Summer 2019

The Role of Metacognition in Visual Art Education

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THE ROLE OF METACOGNITION IN VISUAL ART EDUCATION

A Thesis

Presented to

The Faculty of the Department of Art and Art History

San José State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

Renae McCollum

August 2019

The Designated Thesis Committee Approves the Thesis Titled

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APPROVED FOR THE DEPARTMENT OF ART AND ART HISTORY

SAN JOSÉ STATE UNIVERSITY

August 2019

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ABSTRACT

THE ROLE OF METACOGNITION IN VISUAL ART EDUCATION

by Renae McCollum

Metacognition is a conscious activity that occurs in the brain when an individual monitors or controls his or her thinking. Research in multiple fields has found that metacognition plays a significant role in a person's learning. It is currently a popular trend in general education to teach students metacognitive strategies, and research has shown that it is a practical tool to boost student success. Moreover, metacognition is most effective when it is taught explicitly and regularly practiced by the students. There is a need for more research into the effectiveness of explicitly teaching metacognition in middle and high school visual arts classrooms. Art education has undergone architectural changes over the past few decades; as of late, it is moving towards a more open-ended approach which is demonstrated in current art standards. Based on the author's student teaching experiences and the literature review of this thesis, she proposes what art curriculum could look like when metacognition and cognitive development are the focus of the classroom. She concludes that embedding metacognitive strategies in the visual art curriculum will help students develop critical thinking and self-reflective skills in addition to artistic skills.

ACKNOWLEDGMENTS

Special thanks to my professors at San José State University for your support and guidance through this Master's degree and thesis process, especially: Adam Shiverdecker, Dr. Anne Simonson, Dr. Barbara Hughes, and Dr. Beverly Grindstaff. Additional gratitude goes out to my mentor teachers Stacy Rapoport and Brandi Fabricius for their ongoing encouragement and advice. The staff and faculty of the Lurie College of Education provided me with a great foundation and the tools I needed to successfully pass the CalTPA in order to receive my single subject teaching credential in art. Finally, I want to thank my partner Christian, for smiling and nodding along with me while I discussed various theories and analyzed my thinking out loud for almost an entire year.

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LIST OF ABBREVIATIONS

ACC – anterior cingulate cortex
aPFC – anterior prefrontal cortex
CalTPA – California Teacher Performance Assessment
CCSS – Common Core State Standards
DBAE – discipline-based art education
EEG – electroencephalogram
EF – executive function
ELA – English Language Arts & Literacy
ELD – English Language Development
MC – metacognition
mPFC – medial prefrontal cortex
MRI – magnetic resonance imaging
PDP – parallel distributed processing
PET – positron emission tomography
PFC – prefrontal cortex
SHoM – Studio Habits of Mind
ToM – theory of mind
WHST – Writing (standards for) History, Science and Technical Subjects
ZPD – zone of proximal development

Introduction

As an artist, I often step back from my art making in order to reflect upon my process. This is an act of metacognition, an example of monitoring and controlling my thinking. After reflecting on what is working and what needs improvement, I can move forward based on past situations to determine how I can be most successful at the creative task ahead of me. Although I was never taught what metacognition is until recently in the teacher education program at San José State University, I recognize how I naturally use it in my artistic practice to monitor and control my creative thinking.

In my personal experience as a middle and high school art student, I was expected to come up with ideas for art projects and plan out how to accomplish that vision; my former art teachers would often guide me and offer solutions. However, I was never taught how to think about my creative choices explicitly and rarely was I required to reflect on my thinking and problem-solving abilities in art class. The process was not the focus, and only the end product's technical skills seemed important; this caused me to frequently wonder: "Is this good enough for an A?" rather than question the reason behind my artwork and the refining process that happened along the way. I pose that my classmates and I would have benefited from understanding the fundamentals of cognition, especially when facing creative endeavors. Too often we aimlessly worked on assignments without stepping back and reflecting on what we were creating.

As a visual art teacher, I plan to bring student attention to their cognition and metacognition as they work on various creative projects. It is essential for students to learn about artists and specific skills like painting, drawing, and ceramics; however, it is more impactful and relevant for sixth through twelfth graders to also learn about how their brains work and how they have the power to control their thinking and actions inside and outside the art classroom.

During my time as a student teacher, I came across two significant groups of students: those who were excited, or at least curious, to learn and critically think about their creative process, and those who were not interested in this at all. There were also students who lingered in the middle of the two groups, sometimes engaged and other times not at all. From what I have learned in my teacher-training program, it is vital to differentiate how I teach the material to a class in order to reach as many students as possible. I believe this is where embedding metacognition into my pedagogical practices is key to engaging and empowering students to be self-sufficient learners. Additionally, the visual arts have an extraordinary role to play in developing student minds because of the open-ended nature of art projects and assignments.

My interest in this topic stemmed from the interdisciplinary nature of metacognition. Research in the fields of developmental psychology, neuroscience, and education has been conducted to understand what metacognition is, where it occurs in the brain, why it is useful for enhancing learning, and how it can change and develop over time. Understanding the

history and interconnectedness of these fields as they relate to metacognition will provide a robust foundation for my philosophy as an art educator. Utilizing the current knowledge of these fields to shape the curriculum design will benefit my future students' overall experience as learners. Moreover, I hope the findings made from this thesis will justify re-evaluating the focus of how the visual arts are taught to middle and high school students.

Literature Review

Introduction to Literature Review

History of Metacognition as a Concept

The idea of metacognition, or thinking about one's own thinking, has become an increasingly studied topic across multiple fields.[1] However, this phenomenon of self-reflection is not wholly new to the modern day. Historians would say that Socrates was one of the first educators to encourage his students to gain self-knowledge.[2] Later in the seventeenth century, the philosopher Descartes wrote famously "I think, therefore I am" which was part of his explorations of the self, the mind, and existence.[3] This pondering connects to the self-referential aspect of thinking about thinking, in which we are aware of our own cognitive (and emotional) abilities.[4] Today, researchers are exploring how metacognition happens, where it happens in the brain, and how specific strategies can help improve learning abilities. Questions and definitions vary slightly depending on the sector studying it; however, most researchers would agree that metacognition involves knowledge of cognition in general and self-regulation (or monitoring) of cognition. Metacognition cultivates a more in-depth perception of self and plays a

[1] In Greek, "meta-" means beyond; metacognition can be thought of as "beyond cognition." According to the Oxford English Dictionary, cognition is, "the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses."
[2] Zull, *From Brain to Mind*, 279-280. Socrates was known to encourage his students to "know thyself."
[3] René Descartes, *Discourse on Methods and Meditations on First Philosophy*, trans. Donald A. Cress (Indianapolis: Hackett Pub, 1998), 9-10. He further ponders: "But what then am I? A thing which thinks. What is a thing which thinks? It is a thing which doubts, understands, [conceives], affirms, denies, wills, refuses, which also imagines and feels".
[4] Metcalfe & Schwartz, "Ghost in the Machine", 408.

vital role in how we make decisions, respond to stressful situations, and reflect on or judge our ability to learn.

John Flavell is a developmental psychologist who first coined the term metacognition (MC) in a 1976 paper. Flavell was initially interested in how young children had limited knowledge of cognition and rarely monitored their own "cognitive enterprises."[5] His model of cognitive monitoring was published in a 1979 paper and has been a stepping stone for many psychologists, neuroscientists, and educators. It is comprised of "the actions and interactions of four classes of phenomena: metacognitive knowledge, metacognitive experiences, goals (or tasks), and actions (or strategies)."[6] Metacognitive knowledge "consists primarily of [worldly] knowledge or beliefs" about one's mental abilities and relies on an individual's memory. It occurs, for example, when you believe you are more of an auditory learner than a visual learner. It also exists when you notice something about another person; for example, when you are aware that your sister is not good at reading people's social cues. Metacognitive experiences are conscious events that require some form of action to happen, usually based on recalled metacognitive knowledge; for example, when an author is writing a new novel and hits a block, then proceeds to reach into his or her memory to pull out past strategies that may have helped overcome something similar in the past.[7]

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[5] Flavell, "Metacognition and Cognitive Monitoring," 906. Examples of cognitive enterprises include monitoring of their own memory and comprehension.
[6] Flavell, 906.
[7] Flavell, 907-908.

Flavell's concept of metacognition is rooted in developmental psychology, the scientific study of how humans grow, learn, and adapt over time.[8] His understanding of MC was formed based on his own study of metamemory from 1971, a task monitoring study by Hart in 1967, Butterfield and colleagues' study on memory improvement in 1973, and Brown's 1975 approach to teaching monitoring strategies to children.[9] These studies created the foundation for developmental psychologists and researchers from other fields to spring from and learn more about how humans think about their own thinking. Before exploring more recent research on the topic, it is useful to address other key influences on the concept of metacognition.

Influence of Cognitive Development Theories on Metacognition

Children were the main focus of study early on in the field of developmental psychology. One main contributor to the field was psychologist Jean Piaget whose Theory of Cognitive Development was also foundational to Flavell and his contemporaries.[10] Piaget was curious about how children think differently than adults and proposed that individuals go through four distinct stages of development.[11] The stages categorized how children biologically develop

[8] According to the American Psychological Association's website, "Developmental psychologists focus on human growth and changes across the lifespan, including physical, cognitive, social, intellectual, perceptual, personality and emotional growth." "Developmental Psychology," American Psychology Association, accessed February 15, 2019, https://www.apa.org/action/science/developmental/index.

[9] Roebers, "Executive Function and Metacognition," 32.

[10] Piaget's theory originated in 1936, but he continued researching and publishing works for decades after.

[11] He proposed four distinct stages of cognitive development, which corresponded with children's ages: Sensorimotor (birth – two years), Pre-operational (two – seven years), Concrete operational (seven – eleven), Formal operational (eleven – adolescence and adulthood).

different cognitive abilities over time. Flavell utilized the Piagetian-type stages in general when studying human intellect and has acknowledged Piaget's profound influence on the understanding of cognitive development. However, he also recognized the holes in Piaget's theory, including the inability to prove that distinct stages indeed exist. Also, individuals cannot always accomplish the specific tasks Piaget laid out within each stage.[12]

Flavell's model of cognitive monitoring used a different aspect of Piaget's theory when explaining metacognitive experiences.[13] Piaget viewed human development as a constant process of adjustment to one's understanding of the world. This process, known as equilibration, happens when new information is presented, which causes *assimilation* and *accommodation* to occur. Piaget called the bits of knowledge that are gained by an individual over time *schemas*. An existing schema, for example, could be a young child's understanding of what a horse is from his or her favorite book. Assimilation occurs when that child uses the existing schema to make sense of a new situation; for example, going on a trip to a farm and seeing horses in person for the first time. Accommodation occurs when the existing schema does not match with the child's prior understanding when faced with a new experience or situation, and therefore needs to be altered; for example, if the same child goes to the zoo and sees a zebra for the first time and calls it a horse. The parent most likely would correct

[12] Flavell, "On Cognitive Development," 3. Flavell further ponders the stage-like development theories in this article and questions if a child's mind develops heterogeneously (no stages, more fluid) or homogeneously.
[13] Papleontiou-Louca, "Concept and Instruction," 16.

the child and say that is not a horse, but a zebra. The child then modifies his or her schema about horses in order to make sense of this new understanding of the world.[14]

The metacognitive experiences Flavell discussed are typically formed in childhood or adolescence and directly affect one's metacognitive knowledge; however, they can continue to occur and evolve throughout a person's lifetime.[15] Assimilation and accommodation can occur during metacognitive experiences in which an individual must retrieve or modify existing schema in order to move forward. Moreover, metacognitive knowledge that one already holds (like Piaget's existing schema) can undergo modifications based on various metacognitive experiences. For example, if a student believes he or she will fail on an upcoming exam, a metacognitive experience is underway. According to Flavell, during this type of experience, cognitive or metacognitive goals are activated, and actions (or strategies) are needed to achieve the desired outcome. This belief of doing poorly on the exam may cause that person to evoke ways to avoid failing, such as reading over the material carefully (cognitive strategy). Perhaps instead of believing failure is inevitable, the student is curious to know if he or she understands the material for the exam (another type of metacognitive

[14] McLeod, "Piaget's Theory." Moreover, *equilibration* is an integral part of Piaget's theory of cognitive development, with regards to an individual's learning. It involves being in states of *equilibrium* and *disequilibrium*. The former has to do when a new situation can alter existing schema through assimilation; the latter occurs when the new experience does not make sense and calls for accommodation, which can be frustrating for children and adults alike to make that mental adjustment.

[15] Flavell, "Metacognition and Cognitive Monitoring", 908. Metacognitive experiences can be brief or long, simple or complex.

experience); this curiosity causes the student to ask review questions and assess how well he or she answers them (metacognitive strategy). In either case, the student achieves the cognitive goal by using either of the strategies that exist in his or her metacognitive knowledge or schema. To clarify further the difference between cognitive and metacognitive, "cognitive strategies are invoked to *make* cognitive progress, metacognitive strategies to *monitor* it."[16]

Flavell also recognized the utility of metacognition in areas such as memory, writing, language, social interactions, and personality development, but he especially saw the value of applying MC training to formal education. Ultimately, Flavell believed that an individual's metacognitive knowledge and strategies could be strengthened through training (for both children and adults), in order "to make wise and thoughtful life decisions as well as to comprehend and learn better in formal educational settings."[17]

Countering Piaget's Theory of Cognitive Development were the ideas of his contemporary Lev Vygotsky, another foundational figure in the field of developmental psychology.[18] He argued, "Social interaction is crucial for cognitive [and other higher mental function] development."[19] Vygotsky's work on cognitive development looked at the socio-cultural influences on an individual;

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[16] Flavell, 909.
[17] Flavell, 910.
[18] Vygotsky's work was relatively unknown in the U.S. until 1962 when his writings were translated into English and published in the states. He was a Russian psychologist who died relatively young in 1934. Many of his writings were posthumously translated into English and published in the US. His ideas of learning and development are now commonly taught in teacher training programs.
[19] McLeod, "Piaget's Theory."

this differs from Piaget's theory, which focused predominantly on individualism and biological factors. Additionally, Vygotsky emphasized the critical role that language has in helping children learn how to learn and think. Ann Brown, a contemporary of Flavell who also played an influential role in early metacognition research, argued that Vygotsky's work influenced the theory of metacognition especially with regards to self-regulation, or the ability to monitor one's own thinking.[20] Without language or social influences, an individual would not learn how to be introspective or self-observant, which are vital parts of Vygotsky's theory. Moreover, Vygotsky is known for his discussion of the zone of proximal development (ZPD). This is the zone in which a child needs help from someone else to complete a task before being able to do it on his or her own. It is a foundational aspect of contemporary teaching strategies in K-12 classrooms.

Brown's work focused on what strategies support metacognitive growth, especially with regards to literacy. She critiqued Flavell's coinage of the term in her 1978 report along with the field of developmental psychology's overuse of the prefix "meta-" during that time. Brown was dubious about MC initially because of its introspective disposition, and she expressed how challenging it would be to study because self-evaluating one's own abilities cannot be objective.[21] However, she ultimately saw the worth in studying the topic and distinguished the differences between the two main aspects of metacognition: "knowledge about cognition" and "regulation of cognition." The former relates directly to what a

[20] Papleontiou-Louca, "Concept and Instruction," 13.
[21] Brown, "Knowing When," 6.

person knows about thinking in general (what Flavell considered metacognitive knowledge); it can be "stable, yet fallible" because people can learn incorrect information. The latter pertains to the monitoring aspects and self-regulatory mechanisms used when attempting to solve problems (what Flavell would consider as actions or strategies taken during metacognitive experiences); this can be unstable and not always reliable.[22]

Throughout her research on metacognitive strategies, Brown has argued that training interventions could help students to develop metacognitive skills, which would improve their studying abilities and overall success as learners. In line with Vygotsky's socio-cultural views on cognitive development and the idea of ZPD, Brown viewed children's learning as a process that is regulated by adults (and at times by peers); the learners internalize the outcomes of these experiences, which transform their self-regulatory system over time.[23] This idea is similar to that of Piaget's process of equilibration and to the metacognitive experiences Flavell discussed.

