

The Science and Savvy of Visual Intelligence

Kristin Becker

Introduction

Intelligence quotient, or IQ, is a commonly used term with which most people have familiarity. Most experts agree that IQ **remains** fairly stable throughout one's lifetime, though may be increased slightly through certain practices. But what about the lesser known Gv? Gv, or visual intelligence, is described as people having "the ability to visualize the world accurately, modify their surroundings based upon their perceptions, and recreate the aspects of their visual experiences. People with high visual-spatial intelligence are good at remembering images, faces, and fine details."¹ Visual intelligence has also been defined in this way: "The ability to generate, store, retrieve and transform visual images and sensations. Gv abilities are typically measured by tasks (figural and geometric) that require the perception and transformation of visual shapes, forms or images and/or tasks that require maintaining spatial orientation with regard to objects that may change or move through space."²

This unit will attempt to answer two questions: Can one's visual intelligence increase with teaching and training? And specifically, can the study of art increase one's visual intelligence in relation to law enforcement? Amy Herman, a visual intelligence guru, has found success with her methods of building the visual intelligence skills of law enforcement officers. She has expanded her work into other career areas as well, such as the medical field.³ But for the purpose of this unit, we will focus on how visual intelligence can support a law enforcement officer in his or her job on a daily basis. The big ideas from Amy Herman's teaching will be employed in a way that is conducive to learning and applicable for an elementary student.

Reading Amy Herman's book, *Visual Intelligence: Sharpen Your Perspective, Change Your Life*, opened my eyes to new information and ideas I had never before considered. The idea that learning to observe art critically could lead to increased visual intelligence is a fascinating concept to me. I then jumped online and found numerous video clips of Herman sharing her research, her practices, and her results. This piqued my interest even further. I continued to research, read, and view everything I could find relating to increasing one's visual intelligence. My seminar fellows concurred that I should also investigate the physiology behind visual intelligence as well, studying the roles played by both the eye and the brain. Furthermore, my background in psychology led me to evaluate the effect that previous experiences have on perception and visual intelligence.

Reading Herman's work proved to be a valuable springboard for the study of visual intelligence and this culminating unit.

In sum, while this unit was inspired by Herman's work, in substance it takes on a multi-faceted approach to exploring visual intelligence. In addition to exploration of art in a multitude of ways, students will learn about the scientific connections and crucial research that lies behind visual intelligence. Also, students will participate in pre- and post-assessments, allowing for the evaluation of visual intelligence "training" and a determination of whether or not it impacted their visual intelligence.

Rationale

Though I feel that teaching strategies to improve visual intelligence is beneficial for all students, and people in general, I think it's particularly useful for my gifted students. Gifted students often find that schoolwork comes easy to them and crave challenge. Gifted students can benefit from thinking about their thinking. Learning about the idea of visual intelligence and ways that it can be honed provides students with knowledge and skills that can be used throughout a lifetime. Whether it's situational awareness, which increases safety, or critical observation skills, which can enhance the efficiency of virtually any situation, students will reap long-term benefits by having visual intelligence skills and strategies in their repertoires. By including the science behind visual intelligence, and using artwork as one of the strategies for improving visual intelligence, the bar is being raised to meet the needs of a gifted learner. Furthermore, many gifted students excel in the academic world, but struggle when it comes to communicating with peers. This unit gives these students another opportunity to interact and problem solve with their peers.

As stated, visual intelligence is beneficial across the many facets of life. We use our visual intelligence every day as teachers and students. I believe my visual intelligence has increased having participated in this DTI seminar, having read so many materials on the topic, having listened to talks on the subject, and having practiced some online training techniques. This will enable me as a teacher to observe more keenly the interactions in my classroom and to critically evaluate student performance.

