Arts Education in Maryland Schools Alliance

A Compilation of Thoughts from Maryland Arts Educators on Learning, Arts and the Brain

This document records conversations among artists, artist/teachers, teaching artists and arts teachers held in preparation for the Learning Arts and the Brain (LAB) Summit hosted by the Johns Hopkins Neuro-Education Initiative in Baltimore, Maryland May 2009. It was compiled, edited and shared with the LAB Summit participants as a project of the Arts Education in Maryland Schools (AEMS) Alliance.

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Artwork on the cover of the printed compilations distributed at the LAB Summit was provided by Maryland students who were asked to draw what they thought was going on in their brains when engaged in the arts. They attend the following schools:

Kensington Parkwood Elementary, Montgomery County
Landon School, Bethesda
Potomac Elementary, Montgomery County
Roland Park Elementary/Middle School, Baltimore City
Southwest Baltimore Charter, Baltimore City
Western High School, Baltimore City

Introduction

The genesis of this compilation was a conversation on a train over a year ago with Susan Magsamen, Mariale Hardiman and Guy McKhann. We were on our way back to Baltimore after attending the release of the Dana Foundation Learning Arts and the Brain Consortium Report on Arts and Cognition. The subject of our conversation was the idea of holding a summit sponsored by the Johns Hopkins Neuro-Education Initiative focusing on learning arts and the brain and furthering the research agenda. I advanced the case that there is a need to bring researchers together with arts educators—as I have seen the creative and very thoughtful work of the teachers engaged with students learning in and through the arts and have listened to their insights and believe they merit the attention of researchers searching for truly interesting and meaningful paths of inquiry. My companions were most receptive and we continued discussing this as plans crystallized for the Learning Arts and the Brain Summit.

In the interest of facilitating meaningful conversation among researchers from neuroscience, education, and related fields with artists and arts educators, I have been in conversations with artists and teachers who are engaged in teaching and learning in and through the arts. I did group sessions with teaching artists (artists who provide services to schools such as residencies), artist/teachers (classroom teachers who are trained in arts integration), and arts teachers (specialists in the arts disciplines—dance, music, theatre and visual arts). Young Audiences of Maryland-Arts for Learning helped me gather teaching artists, many of whom are on the YAMD roster. For artist teachers, I enlisted teachers from the Montgomery County Arts Integration Model Schools Program who have completed the Post-Baccalaureate Certificate in Arts Integration awarded by Towson University in partnership with University of Maryland, College Park; University of Maryland, Baltimore County (UMBC) and Johns Hopkins University. As part of the Post Bac program candidates develop their own inquiry about student learning and the arts; I have been impressed by the work they have done. To identify arts teachers I drew from recommendations of colleagues.

Each group addressed three clusters of questions included below. I collected written responses and took notes during extensive discussions. I also had one on one conversations with people from the field and captured their thoughts in notes. The collective responses are included in this compilation, which I hope will provide useful input. Many of the arts educators with whom I had discussions are participating in the Summit. I hope that the conversations we have had over recent months will contribute to the thinking that goes on in the roundtable discussions.

I want to stress that this has been in no way a formal or a scientific process. In many ways it has been an effort at engagement as much as a process of collecting ideas and insights. I have found that there is great enthusiasm among all of the arts educators who have joined the conversations for beginning this dialogue with researchers.

Artists/educators in dialogue with neuroscientists and education researchers:

What has struck me in thinking about how to facilitate this dialogue is how we are siloed—artists, educators, and researchers come from different cultures -- it is important to understand that and listen carefully to one another. I read an analysis of an international effort to bring researchers and educators together around Learning Sciences and Brain Research and it spoke frankly of the challenges in communication

and collaboration and the need for developing a common language. A necessary step before that is to be open to learning about each other's language and culture. In this specific case, we are introducing the arts to the fields of science and education.