Literature Review Overview

The remainder of this literature review will focus on studies from both social sciences and hard sciences to explore further what metacognition is, how it works, and where it occurs in the brain. Research for this thesis focused on articles and books from the past decade; however, some earlier sources were used to help complete the picture of what is known already about metacognition

[22] Papleontiou-Louca, 11.
[23] Papleontiou-Louca, "Concept and Instruction," 12-13. The author cites Brown's 1987 work.

and how recent studies have furthered those initial findings. It is organized relatively chronologically and separated by three main fields: 1) developmental psychology, 2) neuroscience and cognitive science, and 3) education and learning. This research will provide a stronger foundational understanding of the topic, before metacognition's role in art education is explored in the final section. Finally, the conclusion will synthesize the literature's findings and propose the remaining goals of this thesis.

Contemporary Methods of Studying Metacognition

Metacognition is hard to objectively measure because it centers on individual internal experiences one has with his or her own cognitive processing. Depending on what field of study is researching this phenomenon, methods and measurement tools vary. The social science fields traditionally collect participant surveys and use observations or interviews inside classrooms or in research facilities. On the other hand, cognitive science and neuroscience utilize the technological advances of various brain-scanning equipment to pinpoint activity in the brain while a participant is going through a metacognitive experience. Cognitive science, neuroscience, and education studies commonly measure MC by the judgment participants make based on their self-evaluations of tasks.

Developmental Psychology and Metacognition

Flavell's concept of metacognition in the seventies and eighties evolved decades later to include metacognitive skills. Brown specifically addressed "metacognitive skills" in her 1978 report when discussing metacognition and

briefly described them to be viable to everyday life. In a way, these acquired skills are "trans-situational, i.e., they apply to many forms of problem-solving activity."[24] Metacognitive skills are "conscious control processes such as planning, monitoring of the progress of processing, effort allocation, strategy use and regulation of cognition."[25] In other words, metacognitive skills help to control one's cognition whereas Flavell's original concept of MC mainly explained the general knowledge and monitoring of one's cognition through various strategies or actions. Metacognitive skills complement both metacognitive experiences and knowledge; the three work together, sometimes overlapping in nature, "informing and eliciting one another during a cognitive task."[26]

Predominantly, researchers study aspects of MC on children and adolescents because of the significant metacognitive growth that occurs during this period of life. According to Claudia Roebers, MC was traditionally thought to be not evident until a child went into formal schooling. However, the earliest metacognitive abilities that have been detected, according to the literature, occur around 24-26 months.[27] Observations of metacognitive ability consist of monitoring, or checking in and asking someone to specify instructions when needed, and controlling, or correcting action and changing strategy. Metacognitive monitoring is found to be more precise around age eight, while metacognitive controlling

[24] Brown, "Knowing When," 5.
[25] Papleontiou-Louca, "Concept and Instruction," 16.
[26] Papleontiou-Louca, 16.
[27] Roebers, "Executive Function and Metacognition", 38. The author attributes these findings to a 1985 study conducted by DeLoache and colleagues in which they observed some monitoring and control of toddlers' thinking.

takes a while longer to develop. Judging one's own ability of a task and knowing which strategies to implement is part of MC and "substantially improves between 11 and 18 years old."[28] Van der Stel and Veenman cite evidence that Theory of Mind (ToM), "the understanding of one's own and other people's state of mind," is a precursor to developing metacognitive knowledge.[29] They also argue that metacognitive skills develop alongside metacognitive knowledge during early childhood and improve significantly in more formal school settings according to a study conducted by Veenman published in 2006.[30] Thus, the environmental factors, such as parenting or exposure to reading at a young age, during child development are of great importance to a child's cognitive and metacognitive abilities. Roebers cites a variety of research that concluded metacognitive development is affected by "parents' explicit and implicit input" during childhood. This input can positively influence a child's metacognitive knowledge and experiences, which in turn can also lead to improved metacognitive skills.[31]

Roebers discusses the importance of a child's ability to develop self-regulation skills and the association between executive function (EF) and MC.[32]

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[28] Roebers, 39. The author cites Weil et al., 2013.
[29] Van der Stel and Veenman, "Metacognitive Skills and Intellectual," 119.
[30] Van der Stel and Veenman, 120.
[31] "Parental language during social interactions might influence children's metacognitive development. Specifically, parents' utterances relating to planning, self-monitoring, and control such as 'what do you think we should do next?,' or 'are you sure that this is right?,' or 'did you want it to go that way?' are considered important for MC development." Roebers, "Executive Function and Metacognition," 40. (Author cites Thompson & Foster, 2013; Lockl & Schneider, 2006; Carr, Kurtz, Schneider, Turner, & Borkowski, 1989.)
[32] The author expands on the definition of EF: "executive function has been defined as a set of heterogeneous, higher-order cognitive processes involved in goal-directed, flexible, and adaptive behavior and the top-down regulation of cognition and behavior, that are particularly triggered in novel, challenging, and complex situations (Miyake et al., 2000)." Roebers, 32.

EF and MC are both higher order cognitive processes, yet the idea of EF only started being researched in the late 1980s due in part to technological advances within the neuropsychology field. In 1988 Pennington and colleagues looked at developmental disorders such as children with ADHD and made a case that EF is a factor for normal development. Roebers argues for a more unified framework for future research because the overlap of EF and MC occur in similar regions of the brain and both relate to the self-regulated information processing aspects of cognition; the overlap is there and the effect one has on the other could be significant to understanding how MC functions.[33]

With regards to deficits in development, many in the psychology-related fields have focused their studies on the connection between metacognition and personality disorders, like Obsessive Compulsive Disorder (OCD), schizophrenia, and anxiety. Metacognitive abilities are related to internal mental states and can be negatively affected when a disorder is present. Moreover, if individuals are not able to process these internal metacognitive functions, it can markedly attribute to an inability to form interpersonal relationships.[34] In 1995 Adrian Wells was one of the first scholars to discuss metacognition in regards to mental states and is known for introducing the Cognitive-Attentional Syndrome (CAS). This syndrome is tied to negative metacognitive beliefs and worrying, which can occur in individuals who have General Anxiety Disorder or other emotional or personality

[33] Roebers, 45.
[34] Coulacoglou and Saklofske, "Chapter 6," 131. Lacking MC can also play a role in a person's inability to have empathy towards another person.

disorders. Psychopathologic strategies, known as metacognitive training (MCT), have been implemented to help people who lack metacognitive abilities, such as individuals with schizophrenia.[35] These interventions have proven to be effective with supplemental supports such as medication. Moreover, research of MC and mental states is continuing to grow and, in conjunction with brain scanning technology, can help shed light on where MC occurs in the brain and provide more data on disorders with MC deficiencies.

As people without developmental or personality disorders age do their metacognitive abilities get stronger or weaker? Cognitive science researchers Palmer, David, and Fleming published a study seeking the answer to this question; they studied sixty adults (ages 18 to 84) to measure the effects of age on metacognitive efficiency.[36] Using computer-generated tests, participants had to rate how well they think they did on a visual perceptual task followed by a memory task.[37] The researchers used these tests to measure EF and logical memory to conclude the overall metacognitive efficiency. Palmer and colleagues combined their results with a 2013 study of adolescents (ages 11 to 18) and found that as people age, their perceptual metacognitive efficiency, or their ability to correctly judge how they did on a cognitive task, "increas[es] during adolescence, plateau[s] in early adulthood, and decline[s] in older age."[38] Future

[35] "MCT is a hybrid of psychoeducation, cognitive remediation, and cognitive-behavioral therapy (CBT)." Coulacoglou and Saklofske, 144.
[36] "Metacognitive efficiency refers to the relationship between subjective reports and objective behavior." Palmer, David, and Fleming, "Effects of Age," 151.
[37] Palmer, David, and Fleming, 152-153.
[38] Palmer, David, and Fleming, 158.

studies need to look at the effects age has on metacognition a more extended period, especially to understand higher-order cognitive functions on aging populations.

Neuroscience, Cognitive Science, and Metacognition

Metacognition is known to play an important role in information processing, behavior, and higher order thinking, which all take place in the EF regions of the brain, specifically the prefrontal cortex (PFC).[39] Technological advances in brain scanning such as fMRI, PET, and EEG have opened up new doors to studying this phenomenon and how it is unique to human (and primate) brains.[40] Studies have shown that the anterior and medial prefrontal cortexes (aPFC and mPFC) are the most active areas when metacognitive abilities are happening.[41] The anterior cingulate cortex (ACC) also plays a key role in monitoring and detecting conflicting information; these are both distinct aspects of metacognitive functions (see Figure 1).[42] Although there have been several studies that utilize neuroimaging to see what areas of the brain are activated during MC, Vaccaro and Fleming point out: "The neurocognitive architecture of metacognition remains underdetermined, partly due to study-specific differences in task domain and type

[39] The PFC is located at the very front of the brain in the prefrontal lobe of the neocortex. See Figure 1.
[40] Metcalfe and Schwartz, "Ghost in the Machine", 420-421. Research has pinpointed a specific part of the prefrontal cortex – BA10 – that is also present in nonhuman primates; studies have found that both MC and self-relevant processing activate the BA10 region. This region is most developed in humans, and somewhat in apes. Other species may have the ability to learn a task, but the underlying self-reflection that makes up MC is seemingly unique to us.
[41] Metcalfe and Schwartz; Allen et al., "Metacognitive Ability"; Vaccaro and Fleming, "Thinking About Thinking." Medial refers to the part closer to the center of the brain while Anterior refers to the front most part.
[42] Metcalfe and Schwartz, "The Ghost in the Machine."

of metacognitive judgment under study."[43] Moreover, Metcalfe and Schwartz put it more colloquially:

> The literature on the neural basis of human metacognition, although numerically modest, is, nevertheless, confused and confusing. Searching for metacognition in the brain is like searching for the Holy Grail: It always seems to be in the next valley.[44]

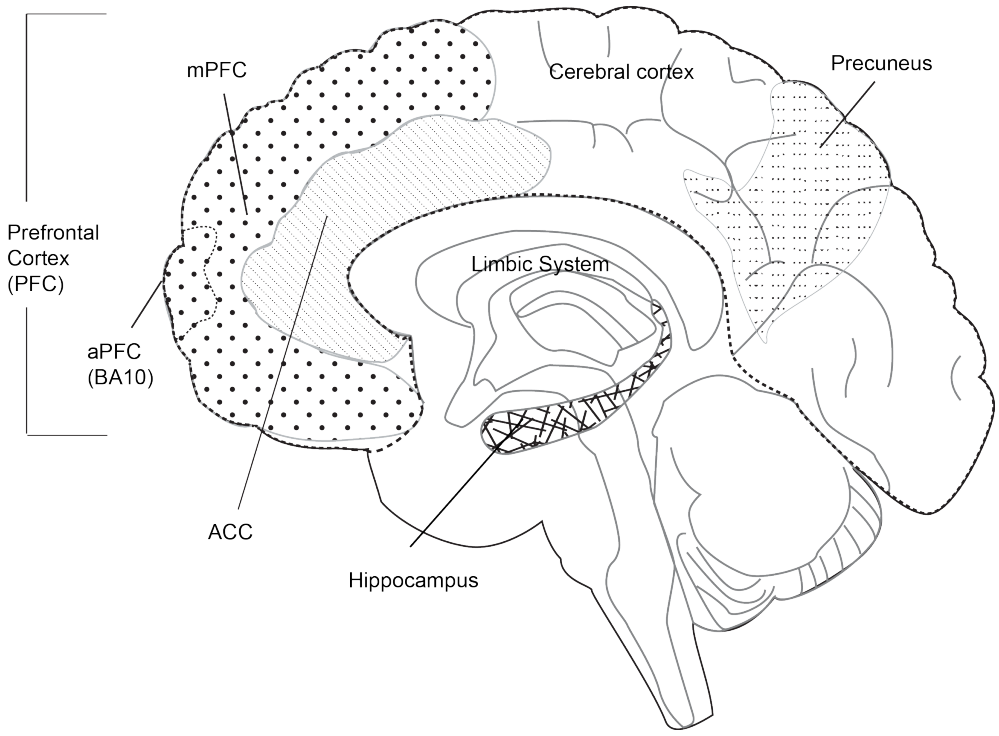

Figure 1. A medial view of the brain with main areas highlighted where metacognitive activity is known to occur.[45]

In his book, Zull describes a study done by Allman and colleagues who discuss how the ACC plays a pivotal role in connecting emotion to cognition due

[43] Vaccaro and Fleming, "Thinking About Thinking," 2.
[44] Metcalfe and Schwartz, "The Ghost in the Machine," Abstract.
[45] Figure 1 was illustrated by the author. Illustration is most notably inspired by an image found in Baars, Bernard J. and Nicole M. Gage, *Fundamentals of Cognitive Neuroscience* (Cambridge: Academic Press, 2013).

to its location between the cortex and limbic system. The ACC contains spindle cells (aka Von Economo cells), which may influence "adult competence or dysfunction in emotional self-control or problem-solving."[46] Spindle cells are also known to exist in the mPFC where they are known to relay the motivation to act.[47] Since the ACC borders the limbic system, which is mainly responsible for emotions and memory, researchers argue that metacognition plays both a cognitive and emotional role and is heavily dependent on memory.[48]

Metcalfe and Schwartz argue that metacognition is a conscious activity that spontaneously occurs in multiple neural networks when an individual notices a discrepancy of information.[49] Since metacognitive tasks involve multiple neural networks, the mapping of MC in the brain is complex and difficult to precisely pinpoint. These researchers focused on the self-referential aspects of MC, specifically on monitoring and controlling. They propose that the ACC is highly involved in MC because it is an area known for monitoring processes and detecting conflict. Additionally, they specify a region in the PFC known as Broadman's Area 10 (BA10), the precuneus, and the insula.[50] These areas are

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[46] Zull, *From Brain to Mind*, 272. The author quoted Allman's 2010 paper. Allman's study is also cited in Metcalfe and Schwartz, "Ghost and the Machine."
[47] Metcalfe and Schwartz, "Ghost and the Machine," 420-21.
[48] Ohtani and Hisasaka, "Beyond Intelligence;" Metcalfe and Schwartz, "Ghost and the Machine;" Allen, et al., "Metacognitive Ability."
[49] Metcalfe and Schwartz, "Ghost and the Machine," 407-408. A neuron is a nerve cell in the brain; neural network refers to the interconnectedness of neurons transmitting various signals across regions of the brain.
[50] Metcalfe and Schwartz, 408. Broadman's Areas are specific regions of primate brains labeled by numbers 1-52. Refer to http://en.wikipedia.org/wiki/Brodmann_area for illustration of the areas. The precuneus is located in the parietal lobe (see Figure 1) and is known to be involved with reflections of self, consciousness, and episodic memory. The insula is a memory-related area

involved in “high level monitoring/control” and “self-relevant ideation.” During MC, these regions act as a reflective system, first recognizing the inconsistency, then, resolving to change something to fix it. Ultimately though, Metcalfe and Schwartz conclude, with support from other neuroscience studies, that the ACC and mPFC are the most consistent areas activated during metacognitive reflection.

Measuring metacognition in the field of neuroscience typically involves either scanning or mapping technology in conjunction with self-reported data to identify brain activity while a participant is completing a task related to MC. Allen and colleagues expanded on these quantifiable strategies and used newly developed multi-parameter mapping (MPM) and voxel-based quantification (VBQ) on 48 individuals to measure the cortical thickness and other previously hard to detect factors.[51] The researchers agree with previous findings that MC ability occurs in the aPFC, yet they believe the exact placement of MC in the brain is still unclear because it tends to overlap with other higher-order functions. Allen, et al, discuss the difficulty of accurately mapping MC even with advanced brain scanning technologies. For example, participants completed the MC-related task while their brains are scanned then they are required to share their confidence levels on how well they think they did on the task. Self-reporting an experience depends on an accurate and efficient memory (and is arguably subjective).[52] Although this study was quite technical and heavy on clinical neuroscience research, their

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located where the frontal, parietal and temporal lobes meet (not shown in figure due to its lateral location).

[51] Allen et al., “Metacognitive Ability,” 416.

