outcome.

Investment overtime has been understood as a smart decision. Elementary students are included in this category because they are the future! Creative Problem Solving (CPS) skills invested lay the foundation for new innovations and outcomes. As an early art educator in his career, the thesis author would like to believe that the term “creatives” would not just apply to those who are in the fieldwork of art. Even though he values the craft in art, the author believes the ideas, processing, (other terms in CPS) behind developing are just as powerful. The origins of art education come from the need for development in industries and factories. education has developed further into the realm of supporting the ideas behind these industries through the strategies and awareness of creative problem solving.

Creative problem solving in early childhood learning scaffolds future possibilities for our vast and developing global world. Whether students choose a career path in agriculture, engineering, business, education, art or other industries, these skills can be applied in all professional settings. Creative problem solving provides several benefits; one in that it enhances possible outcomes in developing creative solutions. The second is that these strategies are an essential part of education for all learners as we all can interact and enhance our outcomes with layering solutions to the wheels already created in the fields and industries of today, in addition to developing new forms of ideas during childhood development.

Implementing Creative Probleming Solving for early childhood learning can have great benefits! Creative Problem Solving incorporates the ability of students both physically and mentally to make advancements on discovering an explanation to an answer that can be solved. Building CPS strategies and skills for elementary school learners can lay the framework for future industries and careers beyond the art classroom. Creative problem solving is an essential part for solving and innovation. It is common to see creative problem solving where there is a needed solution or a new development to be required. Creative problem solving can be very collaborative and a good way to practice sharing and communicating ideas. Creative problem solving can also be incredibly personal and link to interest, experience, and identity. Creative problem solving can happen in the classroom over directed activities, classroom strategies and environmental settings.

X. What can hinder creativity from solving new solutions?

You can only respond with the information that you know. With holes of gathered information this can hinder the creative problem solving process. This is why inquiry based approach is essential for later generating ideas that could be later used as creative options in this process. Having a collaborative diverse team contributing varied perspectives can also apply to combat the hindrance of the same tried, same windows of perspective. Having a diverse team can have a powerful impact to explore different perspectives for a global innovation. A classroom environment that is non-judgmental in the sharing phase is also important to promote the amount of creativity and options that could be shared. Having groups share ideas in smaller groups can also increase the engagement levels. Having a classroom that is curious rather than judgmental -“yes/no” can combat a hindrance in lack of ideas. Lastly, time management and a lack of time could be factors that have an effect on completed creative solutions.

All ideas can be contributed in the right place. Burton (2009) shared:

> Into all our awareness—perceptual, imaginative, conceptual, and aesthetic—there enter countless influences, influences of what may (but need not) have been once fully conscious, but are now consciously forgotten, taken for granted, having become part of our disposition to attend and apprehend. We ‘see’ the world in perspective as coloured, resonant, three-dimensional continuum, a world of nameable things and relations... We see it because of countless explorations, learnings, teachings, education—from babyhood onwards. Everyone comes to the arts with all this ordinary equipment. We come, too, as individual persons—with certain temperaments, dispositions, and gifts, with special personal associations which effect what is seen, with a particular cultural background in which the arts and aesthetic may or may not have played a part (Burton, (2009) p. 183).

As a result of personal experiences, students come with different perspectives. Not everyone is an expert on a topic, but allowing these shared experiences can help combat creative stagance. Allowing time for students to ask supporting questions to better their understanding of the topic or problem can help dimension lack of information that can hinder creative outcome.

As Housen, (2001) described examples:

'What is going on here...?' Responding to this is effortless for the viewer, for it invites him to begin with his natural inclination, namely to record his observations or tell a story. Followed by, 'What do you see that makes you say that...?' This question challenges the viewer, as it call for the learner to cite evidence for his interpretative comments (Housen, p. 4). Without questions that support natural inclination followed by asking for evidence, research would be lacking.