To illustrate a fundamental difference, consider the processes of inquiry we use. Scientific research often focuses on setting controls to isolate outcomes about which researchers have made predictions. Artists try to create and invent; they expand their thinking by eliminating controls as much as possible, seizing whatever comes to hand and combining and taking apart and recombining to find what they want. They actively avoid the predictable. In the input from artists this kind of process was described repeatedly!

On the other hand, scientists and artists share a dedication to discovery and commitment to truth and both apply enormous discipline to their work. Further, the most profound work of scientists and artists does intersect. As Dr. Solomon Snyder has said,

*From my own background as a physician and research scientist, I have noticed that the most talented, the most productive people in the field are those who actually have a background in the arts because simple narrow scientific training is not enough to make major discoveries. The greatest scientists actually are artists in a sense. They are creative; they put together disparate things.**

Most of the research that we use as advocates and arts education practitioners has been education research involving observations of correlations between arts learning and positive student outcomes whether in arts learning, other academic achievement or behavioral changes. The potential of neuroscience for making even clearer what happens in students' minds when engaged in the arts is very exciting. We understand that neuroscience is nascent and that the development of methodology is part of the important work being done. But we are intrigued at the possibilities of what may be revealed in coming years and how it might complement what education research is showing. Ideally the conversations today and emerging and ongoing from today will join the work of neuroscientific and educational research and arts education practitioners.

Contextual intersections:

There are certain contextual intersections with current trends and areas of public interest that bear noting. There seems to be great interest in the human brain, stimulated perhaps by the new and growing capacity to peer inside it. What is being revealed is that the brain is complex and messy and we aren't the highly rational creatures that some of us pretend to be. Hierarchies in intellectual endeavor are being challenged. Our decision making processes are not purely linear; they are much more complex. And our memory plays tricks and our emotions govern us more than we might think. The importance of the right side of the brain and creativity for our individual and collective competitiveness in the global economy has been highlighted by economists Daniel Pink and Tom Friedman. Strong and recurring criticism of No Child Left Behind is that it has lead to the "stifling of the imagination" and narrowing of the curriculum to the exclusion of the arts. Arts education attains new significance in these contexts.

In another context, there has been recent attention to the role of emotional intelligence Drake Bennett's article in the Boston Globe (4/5/09) discusses efforts to promote student learning about emotions. All of the arts address emotions—whether drawing on

them for more compelling forms of self-expression and communication or analyzing them in the context of experiencing works of art. Work with young people in theatre has been studied in terms of its effects on tolerance and enhanced understanding of and communication with others. Are there opportunities to learn more about how learning in the arts enhances "emotional intelligence?"

An area that is receiving a considerable amount of attention currently is the malleability of IQ, particularly of low SES populations. (Cf. Richard Nisbett's book, *Intelligence and How to Get It)*. Research might look at the impacts of arts learning on raising IQ among low SES students? However, what is most important for arts education is the whole notion of malleability. Beyond IQ, what are the ways in which capacity of students in the arts disciplines can be enhanced? Ironically the idea of talent in the arts as innate has created enormous barriers for equity in arts education. To demonstrate malleability in arts capacities would be helpful for practice as well as supporting advocacy around equity, which is by far the most important policy issue in arts education. Malcolm Gladwell's book about outliers also raises questions about equity of opportunity for achievement in our society, which are relevant to arts education.

It might be valuable to consider these contexts and trends in thinking about education as opportunities to examine their interplay with the arts. Whatever the inquiry, it is critical to look deeply at arts processes and their relationship to thinking and learning so that the research will be substantive and not superficial.

In thinking about the need and usefulness of research I put the primary emphasis, on its potential to help those engaged in teaching in and through the arts understand what is happening in their teaching, approach the art of teaching with a spirit of inquiry, grow and improve in their practice and validate their convictions about their teaching and its value. And so while researchers may have a stream of inquiry, which is abstractly of interest, how much more compelling might research be that through intersection with educational theory--but more important--practice will change children's lives in wonderful ways. And then those of us as advocates will have even richer stories to tell about how the arts benefit children.