[52] Allen et al., 421.

findings show that the structure of one's hippocampus (part of the brain that is mainly associated with memory) is a predictor for MC ability, suggesting that memory-related functions play a fundamental role for perceptual MC, more so than previously expected.[53]

Another recent study analyzed forty-seven existing metacognitive and judgment-related studies (JoL or Judgment of Learning) that involved MRI technologies to synthesize existing data in order to build a more comprehensive "neurocognitive architecture."[54] Like Allen and colleagues, Vaccaro and Fleming did not believe that there was a comprehensive picture of MC in the brain. Their meta-analysis looked at multiple factors including where MC activity occurs, confidence levels of judgment-related activity, metadecision, metamemory, and the comparison of MC to Theory of Mind (ToM) activity.[55] ToM is the capacity one has to understand another person's mental states, similar to the notion of empathy. Importantly, Vaccaro and Fleming found overlap occurring in the brain between MC and ToM, which are both related to self-reflective processing. Additionally, they found that cortical thickness (in the PFC) predicts MC ability; and deficits in MC were found in individuals with disorders like schizophrenia as

[53] Allen et al., 2017, "Metacognitive Ability," 421. How one perceives their performance on a task is tied to their memory.
[54] Vaccaro and Fleming, "Thinking About Thinking," 1-2.
[55] Metadecisions are decisions about how to decide, e.g., in group planning a work meeting it is commonly decided beforehand what will be discussed and who will be involved in making the final decision. Metamemory has to do with one's awareness of their memory capabilities and strategies that can support memory.

well as in addicts.[56] The researchers admit they were not able to control for variation in tasks between the different studies or the way participants judged their abilities before or after the task. However, neuroscience research of MC does consistently look at whether an individual's judgment resembles his or her actual performance, aka metacognitive sensitivity.[57]

Education, Learning, and Metacognition

Thus far, we have looked at what MC is, how it functions, and where it occurs in the brain. This section will first discuss connections between neuroscientific findings, education, and MC. The remaining parts will focus on literature that discusses why MC can be a valuable cognitive tool in education and how metacognitive strategies can be used to enhance metacognitive skills.

Implications for Neuroscience Research in Education

Increases in neuroscience research about how we learn and process information, allow room for more science-based practices to be implemented in education. Aldrich argues for neuroscience and education to be examined together, especially as more studies on neuroplasticity are being conducted.[58] Neuroplasticity research suggests that the human mind is not fixed, but is capable of growing and adapting to new situations throughout life. An understanding of cognitive neuroscience research is not commonly part of

[56] Vaccaro and Fleming, "Thinking About Thinking," 11. Changes in the mPFC predicted the severity of addiction according to a study done by Moeller and Goldstein, 2014.
[57] "[Metacognitive] sensitivity is defined as the association between performance and confidence over multiple trials;" it is affected by task performance, so it is vital for researchers to control for differences in task performances in the design of experiments. Vaccaro and Fleming, 9.
[58] "'Neuro' meaning related to the brain and nervous system, and 'plastic' meaning changeable." Aldrich, "Neuroscience, Education," 397.

teacher training as much as developmental theories, but Aldrich hopes that with the relatively new field of educational neuroscience that there can be a bridge between the science and the pedagogical practices. "[Brain research] can be used to support particular psychological theories of learning, which in turn can be used to design more effective forms of instruction."[59] In theory, this is a worthy goal for educators to strive for; yet, the question remaining is how does one turn the research findings into practical teaching strategies.

Zaretta Hammond would agree with Aldrich and argues that brain-based learning strategies, backed by neuroscientific findings, do have a place in the educational system. In her book, *Culturally Responsive Teaching and the Brain*, Hammond focuses on how crucial it is for teachers to understand the brain's functions in order to improve their own abilities to teach students of all backgrounds.[60] She encourages educators to exercise a form of metacognition, to first look at themselves and the unconscious biases they may bring to the classroom: "De-biasing requires a level of metacognition. In this case, you are not thinking about your thinking, but thinking about your unconscious reacting."[61] Teachers must first understand themselves and practice self-reflection in order to widen their cultural frames of reference; Hammond sees this as a valuable path to being more effective in the classroom, especially in schools with students of

[59] Aldrich, 401. The author quoted American psychologist James Byrnes whom Aldrich describes as a "cautious convert" to educational neuroscience.
[60] Hammond, "Culturally Responsive Teaching." She outlines how to combine brain-based strategies with culturally responsive teaching strategies to help create a deeper connection to the curriculum for minority students.
[61] Hammond, 55-56. Unconscious bias is also known as implicit bias or "deeply ingrained social habits and ways of valuing and evaluating what we are scarcely aware of."

color. Hammond's call to use culturally responsive strategies aligns with current trends in education that encourage learner-centered classrooms, a focus on teaching to the assets that students have as individuals, rather than teaching in a one-size-fits-all manner. Additionally, she outlines various parts and functions of the brain and then ties that foundational understanding to specific teaching and relationship-building strategies, which educators can implement in their learning environments.

Another example of neuroscience and education merging is demonstrated in a model called Brain-Targeted Teaching that takes findings from brain research and translates them into teaching strategies. Mariale Hardiman compiled six main targets for teachers to consider when teaching with the brain in mind: emotional climate, physical environment, learning outcomes, declarative and procedural knowledge, extension and application of knowledge, and evaluation of learning. Together these elements all play an integral part in student learning, and Hardiman makes her case for this model through the discussion of neuroscience research. The author recommends a few tools teachers can use in their classes to promote metacognition, most notably are KWL charts and concept maps. KWL charts are graphic organizers that ask students to write what they Know about a topic, what they Wonder about it, and after the lesson or unit, students reflect on what they Learned. Hardiman encourages teachers to have broad objectives so students can personalize their learning goals, strengthening their cognitive connection to the material. Concept mapping can enhance student

understanding of the interconnectedness among topics or subjects; it is a visual representation that helps organize thinking.[62] These examples are not new nor did the author create them; in fact, many teachers of all subjects already use these with or without MC in mind. However, Hardiman's focus throughout the book is about understanding how the brain works and knowing why certain strategies are more beneficial for student learning. A common thread between Hammond, Aldrich, and Hardiman revolves around neuroplasticity and how educators play a critical role in developing student minds; therefore, pedagogical methods should be approached in a holistic way that is sensitive to student emotions and cognitive development.

The Case for Metacognition in Education

Before looking deeper into the efficacy of specific strategies or metacognitive interventions, it is valuable to ask what is known about how MC influences students' ability to learn. Educational psychologists explore metacognition's relevance to education and tend to focus on MC's impact on academic performance. Marcel Veenman is a pivotal player in the field as he has been studying the relationship between metacognition, intelligence, and academic performance for over two decades. In 1997 he proposed three metacognitive models that demonstrate the relationship between the three factors, providing different possibilities for how academic performance is achieved. The Intelligence Model shows that intelligence manifests MC, the Independent Model implies that

[62] Hardiman, *Connecting Brain Research*, 49-51.

both MC and intelligence act independently from one another, and the Mixed Model demonstrates "the correlation between [metacognition and intelligence] and shows that they are significant predictors of academic performance."[63] These three models have all been supported to some extent in a variety of research; however, the Mixed Model has received the most consistent and reliable support.[64] Ohtani and Hisasaka conclude "support for the Mixed Model is somewhat appealing, in that educational psychologists and teachers could improve students' academic achievement via interventions designed to enhance their metacognition."[65] In multiple quantitative studies from 2004-2014, Veenman and his various colleagues conclude that a number of strong claims can be made about metacognition: 1) "it can be successfully taught from primary school to university level", 2) to maximize impact: MC must be embedded across curricula, explained explicitly to the students, and learning about MC should happen over a long period of time, and 3) it is "a strong predictor of academic performance."[66]

A Systematic Literature Review (SLR) was recently conducted to figure out the overall effectiveness of teaching MC strategies in schools. The researchers

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[63] Ohtani and Hisasaka, "Beyond Intelligence," 184.

[64] Ohtani and Hisasaka; van der Stel & Veenman, "Metacognitive Skills." Ohtani & Hisasaka claim that the studies in support of the intelligence and independent models are contradictory and potentially were biased due to the small sample sizes. The support for the Mixed Model is backed by the robust statistical measurement called MASEM that Ohtani & Hisasaka used in their meta-analysis of 137 studies.

[65] Ohtani and Hisasaka, 204. The authors discuss the limitations of the existing metacognitive models and the possibility of other variables at play; they also believe that more studies are needed to see the effects on specific developmental periods to gain a stronger sense of how MC develops over time.

[66] The third claim "is reinforced by [John] Hattie (2013), who suggests that pupils are very clear about their own academic performance when taught appropriate skills of metacognition." Perry, Lundie, and Golder, "Metacognition in Schools," 8.

Perry, Lundie, and Golder looked at fifty-one metacognitive studies between 2000 and 2017; they cite specific research and the overall effects of metacognitive strategies. Citing the Education Endowment Foundation (EEF) based in the UK, MC is one of the highest performing strategies in the EEF's Teaching and Learning Toolkit. It is low-cost for teachers and schools to implement and has compelling supporting evidence for academic success.[67] One of the studies the EEF draws from is that of Dignath, Buettner, and Langfeldt (2008) who conducted a meta-analysis of studies administered to primary students' cognitive and metacognitive strategy use, academic performance, and motivation; the effect sizes of their analysis between the three factors were found to be reasonably high. Whenever metacognitive skills were taught in lessons regardless of the subject, "there appear to be improvements in pupil outcomes."[68] Additionally, Perry et al. discuss the prolific educational researcher John Hattie's Visible Learning Project, in which meta-analysis is used to quantify the effectiveness of a variety of teaching strategies. Overall, teaching metacognition has a positive impact on students in general, primarily when strategies like self-questioning are implemented.[69] It is worth noting here, however, the inevitable limitations of measuring MC consistently because of the varying methods used across studies. Self-reporting is the primary type of data collection, and it is not

[67] Perry, Lundie, and Golder, 6-7; Quigley, Muijs, and Stringer, "Metacognition," (EEF report).
[68] Perry, Lundie, and Golder, 7. Some research concluded that the MC is most effective in the sciences and math; however, there is other research that explores the positive impact MC has across curricula.
[69] Perry, Lundie, and Golder, 13. Mean size effect of .65 overall, which is a very significant effect size and broadly consistent across all studies examined.

the most reliable (for adults or children) because of the dependency on memory.[70] They suggest that future research should develop two tools, one that measures MC in action and one that measures the long-term impact of teaching it to students.

Teaching Metacognitive Strategies

Askell-Williams, Lawson, and Skrzypiec believe that "the quality of teachers' knowledge about how people learn influences students' learning outcomes" and support the need to teach students metacognitive (and cognitive) strategies explicitly in order to help them achieve academic success.[71] Through an initial survey (at three secondary school sites), they found that students were not receiving enough cognitive or metacognitive strategies to use for their schoolwork. In two different studies, the researchers provided practical tools teachers could use to embed "explicit cognitive and metacognitive strategy instruction" into their lessons with little planning.[72] The instructional tool was a reflective, paper-based writing prompt that focused on four components: 1)

[70] Perry, Lundie, and Golder, 10-11. The challenge of measuring MC (through self-reporting mostly) is prevalent in the literature, including Baas et al., "Relation between AfL," King and McInerney, "Do Goals Lead to Outcomes," and van Velzen, "Measuring Students." In studies done with students self-reporting, the Likert scale can provide researchers with quantitative data; however, students could potentially rush through circling answers without consideration and do not have space to elaborate as they would in open-ended reflection questions. Joke van Velzen (2017) uses two different studies to address issues of data collection from self-reporting by using open-ended questions and focusing on student self-reflection thinking.

[71] Askell-Williams, Lawson, and Skrzypiec. "Scaffolding," 1.

[72] Askell-Williams, Lawson, and Skrzypiec, 418-423. Evidence is from surveys taken by 1388 year 7, 8, and 9 students in Adelaide, Australia; gender was an additional factor they looked at in the results.

focusing attention on key objectives, 2) elaboration of the main ideas,[73] 3) organizing critical information, and 4) monitoring understanding.[74] This tool is an example of how to combine cognitive strategies (components 1-3 above) with metacognitive strategies (component 4). Results from the intervention studies suggest that the learning protocol implemented in the classrooms was easy to use (for teachers) and had the potential to be embedded and extended in multiple school subjects. Moreover, their methodology of joint researcher-teacher planning poses a potential solution to reducing the existing gap between research in MC and practical pedagogical strategies.[75]

Ellis, Denton, and Bond synthesized prior research from nine different studies to see what had been the most effective teaching strategies that could translate metacognitive theory into the classroom. First of all, they highlight the effectiveness of teachers' reflection on their own pedagogical strengths and weaknesses. Additionally, they point out that much of the MC literature is predominantly theoretical, without suggesting specific practices: "metacognitive knowledge is positively linked to student learning" and "explicitly teaching metacognitive knowledge to facilitate its development is needed."[76] In sum, their literature review finds some ways teachers can use MC effectively in classrooms:

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[73] Elaboration is a cognitive strategy to promote memory or recall. It involves making connections between new ideas and what a person already knows (aka prior knowledge).
[74] Askell-Williams, Lawson, and Skrzypiec, 423-425.
[75] Askell-Williams, Lawson, and Skrzypiec, 438. Researchers worked closely with teachers and administrators in order to design a strategy to implement. This involved frequent meetings and feedback sessions to figure out the best, most functional solutions.
[76] Ellis, Denton, and Bond, "An Analysis," 4016. Tracing back to Flavell's and Brown's initial ideas on metacognition, metacognitive knowledge consists of the general ideas about thinking, whereas

1. Have an engaging curriculum that allows frequent opportunities for students to reflect on their own thinking. This can be achieved by integrating student interests or through problem-based learning (PBL).[77]
2. Create assessments that encourage divergent thinking (aka open-ended questions).[78] This allows for students to reflect and evaluate their performance and promotes the expectation that there is not one right answer to a problem.
3. Be consistent when using metacognitive strategies during instruction and use across multiple lessons to see tangible results of student achievement.
4. Be explicit in the method of teaching metacognitive strategies because MC is correlated positively with student performance and is more effective than implicitly teaching. For example, a teacher can model a verbalizing strategy by thinking aloud to the class.[79]

Diagramming or using other visuals to help students plan and map out their ideas is also a very effective MC strategy according to their research. Their findings conclude that instructional strategies that involve planning, monitoring, and evaluating thinking have high effect sizes. However, they also emphasize there

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metacognitive strategies help in increasing that knowledge and specifically helps learners gain skills to control their own MC.

[77] PBL is a student-centered teaching strategy that uses real-world problems to learn and explore a subject. For example, designing an app for their community or creating a proposal for a public art mural.

[78] Divergent questions are an alternative to convergent questions, which require a specific answer.

[79] Ellis, Denton, and Bond, "An Analysis," 4018. The authors cite Kistner et al.'s 2010 study; also confirmed in van der Stel and Veenman, "Metacognitive Skills." Being explicit is one of the most effective MC teaching strategies.

are few studies to draw from so more studies are needed to make claims even stronger.