A lack of motivation could also be a hindrance to the creative process. Ask later shared by Housen; Motivation is further built given that there is more than one right answer,and the teacher does not evaluate responses, but merely ensures that all who express ideas share the basis for their observation (Housen, p. 4). Not discrediting ideas builds a space for motivated responses.

Not being observant can hinder the creative process. As shared the importance; On the other hand, the second question, "What do you see that makes you say that,"requires the Stage I viewer to do something new, namely return from a world of associational imagination, to the

work itself to have a second look, to look harder, to look longer, for evidence (Housen, p. 4). Allow students to look for evidence that supports a second look.

Lastly, if the environment is not a safe one students will struggle to find collaborative outcomes for new innovation. Lambert (2013) stated:

> I believe the positive outcome of this program was due to the inquiry-based lessons we used, the discussions about art, and the kindness the university students and exhibited to the children in our art program. We modeled tolerance and respect for the students. We were able “to bear the vulnerability” (Lampert, 2011b, p. 121) of the young artists as they worked on and discussed art, and perhaps that resulted in a safe place where the children could grow artistically, cognitively, and socially (Lampert, p. 10). “To bear the vulnerability” as stated from Lampert, supports a safe place for children to grow in an artistic environment, (Lampert, p. 10).

SECTION II- HOW INQUIRY BASED LEARNING AND CREATIVE PROBLEM SOLVING ENHANCES THE K-5 ART CLASSROOM

Critical thinking skills have never been more important to be practiced in the art classroom. Students identifying, gathering, organizing and analyzing through inquiry based teaching will be a valued trait to group contributions further in their education, and later in the workforce. The need for innovation and creativity is incredibly valuable. To have students practice skills that empower them to feel more confident to make choices with incorporating their discoveries through curiosity, interest and discussion will be a powerful skill to enhance the K-5 art classroom experience.

Students' activities will range from the cognitive capacities that they are appropriately aged grouped for. Five year old students often are curious learners with big ideas. The activities that are age appropriate can be very imaginative, whereas older students in the elementary levels such as ages 10-11 are interested in connecting real world experiences to solve problems. These developmental cognitive capacities will later be explored in this section from the research of Chip Woods.

Curriculum that supports inquiry based learning will provide students with new skills to tackle problem solving and apply new solutions to their known knowledge by inquiry. Applying critical thinking skills in the art room is the perfect place for practicing creativity to problem solving. Critical thinking skills practiced in the art classroom will enhance creative problem

solving, and this could be approached with inquiry of art appreciation, art elements and playful thinking activities.

Inquiry based learning provides for a hands on and purposeful experience for students to be later equipped to be innovative problem solvers. These skills are achievable to be practiced in the art classroom for students to gain powerful cutting edge skills.

I. How to create an Art classroom community that supports that inquiry-based learning and creative problem solving.

Creating a classroom community that encourages idea sharing can greatly support school learning. It may also shift the mindset to think alike and have students come up with their own ideas. Learning from the perspectives of others can bring about new understanding. “Explanations are ways to learn about what is unfamiliar by relating what is observed to what is already known. So, explanations go beyond current knowledge and propose some new understanding” (National Research Council) (NRC, 2000, p. 26). This can help students think of new ideas. Thinking of new ideas is important in the creative process. Activities in the art space that support divergent thinking can generate lots of possibilities for students to try, and learn from.

A specific example to apply divergent thinking skills in the classroom would be turning a basic shape into different outcomes. Students could be handed an activity sheet with 20 squares. For each square they need to create it into something new. Examples might be turning the square into a dice, or window, tv… Students will notice that other peers bring their own innovations or maybe there are some similar ideas with different approaches.

Another art activity example could be turning a scribble into something new. Students would first look at the scribble and see if they have an idea first. If not sure, they can be encouraged to turn their small sheet of paper around and look from another direction. After about a minute to make a plan, students will then use the scribble on their page and draw attaching detail to turn the scribble into something new.