The compilation that follows will lead you through insights and ideas from some wonderful artists who are educators and educators who are artists.

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Founder and Trustee, Arts Education in Maryland Schools (AEMS) Alliance

* *The Arts and Children: A Success Story*, a video produced by Arts Education in Maryland Schools (AEMS) Alliance

Contributors to Compilation

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Music
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Artist/teachers are classroom teachers trained in arts integration. The group that gathered are all recipients of the Post-Baccalaureate Cerificate in Arts Integration awarded by Towson University in partnership with University of Maryland, College Park; University of Maryland, Baltimore County (UMBC); and Johns Hopkins University.

Teaching artists are artists who work in schools, often in extended residencies. Among the teaching artists who participated are artists who train classroom teachers in arts integration through MATI (Maryland Artist/Teacher Institute) and their colleague teaching artists through the TAI (Teaching Artist Institute) program. Many of the participating Teaching Artists are affiliated with (YAMD) Young Audiences of Maryland Arts for Learning. YAMD helped facilitate the conversations with teaching artists.

Arts teachers teach students dance, music, theatre and visual arts.

Questions

Your work as an artist/teacher - teaching artist- arts teacher and your mind/brain:

What do you think is happening in your mind/brain when you are creating art and when you are teaching as an artist/teacher – teaching artist – arts teacher ?

How do you think you use your mind/brain when creating and participating in your art form and your teaching?

What changes are occurring in your mind/brain as a result of your process?

As an artist/teacher- teaching artist- arts teacher working with students and their minds/brains:

As you apply your experience and ways of thinking and creating to your work with students, what do you think is happening in their minds/brains?

What do think are significant effects on students' learning/thinking/ brain function as a result of the work in which you engage them?

Interesting questions as you think about the arts and learning and the mind/brain:

What are questions that you would like neuroscientists to explore?

Perhaps you have theories of what takes place in students' minds as you work with them—are there any which would be useful to test through research?

Would you want to collaborate with researchers in formulating questions?

Note that interesting questions for research are highlighted in boldface in the notes from conversations that follow.

Conversation with artist/teachers:
Written responses to three sets of questions:

1. Your work as an artist/teacher and your brain:

- What do you think is happening in your mind/brain when you are creating and teaching as an arts teacher?
- How do you think you use your mind/brain when creating and participating in art forms and your arts teaching?
- What changes are occurring in your mind/brain as a result of your process?

2. As an artist/teacher working with students and their brains:

- As you apply your experience and ways of thinking and creating to your work with students, what do you think is happening in their minds/brains?
- What do think are significant effects on students' learning/thinking/ brain function as a result of the work in which you engage them?

3. Interesting questions to you as you think about the arts and learning and the brain:

- What are questions that you would like neuroscientists to explore?
- Perhaps you have theories of what takes place in students minds as you work with them—are there any which would be useful to test through research?
- Would you want to collaborate with researchers in formulating questions?

Artist Teacher #1

1. Your own mind/brain process when you are engaged in arts activity and/or arts teaching:
   - Have to know a lot as a teacher when you provide open-ended experiences; they can go in a lot of directions.
   - Help them connect to a field of experiences.
   - Thinking ahead about the big idea. What do I want to create/teach in general?
   - Making a plan for how/what steps I will take to do it—OK—Jumping right in and experimenting with materials and ideas, working and re-working along the way
   - Become more attuned to the audience and increased desire and want to continue experimenting and performing.
2. What is happening with the student's mind/brain when engaged in the arts:
   - Learn to create by being given freedom and space to tap into the emotion that comes from experiencing art.
   - They are given opportunities to analyze, create their own opinions and questions.
   - As I model my own creative process, they have a jumping off point for theirs.
   - They are able to find their own voices and express their own ideas. They develop a disposition of curiosity towards the works of art, processes of making art and artistic expression in general. Also empathy and emotional connectedness.
3. Interesting questions for research:
   - **Yes I would be excited to collaborate with researchers to formulate questions.**
   - **How does art museum/arts integrated education influence students who are performing below grade level and/or are in low socio-economic environments?**
   - **Emotion (role in arts and learning)?**

Artist/Teacher #2

- Teaching through arts helps students in all areas of learning—social, academic etc. and helps foster a love of learning.
- Through arts social development in Kindergarten is greatly enhanced—arts foster cooperative learning.