Recent research looked into the relationship between teaching metacognitive and cognitive strategies and Assessment for Learning (AfL) among elementary school children.[80] AfL is an assessment strategy that consists of ongoing monitoring of student learning; it also utilizes scaffolding to help students reach bigger learning goals.[81] Baas et al. focused their study on the "relation between AfL and students' self-reported cognitive and metacognitive strategy use" by looking at portfolios of 528 nine to twelve-year-olds in seven Dutch schools. Using portfolios is a form of ongoing assessment (AfL) that allows the teacher to facilitate self-regulated learning.[82] Students monitored their learning by choosing work to include in their portfolio and reflecting on it; this was followed by receiving feedback from the teacher to assess if learning goals needed to be adjusted. The researchers found positive outcomes when students monitored their own progress on a task and were provided with scaffolds to help students know their next steps for learning. They suggest that future researchers should look further

[80] Baas et al., "Relation between AfL," 34.
[81] AfL differs from a more standardized and summative form of assessment aka Assessment of Learning (AoL), e.g., a unit test or final project. AfL is also known as formative assessment, which includes frequent checks for understanding of the lesson's goals. Scaffolding is a process where the teacher models or shows examples in steps, to help guide students progressively to the end goal of a lesson or unit. This supportive strategy is crucial for academic success among all learners.
[82] Self-regulated learning has to do with the students' "ability to take responsibility and control for their learning." "The metacognitive aspect of self-regulated learning refers to students' ability to plan and organize learning activities, set goals, and evaluate their learning at various points during the process." Baas et al., 34. Authors cite Zimmerman, 1990.

into the causal relationship between MC and AfL and they also stress the need for a longitudinal study to see the effects over time.[83]

Art Education and Metacognition

Research into education and metacognition rarely investigate the role art education can play; instead, researchers tend to look into math, reading, or science. What metacognitive strategies exist for a middle or high school art classroom? Additionally, what is the most effective way to teach MC in conjunction with the visual arts? Self-discovery and self-regulation are essential goals art teachers want to help their students achieve, therefore including MC into their classroom seems beneficial to all. As discussed in previous sections, when teachers explicitly teach what MC is and provide students with strategies to build metacognitive skills, ideally the students' metacognitive knowledge strengthens from these metacognitive experiences planned out and supported by the teacher.

Drawing from a variety of sources from the past twenty years, the remainder of this section will provide a brief historical overview for the context of art in education followed by a discussion of more recent developments in art pedagogy and the role MC has in the visual art classroom.

History of Art in Education

Arthur Efland stresses the social role that the arts have historically played in his book *History of Art Education*: "The arts themselves reflect the society in

[83] Baas, et al., 43.

which they arise, but so does the art education system that teaches the arts."[84] He discusses the evolution of art education in Western culture beginning with Ancient Greece and traces the connection of those early philosophies to modernity. There has been a sense of elitism tied to teaching visual arts throughout history, Efland argues, mainly due to issues of access to art education (and general education as well) depending on one's class, gender, race and societal opinions towards the arts. It was not until the introduction of the public school system in the mid-nineteenth century that the arts made their way into the general curriculum in the United States. Although the arts consist of music, theater, dance, literature/poetry, and visual arts, the focus of this thesis will remain within the realm of visual arts, e.g., painting, drawing, and sculpture.

Individuals today study art in their post-secondary education in order to be working artists, designers, architects, photographers, or even art educators. Typical paths for visual arts college students include studio classes, lectures on art history and theory, and additional non-art courses to meet the university's requirements.[85] Art students are typically taught iterative processes to enhance their ability to conceptualize and produce art, and also to analyze art critically from different periods and cultures.[86] Some of the practices that emerged from early academies during the Renaissance are still foundational to teaching art in

[84] Efland. *History*, Chapter 1.
[85] This, of course, is a broad generalization and does not account for the vast differences between art schools and universities that have art departments/majors.
[86] Iterative steps for the creative process include thumbnail (or small) sketches to conceptualize a project before moving on to a larger rough draft and the final product. Additionally, with regards to writing or analyzing, iterative working processes can include brainstorming via a mind (idea) map before moving on to an outline and then the first draft.

the modern day, such as open dialogue between teachers and students, critiques, observational sketches, and preliminary sketches to prepare for a final piece of art.[87] Moreover, these practices in the visual arts are in line with metacognitive strategies, which aim to improve one's ability to self-reflect and think about his or her own creative process while solving an artistic problem.

In the K-12 setting, students are not consistently taught the visual arts among U.S. schools because of different district priorities and variation in state funding of the arts. As Efland poignantly acknowledges, there is not equal access to art education.[88] Although this problem persists, national and state standards do exist for teachers to use as a framework when designing their art curriculum. According to the narrative document that prefaces the newest national art standards, "The arts have always served as the distinctive vehicle for discovering who we are…they continue to infuse our lives on nearly all levels—generating a significant part of the creative and intellectual capital that drives our economy."[89] Initially, the *National Standards for Art Education* came out in 1994 and was revised by the National Coalition for Core Arts Standards (NCCAS) in 2014 to be more aligned with Common Core Standards.[90] The voluntary national arts standards narrative further state their purpose to education:

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[87] Efland, *History*.
[88] NCCAS, "A Conceptual Framework," 3.
[89] NCCAS, 2.
[90] NCCAS, 4-5. The 1994 standards were in response to the passage of the *Goals 2000: Educate America Act.* Although the arts were not part of the original core content of this act, they were "the first academic subject to successfully write standards under that law." The new standards are fully digitized and can be accessed at https://www.nationalartsstandards.org/; The Common Core Standards is a 2010 national education initiative that has been adopted by 42 states. It includes

> [These] philosophical foundations and lifelong goals establish a definition of artistic literacy that clarifies how students can be involved in the arts beyond the high school level, and how that arts involvement contributes to college, career, and lifelong learning.[91]

Some states have adopted these standards as their own while others have revised (or are currently revising) them.

Focusing on California specifically, as of 2000 K-12 public schools are required to offer art courses, although there is no mandate to assess pupils in the visual and performing arts.[92] The California State Board of Education (CASBE) adopted the first state visual and performing arts standards in 1996, which were later revised and formatted into the 2001 version. The revised 2001 standards were based on the theoretical framework called discipline-based art education (DBAE) and included five main threads: Artistic Perception, Creative Expression, Historical and Cultural Context, Aesthetic Valuing, and Connections, Relationships and Applications.[93] At the beginning of 2019, the newly revised *California Arts Standards for Public Schools* were officially adopted by the CABSE and are more closely aligned to the national standards than their predecessors were.[94] The 2019 CA art standards and the most recent national

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English Language Arts/Literacy (ELA) and Mathematics standards that states can adopt or revise for their own local needs. More information can be found at http://www.corestandards.org/about-the-standards/

[91] NCCAS, 18.

[92] CASBE, *VAPA Standards 2001,* ix.

[93] Eisner, *Arts*, 26-28. Jerome Bruner first initiated DBAE in 1965 in order to bring structure and rigor to what was considered a "soft" subject. It is centered on four artistic disciplines, which are typically found in artistic professions: art studio, art history, art criticism, and aesthetics; Manuel Barkan is also mentioned as an important figure in DBAE development in the 60s-70s.

[94] CASBE, *CA Art Standards*. There is no formal publication version released yet; however, they provide access to the pre-publication chapters on their website. As mentioned in NCCAS, "A Conceptual Framework," 7: "No longer will we talk about standards as lists of what students

arts standards focus on four main components (or artistic processes): creating, performing or producing, responding, and connecting. The framework for both sets of standards was designed to engage students in more authentic and relevant contexts and to provide opportunities for students to use higher order thinking skills.[95] While the previous DBAE-influenced standards were focused more on specific knowledge and skills, the current trends in art education are moving towards setting broad goals rooted in essential questions and enduring understandings that address student cognition.

Metacognitive Teaching Strategies in the Visual Arts

Typically in middle and high school visual arts classrooms, students are given an open-ended assignment with some set of guidelines or expectations. This type of assessment does not result in a right or wrong answer but instead requires a spectrum of nuance to achieve broad objectives. Herein lies a natural opening for metacognition to play a vital role in encouraging art students to think about their own thinking within their creative process. Elliot Eisner, a leading scholar in art education, believed that "curriculum is a mind-altering device" and that teachers play a vital role in helping students improve the way they think.[96] Moreover, he argued that the arts contribute to the development of complex and subtle forms of thinking. Eisner believed the arts promote cognitive development and that the arts set up opportunities for teachers to help students make

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should know and be able to do. Rather, we will talk about standards as measurable and attainable learning events based on artistic goals."

[95] NCCAS, "A Conceptual Framework;" CABSE, *CA Art Standards*, "Introduction".

[96] Eisner. *Arts*, 13. This idea is aligned with Vygotsky's socio-cultural theory and the concept of ZPD.

connections between other subjects and events in the world. In *Arts and the Creation of Mind*, he advises art teachers to use reflection as a tool to promote metacognitive development in which students write or discuss their own creative process for a work of art they made. Additionally, he discusses the value of "crits" (or peer critiques) as a formative assessment strategy that promotes student-led discussion and critical analysis of student artwork by other students.[97] During critiques, students are encouraged to reflect on their artistic goals as well as those of their peers; this activity involves utilizing self-knowledge in which "students learn about themselves and their reactions and judgments as they evaluate work."[98]

Efland called for an integrated cognitive theory for education in the arts in order to have more robust art programs. In his book, *Art and Cognition*, he provides a critical analysis of cognitive development theories, such as Piaget's and Vygotsky's, and their implications for art education. He discusses the evolution of teaching art from nonintervention or a no-teaching manner into a more gradual, teacher-facilitated learning process and explains how drawing is a cognitive process that is often influenced by a child's social and cultural influences.[99] Learning in the arts, according to Efland's proposed integrated theory, involves the consideration of some of the following aspects: how learners acquire new knowledge and skills through constructive processes; how students

[97] Eisner, 191-193.
[98] Hetland et al., "Studio Thinking," 81. This also occurs when students evaluate their own work or a piece from a historical or contemporary artist.
[99] Efland, *Art and Cognition*, chapter 2. This more recent trend is inspired by Vygotsky's socio-cultural theory of cognitive development and ZPD.

monitor their own learning; how metacognitive strategies are used in the art room; and how knowledge becomes meaningful when linked to its social context.[100] Moreover, students need to learn cognitive flexibility; this can be developed through the instruction of metacognitive strategies and by providing opportunities for students to utilize them.[101] Efland concludes that the nature of the arts, which reflect social environments, have a "built-in potential to connect domains of knowledge," i.e., integrate into other curricula.

Visual culture, or "all that is humanly formed and sensed through vision or visualization" surrounds our daily lives, and, according to Kerry Freedman, it is the "context for the visual arts in its effects and points to the connections between popular and fine art forms."[102] The author advocates for the importance of not teaching art in a vacuum, because art exists within the realm of students' visual culture, which innately is interdisciplinary; instead, Freedman stresses the value of social, political, and cultural contexts that art education needs to utilize in order to teach students how to analyze and understand their visual surroundings. Her fourth chapter of *Teaching Visual Culture* focuses on art and cognition, specifically looking at cognitive research and the psychobiological and sociocultural processes that go into perceiving visual culture. Biologically, we initially perceive visual information as simple shapes, colors, or other meaningless sensory signals; it is not until this information interacts with

[100] Efland, 78. The longer list of items can be found in his book.
[101] Efland, 88-89.
[102] Freedman, *Teaching Visual Culture*, 1.

decoding mechanisms (like the eye and the brain) that the perceived features can take on meaning. Cognitive science researchers use computer models to mimic brain activity; when visual information is processed it theoretically distributes impulses in large areas across the brain in a parallel manner, known as Parallel Distributed Processing (PDP).[103] This cognitive processing suggests that when we view visual content, our brains search for existing knowledge to make sense and understand what it is we are viewing. Freedman argues that because of our brain's ability to make meaningful connections, teachers should focus on helping their students find relevance and connections to content in the art classroom to enhance learning. One method of achieving this is through curriculum integration and using cognitive and metacognitive strategies, like critical reflection.[104]

Julia Marshall agrees with Freedman and discusses in her article how PDP (aka 'connectionism') makes curriculum integration possible.[105] By expanding connections between academic subjects, students can effectively categorize schema meaningfully, resulting in more efficient memory recall; this also supports the idea that skills or knowledge learned in one subject can potentially transfer in other contexts. According to Marshall, MC is vital in the transfer of skills and for the understanding of content. She advocates for teachers to display images of

[103] Freedman, 82. The author cites work done by Solso, 1994.
[104] Freedman, 84-85. Curriculum integration refers to a cross-disciplinary approach to teaching; for example, in a visual art class, a teacher could partner with a history or English teacher to collaborate on a unit in which the students would be approaching the same topic from different subject perspectives. Alternatively, for example, an art teacher could also integrate other subjects directly into their art lessons to make historical or scientific relevant connections.
[105] Marshall, "Connecting," 229. The author also discusses Solso's 1994 work on PDP.

Contemporary art so students can practice analytic and reflective skills. Both Marshall's and Freedman's work focuses on teaching strategies that utilize imagery to facilitate (not dictate) discussion, analysis, and evaluation to promote cognition and metacognition in the art classroom. More quantifiable or qualitative research is needed to make the PDP and Connectionism case more credible, specifically for the art classroom.

Another approach that encourages MC in the visual arts is through drawing and teaching students how to use it to plan and prepare for projects. There have been countless studies that document the stages of children's drawing abilities with their cognitive development.[106] However, these examinations predominantly look at primary aged children's final products rather than the thinking process behind their drawings. Gill Hope's work focuses on the role that drawing plays in supporting thinking with children under twelve years old, paying close attention to the development of an idea versus the cumulative artwork. One example is the concept of "drawing to design" and how the ideation behind art cultivates MC. Hope's doctoral research found that students (ages 6 – 7.5) who received an intervention lesson that taught them how to use drawing as a process tool were able to use drawing more effectively to generate ideas compared to the control group.[107] In Hope's book, the author discusses how children under eight have a difficult time with abstract thinking and that the idea of using drawing to plan a

[106] Elliot Eisner discussed multiple theorists on the topic of children's artwork, including John Matthews, Rudolf Arnheim, Anna Kindler, Rhoda Kellogg, and Viktor Lowenfeld. Eisner, *Arts*, 100-107.
[107] Hope, *Thinking and Learning*, 160.

product does not appear until eight to ten years old.[108] This point coincides with cognitive development research that has shown this is also the age where children begin to be self-critical and when metacognitive abilities are more developed. Therefore, when educators of all subjects are planning curriculum, they should be mindful of student ages and cognitive growth in order to provide the most appropriate supports. Hope argues that students' MC will develop over time when they practice translating thoughts or concepts into drawings.[109]

Recent Trends in Art Education

General approaches to teaching visual arts have evolved over the years. Before public education, there were guilds, specialized art academies, and mentor-apprentice relationships. In the early twentieth century, there was the hands-off, freedom from adult intervention approach.[110] The discipline-based (DBAE) approach entered the scene in the nineteen sixties and remained at the forefront in the US for decades. DBAE aims to develop specific craftsmanship skills relevant to becoming an artist (or at least learning to appreciate art) and is structured by the teacher with limited choice for the student. Current trends are turning away from DBAE (as reflected in the new national and CA core arts standards) to use more goal-oriented methodologies that include material exploration and self-expression with a focus on creative problem solving and self-

[108] Hope, 150-151. For example, creating a two-dimensional sketch for a three-dimensional item.
[109] The author also addresses that these drawing strategies can be used in all subjects; however, her focus of the book was mainly for primary grades.
[110] Efland, *Art and Cognition*, 36. Without any support or guidance, little was learned in this style of "teaching" art.

regulation.[111] Studio Habits of Mind (SHoM), Design Thinking (DT), and Teaching for Artistic Behavior (TAB) (also referred to as choice-based learning) are approaches some teachers are utilizing when designing curriculum to allow more freedom for students to practice those skills and others such as critical thinking, innovation, and collaboration. The latter three approaches will be looked at next.

Hetland, Winner, Veenema, and Sheridan developed SHoM from observations of studio art teaching; it is part of the framework called Studio Thinking which they initially published in 2007.[112] SHoM combines discipline-based principles with developing higher order thinking skills in eight different habits (or dispositions), in which the authors state "are used in many academic arenas and in daily life;"[113] these include, Observing, Envisioning, Reflecting, Expressing, Exploring, Engaging and Persisting, and Understanding Art Worlds. In their book, Hetland et al. provide practical art studio teaching and management strategies for teachers that act similar to the guidelines art standards offer. The disposition "Reflecting" most directly connects with fostering MC in the classroom and is integral to the other seven studio habits. As mentioned earlier while discussing Eisner, critiques are one method to provide opportunities to utilize metacognitive skills. Evaluation of one's own artwork and

[111] These are twenty-first century skills that are desired by many companies according to the Partnership for 21st Century Learning. *Framework for 21st Century Learning*, 2018. http://www.p21.org/component/content/section/9

[112] Hetland et al., "Studio Thinking." The revised version of 2013 includes utilizing exhibitions as a studio structure for learning and also approaches to thinking within each habit that can posit for potential transfer to non-art areas.