Sometimes students might be stumped and not know what to create. Pointing out identifiable parts to the scribble can support outcomes for students. Giving them the skills to know how to identify later on their own too. For example the teacher might identify, “this part looks sort of pointy…” Teacher asks, “What is something that has a point like this?” “Could it be an animal or something you might see outside?”.

Art appreciation: Distinctions could be: Identifying what they observe, and noticing what are aesthetic factors, etc. With enough gathered information students may later apply their own creative problem solving approach to create their own innovations in the art classroom. Creative problem solving allows students to use their critical thinking skills to create a new outcome in their artwork.

An example to apply inquiry-based learning in the art classroom is for students to identify inclinations they have from an artist. “Explanations are ways to learn about what is unfamiliar by relating what is observed to what is already known. So, explanations go beyond current knowledge and propose some new understanding” (National Research Council) (NRC, 2000, p. 26). Students may look at artwork on the smartboard and notice key elements of the artist’s work. What do you see? How does it make you feel? What does it remind you of? What shapes do you notice? Do you notice a pattern? Their answers will vary and their perspectives will be different. This may also draw them to their own interest and motivate them toward further exploration.

II. How does inquiry-based learning and creative problem solving align with the different stages of child development of students?

Child cognitive development should be considered when using inquiry-based learning and practicing creative problem solving with students. The truth is children range with abilities and cognitive capacity. Asking age appropriate questions to students with language that is understandable will be helpful for students to engage through inquiry answering. As well, factoring students' coding skills to analyze and reflect can be scaffolded more for the younger ages to solve problems creatively.

This section is referencing: Cognitive Capacity by Chip Woods, YARDSTICKS Child and Adolescent Development Ages 4 - 14

Kindergarten: Ages 5 - 6
First Grade: Ages 6 - 7
Second Grade: Ages 7 - 8
Third Grade: Ages 8 - 9
Fourth Grade: Ages 9 - 10

Fifth Grade: Ages 10 - 11

Age 5

Cognitive Capacity:

- Often see only one way to do things; rarely see things from another's viewpoint (Woods, p. 49).

- Think intuitively rather than logically; for example, "It's windy when the trees shake, so the trees must make the wind" (Woods, p. 50).

- Can become stuck in repetitive behavior (for example, always drawing rainbows or flowers) for fear of making mistakes when trying something new (Woods, p. 50).

Playful activities for 5 year olds to break outside their repetitive behaviors can allow them new experiences and realize that we go to school to learn, and it's ok to make mistakes. We can create "happy oops" from them, and try something new.

Age 6

Cognitive Capacity:

- Very curious; love discovery, new ideas, and asking questions (Woods, p. 62).

- Very motivated to learn; enjoy the process more than the product; beginning to value skill and technique for their own sake (Woods, p. 62).

- Love to color, paint, read, write; experience an artistic explosion; learn the most when teachers value their efforts and encourage risk-taking (Woods, p. 62).

- Proudly produce a great quantity of work but are unconcerned with quality; can produce products of higher quality when encouraged to work more slowly or when teachers limit number or complexity of tasks (Woods, p. 63).

They are excited to experience art. And are very imaginative. Thinking of new ideas, and learning with limitless possibilities seems to be the energy of this age group. As they are very curious to explore new ideas, the inquiry-based approach is age appropriate for young children by asking questions.

Age 7

Cognitive Capacity:

- Like to repeat tasks; like to review learning verbally or frequently touch base in other ways with their teacher (Woods, p. 76).
- Bothered by mistakes and try hard to make their work perfect (Woods, p. 76).
- Enjoy inquiry activities and hands-on exploration; often work well in “discovery” centers (Woods, p. 76).
- Like to collect, sort, and classify (Woods, p. 76).
- Increasingly able to share what they are learning and how they feel about it through verbal, written, and artistic reflection (Woods, p. 77).