One of the ways students will experience immediate benefits includes their ability to assess a situation, good or bad. Upon entering a classroom, a locker room, a friend's house, anywhere...students can keenly evaluate the situation, the mood, the expectations, and act and/or react appropriately. Second, students can serve as critiques of their peers work in an effective manner. Whether it is a work of art, an essay, or a presentation, students who have learned about the power of visual intelligence will be armed with the skills necessary to provide relevant feedback to their peers about their work. Third, students that participate in group activities, such as sports and academic competitions,

can use their visual intelligence to better their personal performance, as well as enhance their ability to interact with their peers. One more benefit of visual intelligence is providing students with the tools necessary to navigate the images, offers, and advertisements with which they are inundated on a daily basis. Teaching students to read between the lines, so to speak, and find hidden messages, will help them to be better decision makers and consumers.

In addition to immediate benefits to students today, plenty of benefits exist as they become adults, as well. The primary example, which is my hook for student engagement in this unit, is law enforcement. Police, FBI, military...all need astute visual intelligence. Amy Herman has trained countless law enforcement officers, as well as first responders, in visual intelligence techniques and strategies with great success. Visual intelligence is crucial to their job success, which ultimately provides safety for the community as a whole. Another example shared by Herman is the benefits for those in the medical profession. Here is a place where every little detail matters, sometimes to the extent of determining life or death outcomes. There is no room for error. Particularly in an emergency room or trauma situation where time is of the essence. Employees trained in visual intelligence can offer a greater level of clarity and efficiency to these positions.⁴ Law enforcement and the medical field are just two examples of future benefits for students. I believe everyone would agree visual intelligence is beneficial for every person in almost every circumstance.

Learning Objectives

The primary learning objective of the unit is to increase one's visual intelligence. Many other learning objectives support this overarching objective along the way. One is learning to be a keen observer. For example, when observing a piece of artwork, one must be able to identify what is there, as well as what is missing. The same goes for "crime scenes". As stated above, this unit will test a student's ability to be a good detective. Strategies will be demonstrated and practiced to improve observation skills. A number of images and artwork, both familiar and unfamiliar, will be used.

Two is to hone one's listening skills. Students hear thousands of words a day, but truly listen to much less. Students will learn active listening strategies to improve their listening focus, as well as their ability to quickly determine what information is important and what information may be discarded.

Three is building effective communication skills. In order to support one's visual intelligence, one must be able to clearly and concisely communicate what is being seen to others. Failure to communicate effectively can have detrimental effects in certain careers. Our charge to have all students college and career ready requires effective communication skills, and it starts in elementary school.

Through meeting the objectives of keen observation, careful listening, and effective communication, we will have met the ultimate goal of increasing one's visual intelligence.

Content Objectives

Many are surprised to hear that the eye is part of the brain. The retina is the neural part of the eye. In other words, the retina is attached to the brain and the brain is necessary for us to “see” anything. This is the basis of the science behind visual intelligence. David Hubel explains it for the lay person in his book *Eye, Brain, and Vision* as follows:

“The eye has often been compared to a camera. It would be more appropriate to compare it to a TV camera attached to an automatically tracking tripod—a machine that is self-focusing, adjusts automatically for light intensity, has a self-cleaning lens, and feeds into a computer with parallel-processing capabilities so advanced that engineers are only just starting to consider similar strategies for the hardware they design. The gigantic job of taking the light that falls on the two retinas and translating it into a meaningful visual scene is often curiously ignored, as though all we needed in order to see was an image of the external world perfectly focused on the retina. Although obtaining focused images is no mean task, it is modest compared with the work of the nervous system—the retina plus the brain.”⁵

In this unit, students will learn the roles and the importance of the eye and the brain in visual intelligence.

Leonardo da Vinci and I. M. Pei are examples of two men with heightened visual intelligence skills. In other words, they have proven their abilities to visualize the world accurately, modify their surroundings based upon their perceptions, and recreate the aspects of their visual experiences.