[113] The authors chose this word because a disposition "includes not only skills but also the inclination to use these skills and alertness to opportunities to deploy particular skills." Hetland et al., 39.

that of others is vital to the cultivation of MC. As the authors of SHOM point out, there are no "right" or "wrong" judgments of the quality of works; by regularly practicing evaluation verbally and in writing, students will gain a firmer grasp on perceptive responses versus those that may be poorly thought out. Teachers can help students' cognitive processing by posing questions and modeling examples. Additionally, they can encourage internalization of the evaluative and inquisitive processes by asking students to monitor their metacognitive thought processes in a journal or sketchbook or digitally on a blog.[114] This artistic process reflection strategy can be implemented throughout a project, semester, or even school year in the form of a portfolio.

Design Thinking is a popular problem-solving methodology used in primary, secondary, and university classrooms. It is an iterative, non-linear process that is used in the design world and includes sketching, prototyping, testing, and trying our concepts and ideas.[115] One teacher conducted a phenomenological study for his Master's of Arts degree with his two AP Art classes. He spent time explicitly teaching metacognitive strategies tied to the design process, such as backward design and empathetic design.[116] Afterward, he interviewed three of his students to understand better their perception of what they discussed as a class.[117] One of his students found that discussing and shedding light on specific aspects of

[114] Hetland et al., 88-89.
[115] Dam, Rikke and Teo Siang, "What is Design Thinking and Why Is It So Popular?" Interaction Design Foundation, accessed March 7, 2019: https://www.interaction-design.org/literature/article/what-is-design-thinking-and-why-is-it-so-popular
[116] A phenomenological study is a qualitative research method based on a person's direct experience with a particular phenomenon.
[117] Watson, "Design Thinking."

Design Thinking helped with the learning process; when he felt stuck, he could go back in his mind to recall other ways he solved a problem in the past. Although this study's sample was small and the author only focused on three passionate and outspoken students, the main takeaway is that the explicit teaching of metacognitive strategies is valid to the art curriculum through a Design Thinking approach.

Choice-based approach to art education has been around since the 1970s, but "choice" is becoming a popular buzzword in many of today's classrooms.[118] TAB philosophy is centered around: "What do artists do?; The child is the artist; The art room is the child's studio."[119] Moreover, this methodology requires flexibility with curriculum, materials, and time for exploration that is predominantly learner-centered. Ideally, in a TAB classroom, students are having authentic experiences creating art that is meaningful to their lives, and the teacher acts more or less as a facilitator to guide them. It is possible, however, that not every learner is intrinsically motivated to create art on his or her own or perhaps they do not have artistic confidence to try something new.[120] Art teacher resource site, Art of Ed, suggests that there is not one right way to teach art, countering

[118] Some would argue choice-based has been around even longer, tracing back to Montessori's philosophy of teaching that was developed about 100 years ago. In Montessori schools, students can choose to create (or not to create) based on the material of their choice and the project of their choice without influence from the teacher; however there are open-ended activities that are introduced, and the teacher does have control over what supplies are made available for the children to use. More information about Montessori-based education: http://www.montessori.edu

[119] Douglas and Jaquith, "Engaging Learners," 4. The philosophy is based on principles that focus on artistic process, relevance for the student to make meaningful connections, and having systems in place and routines for all learners.

[120] Bogatz, Timothy, "It's okay not to have a TAB classroom," *Art of Ed*, January 12, 2015. https://theartofeducation.edu/2015/01/12/its-okay-not-to-have-a-tab-classroom/

pedagogy dictated by one philosophy. Instead, the teacher should adjust the methodology based on the students' and school site's needs, perhaps combining multiple approaches when teaching art.[121]

Recent Research on Metacognitive Strategies in Art Education

Explicitly teaching metacognitive strategies has been mentioned in previous sections as an effective strategy (arguably the most effective) to enhance student's metacognition.[122] However, it is an uncommon practice in visual art education. Dutch researchers van de Kamp, Admiraal, van de Drie, and Rijlaarsdam conducted a study to examine if explicit instruction of metacognition improves creative thinking. They had five classes of 147 secondary students work on the same project that involved art perception, production, and reflection. The non-control group received an intervention of an explicit metacognitive strategy lesson.[123] The lesson taught students cognitive and metacognitive knowledge and about divergent thinking as a crucial part of the creative process;[124] it also involved discussion and time to practice divergent thinking through an activity.[125] Findings from pre- and post-tests showed positive effects

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[121] Balsley, Jessica, "Where are you on the Choice Spectrum?" *Art of Ed*, December 19, 2014: https://theartofeducation.edu/2014/12/19/where-are-you-on-the-choice-spectrum/. There is a visual choice spectrum graphic to help art educators consider what approach is best for their class.

[122] Ellis, Denton, and Bond, "An Analysis;" Askell-Williams, Lawson, and Skrzypiec. "Scaffolding;" and Watson, "Design Thinking."

[123] Van de Kamp et al., "Enhancing," 49-50.

[124] From the Intervention Lesson, Table 1: "Instructional and Learning Activities: Direct instruction with classroom interaction concerning declarative, procedural, conditional, and contextual knowledge about creative processes and about using divergent thinking strategies in the generative phase of creative processes," van de Kamp et al., 51.

[125] Divergent thinking consists of the ability to produce multiple responses to an open-ended question; versus convergent thinking, which does not require creativity and consists of a right or

that the intervention lesson had on flexibility and fluency of divergent thinking, but not for the originality of ideas. The authors suggest that students would benefit from more than one lesson to show improvement in originality. Ultimately, their study does confirm previous research on the effectiveness of explicitly teaching metacognition, and demonstrates its usefulness in the visual arts to promote skills such as creative thinking. Further research is needed, especially to see the long-term effects of explicitly teaching metacognition.[126]

Portfolios and reflections on student work have been discussed previously as tools to improve students' metacognition.[127] Fahey and Cronen pose that digital portfolios are useful tools because they can capture the process *for* learning and allow art students to tell their story while being "metacognitive about their work."[128] Moreover, they specify process portfolios are valuable because they demonstrate the student's ideation and reflection from the beginning to the end of a project (versus a product portfolio which only shows the finished work).[129] Teachers need to provide the structure to help students reflect systematically over time. Depending on the class needs, teachers can choose to use either a process or product portfolio or both; and depending on resources and preference, teachers can have students digitize them or not. This article

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wrong answer, like on standardized multiple-choice test. Students were asked to generate ideas in an alternative use task (e.g. think of as many different types of original uses for a brick.)

[126] Van de Kamp et al., 55-56. The authors also suggest that researchers could look at adapting the intervention lesson further such as looking at the effect of using images rather than words in an intervention lesson.

[127] Baas, et al., "Relation between AfL;" Askell-Williams, Lawson, and Skrzypiec. "Scaffolding;" Ellis, Denton, and Bond, "An Analysis;" Hetland et al., "Studio Thinking."

[128] Fahey and Cronen, "Digital Portfolios," 135. Authors cite Berret, 2005. Portfolios can be a way teachers assess for learning (AfL), see Baas, et al.

[129] Fahey and Cronen, 138.

advocates for digital portfolios because of the emphasis on the twenty-first century skills that require technological competence. The authors also claim that digital portfolios can provide more ownership and self-directed learning. Another benefit to transitioning portfolios to an online platform is that student work can be safely archived and more easily readily for teachers (and peers) to view the artistic process and metacognitive progression.[130] Research in this article was somewhat vague and not explicitly discussed, resulting in a need for a more qualitative look at the effectiveness portfolios and reflections have on students' metacognition.[131]

Teaching visual literacy is a strategy that art educators can use to help their students learn how to decode images, understand the context of an image, and insert personal connections into visual artwork. Australian researchers Morris, Lummi, and Lock conducted a mixed methods study that looked at 147 eleventh graders' perceptions of cognitive engagement in responding to visual arts.[132] They used a combination of questionnaires and interviews to assess three different indicators of cognitive engagement: autonomy, intrinsic motivation, and metacognition.[133] The results for metacognition demonstrated that students expressed more confidence in knowing what they need to do (or what knowledge

[130] Fahey and Cronen, 140.
[131] Fahey and Cronen. A brief literature review was included and the authors provided a setting and context in which the digital portfolios were used; however, specific samples were not cited and methods on data collection and analysis were lacking.
[132] Morris, Lummi, and Locke. "Questioning Art," 497-498. Vi
[133] Metacognition was looked at in terms of "knowledge of self," "task knowledge," and "strategic knowledge." Also, authors cited limitations with self-reporting tools (like questionnaires or surveys), as mentioned earlier in this literature review; they supplemented the student surveys with interviews (of a smaller sample) to gain a deeper understanding.

they need to use) to complete a visual task, such as analyzing an artwork.[134] From one of the interviews, the researchers claimed that one student made a metacognitive connection between making art and responding to it; however, it did not merit as strong evidence as the student was acutely aware of this connection and did not explicitly understand that MC specifically was at play. The researchers suggest that teachers should use a diagnostic tool, such as a questionnaire, to measure student engagement and to help improve their own teaching methods. For example, the results of this study determined that students could benefit from the teacher scaffolding for digital research and explicitly relating the artwork analysis tasks to students' lives for deeper engagement.[135] This study, Freedman's book, and Marshall's article are similar in the amount of stress placed on visual literacy; however, there is a lack of connection to the practice of art making and metacognition.

An art teacher at Berkeley High School in California uses a teaching strategy called arts-based research, which places metacognition at its core. Her method is the only example found of a teacher explicitly instructing MC in a studio art room and of students regularly practicing MC. Julia Marshall teamed up with high school art teacher Kimberly D'Adamo to help develop the student-centered curriculum that D'Adamo has used for the past nine years with her junior and senior art students in an International Baccalaureate program. According to the

[134] Morris, Lummi, and Locke, 502. An example of a statement on the questionnaire regarding MC included, "When I see a visual artwork I know what knowledge I need to analyze it."
[135] Morris, Lummi, and Locke, 507.

authors, “the model [arts-based research] promotes metacognition; it incorporates "investigations" or activities that call attention to the kinds of thinking and learning that emerge through making art.”[136] At the beginning of the school year, students are explicitly taught both cognitive and metacognitive strategies to support their research into a topic they are interested in exploring. Marshall and D’Adamo call the art room the “art thinking lab” for this reason; it is less about teaching students techniques and more of teaching students how to monitor their thinking while solving a creative problem.[137] Students are taught research and metacognitive strategies but are released on their own to dive deep into a topic of their choice in order to produce a project. During the conceptual process, students interact with their peers for feedback on their ideas and monitor all stages from beginning idea to final product in their research journals. At the end of the school year, students host a public exhibition in which they showcase their projects and art research journals. Additionally, they are required to compile a written reflection about their experience researching and creating art based on the topic they chose. Although the research into the effectiveness of this strategy is mostly anecdotal from a few student research journals and interviews, the examples and metacognitive strategies given by the authors can be useful for art educators. The article demonstrates that the students in D’Adamo’s class

[136] Marshall and D’Adamo, “Art Practice,” 12. The authors did not create arts-based research; their model borrows from three approaches to learning and pedagogy: experiential learning, inquiry-based learning, and project-based learning. The research workbook (or journal) is the “backbone” of the arts-based research model.
[137] Marshall and D’Adamo, “Art Studio as Thinking Lab,” 10.

understand what MC is and how they used it while working on their projects.[138] Marshall and D'Adamo believe "art practice as research" should be a method embraced by professional researchers and has the potential to transform art education in secondary schools.

Ultimately, more research is needed to explore the relationship of art education and metacognition. There are many books, websites, and articles about general strategies teachers can use, however, most of the research is being administered for other non-art subjects. In the examples discussed previously, many in the art field draw conclusions based on anecdotal evidence and measurement tools were limited to pre- and post-tests, questionnaires, student interviews and portfolios, and student journals. Little research was conducted on students' MC during the art making process, but rather the focus has been on student utilization of metacognitive strategies when analyzing other artists' work. More research needs to be done inside the art classroom as students are in the middle of their creative process, after their final product is finished, and when they are self-assessing or peer critiquing. Since MC is most likely used during these activities, future research has the potential to make stronger conclusions about how the visual arts cultivate this valuable higher order thinking skill.

[138] Marshall and D'Adamo, "Art Studio," 16. The website created by the authors provides resources of practical curriculum and pedagogical strategies teachers can implement in their studios, such as research journals, concept mapping, and a year-long project outline for both students and teachers. https://www.artasresearch.org/

Additionally, there needs to be more research to bridge the gap between neuroscience studies and visual art education. Perhaps art educators can work with brain researchers to test the effectiveness specific questions have on a students' MC, or the effect self-reflection has on students' judgment of their creative projects. However, there are obvious limitations with this crossover study, because it is highly unlikely that brain scanning equipment and controlled experiments could be brought into a classroom. Also, the amount of variation between each art teacher and classroom is probably impossible to control for if the researchers wanted to conduct the study over a large sample. A possible solution would be to video record students' thinking aloud while in the classroom or utilize their reflective journal responses. Researchers could use either of these resources in the lab by asking student volunteers to reflect on their thinking while watching the video or reading the written responses. Depending on the research goals, students can wear an EEG cap or go through an fMRI machine during the metacognitive activity. It would be interesting to see the comparison of how MC is used while thinking about one's art making process to the existing data of where MC activity is known to occur.

Literature Review Discussion and Conclusion

Based on this body of research, metacognition is demonstrated to be an essential cognitive function that can be trained and enhanced over time. MC is dependent on one's memory and past experiences to make sense of one's thinking processes. It is not a phenomenon that can be wholly isolated because

MC involves multiple neural networks, in other words, it is dependent on other aspects of higher-order thinking such as planning, understanding tasks, information processing, and remembering prior experiences, knowledge, or emotions. Just as a person's knowledge of a subject can improve with practice, so can a person's metacognition. MC starts developing at a young age and can continue to be cultivated and strengthened until adulthood, eventually declining with old age. Even if an individual has a personality disorder in which MC develops atypically, it is possible for that person to improve with MCT or metacognitive training.

Metacognition is a process that is difficult to measure and analyze because of the individuated nature of one thinking about his or her thinking. However, with a mixed method approach that combines surveys and interviews, quantitative and qualitative data can be collected; also, researchers have found that this process produces stronger results over a long-term study. Neuroscience research has narrowed down the main areas of the brain where MC activity occurs in general, but because there is a wide variety of methods and participant tasks used in those scientific studies, additional research is needed to pinpoint MC in the brain further. Due to its overlapping nature, more quantitative studies are also needed to examine the relationship between MC and executive functions (EF), Theory of Mind (ToM), and memory to discover how these components interrelate in the brain.

Researchers in the fields of developmental psychology, neuroscience, cognitive science, and education have imbricated findings when looking at MC. First of all, the idea that MC can be practiced and improved over time is consistent in these fields. Influences from formal education, parenting, and other social aspects have been shown to affect children's metacognitive development (see Roebers). In the brain, Allen et al. state that cortical thickness correlates with metacognitive ability and individuals with certain personality disorders tend to have a less developed cortex; this hinders their development of MC. Overall, whether a person develops typically or atypically, an individual's MC has the potential to grow with regular training and support from either a professional psychologist or educator (depending on the individual's needs). It is crucial for educators to be aware of their students with special needs, such as those with personality disorders, who will most likely need supplemental supports. Encouraging behaviors like positive metacognitive beliefs in the classroom can help counter negative rumination (see Coulacoglou and Saklofske).

Secondly, cognitive developmental theories are beginning to be backed by cognitive science and neuroscience research. For example, the reflective system that Metcalfe and Schwartz discussed involves a multi-step process where the ACC detects an inconsistency and works with other regions (e.g. aPFC, insula, and precuneus) to reflect, process, and make sense of this new information. This reflective system is reminiscent of Piaget's concept of equilibration: disequilibrium occurs which causes a person to assimilate or accommodate the

new schema in order to return to a state of equilibrium, i.e., making sense of the inconsistency. Additionally, developmental psychologists like Flavell assumed that MC depended on an individual's memory. In the recent neuroscience research by Allen and colleagues, they found that metacognitive activity does overlap in the frontal lobe and in the limbic system where the hippocampus is located, i.e., the brain's memory region. Moreover, the overlap of brain activity in the frontal lobe during metacognitive activity supports Roeber's claim that MC has a close relationship with EF. These aspects make a strong argument in the field of education for teachers to utilize pedagogical strategies that support students' MC, critical thinking, and memory; for example, making relevant connections to their prior knowledge or experiences and asking students to write down what they already know about a topic using a tool like the KWL chart (see Hope).