Considering table centers to explore new ideas can be a very age appropriate choice for the age group. This age group is excited to organize and sort, this can be used with colors, shapes or tiles and provides a hands-on experience to solve.

Age 8

Cognitive Capacity:

- Full of ideas; like to talk and explain ideas; tend to exaggerate (Woods, p. 90).
- Very industrious; become engrossed in what they’re doing, but have limited attention span; short exercise breaks help concentration (Woods, p. 90).

- Often take on more than they can handle; short assignments build confidence (Woods, p. 90).

- Show increasing interest in rules, logic, how things are put together, how things work, the natural world, and classification, (Woods, p. 90).

- Can handle increasingly complex tasks but tire easily; may give up, but soon want to try again with a new idea about how to approach the task, (Woods, p. 90).

- Care about both process and product of schoolwork, though they tend to be impatient and sloppy; love to add to work, but are not always interested in revising work (Woods, p. 90).

This age group is very ambitious to solve big problems! They value divergent thinking and discussing their ideas and hearing from others. Steps to help scaffold can help with their attention spans to problem solve.

Age 9

Cognitive Capacity:

- Industrious and intellectually curious, but less imaginative than at eight; focus more on the “real” world; look hard (often anxiously) for explanations of facts, how things work, why things happen as they do (Woods, p. 101).

- Beginning to be more aware, wondering about and exploring a bigger world of ideas, including issues of fairness and justice (Woods, p. 101).

- Able to manage more than one concept at a time (for example, when studying history, they can understand both “long ago” and “far away” (Woods, p. 101).

- Take pride in attention to detail and finished work, but may jump quickly between interest (Woods, p. 101).

- Able to copy from the board, recopy assignments, and produce visually attractive final drafts (Woods, p. 101).

This age group wants to consider real world problems to solve. They are interested in making connections that could connect to more purposes to help. Design or building projects would be a great activity for this age group. Thinking of a problem to solve through the mindset of design. For example; designing a chair for someone who doesn't have legs.

Age 10

Cognitive Capacity:

- Increasingly able to think abstractly (Woods, p. 116).
- Take great pleasure in collecting, classifying, and organizing (Woods, p. 116).
- Take pride in schoolwork; pay close attention to form, structure, directions, and organization (Woods, p. 116).
- Very eager to learn (Woods, p. 116).
- Enjoy rules and logic; good at solving problems (Woods, p. 116).
- Can pay attention to spelling, dictation, and penmanship simultaneously, but work may be somewhat sloppy as they learn to integrate these skills (Woods, p. 116).

This age group is ready to use visual maps to collect and organize their own ideas to solve problems through inquiry. They are able to think abstractly and think outside the box. They are excited to apply what they have learned into solving a solution. They are still developing their recording skills to collect this information. Auditory recall or visual drawings can get their ideas across to keep their momentum up too.

Age 11

Cognitive Capacity:

- Would rather learn new skills than review or improve previous work (Woods, p. 129).
- Have trouble making decisions and are defensive about mistakes (Woods, p. 129).
- Becoming more adept at abstract thinking and deductive reasoning (Woods, p. 129).
- Enjoy the challenge of reasonably hard work (Woods, p. 129).

Making revision is draining for this age group. They are up to the challenge to be stretched. They are eager to learn new tools to solve problems. Having structure or lists to follow can be helpful for this age group. They are beginning to understand the world more through including their own experiences, and applying skills of deductive reasoning to collect their own information through inquiry-based questions.

Overall, cognitive capacity needs to be considered in the application of inquiry-based instruction for elementary students. There indeed is placement for this approach as learning builds. Later stated by Gollub, “Research on cognition has strongly confirmed the importance of prior knowledge for all aspects of thinking and learning. One reason prior knowledge is important is almost self-evident: new knowledge is built on what learners already know” (Gollub, 2002, p.160).