Leonardo da Vinci, who lived from 1452 to 1519, was a painter, sculptor, architect, inventor, military engineer and draftsman. da Vinci studied the laws of science and nature, which greatly influenced his work. In turn, his work and ideas have influenced countless artists and made da Vinci the highlight of Italian Renaissance.⁶

M. Pei was born in China in the year 1917. He studied architecture in the United States and eventually earned his B.A. from MIT and his M.A. from Harvard. Pei has designed such well-known structures as the Kennedy library, the glass pyramid at the Louvre and the Rock and Roll Hall of Fame. Pei is now in his nineties, and he continues to design innovative structures around the globe. He has earned numerous honors for his work within the field of architecture.⁷

These two men, from entirely different worlds and time periods, share the gift of visual intelligence. In this unit, students will study the accomplishments of these two men and analyze and evaluate how visual intelligence had an impact on each of their successes, thus understanding the value of visual intelligence.

Visual intelligence has its limitations if persons who have honed their visual intelligence skills do not have the ability to communicate effectively with others. Communication entails both speaking and listening. Often people forget the significance of the listening part. According to Bob Moulesong, a *Times* correspondent, hearing is a physical ability, while listening is a skill. Listening skills are necessary to make sense of and understand what another person is saying. Essentially, listening skills allow one to understand the meaning behind what someone is saying. The United States Department of Labor Secretary's Commission on Achieving Necessary Skills has identified competencies that are crucial for those entering the workforce. Listening skills were among the foundational skills determined to be most critical.⁸

“While a picture may be worth a thousand words, those words will no doubt come in handy if the picture is distorted or poorly understood. After all, the most effective way to communicate is through speech. Thus, speaking skills are a vitally important method of communication. The four language skills of listening, speaking, reading, and writing are all interconnected. Proficiency in each skill is necessary to become a well-rounded communicator, but the ability to speak skillfully provides the speaker with several distinct advantages. The capacity to put words together in a meaningful way to reflect thoughts, opinions, and feelings provides the speaker with these important advantages: ability to inform, persuade, and direct, ability to stand out from the rest, ability to benefit derivatively, career enhancement.”⁹

In this excerpt from Moulesong’s article, he argues that while all four language skills are important, speaking is the most crucial. I am inclined to agree.

Instructional Strategies

Concept mapping is an important instructional and learning strategy in this unit.

“When new knowledge is integrated with and connected to existing knowledge, that new knowledge is easier to understand and to remember. A professor’s job is to build scaffolding from existing knowledge on which to hang incoming new knowledge. Using a concept map is one way to build that scaffolding. A concept map is a visual organization and representation of knowledge. It shows concepts and ideas and the relationships among them. You create a concept map by writing

key words...and then drawing arrows between the ideas that are related. Then you add a short explanation by the arrow to explain how the concepts are related.”¹⁰

In this unit, the concept map should be used at the beginning to connect new learning to previous learning and shared experiences, but even more importantly, it can be revisited throughout the unit and updated with learned information. Students should maintain their own concept maps and the teacher should have one posted in the classroom. Keep in mind that not all the maps need be identical. Every person may connect their learning in different ways, so be open to variations. Simply check for misconceptions and reteach as needed.

“Guided Observation” is a strategy that I will employ in this unit. Like guided reading, which scaffolds learning and provides real-time support during the process of reading, I will scaffold the elements of careful observation and provide real-time support through questioning, leading, and commenting. For example, when evaluating a piece of art, I will ask the students to observe the piece for several minutes without talking. I will then remove the piece from their sight and ask them to tell me what they saw. I will ask probing questions to further their description based on their responses. I will then ask what they do not see, a seemingly odd question, but one that forces the students to think outside the box. Finally, I will guide students in a discussion of their interpretations of the artwork.

Discussion is a key strategy in this unit as it is necessary to get to the heart of visual intelligence. A student must share his or her observations, connections, and conclusions in order for his or her visual intelligence to be measured. Discussion will be embedded throughout the unit. To share thinking, as just stated, but also as a means of practicing the art of communication, fine-tuning those listening and speaking skills.