A third connection between the different fields has to do with the relationship between Theory of Mind (ToM) and MC. Developmental psychologists van der Stel and Veenman believe that ToM develops before or right along with MC. Vaccaro and Fleming discuss how prior studies have demonstrated that the two are related, like when we make judgments about our actions based on inferring how another person may act in a similar situation. Self-reflective processing is used in both MC and ToM, for example, when one understands other people's perspectives or when one can predict what is needed in order to achieve a cognitive goal. In their meta-analysis, Ohtani and Hisasaka found that

metacognition has both a cognitive and emotional role due to the location of the ACC, which is activated during many metacognitive instances. Understanding someone else and experiencing empathy could play an important role when it comes to monitoring or controlling one's own thinking, but more research is needed to support this claim and the connection between ToM and MC. However, based on what is known, it can be argued that MC develops stronger when working with others, especially in a setting where learning is the focus. Art educators can use what is known to encourage ToM, MC, and EF and implement teaching strategies that involve interaction, like peer critiques or collaboration projects. Additionally, the more opportunities students have to practice these cognitive functions, the stronger their metacognitive skills (and arguably their interpersonal skills) will develop.

MC is a valuable tool to monitor and control one's learning and is useful for students in all subjects. Students will inevitably enter stages of discomfort (or disequilibrium) when they are stuck and do not know how to solve a problem. Vygotsky's concept of the ZPD calls for a teacher or mentor to support students and provide tools for them to overcome this stage. When a student hits a roadblock, it is also prime time for MC to kick in; at this point, students can retrieve existing metacognitive knowledge or past metacognitive experiences to help overcome their setbacks. As a teacher, one can act as a facilitator who can help students learn how to approach tough cognitive situations by providing them with metacognitive strategies to monitor and control their own thinking. For

example, posing questions to the class or individuals can help trigger metacognitive processing, such as: What worked for you during this process? Where did you feel the most stuck? How did you overcome an experience similar to this in the past? Teachers can also take preemptive measures to help students set goals and pre-assess their ability at a task in order to predict where they might struggle; from there, a discourse can happen about what strategies would be best to use for each unique situation.

Educators should implement metacognitive strategies and allow regular time in the school day for students to practice MC. Moreover, it is also wise for educators to set aside time for self-reflection of their pedagogy and the thinking behind their choices in the classroom. Self-awareness of one's thinking habits can help a teacher understand how to best guide his or her students' metacognitive journey. MC is an advantageous cognitive mechanism that educators should regularly be using in order to grow and improve in their practice, which in turn should benefit their students.

As the research elicits, implementing clear and specific metacognitive interventions in the classroom will help students understand how their brains work and how they can play an active role in the monitoring and controlling of their learning (see Ellis et al.). Little investigation has been carried out on this specific approach in visual art education, and few resources are available to know what it looks like to embed metacognitive strategies across the visual art curriculum for middle and high school. Although it can be argued that many

studio classes already utilize some metacognitive strategies like self-reflections, process portfolios, and class critiques, rarely do teachers teach metacognitive strategies to their students that can be used to monitor thinking and the overall creative processes. In the case of D'Adamo's high school art classroom, students learn what MC is in addition to other cognitive strategies. Students process the lesson through journaling, create word maps about the term and how they might already use MC, and reflect on their own thinking through a metaphor exercise.[139] Iterative processes are typically taught in the art room in order to provide some structure to creatively solving open-ended problems; this can include the steps taken before creating the end product such as making thumbnail sketches and rough drafts. Instilling "studio thinking" or "design thinking" habits such as these can provide students with the supportive strategies needed when they feel a mental block during the creative process.

In sum, middle and high school students should understand how the brain functions and how thinking about their own thinking can benefit the monitoring and controlling of their own learning. MC can (and should) be taught in all subjects, but it has the potential to be fostered regularly in the visual arts classroom; the open-ended assessments typically used to encourage divergent thinking are fertile grounds for metacognitive growth. As a beginning art educator, I plan to put students' cognitive and metacognitive development in the

[139] Marshall and D'Adamo, "Art Studio." Some examples of student metaphors: "My thought process is like a gumball machine;" "My brain is like a pot of boiling water;" "My thinking is like a banyan tree." Each statement is accompanied by a colorful drawing.

center of my pedagogy; I want to create a safe learning environment where students are able to practice critical thinking and metacognitive skills in order to support their overall success and creativity in (and out of) the art room.

The focus of my thesis is to explore what a middle or high school visual art class would look like if a teacher were to explicitly teach their students cognitive and metacognitive strategies on an ongoing basis. When thinking about what explicit metacognitive strategies would look like in the art classroom, I am also curious about the following questions:

1. How can art curriculum be designed to include metacognition in addition to visual art skills and knowledge?
2. How can teachers monitor (or assess) their students' metacognition most effectively? What are some practical evaluation tools for the studio art classroom?

For the remainder of this thesis, I will discuss my experiences with using some metacognitive strategies in the art classroom and propose ideas to implement in future art classes. In the first section, I will practice metacognition and self-reflect about my experiences as a student teacher, including how my pedagogy can improve based on my findings in this literature review. In the second section, I will outline potential solutions to what metacognitive-centered curriculum in the visual arts could look like, based on my research and experiences.

Metacognitive Experiences as a Student Teacher

As a teacher candidate at San José State University (SJSU), I underwent three semesters of coursework, which included two phases of student teaching at local high schools. The single subject teacher education program focuses on providing its teacher candidates with best practices in general for the teaching of middle and high school students. It is set up for students in the program to have only one course available in discipline-specific pedagogy. My desire to pursue a Master's degree transpired in that first semester while taking the art methods course and educational psychology course. I wanted to delve deeper into these two fields because I saw a connection between teaching art and developing student cognition. Throughout the teacher education program, I gained an immense amount of knowledge that could potentially be applied to my philosophy of teaching; however, it was not until I started lead teaching in a classroom that I realized how challenging it is to put theory into practice.

Part of the California teaching credential process requires teacher candidates to complete a two-part Teacher Performance Assessment (CalTPA). This rigorous process includes filming lessons and self-analyzing in written responses. Phase One of the CalTPA focuses predominantly on how teacher candidates are able to utilize their students' prior knowledge and interests to implement one engaging lesson. Additionally, the teacher candidates choose three focus students with specific needs and analyze the use of differentiation during one

lesson in order for all learners to meet the objectives.[140] Phase two of the CalTPA focuses on teacher candidates' ability to assess students in a formative and summative way across a learning segment (or unit). In retrospect, this state mandated, formulated, standards-based assessment does have metacognitive aspects embedded into the self-analysis and reflection sections at the end of the second phase. The following case studies are personal accounts from my two semesters of student teaching in San José public schools, using some evidence from my CalTPA preparation and responses. I will not be using specific names of the schools or information about the students but will provide an overall context for each situation.

Case Study 1: Student Teaching Phase One

Context and Demographics of School A

Located on the east side of San José, School A's population is just below three thousand high school students from a diverse cultural, economic, and racial background. About fifty percent qualify for the free/reduced meal program and seventeen percent of the students are English Learners.[141] School A is a Title 1 public school that has been around since the mid-1970s and currently offers an array of academic and extracurricular activities, including AP classes, sports teams, and the arts (drama, music, and visual art).

[140] Differentiation is a teaching strategy that adjusts instruction of curriculum based on student needs. An example would be grouping students in a certain way or providing visuals and guided notes to go along with a lecture.
[141] Data is public information and was accessed from ed-data.org.

The art department has five teachers and facilities include a gallery space, a dark room for photography, Apple computers for multimedia, shared light tables, three kilns for ceramics, and access to laptops for students when needed. During my student teaching experience, I worked with a mentor teacher who had fourteen years of experience teaching studio art. I observed her Art 1 (beginner) class and led taught her Crafts class, which consisted of students learning how to create two and three-dimensional projects with various materials such as clay, wire, and screen printing ink and frames.

Crafts Class and Sound Art Unit

While I was the lead teacher during the spring semester of 2018, I worked with thirty students ranging from ninth through twelfth grade on three units. The students' artistic skills and knowledge varied greatly; about one third had a previous visual art class. Therefore, only part of my class had some understanding of the elements of art or principles of design.[142] Class periods at School A were usually fifty-five minutes (with some exceptions due to special schedules). A seven-minute warning bell rang before each period was over. Since I started my student teaching in the middle of the school year, it was challenging to come into another teacher's classroom and insert a new routine. Overall, I adapted well enough and was able to build relationships with many of my students.

[142] Elements of art are like the building blocks in visual arts, e.g., line, shape, form, color, value, texture; and the principles of design consist of the ways those building blocks can be used to create a work of art, e.g., emphasis, proportion, rhythm, and contrast.

The unit I will analyze in this case study is titled “Sound Art & Form” and was designed based on my students’ interests in their cell phones and listening to music. I wanted students to learn how to most effectively hand-build a clay sculpture that could hold their cell phone and amplify its sound. In total, it took about five weeks of instruction and studio time to complete the unit goals, which are outlined in Appendix A. This unit was created based on Wiggins and McTighe’s backward design method (UbD) in which the central learning outcomes were first selected.[143] From there, the assessments (or evidence of learning) were chosen, followed by the appropriate types of instruction and the necessary student activities in order to achieve the overall goals. The learning objectives were aligned with California’s 2001 Visual and Performing Arts Standards and included at least four of the five strands: art history, artistic perception, aesthetic valuing, and creative expression.[144]

Many aspects of the lessons I taught during this period could be improved upon for next time; however, I want to turn the discussion back to metacognition in the art classroom by looking specifically at the efforts I made to have students monitor their own artistic process through self-reflection journaling. The clay amplifier project was introduced with a PowerPoint slideshow and handout with specific guidelines of the steps students would need to take to achieve unit objectives. To prepare for the written reflection (one of the last steps as shown in

[143] Wiggins, Grant and Jay McTighe. *Understanding by Design* (Alexandria: ASCD, 2005).
[144] CASBE, VAPA, 152-154. The new 2019 standards were not available at the time of this unit design process.

Appendix B), I asked students to keep a daily journal about what they did each day, what changes they made to their project and why, and what challenges, if any, they faced. Most days, I put up a journal slide on the overhead screen with about ten minutes left in class. Students had that slide as a prompt to write in their reflection journal before cleaning up their surroundings. These journals are an example of assessment for learning (AfL), which is a way teachers can monitor student learning as discussed earlier in the Literature Review (see Baas et al.). I periodically collected their journal entries to see if students were writing and recording their thinking; this also helped me assess their progress and understanding of the task during the design and hand-building process. At one of the earlier journal checks, I recorded that only half of the class turned something in. My assumption at this point was that students were not reflecting every day because I had not been very commanding about it and we typically ran out of time, especially once we started working with the clay. When I collected the entries for a second time, I pleasantly discovered that the majority of my students were at least writing something down about their process.[145] Even if they did not have much to say, the exercise of documenting their steps each day was intended to help the students' recollection for when they wrote their final project reflection.

As outlined in the Project Guidelines (see Appendix B), six steps were presented to the class so the expectations were clear before we started

[145.] My recordings referred to are from a digital journal log I kept for 15 days during this unit.

designing. Students came up with five different thumbnail sketches for designs then chose one of the drawings to refine and enlarge.[146] This design was then turned into a three-dimensional paper model so that students had the experience of turning their two-dimensional drawings into a three-dimensional paper form before working with clay. Some students refined their design after creating the paper model because they recognized where an improvement could be made. The class first watched a teacher-lead tutorial about using templates with the slab method for hand building with clay before they were released to begin their final project. In general, this multi-step design process is standard in many studio art classes and provides a framework for problem-solving. Each step of the way, students inevitably practiced MC because they were reminded to pay attention to their process and to their thinking behind why they chose one method over another or why they decided to change something in their design.

Reflection on Case Study 1

As I reflect on my teaching during that time, I recognize that I can improve on providing more precise instructions and additional examples to support students in their written reflections. In this case, the structure of journaling and recording their daily process was not clear to all of my students. Verbal instructions and a written example were provided to the whole class, yet some students needed additional supports.[147]

[146] Thumbnail sketches are small drawings that are intended to be quick and undeveloped. They are useful for coming up with concepts in sculpture, drawings, and paintings.
[147] A written example of the final reflection was included in their guidelines handout; however, the example I provided for their daily journal was on a slide and only looked at one time.

Before the introduction to the project, we spent a few days working on a packet that had students explore the science of sound, what sound art is, and research a contemporary artist who uses sound as a medium in their art. This packet acted as an introduction to the unit and as a support to help students develop and practice academic language. Once they began working on the designing portion of the project, they were asked to journal every day about their process. In hindsight, students would have benefitted from an additional handout or packet to act as their reflection journal since they were not familiar with using sketchbooks or journals previously in this Crafts class.

As part of this hypothetical journal handout, I could have included an example journal entry and specific questions along with the final reflection assignment guidelines and rubric, so that everything was in one place. Students could use this as a reference in case they felt stuck on what to record throughout their creative process. Additionally, it would encourage better organization and self-regulation skills. From my observations, about half of the class was self-directed enough to keep up with the journal entries on their own paper while the other half either did it sparingly, misplaced their journals, or did not have much to say in their entries. Overall, I wonder how I could have made this reflective process more engaging and meaningful to students based on the writing I assessed.

When I teach this or any other art project, I plan to utilize the teaching strategies that Ellis, Denton, and Bond found to be most effective: be explicit about what MC is, provide strategies students can use to improve their own MC,

and be consistent in practicing these strategies in order for students to strengthen their metacognitive skills. By addressing the reason why I am asking students to be reflective of their creative process, they will learn the foundational context behind their own learning and eventually gain a stronger ability to self-reflect and self-regulate. Many of my students that spring semester had difficulties with time-management and deciding on clay amplifier designs. If I provided the additional journal packet, established a better structure to help them write the content, and set aside a consistent time for everyone to work on the reflections, I think more students would have felt in control and confident in their clay amplifier design. Moreover, engagement might have been higher with an established routine and students would have a stronger understanding of the reasoning behind the reflective part of the assignment.

After reading the students' summative written reflections and self-reflecting on my teaching of the unit, it is clear what can improve next time. This includes providing more examples to students about what designs are more effective than others and demonstrating additional hand-building techniques to show that there are multiple ways students can choose to create their amplifier. Additionally, it would probably be beneficial to introduce what designers and artists do when planning projects in order to provide more real-life context for student understanding; this could help demonstrate how metacognition is used when designing something, for example, from a two-dimensional sketch to a three-

dimensional sculpture.[148] Since this was the last unit of the semester and school year, there was not time to provide students with meaningful feedback on their writing; this is a necessary form of assessment that could have benefited students. In my future classroom, I will be sure to implement journaling frequently so students have consistent practice in self-reflection and self-regulation.

Case Study 2: Student Teaching Phase Two

Context and Demographics of School B

School B is located in south San José with a population of just above nineteen hundred high school students. About eleven percent of the student body qualifies for the free/reduced meal program and only two percent are English Learners.[149] School B is a public school that has been around since 1980 and currently offers many similar academic and extracurricular activities that School A has, including AP classes, sports teams, debate, robotics, and the arts (drama, music, and visual art).

The visual art department also has five teachers, and the students have access to similar equipment and materials that School A has. During my second semester of student teaching, I worked with a mentor teacher who had ten years of experience teaching studio art. I observed her AP Art and Beginning

[148] Learning to translate a drawing into a product promotes MC and is beneficial especially for younger students to experience as they are still developing abstract thinking. Hope discusses this further in her book *Thinking and Learning to Draw*.
[149] Data is public information and was accessed from ed-data.org.