- Student learning is “stretched” – makes more connections to other areas when arts are used.
- As a Teacher, my “brain”/understanding is expanded through arts teaching.
- As a teacher, I am thinking in new and different ways.

Artist/Teacher#3

1. Your own mind/brain process when you are engaged in arts activity and/or arts teaching:
   - Finding conceptual/shared thematic similarities between domains—shared fundamental concept (pattern recognition)
   - Looking at learning as broad love of understanding, and representing it in a variety of ways.
   - New stronger neural pathways that bridge domains that are not normally associated.
2. What is happening with the student’s mind/brain when engaged in the arts:
   - Motivation, transfer, pattern recognition, cognitive meaning making processes, distributed cognition.
   - Motivation, newer/stronger neural pathways that bridge domains, broad and deep, transfer pattern recognition, seeing the learning landscape conceptually.
3. Interesting questions for research:
   - **What areas of the brain are activated by different arts experiences (both as a viewer and maker)? Is there a theoretical link between them? What do we already know about these brain areas?**
   - **Do arts integration experiences require the brain to work differently than in traditional learning experiences?**

Artist/Teacher #4:

1. Your own mind/brain process when you are engaged in arts activity and/or arts teaching:
   - Seeing endless possibilities to foster connections
   - Opportunities to engage learner in skills and processes in hands on/kinesthetic/real life context
   - Seeing new ways to expose kids to concepts

Changes in teaching:
   - Learning from the students as they make connections with what they see and hear
   - Identifying opportunities to extend learning
   - My own thinking and learning includes taking risks
2. What is happening with the student’s mind/brain when engaged in the arts:
   - Multiple opportunities for enquiry
   - Students are more willing to engage because there are meaningful connections
   - Struggling students are having positive learning experiences

Artist/Teacher #5:

2. What is happening with the student’s mind/brain when engaged in the arts:
   - Helps students to take risks
   - Students are seeing/thinking more broadly
   - Considering open ended concepts
   - Considering multiple responses for identifying support
3. Interesting questions for research:
   - **How integrating the arts supports motivation and engagement.**

- **Theories – How integrating the arts helps students to make connections across content areas.**
- **How the process of integrating the arts helps students to generalize across content areas and even across same subject concepts.**

Artist/Teacher #6:

1. Your own mind/brain process when you are engaged in arts activity and/or arts teaching:
   - Brain always revising
   - Making connections to see an overall "big picture"
   - Motivated
   - Mind used to make connections and draw out similarities
   - Brain thinking metaphorically
   - Mind focused on a goal

Changes in teaching:
   - Becomes more focused and open to connections and possibilities

2. What is happening with the student's mind/brain when engaged in the arts:
   - Find importance
   - Focus
   - Deeper connections and comprehension
   - Focus, concentration, confidence
   - Permission to think and make mistakes

Artist/Teacher #7:

- **How does using the arts in education affect comprehension and other language arts skills?**
- **How does student engagement impact the learning process? In what ways? How can it be maximized?**
- **It has been my experience that using drama increases a student's ability to recall information, assist in story sequencing and deepen knowledge of character traits. What are other ways we can use the arts to increase comprehension of text?**
- Teaching with the arts is an open-ended process in which the teacher is a facilitator. Therefore the teacher is as fully engaged as the student
- Positive social interactions

Artist/Teacher #8

1. Your own mind/brain process when you are engaged in arts activity and/or arts teaching:
   - Making connections while teaching/creating—I am challenged and pushed to be better than I might otherwise be.
2. What is happening with the student's mind/brain when engaged in the arts:
   - They are making connections, solidifying or reinforcing knowledge or they are creating it in multiple ways (e.g. 1. visually see a clock 2. their bodies are making a clock) I think they are going deeper and hanging on to their learning.
   - Much of the drama-integrated work is collaborative/cooperative—I think the conversations they have during this work helps them build and refine their understanding.
3. Interesting questions for research:
   - **How memory is influenced by arts integrated learning**