Fishbowl would be a suitable strategy for discussion, as well. When students discuss the “crime scene”, it will be beneficial for students to sit in two concentric circles. The inner circle can discuss their observations, findings, and conclusions while the outer circle is taking notes, not permitted to speak. This will encourage students to speak clearly and concisely and make their points heard. Since the outer circle cannot speak, they cannot ask clarifying questions. Therefore, the speakers must lay everything out clearly and in an understandable fashion. Switching roles is ideal so that students can practice both sides of communicating their visual intelligence findings.

Say It, Do It is a strategy that works best in pairs. One student will use his visual intelligence skills to interpret an image or object. That student will then use his communication skills to relay the information in a concise manner to a second student. The second student must use her visual intelligence skills and communication skills to interpret what she is being told and to envision the image or object. She then must recreate the image or object. This activity could be a drawing, a structure made of blocks,

Legos, clothespins, popsicle sticks...anything, or even an object made of clay. The idea is that the closer the creation is to the original, the better the visual intelligence and communication that took place. This can be done in a Write It, Do It fashion as well, simply substituting the verbal communication with written communication. The Write It, Do It protocol is a competitive event in the Science Olympiad forum.

Cooperative Learning is an integral part of this unit, as it is necessary for the practice of visual intelligence skills, and required to ultimately be successful in solving the case through proper interpretation of the crime scene and effective interviews of witnesses and suspects. Many benefits of cooperative learning exist, including developing higher level thinking skills, building self-esteem in students, enhancing student satisfaction with the learning experience, developing oral communication skills, developing social interaction skills, and creating an environment of active, involved, exploratory learning.¹¹

Promoting Student Metacognition is a key instructional strategy that will be employed in this unit. Metacognition is, at its core, thinking about one's thinking. It includes the ability to monitor and assess one's own understanding. Metacognitive practices increase students' abilities to transfer their learning to new situations. This is key in this unit as students will focus on metacognition through the study of art, then be asked to transfer that knowledge to a new situation, the crime scene investigation. In addition, metacognitive practices help students become aware of their strengths and weaknesses as learners, group members, and so on. A key element is the ability to recognize the limit of one's knowledge or abilities, then having the ability to figure out how to extend one's knowledge or abilities.¹² The latter is particularly useful for gifted students. I have found that the benefits of promoting student metacognition in the classroom are immeasurable for any instructional experience, including this unit.

Activities

All of the activities planned for this unit are rooted in Herman's philosophy that one's visual intelligence capabilities can be improved with education and practice. Some of the listed activities mimic the activities Herman provides to her own workshop participants, while most are simply inspired by her ideas, yet modified to provide a wide range of activities that are appropriate for elementary-aged students. The activities are designed to give students background information, hands-on practice, and reflective analysis of their growth. The sampling of activities I provide here address the main objectives for the unit.

This first activity is based on the ideas of Ron Berger and his work with "Austin's Butterfly." Berger teaches students to look critically at a photograph and a first-grade student's (Austin's) artistic rendition of that butterfly. Students are required to look critically at a photograph, followed by a drawing, and offer constructive criticism. Students are required to have a keen eye, communicate their thinking precisely, and

modify their thinking as they received new information. The artist (Austin, in this case) is expected to revise his drawing numerous times based on the feedback of his peers. Berger's main purpose in this activity is for students to work on a growth mindset, i.e. his main purpose focuses on the students doing the artwork, with the other students receiving secondary benefits. My lesson activity mimics his process, but the focus is on the students doing the observing, judging, critiquing, and communicating. After watching the video clip, the process will become crystal clear.¹³ In my own classroom, I will have a few students volunteer to recreate a photograph or artwork through drawing. Most of the students will analyze the two works and provide the feedback. This can be modified with original student artwork, which would require a student willing to accept and consider peer critiquing, as well as that student's ability to communicate verbally what he or she is trying to convey artistically. This version of the activity is for more mature students and it can be quite subjective, so it may not fit every classroom. But the conversations and personal growth could be fantastic if you have students that would embrace the experience.