Drawing/Painting/Design classes and led taught her two periods of Advanced Drawing/Painting/Design classes.[150]

Advanced Art Classes

During the second phase of student teaching, I had the opportunity to lead two classes right from the beginning of the school year until the end of the fall semester. This schedule alignment was beneficial because I could establish classroom norms and expectations from the start. Each advanced art class had about twenty students, and the majority had completed a beginning art course the previous year. School B was on a block schedule, which meant that Mondays had all six periods (about one hour each), while Tuesday through Friday alternated between odd and even periods (about 105 minutes for instruction and studio time).

One main goal I had for the advanced art classes was to regularly implement the use of sketchbooks. Additionally, I wanted students to have opportunities to practice writing in general and to practice assessing artwork including their own, their peers, and contemporary artists. For the remainder of this section, I will analyze my attempts at including metacognition in the classroom through the sketchbook warm-ups, through self-assessments, and through written reflections at the end of projects.

[150] Towards the end of the semester, I was the lead teacher for all five of her classes for two weeks. This included teaching lessons, monitoring students on their projects, facilitating discussions, and critiquing/grading artwork.

Sketchbook Warm-Ups

At the beginning of the school year, students were asked to bring a sketchbook each day to class for warm-ups and brainstorming ideas for projects.[151] I created a shared slide show that acted as an ongoing sketchbook warm-up presentation that students could refer to if they missed a day. In total, there were only twenty warm-ups during that first semester and nineteen that required students to write or draw. Of those, only one might be considered related to metacognition; the others were exercises for creative brainstorming or tied to something we went over in a previous class.

Overall, students participated very regularly during the warm-ups. Only a couple of students did not regularly use their sketchbooks due to personal preferences. Although I did not explicitly use metacognition in the prompts, some of the sketches and written responses revealed students' thinking and allowed me to get to know them on a deeper level. Some students were more prone to opening up in their responses rather than sharing aloud in class or during a one-on-one conversation. However, these exercises would be considered more cognitive rather than metacognitive because they did not necessarily ask students to reflect, monitor, or control their own thinking.

I frequently faced challenges to create relevant prompts and to maintain the momentum of routinely having students do the warm-ups. At least a quarter of the time, the entries were unrelated to the project we were working on, and

[151] My mentor teacher gave students sketchbooks if they were not able to get one.

instead were intended to allow students some time to share about their weekend or free draw or come up with quick sketches from an idea generator website. My attempts were shortsighted; I did not focus on teaching what MC is nor did I allow students ample time to practice it. Rather, these warm-ups attempted to allow time for students to creatively think and draw before we jumped into the day's lesson.

If I continue with the sketchbook warm-ups in future classes, I want to be more transparent with my students about why we are doing them and how they can be helpful for their overall learning and engagement in the classroom. This effort will take additional long-term planning on my part but may provide an opportunity to include MC regularly in the classroom. As discussed previously, being explicit about what metacognition is and stating how it can help students will be a priority in my classroom.

Marshall and D'Adamo discuss using a sketchbook as a research and metacognitive tool. In one of their examples, the students were asked to think of ways they might already use MC in different subjects and outside of school; they recorded their thoughts in a graphic organizer and pasted it into their books. The authors share student examples and describe the use of sketchbooks as the crux to metacognitive learning:

> In their books, they mix and match visual imagery with verbal reflections and notes to create a tangible, visual chronicle of their process. Because all of their thinking, information, images, and ideas are in one place, students become particularly metacognitive. They are able to look back to earlier work and see how their

> thinking and ideas continue to emerge, accumulate, and progress.[152]

Inspired by these efforts, altering how I use the sketchbook could be a great solution to what my experience lacked. Perhaps general creative prompts can still be used, but also including short response questions to encourage self-reflection immediately after activities will help students capture their thinking in real time. Moreover, based on how the brain makes stronger connections when links are made to prior knowledge or experiences, including prompts that relate directly to what was taught previously will help students to process the information and cultivate a deeper understanding of the content.

Reflective Self-Assessments

During the fall semester, the Advanced Art classes experienced three units: Extraordinary Creatures (illustrations), Ink Drawing, and Watercolor Abstraction.[153] Each unit required some form of summative written reflection, but in the Ink Drawing Unit, students were asked to self-assess their drawings while in progress. They reflected on how their drawing was advancing by marking where they fell according to the project rubric and answered two reflective questions (see Appendix C).[154] After students completed the self-assessment, I

[152] Marshall and D'Adamo, "Studio Art," 11.
[153] Students also had an ongoing assignment to work on if they finished assignments early or needed a break from their project. They had to create ten original Artist Trading Cards (2.5" X 3.5") by their final.
[154] I used this unit for my second phase of the CalTPA. The project rubric was aligned with the content-specific learning goals and objectives based on California Visual Arts Standards from 2001. The 2019 standards were not yet available while designing this unit.

met with them one-on-one to provide any additional feedback and guidance before they finished their final drawing.

The self-assessments enabled my art students to look at their drawing more or less objectively. Often when one is working on a visual project, it is beneficial to physically step back from it and look on at a different angle to reassess the trajectory. With the help of the rubric, students decided if they were meeting the project criteria to form an evidence-based self-evaluation. Additionally, it provided a chance for students to engage in a metacognitive strategy that involved written reflection and generating action steps. Although it was rigidly structured, this informal assessment evaluated if students understood the objectives and if they could make a judgment about their work. Students had a chance to explain their thinking behind their thinking more in-depth once we met and discussed what areas of their drawing were working and what could be improved. Moreover, I used this tool as a catalyst for conversation between student and teacher. Check-ins also occurred daily or weekly to see how students were progressing on the project, before and after the self-assessment was completed.

Self-assessments in the visual arts are one of the best strategies teachers can use to support student metacognitive growth. With regular practice, students will be able to improve their judgments of learning and also draw from their past metacognitive experiences to know what strategies worked for them in order to finish a project successfully. Overall, the implementation of self-assessments during this unit was helpful for both student and teacher; however, it would have

been more useful to include a midway self-assessment for the other two units that semester to allow even more opportunities for practice. The written reflections students did for the other units were at the end of the project and did not allow for active discourse between teacher and student while in progress. Although I did check-in with my students frequently during the other projects, I found that the midway self-assessment provided more structure, substance, and opportunity for metacognitive practice while students were working.

Written Reflections

The written reflection prompts were adapted from my mentor teacher's past examples and were made available to students in Google Classroom. When students completed each project, they uploaded a picture and completed the written reflection using full sentences. The majority of the advanced art students wrote in complete and thoughtful sentences for each project; however, there was a small percentage of students who either did not always complete this part or did not take it seriously and wrote fragmented responses. In the future, this can be improved upon by holding students more accountable to their writing in order to emphasize that reflection is as imperative as the final project. Additionally, expectations could be made more transparent by providing examples of past student work.

The summative reflections allowed students to reflect holistically on their creative process and included questions to encourage MC after they completed a final project. Appendix D shows the prompts students responded to after they

completed their ink drawing. It was created intentionally to have students connect back to their midway self-assessment responses.[155] In general, my mentor teacher and I wanted students to feel confident in discussing their artwork honestly in order to reflect on how they could improve on future projects. These questions were metacognitive because they had students describe their thinking during the process of creating and asked students to share their feelings toward the end product. If students did not respond to these questions thoroughly, it was usually clear, so they were asked to add more to their responses.

The flaws with this system, however, fell on my shoulders when I did not read their submissions promptly. If too much time goes by, there can be gaps in students' memory of exactly what was going through their head while creating art.[156] One solution to this issue is to incorporate daily or bi-weekly journal entries so students are monitoring their thinking more frequently (similar to what I attempted in the clay amplifier unit in Case Study 1). By the time they are finished and ready to write the summative reflection, they will have their mini journal entries to refer to and support their recollection. Another challenge of the summative project reflection is that there is not always time to talk to students about their responses. We have to keep moving on to the next project and students frequently finish their work at different times. The best solution to these ongoing issues would be to provide students with written or digital comments

[155] The other two units that semester did not include this part; otherwise, questions were relatively the same.
[156] This is widespread knowledge that can be applied to all subjects; students will benefit best from immediate feedback, especially if they also get a chance to revise their work based on what was said.

about how they did overall on the project and also give feedback about their reflections to ensure students that their voices were heard.

All students will benefit from having regular opportunities to record their thinking. A combination of journaling and sketching about one's creative process will support metacognitive growth and can visibly show students how their thinking evolved over the school year, similar to the example of D'Adamo's use of research journals to track student learning. Ideally, students would keep these ongoing records in their sketchbooks; however, to accommodate all students, I believe it is beneficial to allow voice or video recording if students are more apt to follow through with that method. These files can be stored in a shared folder with their teacher; students can refer to their recordings in their art journals if needed. The end metacognitive goals would be similar for all students, but methods of how they get there should be flexible, depending on the individual needs.[157]

Additional Strategies and Concluding Thoughts

In sum, I felt more confident with the various strategies I tried in my phase two experiences. Although not previously discussed, I did facilitate a few critiques and peer feedback activities during that fall semester that had the potential to provide additional metacognitive opportunities. One of the written critiques was more formal in which students had to analyze a Georgia O'Keefe painting using

[157] I am considering my students from both semesters who had IEPs or 504 Plans and needed additional supports to help them be successful in the class. Some students also might respond better to this process if they are allowed to digitize everything.

the Feldman Model.[158] Another activity involved students silently rating past student artwork with different colored tokens to choose the most successful piece, one in the middle, and one that was least successful. We then discussed the results as a group evaluating the artwork based on the specific criteria for the project. At the end of the Ink Drawing unit, I implemented a peer feedback activity that involved students writing specific feedback on sticky notes during a gallery walk. This critique lesson was part of my CalTPA response in which I needed to extend student learning after the unit concluded. I received a mixed reaction on that particular type of critique because some students did not think their peers' comments were constructive enough. The feedback I received demonstrates how little practice students had with talking to each other about one another's art; it is something I want to refine and incorporate periodically in my future classroom.

In addition to implementing more time for peer critiquing, I also see how the other strategies described in this case study can be improved upon. Using sketchbooks more intentionally to capture students' concepts and process on a regular basis will ideally demonstrate metacognitive growth. Facilitating self-assessments while students are working and providing ongoing feedback will also encourage regular MC in the art classroom. Finally, consistently combining self-assessments with summative written reflections will support MC especially if it is embedded throughout the visual art curriculum.

[158] The Feldman model is a structured way to analyze and evaluate a work of art. It includes four steps: describe, analyze, interpret, and evaluate/judge.

What Metacognition Looks Like in the Visual Arts

Implications for Art Education

Based on the literature review and my few experiences in the classroom, I believe that students will be most successful as learners if they are taught how to self-regulate and are given time to self-reflect regularly about their work. It cannot be done with one intervention lesson but must be introduced explicitly to the students, then revisited and practiced regularly over time. Essentially, metacognition needs to be at the center of the classroom so students can learn to monitor and control their thinking. "Being metacognitive helps learners develop positive dispositions toward learning and gives them autonomy and agency, both of which generate motivation and engagement."[159] Adolescents in middle and high school are extremely capable of developing metacognitive skills to help them become better learners because there brains are still growing, most notably their PFC. Moreover, if teachers are transparent with their students about the why and how of learning, I believe those students will have better experiences in their classes.

MC can be taught in conjunction with the psychology and neuroscience behind it, regardless of the subject. Students will benefit from this larger perspective of the topic and can make more connections if MC is related to what they already know about how their brains function. During the beginning of the school year, teachers can introduce the topic of MC to their students by asking

[159] Marshall and D'Adamo, "Art Studio," 10. Authors site Kolencik and Hillwig's book *Encouraging Metacognition* (2011).

them to explore how they are already thinking about their own thinking in different situations. For example, teachers can ask students to consider how their thinking varies in social settings versus different classes at school. This will help build connections between what they are doing in other classes and outside of school. Teachers can then provide an overview of how the brain works using simplified images or videos and explain how students have the potential to monitor and control their thinking. New vocabulary should be introduced to the students along with time to practice and process how metacognition can positively affect their learning. Making time to cover this might be daunting for some teachers; however, once it is introduced as part of the classroom learning objectives, it can begin to reappear throughout lessons encouraging self-reflection and self-regulation.

The visual arts have a unique opportunity to consistently bring the attention back to students' MC through activities such as written reflections, self-assessment, and peer critiques. Most likely students have not been encouraged to be aware of the thinking behind their thinking regularly, so it is important to provide scaffolding to support their metacognitive (and cognitive) growth. Students can start practicing MC by recording their thinking in a journal while working on an art project. Reflective journaling will help students learn to process and monitor their thinking over time, through multiple projects; eventually, this can pave the way for students to begin to control their thinking and develop stronger MC and learning habits. Higher order thinking skills should be utilized in

addition to metacognitive skills to promote the overlap that happens between EF and MC in the frontal lobe. Through activities like peer critiques and self-assessments, students will use the self-reflective parts of their brain and learn how to make critical judgments of artwork, while being considerate of their peers' feelings. These foundational MC-related activities can be consistently embedded in the curriculum and can adapt to the needs of the class.

Visual Arts Standards and Designing Curriculum

Art teachers should design units that incorporate metacognitive strategies in the visual arts and align their objectives with the *National Art Standards*, or for those in California, the 2019 *CA Arts Standards*. Both of these standards are designed to be open-ended and provide easy to use guidelines for planning curriculum, including essential questions and enduring understandings for each anchor standard. Additionally, each of the four strands can co-occur, mirroring the multiple aspects of artists' lives:

> The artist imagines, executes, reflects and refines work before finally completing a piece of work (creating), shares or displays the work (presenting), reflects on the completed work (responding), and connects the experience to other contexts of meaning or knowledge (connecting).[160]

Educators can take advantage of the open-ended nature of the visual arts to embed MC throughout their curriculum. Additionally, other subject standards can be used in tangent with the visual arts standards, such as language arts and literacy (ELA), English language development (ELD), and the New Generation

[160] CASBE, *CA Arts Standards, "*Introduction".

Science Standards (NGSS) if the school allows time for cross-curriculum collaboration. Appendix E is an example of a unit outline that aligns art standards with ELA and ELD to promote writing in visual art journals, i.e., sketchbooks. Moreover, the unit is intended to be an ongoing, integral part of the overall curriculum that lasts throughout the school year; it can be adapted as needed, depending on the grade and visual arts class. The journal unit offers a practical, flexible framework that art educators can use in order to promote consistent and explicit MC in the classroom.

Assessment Tools for Teachers

Implementing MC in the visual arts is possible, but teachers will need tools to help them monitor and assess student progress. Assessment strategies vary significantly between visual art classrooms, but typically students receive grades based on their participation and performance on projects. Best practices include using a rubric with specific criteria that are aligned with standards and unit objectives. This way, expectations are clearly defined and judgments can be objectively based on those criteria. With this in mind, a question to consider is how do teachers assess their students' metacognitive growth in the art classroom.

Based on previous research, process portfolios could be one of the better tools for MC to be captured over a while.[161] The portfolio can be approached in a

[161] See Fahey and Cronen, "Digital Portfolios;" Baas, et al., "Relation between AfL;" Askell-Williams, Lawson, and Skrzypiec. "Scaffolding;" Ellis, Denton, and Bond, "An Analysis;" Hetland at al., *Studio Thinking*.

variety of ways but would be most beneficial for capturing MC if it includes student brainstorming, sketches, in progress photos, and final products. Additionally, students could include their written reflections and self-assessments for each project. These items will provide a narrative of their creative process and metacognitive journey during and after each project and will exhibit the judgment of their own learning. Students can be given agency in this form of assessment and gain self-regulation skills by choosing what they want to include in their portfolio. In the end, they can review the progress they made throughout the school year and write a final self-reflection on how their MC and artistic process evolved.

As mentioned before, the use of visual art journals or sketchbooks will be beneficial to illustrate student MC. Teachers can choose how they want to assess this, but I recommend including MC as a criterion with progress checks that asks students to visibly show their thinking, to record their process for each project, and to reflect with short writing responses along the way. Students who wish to record their ongoing reflections can document in their sketchbooks each time they do so it is made clear to the teacher to look at the shared digital file when it comes time to do a progress check. Creating a checklist or log at the beginning of the journals will have students practice monitoring; perhaps the teacher can utilize that in tangent with a self-assessment to assess student progress.