- **How engaging in a movement activity affects the brain rather than being sedentary while learning.**

Artist/Teacher #9:

1. Your own mind/brain process when you are engaged in arts activity and/or arts teaching:
   - I'm thinking more about the child than I am about myself and what I should be teaching – I am more relaxed and open to more ideas generated by actions of students—It's easier to see what should be happening next….
   - I'm learning from the students.
2. What is happening with the student's mind/brain when engaged in the arts:
   - Students are more able to show their creativity and understanding of topics that are difficult for them to put into writing.
   - Students remember the lesson more and remember for a longer time.
   - Social interactions are more positive.

Artist/Teacher #10:

1. Your own mind/brain process when you are engaged in arts activity and/or arts teaching:
   - Students sensory areas are stimulated
   - Activate prior knowledge by going from one side (organization etc.) to the other side (performing – Teaching is performing)
2. What is happening with the student's mind/brain when engaged in the arts:
   - You are activating prior knowledge in that part of the brain where it is stored and students then connect and you are able to spark their learning and the creative process begins. It is most helpful if the learning triggers and then connects to prior knowledge.
   - By engaging students in the arts, their memories are triggered because they are "performing" a skill. It also gets into muscle memory, the more the skill is repeated.
3. Interesting questions for research:
   - **What happens in the brain of students is different with an actively engaged teacher compared to one that is passive.**
   - **How much longer is the retention of curriculum when it is taught in and through the arts?**
   - **Is there a sequence of teaching teachers that is best for preparing students to learn? E.g. a particular combination of left brain/right brain activities to best stimulate the brain?**

Artist/Teacher #11:

2. What is happening with the student's mind/brain when engaged in the arts:
   - Working with children who have limited arts education or arts integration experience, have to overcome their wanting to be told what to do. Have to tell them there are no wrong answers and deliberately get them out of their comfort zone and surprise them. They work very differently than students in an AI school.
3. Interesting questions for research:
   - **Perception—Does visual art education build capacity to analyze and describe visual images and what one sees in the environment?**
   - **Do arts build capacity for nuanced decision-making (not true/false but trade-offs and optimizing?**
   - **Do arts build openness to new ideas -- one's own and those of others?**
   - **Do arts build tolerance of others?**

- **Do arts build capacity to use language well in translating ideas that may be visual, physical, auditory etc.?**

Notes from discussion:

Learning along with students—it is challenging. Making connections is an open-ended process. Teacher is as fully engaged as the students. Be willing to not know where it's going. Stimulating to teacher as much as to student. Struggling – it makes you think fast…learning from the students not waiting for right answer. Learn from struggling students (teachers intimidated – kids heard things they didn't and taught the teacher). Don't wait to know what a child understands/feels in words—they show what they can do more…they can show their thinking dramatically learn what they are thinking --they demonstrate their learning in many ways—can see their engagement initiate a conversation. Teacher looks at students differently

With tableau, acting shows what they know-they change as they go through the process. They want to participate. E.g. groups acting out clocks. One person is the minute hand and another the hour. The hour hand is longer. They have to figure out how to show the longer and shorter hands. This is shifting learning to moving the body differently and listening to the group responses and suggestions. Student is not the only one engaged—it helped everyone refine their understanding. They don't feel stupid as when they are called on for answers (in traditional way); they are picking up from others. Non-threatening. Plays to strength of different students.

Traditional way of teaching about clocks 20-40% tune out.

Kids moving and working with others—they remember things longer. It's multi-sensory, kinesthetic learning. It speaks to all—the high flyers and others. The high flyers set the stage, the others join in. They can extend themselves.