Another activity, based on Herman's training protocol, is to analyze Rene Magritte's piece *Time Transfixed*.¹⁴ Show the students an image of the artwork for one minute. Ask them to study it and observe everything. Then cover up the image and ask the students what they saw. After students respond, likely with the common answers of train, fireplace, and maybe clock, prompt them for the details, such as the mirror, the candlesticks, and the wainscoting. Then ask them what was missing. Answers may include candles, logs, fire, and train tracks. You will likely need to prompt, as well as show the students this image again. I like this image in particular because it lends itself so well to these questions. Repeat this activity multiple times with various other works of art. Students will hone their observation skills through repeated experiences.

An important element in this unit is that the students understand the science behind visual intelligence, starting with the connection between the eye and the brain. I create a folder for research purposes on Schoology on various topics as needed, and will do the same with this topic of visual intelligence. Students access the folder, where all of their information is organized...links to online articles, images, links to a variety of online, interactive visual intelligence tests...to name a few. If your school does not use a system like Schoology, Google Classroom works well to organize resources, as well. For the first part of this activity, I would have the students read online articles on the science of vision and visual intelligence that I've linked for them. Because they are elementary students, I use this time to teach them why I chose the websites I did and how to determine the validity of websites. This is certainly a lesson that can be taught again and again over their schooling years, but elementary school is a good place to lay this foundation of smart and effective internet searches and use. After reading and discussing the articles, either with peers, the teacher, or both, assign students a task that will allow them to demonstrate their understanding of the science of vision and visual intelligence. I like to offer a multitude of choices. The most basic would be a labeled diagram with captions

showing their understanding of the anatomy of the eye and how it is connected to the brain. Another choice might be to build a model of the same with clay, for example. Yet another choice in my classroom would allow student to create a three-dimensional image on the program Tinkercad, then print it on our 3-D printer. This recent donation of a 3-D printer by a parent of a student in our gifted program **and** opened up many engaging possibilities of using more STEM in my classroom, as you might imagine.

... Exposing students to role models is always a positive, particularly for gifted students, who often feel isolated or that no one understands what it's like to be them. In this unit, I introduce students to two men that have demonstrated their gift of visual intelligence. First is Leonardo da Vinci. Most students will have heard of da Vinci in some context, but we will read his biography and take a closer look at his attributes and accomplishments, identifying how he demonstrated his gift of visual intelligence and how that has shaped our lives today. We will do a similar investigation of I. M. Pei. I like that one of these men lived long ago and one is still living today. Also, one is Asian, with which many of my students will identify. It's important to me that a student can see some kind of connection when studying influential people, so they do not see them or what they have accomplished as removed from them or unattainable. And, of course, some of our unit is based on the work of Amy Herman, so that includes a female as an expert in the field, as well. Again, as with most assignments, I like to offer options. For example, students may want to write an essay, a news article, create a Google slide, or even an iMovie, sharing what they learned about these men. They can reflect on others in their lives that they feel have a gift of visual intelligence, too. They can compare and contrast this person, or even themselves, with one of these men. This activity can lead to a discussion about various gifts, and that everyone has gifts, just not the same. This is particularly important to discuss with gifted students.

A fun activity that can be done at any time throughout the unit, even more than once, is a seemingly spontaneous test of visual intelligence to the students, but in actuality planned by the teacher. Have another person come into your classroom and walk up to you, pretending to have a quick conversation, perhaps holding something, or handing you something, or even asking you for something, which he or she would then take from you and leave the room. Then ask your students to describe the person that came into the room. What was he wearing? Be specific...type of clothing, colors, patterns. What did he say? What was he carrying? Then have the person reenter the room so they can check the accuracy of their observations. This can lead to a discussion of bystanders and eyewitnesses, and the validity of their statements made to law enforcement. This ties into the crime scene activities in which the students participate at the both the beginning and end of the unit.

Some online activities that can be done individually or with the entire class include a visual perception activity where you look for "hidden" images,¹⁵ an eye test,¹⁶ and an optical illusions exercise.¹⁷ An additional resource, an engaging piece of authentic

literature titled *Detective Donut and the Wild Goose Chase*,¹⁸ by Bruce Whatley, tells the story of a not-so-visually-intelligent detective, who happens to have a highly visually intelligent partner. This is an entertaining book that will clearly demonstrate the traits and benefits of visual intelligence.