III. How does implementing inquiry-based learning and creative problem solving enhance art curriculum and art teaching methods and strategies?

Inquiry based learning provides a beneficial experience for students to learn in a classroom environment and to practice critical thinking skills. “As students mature and gain experience with inquiry, they will become adept at clarifying good questions, designing inventions to test ideas, interpreting data, and forming explanations based on data” (National Research Council) (NRC, 2000, p. 136).

Playing age appropriate thinking activities that fit within their own age development makes learning fun and exploratory. Having an enhanced experience to practice these skills prepares students for their futures as creative problem solvers. “The NRC declared, “Research demonstrates the importance of students’ taking ownership of a task, which argues for engaging students in identifying or sharpening questions for inquiry” (2000, p. 28).

Implementing inquiry-based learning and creative problem solving strategies provides students opportunities to explore their learning through questions that can scaffold them toward new innovation. It gives students the opportunity to take ownership of their learning, and find interests in the discoveries around the problems to be solved. It encourages students to not be fearful, but instead confident to face the problem with their own approach from the gathered information of inquiry and skills they have practiced. Inquiry based learning can be applied with many art teaching methods.

One method that will briefly be mentioned will be STEM which stands for Science, Technology, Engineering and Mathematics. A new addition has been added as of 2012. STEAM - Science, Technology, Art, Engineering and Mathematics. Applying design (art) with questions of inquiry can provide students the opportunities to problem solve.

> As stated by the author or authors: “Research shows that actively engaging students in design projects can help learners develop conceptual understanding of the knowledge and principles of a domain and support the development of self-guided inquiry skills that are often difficult to teach (p. 35) (Crismound, 2001; Fleer, 2000; Fleer & Williams-Kennedy, 2002; Jonsey, 1993, 1995; Kimmel, Carpinelli, Burr-Alexander, & Rockland, 2006; Koloder et al., 2003; Lewis, 2005; Linn, 2003; Roth, 1995, 1996a, 1996b; Sadler, Barab, & Scott, 2007; Zumbrowski, 2002, (2013).

Later stated by Bennett and Monahan (2013):

> “The true potential of design as a learning approach is that it provides a good foundation for lifelong learning - a process for identifying problems, needs, or goals, as well as gaining strategies for gathering the right resources, information, and materials to tackle problems and generate solutions (Bennett & Monahan, 2013, p. 36.

Design and connections to STEAM can support students in developing creative solutions, use critical thinking, and build curiosity towards the arts from art appreciation.

Students are encouraged to explore their own discoveries with questions that can later be a hands-on experience for them to apply their own discoveries in a creative way. This supports students to apply their creativity with critical thinking choices to better support their problem solving skills. Students follow their learning scaffolded steps of questioning, that then applies to student discussion; collaborating with each other and, or, exploring their own results. It covers a mix of directed and self-directed learning as students are first guided with direction, and later apply their own creativity to solve a problem.

There are many strategies that can encourage critical thinking through inquiry based questioning. Thinking critically can provide students the skills to begin to analyze, and look closer. Inquiry based learning can happen at the carpet with younger students, or at table groups each working on a different task. Applied during morning meetings, or when students may need a constructive reset would be beneficial opportunities for implementing these strategies. These strategies could inspire students to apply a new result to their initial inclination and build skills to work together or learn from one another to gain a solution.

CHAPTER III: DISCUSSION AND CONCLUSION

Elementary Art Implementation:

This research started with the “why”. The “why” being, the need for creative thinking happening in our school systems. The first inclination was the term creative problem solving, but this topic was broken down to functionalities that support it best. Before you do all of this as stated from Marshall (2013), “At ground level, you need to know your students well. The degree to which you know and understand each of your students directly affects the quality of learning that will transpire in your classroom” (Marshall, 2013, p. 14). Research points at the vital importance that inquiry plays in creative thinking.