Conclusion

In conclusion of this quest to understand the thinking behind our thinking and how it applies to art education, I urge the field of art education to step back and rethink our goals and purpose. Not all middle and high school students in our classes will become professional artists, so it is crucial to create a curriculum that is relevant and empowering for all students. The sole focus of art education should continue to move away from technical skills to cognitive training; this involves teaching and regularly practicing metacognitive in addition to higher order thinking skills. Integrating good learning habits within the art curriculum that encourage students to monitor and control their own thinking actively will ideally instill positive attitudes towards learning in general. Additionally, teachers are seeing more students with special needs in their classrooms and these adjustments are beneficial to everyone, regardless of their artistic abilities. In the visual arts, students have the opportunity to self-reflect, collaborate with their peers, and self-regulate during their unique creative process.

This call to alter art pedagogy will only be validated and successfully implemented if current and future teachers are trained on the value of placing MC at the center of the classroom. Talking about MC in teacher training programs and professional development events is a needed first step. Following that, teachers will need to make time to practice and self-reflect on how they use MC in their lives before adding it to the curriculum. Education is a field that is ever changing, and teachers will benefit from stepping back after each year (or month

or week or day) to analyze what went well and what could use improvement within their own practice. Utilizing tools to help capture student thinking and MC will make that reflective process easier for the instructor. Technical skills still play an essential role in the art room, but reframing the way they are taught by including MC and other cognitive skills will provide students with a deeper learning experience.

Future research is also needed to validate the effectiveness of explicitly teaching MC in the visual arts. Quantitative studies are not as common in the field of art education but can be possible with data collected from surveys or questionnaires. Most likely these will be accompanied by qualitative data gathered from observations and interviews. Questions I propose for future research include:

1. If MC is consistently taught or reviewed in an art classroom and students are given ample opportunities to practice monitoring their thinking, how can the improvement of students' metacognitive skills be measured throughout a school year?
2. What impact, if any, will this have on students' creative or artistic processes, and how would that be measured?
3. Will utilizing metacognitive strategies enhance student engagement with the visual arts?
4. Can the MC skills gained in the art classroom be useful for students in other situations?

These studies will be challenging to design because of the complicated nature of measuring some of these phenomena. Overlap of fields participating in this type of research will contribute to robust and comprehensive results. For example, cognitive science or developmental psychology researchers can work with art teachers in the classroom. If possible, art students can be participants in metacognitive studies with questions focused on their self-reflection and creative process. Researchers will also need to conduct longitudinal studies for best results, ideally at least two to four years.

Metacognition as we know uses multiple neural networks, making it hard to locate the precise areas in the brain. Crossover studies are needed to help us understand the holistic relationship of MC and other cognitive functions. Producing and evaluating a piece of artwork, as well as reflecting on the creative process, require the brain to use the prefrontal cortex. Therefore, the relationship between art and the brain needs to continue to be investigated, ideally finding practical knowledge that can inform art education.

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Appendix A: Sound Art & Form Unit Outline

Unit Title: Sound Art & Form

DESIRED RESULTS

Essential Questions

- What's the difference between music and sound? What is sound?
- How can sound be affected by a 3D form/object?
- How can artists utilize objects to create sound and turn it into a work of art?
- What is the creative process behind hand-building with clay?
- Can art be utilitarian?

Enduring Understandings

- Artists can create art that has multiple purposes.
- 3D forms can interact with sound in different ways, depending on the shape and space used.
- Sound is a form of energy that is made up of longitudinal waves whose speed depends on the properties of the medium that propagates them.
- Ceramics is a multi-step process that involves planning for projects to be both aesthetic and utilitarian.

Learning Objectives

Students will be able to:

- Analyze the material used by a designer of DIY amplifiers and describe how the medium, along with the choice of form, affected the meaning and effectiveness of the work.
- Solve a visual arts problem that involves the effective use of form, shape, and space; Design, build, and refine a ceramic sculpture that acts as an amplifier for their cell phones.
- Produce clear writing that articulates their artistic process and rationale for refining and reworking their artwork using varied and precise vocabulary to effectively convey ideas.
- Predict and measure the change in decibels to test the effectiveness of their amplifier once finished.

Students will know:

- How to hand-build with clay using paper templates, slabs, and the score-slip method.
- The basic principles of sound and how form can affect its loudness.
- The difference between the elements of art: shape (2D) and form (3D) and how to use both in the creative process.

Standards:

CA Visual and Performing Art Standards (2001)

- Artistic Perception - 1.5 Analyze the material used by a given artist and describe how its use influences the meaning of the work.

    - *[Students will look at sound art examples and analyze/describe how form and medium affected the meaning of the artwork]*
- Creative Expression - 2.1 Solve a visual arts problem that involves the effective use of the elements of art and the principles of design.
    - *[Students will be focusing on the difference between form and shape and how it can be affected by space - they will apply this knowledge to the design and building of their clay amplifiers]*
- Historic and Cultural Context - 3.4: Discuss the purposes of art in selected contemporary cultures.
    - *[Students will watch 3 short videos and then work with a partner or individually to choose 1 and research the artist's culture and purposes of their sound art.]*
- Aesthetic Valuing - 4.4: Articulate the process and rationale for refining and reworking one of their own works of art.
    - *[Artist reflection at end of project; ongoing journaling throughout]*

CA ELD

- ELD.9-12.I.12. Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas.

CA CCSS for ELA/Literacy

- WHST.9-12.4. 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

ASSESSMENT EVIDENCE

Cumulative Project - Clay amplifier

(**Formative**)Performance Tasks:

- Journal/sketch reflections to EQs and warm-ups
- Unit Packet that includes vocabulary, concepts, and sketches
- Paper form and sound activity; cell phone amplifier test with paper objects
- 3 thumbnail sketches for project ideas; 3 views of the one they will build
- 3D paper form & templates for final project
- Artist reflection paragraph about artistic process and experience of refining and reworking their final project

Appendix B: Clay Amplifier Project Guidelines and Rubrics

Clay Amplifier Project Guidelines & Expectations

GOALS Solve a visual arts problem that involves the effective use of form, shape, and space, by designing, building, and refining a ceramic sculpture that acts as an amplifier for your cell phone;

Produce clear writing that articulates your artistic process and rationale for refining and reworking your artwork using varied and precise vocabulary to effectively convey your ideas.

PROCESS

1. **Come up with 5 different thumbnails for your design ideas**
2. **Choose 1 and refine sketch, adding one additional view**
3. **Create 3D paper model of your idea & template**
4. **Hand-build amplifier using clay slab**
5. **Write Reflection** (while clay is firing)
6. **Measure the effectiveness of your amplifier and paint!**

GRADING Unit Packet = 5 points

5 Thumbnail Sketches + Final Idea Sketch = 5 points

3D paper model & template = 5 points

Journals = 5 points

Fired and Painted Clay Amplifier = 20 points

Typed Written Reflection = 10 points

Total for Unit = 50 points

Summative Assessment Rubric for Clay Amplifier

CA VAPA Standard: *Creative Expression - 2.1 Solve a visual arts problem that involves the effective use of the elements of art and the principles of design.*

Criteria (Skill Addressed)	**EMERGING** Does not meet the Standard *(12 points)*	**DEVELOPING** Partially Meets the Standard *(15 points)*	**PROFICIENT** Meets the Standard *(17 points)*	**MASTERY** Exceeds the Standard *(20 points)*
Design and hand building of clay sculpture to fit cell phone and amplify sound.	I did not design or hand build an amplifier for my cell phone.	I created a design and hand built a clay amplifier, but it does not hold my cell phone and/or does not amplify sound. The sculpture demonstrates that I almost have an understanding of the hand-building process, but could use improvement.	I used a simple design and hand built a clay amplifier that holds my cell phone and amplifies sound. The sculpture overall demonstrates a good understanding of hand-building clay pieces from a slab.	I used an original, creative and/or complex design and hand built a clay amplifier that holds my cell phone and amplifies sound. The sculpture is well-crafted with smooth edges and demonstrates a strong understanding of hand-building clay pieces from a slab.
Effective use of elements of art and principles of design (balance, harmony, proportion, etc.)	I did create some form out of clay, but did not use form, shape, or space effectively for this project.	I used form, shape, and space somewhat effectively for this project.	I effectively used form, shape, space, color and at least one principle of design for this project.	I effectively and thoughtfully used form, shape, space, color and more than one principle of design for this project.

Written Reflection - Due Wednesday, May 9th

Directions: Focusing on the creative process you went through while designing and building your clay sculpture, write at least one paragraph that clearly articulates:

- the process you went through - from brainstorming ideas to putting the final touches on the clay amp (*before painting*);
- your reasoning behind making changes to your artwork as you went through the creative process;
- any other discovery you made while creating your cell phone amplifier - ie. what was challenging? what surprised you about handbuilding with clay? what did you enjoy about this project? what you change next time? etc. (use your daily journal reflections to help)

Be sure to use at least 2-3 vocabulary words that we've talked about so far in class to help you communicate your ideas.
[ie. Sound, Form, Hand-building, Template, Shape, Slab Method, Score and Slip, Amplifier, Clay, Cylinder, 3D, Space, Balance, etc.]

A complete paragraph should have between 5-7 sentences that all connect to your main topic: working on your clay amp.
Written Reflection Paragraph should be typed, double-spaced and include:

1. Topic Sentence
2. 3-5 supporting sentences, using transition words
3. Concluding Sentence

(See rubric on next page)

Summative Assessment Rubric for Written Reflection

CA VAPA Standard: Aesthetic Valuing - 4.4 Articulate the process and rationale for refining and reworking one of their own works of art.
CA ELA Standard: WHST.9-12.4. 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CA ELD Standard: ELD.9-12.I.12. Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas.

Criteria (Skill or Standard Addressed)	**EMERGING** Does not meet the Standard *5.5 Points*	**DEVELOPING** Partially Meets the Standard *7 Points*	**PROFICIENT** Meets the Standard *8.5 Points*	**MASTERY** Exceeds the Standard *10 Points*
Paragraph(s) discussed the process and rationale for refining and reworking your clay amplifier	I wrote only a few sentences about my project, but did not discuss my artistic process and/or reasoning for my choices of refining my clay amplifier.	I wrote an almost complete paragraph, which somewhat discussed my artistic process and reasoning behind my choices of refining my clay amplifier.	I wrote 1 complete paragraph that clearly articulated my artistic process and I coherently expressed the reasoning behind my choices of refining my clay amplifier throughout the project.	I wrote 1-2 well-crafted and complete paragraph(s) that clearly and thoroughly articulated my artistic process and I thoughtfully and coherently expressed the reasoning behind my choices of refining my clay amplifier throughout the entire project.
Writing was clear, organized, and used vocabulary from the unit to help convey ideas.	My writing was not very clear or organized and I did not use any vocabulary	My writing was somewhat clear and organized, and I used 1-2 vocabulary words from the unit.	My writing was clear, well-organized, and I used 2-3 vocabulary words related to the unit to effectively convey my ideas	My writing was clear, very organized, and I used more than 3 vocabulary words related to the unit to support my statement and effectively convey my ideas.

Appendix C: Self-Assessment and Rubric for Ink Drawing Unit

Self-Assessment

Circle where you think you are in each criteria (or row) on the rubric.

What is something you are doing really well?

Next steps: What is something you can still improve on before turning in?

Summative Assessment Rubric for Ink Drawing Final Project

CA Visual and Performing Arts Standard Addressed: *Creative Expression - 2.1 Solve a visual arts problem that involves the effective use of the elements of art and the principles of design.*

Criteria (Skill Addressed)	**MASTERY** Exceeds the Standard	**PROFICIENT** Meets the Standard	**DEVELOPING** Partially Meets the Standard	**EMERGING** Does not meet the Standard
Line drawing techniques	I skillfully combined multiple line techniques with black pen.	I successfully used at least one line technique with black pen.	I used at least one line technique with black pen okay, but could have taken my time to use it more effectively in my drawing.	I did not use any line techniques to create or I chose not to use black pen or I did not follow directions.
Use of value and/or texture	I used my line techniques masterfully to create value and/or texture in my entire drawing.	I used my line techniques effectively to create value and/or texture in my entire drawing.	I created some value and/or texture in my drawing, but could have added more.	I did not use value and/or texture in my drawing at all.
Use of contrast and emphasis in final composition	I masterfully used both contrast and emphasis in my final composition to create interest in my artwork and/or I used additional principles of	I successfully used both contrast and emphasis in my final composition to create interest in my artwork.	I used either contrast or emphasis in my final composition, but not both, and not as effectively as I could have.	I did not use either contrast or emphasis in my final composition.

	design (ie. balance, unity, proportion, etc.) to hold the viewer's attention.			
Composition, Subject and creativity	I designed a highly original and creative composition based on an interesting subject that meant something to me AND my creativity and skill is clearly shown throughout the entire drawing (including the background).	I designed a creative composition based on an interesting subject that meant something to me and created an overall successful final drawing.	I designed a simple composition based on a subject that was somewhat interesting, but I did not demonstrate much creativity in the overall drawing.	I did not have an original composition or subject and/or I did not show any creativity in the overall drawing.

Appendix D: Written Reflection Prompts for Ink Drawing Unit

Reflection Prompt

Respond to all the prompts. You may also add your own prompts if you feel they are relevant and important to reflect on. Write in full sentences/paragraphs.

There are NO wrong answers here and you will not be judged based on your answers unless I believe you are being fake and not really reflecting. In that case I will send the project back to you to be rewritten by your truthful, flawed self; not the perfect version we try to show other people.

Bold font = required prompts. You must include these in your reflection.

Process:

- **Did you use your time well to complete this project? Explain how you managed your time.**
- **How did you decide what subject to choose? Why is it meaningful to you?**
- **Describe your brainstorming process and how you decided on your overall composition.**
- **Which line drawing technique(s) did you choose? Why did you settle on that/those instead of other techniques you practiced?**
- **Look at your self-assessment (midway); [Reassess on that rubric, by highlighting where you think your final drawing lies based on those criteria.]**
    - **Did you make those changes you listed? How else did you refine or rework your drawing along the way?**

Product:

- **What do you feel you did well overall in this piece?**
- **What do you feel you could have done better?**

Conclusion:

- **Do you feel happy with the end results of your piece? Explain why or why not.**

Appendix E: Example of Visual Art Curriculum

Unit Title: Visual Art Journals

DESIRED RESULTS

Essential Questions

- What conditions, attitudes, and behaviors support creativity and innovative thinking?
- How do artists determine what resources and criteria are needed to formulate artistic investigations?
- How do artists work? How do artists and designers determine whether a particular direction in their work is effective? How do artists and designers learn from trial and error?

Enduring Understandings:

- Creativity and innovative thinking are essential life skills that can be developed.
- Artists and designers shape artistic investigations, following or breaking with traditions in pursuit of creative art making goals.
- Artists and designers experiment with forms, structures, materials, concepts, media, and art-making approaches.

Learning Objectives:

Students will be able to:

- Document their creative concepts with thumbnails and sketching.
- Develop artistic ideas over time and organize their thinking visibly in their personal sketchbook.
- Practice metacognition through reflective journaling about their experiences with art making.
- Analyze how other artists approach artistic problems and evaluate artwork from different artists.

Standards:

CA Visual Art Standards (2019):

- Generate and conceptualize artistic ideas and work.
    - Creating – Anchor Standard 1 (Varies per grade level)
- Organize and develop artistic ideas and work.
    - Creating – Anchor Standard 2 (Varies per grade level)
- Synthesize and relate knowledge and personal experiences to make art.
    - Connecting – Anchor Standard 10 (Varies per grade level)

CA ELD -

- ELD.6-12.I.12. Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas.

CA CCSS ELA -

- WHST.6-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- WHST.6-12.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

ASSESSMENT EVIDENCE

Cumulative Project: End of the year essay discussing metacognitive and creative growth using evidence from visual art journal to support claims.

(Formative) Performance Tasks:

- Class warm-ups (open-ended journal response, sketching, etc.)
- Project brainstorming and development (concept map, thumbnail sketches, word web, research notes, rough drafts, etc.)
- Reflection journals that demonstrate monitoring of thinking
- Maintaining an organized, updated visual art journal to demonstrate learning over the entire school year