Teachers have to know a lot when they provide students open-ended experiences. Students can go in different directions. The teacher needs to be ready to take it in a different direction, more of an expert to catch moments and to apply to various subject areas; they need to be more prepared. It lets the teacher know what the students' strengths are. E.g. I put something that the students read to music. Student can go beyond. Teacher may have limited skill; the student can take it beyond. It's ok to tell them that the teacher is learning. If you ask the students it validates their thinking; they have to figure out their own way. Students have to invent many times and this stimulates their creativity. E.g. when students are creating their own representation of music-- their own music notation—more than memorizing—they are creating a method of writing down music.

Develops resilience-learn that it doesn't have to be perfect to learn –e.g. a drawing when a student thinks someone else's is better or it doesn't look like what they want.

One of the big challenges is teaching writing—arts are excellent for pre-writing—attaching writing to arts makes it easier for kids to write. Writing not perfect but thoughtful.

Interesting to have to think about two different domains—find similarities—e.g. mood in text—**disparate domains—shared conceptual nugget—what happens when you must find commonality--very creative and difficult --would be interesting to see how the brain works.**

The idea of transfer – **see how the students can generalize across subjects**.

Arts involve risk taking and seeing multiple responses more than one right answer. Different students taking leadership – child takes risk and feels more confident; gives them strategies. E.g. setting multi syllabic words to xylophone.

Dual coding theory—language not alone for holding in memory and conceptualizing—need to experience in another domain. Remember it differently…E.g. **verbal and visual, kinesthetic and music—double whammy to help remember and remember differently and attach new learnings. Memory and associations—hang on to their learning longer. Connect because of association. Research Question—does this happen? How?**

Look at neural net, web—connects, builds new pathways. More ways to be smart. Whole is greater than the sum of the parts. **Memory book—associations, mental picture. Interesting to measure how kids who have AI are on openness vs. non—ability to come up with more answers.**

Question—Motivation, engagement –given vividness in their lives outside school (Xbox) with lots of intense stimulation, is AI more motivating are kids more engaged in school?

What can we learn from neuroscience to increase engagement, get more out of gifted kids, help students get the spark.

In standard education there is not a lot of opportunity to show fluency, deep meaning. More opportunity to show their fluency in AI.

Tiny toy tales students use props, sounds and repetitive gestures to re-tell story. Teacher does first then they join in and take over. Did action research on retelling and comprehension. Students who used tiny toy tales did much better. **Research question—how do kids apply ongoing?**

Cooperative learning—teacher sets up for kids ahead. Students can do more independently than traditional Kindergarten work. Students stay engaged for more time. Attention span at learning centers in room longer. **Does this help? They lose track of time – flow. What young kids need to do—developmentally appropriate—meets developmental needs – letting them be creative is fun. Where they are and learning should be. Learning for how long—attention span? Can you learn longer through the arts?**

Feel good about AI – I am more likely to be using best practices.

Distributed cognition—more motivating easier for them—hearing about the clock, using their friend's arm.

Mood—mental picture—through artwork see feel touch –it's real and easier to understand – then they can generalize to multiple areas.

With arts, kids discover what's inside their own heads. Cf. The Ben Carson story—Ben's mother told him that knowledge and imagination are there already inside his head.

Conversation with teaching artists (some arts teachers were also in this group)

Written responses to first set of overlapping questions about the artist's perception of their own process in relationship to mind/brain function:
1. What do you think is happening in your mind/brain when you are creating your art and involved in your own artistic process?
2. How do you think you use your mind/brain when creating and participating in your art form?
3. What changes are occurring in your mind/brain as a result of your artistic process?

Artist #1

- I find when I am in creative mode it can be very difficult to listen to unrelated input. The state is trance-like.
- Songwriting: It seems to me that the "dark" part of my brain produces visuals and articulate part of my brain names them, describes them and looks for language in other ways. The "dark" side is offering pitch and rhythmic opportunities to those choices.
- SHOWER moments!
- Performing: It seems as though the "practice room" is geographically distant from performance space. What was apparently well learned can turn out to be far away.
- Improvisation

Artist #2

Question 1.