Assessment

Assessment for this unit is rooted in measuring student growth, not concept mastery. Pre- and post- assessments are employed to measure each student's growth from two perspectives, the student's and the teacher's. A pre- and post-questionnaire that works best with your students will offer quantitative measure of growth, with the caveat that students will likely not assess themselves properly at the beginning of the unit. But this is a positive, as it can, and should, lead to rich discussion at the completion of the unit.

The pre- and post-self-assessments will be used to show the students' growth in understanding what visual intelligence is and how building their visual intelligence skills can benefit them. A simple agree/disagree questionnaire can be given to students at the beginning of the unit. A sample of a statement on this self-assessment would be ... "I am a good observer," and students simply circle agree or disagree. Another way of measuring the students' thinking could be to alter the guide from the agree/disagree method and ask them to mark a scale from one to ten as to where they believe they fall, with one being a poor observer, five being average, and ten being an extremely keen observer. This method provides more specific and measurable data. At the end of the unit, students will be asked to complete the same self-assessment. They will also be asked to look at their original self-assessment and contemplate this question: "Now that you know much more about visual intelligence, do you believe your responses in your first self-assessment were accurate?" I believe most students will find that they inflated their capabilities based on the information they had, or lack of information, about visual intelligence. Their evaluation of their visual intelligence skills at the close of the unit are likely valid, but when they took the first self-assessment, they didn't know what they didn't know, as the saying goes.

At the beginning of the unit, students will be placed in a "crime scene" scenario and asked to play the role of detective. They will look for clues, talk to eyewitnesses, and observe their surroundings. A culminating activity, another "crime scene" scenario, will offer the students an opportunity to put their visual intelligence training to the test. They will again look for clues, talk to eyewitnesses, and observe their surroundings. In the past, I have created crime scenes to kickoff mystery units. A fun one is to leave a package of cookies on a table in the classroom earlier in the day. Later in the day when the students return to the classroom from special, recess, etc. you have the crime scene set up. You have opened the cookie package, drizzled crumbs, left some clues and some red herrings, and surrounded the whole scene with police tape. You can have students or teachers from

other classroom serve as witnesses. Be sure that not all the witness accounts are the same. This is just one example of a crime scene set-up. Use your imagination and have fun! The planning for this is time-consuming, but crucially important to this unit. Note: be sure to take photos of the crime scene so students can go back later and analyze the scene. If possible, allow the students to take the photos. Then repeat this process with a new crime at the conclusion of the unit.

The ultimate goal is that students will see more clues, listen more intently and communicate more clearly with eyewitnesses, and observe their surroundings more critically, not only finding clues left behind, but noting what is missing as well, in the second crime scene investigation than in the first. Teachers can use a variety of tools to measure the students' observations, listening behaviors, and communication skills. In order to record and measure student growth, teachers may want to use anecdotal records, rubrics, checklists, and/or sliding scales. Visual intelligence simply cannot be measured in a traditional format. Teachers must be flexible, and prepared to look at the big picture in order to evaluate student learning and success.

Notes

¹study.com

²i3mindware.com

³Herman, Amy E.

⁴Herman, Amy E.

⁵Hubel, David H.

⁶da Vinci, biography.com

⁷Pei, biography.com

⁸Moulesong, Bob

⁹Moulesong, Bob

¹⁰Concept Mapping

¹¹Benefits of Collaborative Learning

¹²Mcdaniel, Rhett

¹³Talilerner

¹⁴Bigthink

¹⁵Only A Genius Can Solve This

¹⁶How Good Are Your Eyes?

¹⁷12 Illusions That Will Test Your Brain

¹⁸Whatley

Bibliographic References

Bigthink. "Are You Detective Material? Practice Your Visual Intelligence | Amy Herman." YouTube. December 09, 2016. Accessed December 19, 2017. <https://www.youtube.com/watch?v=uwAp917Js2s>.