Inquiry-based teaching supports students to think critically and creatively. Inquiry prompts interest, curiosity, connections, discussions, new knowledge, analysis and reflection. From the facilitation of a classroom teacher students can be engaged with the teaching objectives in a new way by inquiry. A challenge might be introduced to students. This is an opportunity for students to practice critical thinking skills to think creatively. If feeling insecure on your profession responsibilities to foster IBL Llewllyn describes it best; observing a teacher who is considered well versed in inquiry-based teaching watching them move around the classroom and interact with students while validating them in their process is a helpful opportunity for teachers to improve their teaching practices toward IBL (Llewellyn, 2002, p. 107). As well, being a teacher that is continually learning themselves is a required process in the growth to be a professional educator that supports question asking through inquiry based learning. As shared by Gollub (2002), “Successful implementation of advanced study that promotes learning with understanding also depends upon creating opportunities for teachers’ continual learning, and requires sufficient resources to support professional development”, (p. 8, 2002). Being an active

participant in the learning process not just in facilitating is a thriving way to support a learning environment.

Students engage through questions which is a student centered experience for them to take ownership of their learning and not be handed out answers but be empowered by skills to practice, fail, and try again. Guiding students through inquiry provides students with teachable moments to practice critical thinking skills. “In order to decide the amount of teacher involvement in an inquiry lesson, the (National Research Council) (NRC) (2006, p. 17) recommended that the intended learning outcomes must first be decided.” … need to be rephrased: “by doing this, the teacher will be able to sculpt the inquiry around the predetermined learning outcomes. Naturally following , the teacher will be able to determine what amount of interaction would be appropriate in order to meet the intended learning outcomes.

The usage of inquiry based learning in the classroom cannot go without the mentioning of classroom management. According to Peters (2005), “management tends to be the biggest issue for classroom teachers when it comes to inquiry-based labs” (p.16). A factor of this may be from the lack of time. Connection made later by Cheung (2011) offered a suggestion to solving this problem: “One effective strategy is to try to use short inquiry lab activities that require only a few teaching periods for completion” (p. 1467).

Now, as we know inquiry does not need to be considered just a scientific teaching method as reference to “labs” yet, the point of time management to break down specific points to move forward can be a motivation for students' success. As well shared in research, Quigley, Marshall, Deaton, Cook, and Padilla (2011) affirmed “Encouraging students to set their own goals and meet those goals on a day-to-day basis provides an ongoing challenge for students and may minimize boredom” (2011, p. 60).

Inquiry is all about the questions you ask which can lead to more understanding. When this research began, its focus was on the need for creative problem solving and what specific skills and tools were within the K-5 grade art curriculum that supports students through their creative process.

Personal Application:

Surprisingly this thesis topic was inspired by a TedTalk titled *3 tools to become more creative* spoken from Balder Onarheim TEDxCopenhagenSalon. Onarheim references a big study from 2010 where IBM asked 1,600 CEO’s if these leaders were prepared for the future. With nearly less than half reporting they felt they were indeed prepared for the future. With the

follow up question of what CEOs could do better to prepare for the future this is where my curiosity toward this topic for the need of creative problem solving began. Onarheim shares that “creativity” was the most common asked attribute. “So in more than 60 countries, these 1,600 CEOs agreed that creativity was actually what they needed to make their company resilient for the future, (Onarheim, TedTalk). This video was watched in 2018 in the early stages of the research.

Professional Implementation:

Over the time period of the research on this topic, our world changed. Covid-19 disrupted and oddly connected our world. Everyone carries their own stories from that time, and has their own opinions of what was good, and bad. But, one thing I know for sure is that frontline workers that were able rose to the challenge. Frontline worker’s bravery demonstrated through innovation and how to best support our systems that were being shifted and disrupted. Teachers needed to think outside the box, and make choices for their students that would best work for them. Teaching models changed drastically during this time, and teachers were given a BIG ASK, and many were up to the challenge.