Pattern recognition, anticipating evolution and resolution, diagnosing tension, release in phrasing to elicit musicality, expressing inner feeling through interpretation, realizing the point of performance when the music subsumes the performer-who simply becomes the instrument of the music.

Question 2.

Determination of problem solving (fingering etc), engaging knowledge and experience to effectively interpret literature (impressionistic, romantic, composer, periods, style, etc.) Engaging muscle memory (hypothalamic) for pattern recognition.

Question 3.

Understanding flexibility, fluidity, effortless accomplishment, adaptability, instrument facility, performance, third space

Artist #3

Question 1.

- Free association-connecting things that "should not" be connected.
- Visualizing imagery, events (performance in time)
- Trying and retrying different language
- Improvising music till words fit with it.
- Fall in love with a phrase or chord structure to start with

Question 2.

- Riffing with words
- Free association
- Trying different musical melodies and structures till something fresh or that has a good parody quality happens, then play with it over and over, tweaking, adjusting.

Question 3

- One more structure, melody or text that is permanently added to my mental library.

Artist #4
Question 1.

- Making art: Balance of ideas, media and physical forces
- Performing: Balance personal interest with taste or desires of audience
  Suspension of disbelief

Question 2. (Use of brain/mind in creation)

- Balance technical experience and the experience of others with chance on new "ideas"
- Take chances

Question 3. (Changes)

- Learning
- Making mistakes
- Satisfaction in making mistakes work
- Pleasure in drudgery, not getting bored after doing something for the 1,000th time.

Artist #5

- I envision
- I hear it
- Happens a lot when I'm going to sleep/sleepless night or as I am waking and lying in bed
- Putting things together – doing different things together
- Something makes me pause – think and then it haunts me until I can solve it.
- Sometimes have to try to put it away and come back fresh to look at it again and I can solve the problem.
- Memories of experiences and events will be transformed.
- Sometimes unconscious of how something relates to an emotion or a stray Question of experience until I look at it or read it months later and can put it in a context.
- A lot is making unconscious conscious and at same time aspects remain unconscious.
- "Ahas" in the middle of the night.
- Miracle stories about how the most unexpected students respond.

Artist #6:

- Many times my subconscious seems to take a big role in addressing challenges. I stop consciously thinking about a problem – then the solution pops into my head – sometimes fully formed.
- I move beyond the realm of words and expand my thinking beyond the structures set in place by society/culture – the negative/pessimistic side is usually very much turned off when I am on a creative "high."
- Different ideas come from different directions; I visualize, predict, and think about challenges and variables from different dimensions.
- I tend to look at everyday or "non" arts challenges through a lens that does not follow a set of parameters. I try to connect or extend ideas in non-traditional or unorthodox ways. For this I am sometimes labeled a "Troublemaker."

Artist #7
Question 1.

- I am <u>envisioning</u> as I create, <u>pairing</u> my experience rolodex with what I am trying to describe or say and <u>extracting</u> words to match the mental image.

Question 2.

- I use my mind as an immense kitchen cabinet to fish out whatever I need at that precise moment. What's in the spice drawer that'll help me convey a tough concept to 5th graders?

Question 3

- My mind lengthens when I'm creating, broadens. It's being taught while I'm teaching.
- My mind is working then relaxing while I'm creating a poem.
- Expand – contract.

Artist #8:

Question 1.

- Problem solving
- In my mind/brain as I create and am in my process. (God is in the details) – Many things, sometimes several at once or in parallel, and/or many things in series (unordered series) observing, thinking, reacting, conceptualizing, scenario playing, budgeting, trying to be free of constraints, trying to work within constraints. Taking all kinds of notes; trying to dream about a project; looking for opposites.

Question 2.

- Mostly same as in Question 1. But I try to keep my inner critic at bay, letting him in only occasionally as a check, a bit of balance of power.

Question 3.