Bigthink. "Take This Perception Test to See How Visually Intelligent You Are | Amy Herman." YouTube. September 10, 2016. Accessed December 03, 2017. https://www.youtube.com/watch?v=jko5WaG_1mE.

"I.M. Pei." Biography.com. June 03, 2015. Accessed December 03, 2017. <https://www.biography.com/people/im-pei-9436323>.

"Leonardo da Vinci." Biography.com. November 16, 2017. Accessed December 03, 2017. <https://www.biography.com/people/leonardo-da-vinci-40396>.

"Concept Mapping." Concept Mapping | CENTER FOR TEACHING AND LEARNING. Accessed December 03, 2017. <http://ctl.byu.edu/tip/concept-mapping>.

"The Brain and the Eye - How They Work Together." Discovery Eye Foundation. March 24, 2016. Accessed December 19, 2017. <http://discoveryeye.org/the-brain-and-the-eye/>.

"Neuroscience For Kids." Neuroscience For Kids - Retina. Accessed December 19, 2017. <https://faculty.washington.edu/chudler/retina.html>.

44 Benefits of Collaborative Learning. Accessed December 03, 2017. <https://www.gdrc.org/kmgmt/c-learn/44.html>.

Herman, Amy E. *Visual Intelligence Sharpen Your Perception, Change Your Life*. Mariner Books, 2017.

Hubel, David H. *Eye, brain, and vision*. New York: Scientific American Library, 1995.

Eye, Brain, and Vision. Accessed December 19, 2017. <http://hubel.med.harvard.edu/book/b8.htm>.

<http://www.i3mindware.com/5-iq-factors/visual-intelligence>

McDaniel, Rhett. "Metacognition." Vanderbilt University. February 09, 1970. Accessed December 03, 2017. <https://cft.vanderbilt.edu/guides-sub-pages/metacognition/>.

Correspondent, Bob Moulosong **Times**. "Listening skills are an important part of effective communication." Nwitemes.com. December 19, 2010. Accessed December 03, 2017. http://www.nwitemes.com/business/jobs-and-employment/listening-skills-are-an-important-part-of-effective-communication/article_b4d0940a-f919-5d1a-be45-05da2c6752c2.html.

<https://study.com/academy/lesson/visual-intelligence-definition-lesson-quiz.html>

Talilerner. "Critique and feedback - the story of **austin's** butterfly - Ron Berger." YouTube. December 08, 2012. Accessed December 03, 2017. https://www.youtube.com/watch?v=hqh1MRWZjms&list=PLAcF9IqaCbD_0cSYQG0kd1KIJAz14wAW

Whatley, Bruce. *Detective Donut and the Wild Goose Chase*. Harper Collins, 1997.

"7 Mystery Riddles Only the Smartest 5% Can Solve." YouTube. September 15, 2017. Accessed December 19, 2017. https://www.youtube.com/watch?v=m0zrRIN_T5E.

"How Good Are Your Eyes? (EYE TEST)." YouTube. August 04, 2017. Accessed December 19, 2017. https://www.youtube.com/watch?v=0YrJ2e-QVns&disable_polymer=true.

Mshaiz00. "12 ILLUSIONS THAT WILL TEST YOUR BRAIN." YouTube. June 08, 2017. Accessed December 19, 2017.

https://www.youtube.com/watch?v=CYD8zRDaE1I&disable_polymer=true.

"ONLY A GENIUS CAN SOLVE THIS IN 20s (If You Solve 13/15 You Are Smarter Than Einstein!)." YouTube. July 01, 2017. Accessed December 19, 2017.

<https://www.youtube.com/watch?v=xjp0Y9PTg0A>.

Appendix

Common Core State Standards – Grade Five:

CCSS.ELA-LITERACY.SL.5.1.D – Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.

CCSS.ELA-LITERACY.SL.5.4 – Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

Next Generation Science Standards – Disciplinary Core Ideas:

LS1.D – Information Processing: Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.