Over my time as a first year teacher during the 2020-2021 school year, I had teaching models that were changing almost every 6 weeks. From hybrid streaming with pod-rooms, distant learning, live teaching as well as working from a cart it was a full experience that required all hands on deck. From all these teaching models I realize now that inquiry was an integral part of my success in my first year to engage with students.

Art face-off slides were how I started my class during the 2020-2021 school year. Students would compare 2 images and vote on which one they were more drawn to. Students were introduced to how to play the game, and it was also a successful google-meet game to engage with students when later back online. I believe it was through the engagement and ease of the application of inquiry that this game offered that made learning fun for them.

Students were curious about their choices, and learning facts about their artwork was a way to bring in more information. Types of inquiry questions were facilitated such as: What do you notice? What do you see around? What elements of art do you see? How does it make you feel? What does it remind you of? Do you have an idea who the artist was/is? These types of questions engaged students to think more about the artwork and their choice and gather more information through this process. Referencing artworks was great exposure for students to learn new content and to discuss more topics and questions. Sometimes these ideas were shown through their artwork through this activity.

Inquiry was something I was already doing but I wasn't aware of the importance it had in the creative process and the benefits it had toward critical thinking skills which supports innovation for problem solving. I am thankful for trusting in the process, and allowing myself to ponder and learn about creativity and the ways it connects to critical thinking. I believe when students are building critical thinking skills they will be more equipped to be creative thinkers in our changing world.

Limitations of Research:

There is a need for more primary education research making connections to critical thinking, innovation and creative problem solving for art educational purposes. Inquiry-based teaching was implemented in the research to support critical thinking skills. As well, in this review the research samples different age groups that are not necessarily K-5 to make points of inquiry about teaching practices in primary art education.

Some of my research contains reference to science and math subjects. There seem to be more case studies with the implementation of inquiry in the classroom in the sciences and mathematics setting. Inquiry is a favored teaching method to “think like a scientist” Wilson references to think like a scientist. As well, limitations to scaffold learning seem to be needed more in cases of elementary students. Later stated: Bell et al. (2005) mentioned the importance to scaffolding throughout the different levels of inquiry. My research did not show as many examples specific to scaffold classroom inquiry. Other than, listed activities and thinking questions.

Naming innovation is still a question to be answered. The application of gathered information, research, analysis, reflection is implied to be the result of this outcome. Is innovation simply a chosen satisfactory outcome that is gathered information? Or does it simply become another creative option? I have not seen a case study comparing innovation from the inquiry process vs. traditional teaching methods.

Conclusion and Implications for Future Research:

The purpose of this research was to claim the importance of inquiry-based teaching which has on students in K-5 art education. The research reveals 3 main points: Curiosity plays an important role in inquiry-based learning for children, inquiry-based learning supports critical thinking skills, and the application of critical thinking is vital for creative outcomes. Inquiry based learning prompts students to take interest, seek curiosity, make connections, engage in

discussions, find new knowledge, analyze what was learned and reflect. Broken down from research; students identifying their known knowledge can take the place of taking *interest* through inquiry. Making observations were presented throughout the research as examples of inquiry inferring *curiosity*. Students sharing personal experiences/connections that pertain to the questions supports a classroom environment engaged through *discussion*. Students experimenting during the creative process, or researching more supports exploring *new knowledge*. Later, *analyzing* what was successful or research paired well, supports students' critical thinking skills. Atlas, *reflecting* on the choices made is a step toward the creative process. Student engagement through inquiry enhances the classroom experience for K-5 learners. From literature review section 2, lists several activities to be challenged to think critically from different teachable moments. For activities cognitive capacity should be considered with the language acquisition that is used from inquiry questioning. Inquiry-based learning is a powerful teaching method that supports creative problem solving solutions for students to think critically and creatively. Future research as inquiry applies to art education is an important study as it supports creative problem solving skills.

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