- Observing and responding to what I observe (as in "I like that," "that intrigues me"). I imagine, playing out scenarios. The result is that I am often surprised when other people think that I "have such a great imagination"—what I want to do more of is to observe and note my spontaneous creative process as I move about in life doing "non-creative" things.

Artist #9

- Question for researcher: How does brain activity of a person creating art compare with the brain activity of a control.
- We are hindering the influence of "traditional educational thought" which often restricts ideas by pigeon holing them into right and wrong answers. Put positively: artists empower students by validating their natural visual, divergent, quantitative (etc.) thought processes.
- Some students' ability/knowledge are being incorrectly assessed because they are treated linearly—can they do a case study on a class of students who are tested with holistic methods.

Artist #10

Question 2.

- Some are tuning me out, picking cotton. Others are distracted non-creatively-- "wow she's black; she's pregnant." Others are able to be open letting their brain kiss mine -- "wow that was a cool simile! Wow, I've been through that too."
  Ah -ha.

Artist #11

- How do you ponder the imponderable?

Artist #12

- I look at the whole
- Use metaphors to describe thinking

- See the relationships between disparate pieces of information
- I am able to be concrete and abstract simultaneously
- My hands move without me being “conscious”
- I can hear an inner voice guiding my decisions
- I move into a state of flow – hyper aware, time flies.

Artist #13

- Engage the reward pathway—dopamine release—non-verbal – energized
- Inspiration – is the carrot that gets you through the dull part
- Be in the moment connecting to the audience

Artist #14

- When I create, I need to break away from the solutions I already know; I have to “disable my defaults” (defaults being habitual ways of seeing images, conceptualizing ideas)
- Point of view – it is a challenge to see differently – using a deliberately altered perspective can help—turning a piece upside down, looking at a drawing from the top of a ladder.
- Openness as an artist helps me be more open in other aspects of my life—to new ideas and other people’s opinions.

Group discussion notes:

- Optimism of artists – transform our greatest fears
- Work in sequence and in parallel simultaneously
- Observe and let happen at the same time
- Like Darwin observing small things—developing small questions—curiosity—watching worms
- Art as a space
- Create an environment for learning
- Sequencing—feeling space around everyone
- Open
- Endorphins (dance)
- Audience changes performance
- Balance between chaos and peaceful process (making marionettes move)
- Scale—audience members surprised at how small marionettes are.
- Boredom is useful-- mechanical frees one
- Narrative vs. metaphor
- Teach imagination rather than story telling
- Envisioning first—then give words to picture. Honesty. Whiff on wind
- Teaching is artistic process

Notes from tape:

Memory -- open mind bringing my world into the process, feeling the space around me and the space around others and where they are-- feeling on stage –losing myself in my art when performing –performing many choreographers and feeling my feeling towards the material, the audience, and the piece. How this process affects me—I am more alert and more alive-- open to everything and anything --ready for anything. Endorphins release – to work up the mind – movement rejuvenates gets you ready to do anything and everything. Why-- -outlet for frustration working through problems, telling a story Dance can be anything like all arts --

remembering something from your past, creates an environment for learning, connecting to others involved.

Preface-Paint but do other things—I use my artistic process in engaging in doing those book keeping and accounting things – I don't separate—all the same-- all making art life is it's the way I think—tend to look at things as a whole I see the relationship between disparate pieces of information. I'm able to be concrete and abstract—that's the dark ray and the light—that's what that is --the synergy between the two which is really interesting to me when it's working when I'm in that space its like a flow thing.

Every moment you make a decision.

I think about my hands—my hands are moving without me being conscious of them moving; it's a fluidity. I can hear an inner voice – not the critical one. I move into a state of flow…time flies. I engage when it's working—my reward pathway is engaged; dopamine is released --it's a high; it's non verbal those highs those dopamine releases are what get me through the nuts and bolts and the dull parts-- they sustain you till you get to the next place. I am very, very--interested in connecting with audience—that is huge when that happens; it is magical whether taking the work …having a wider scope connection or in teaching –for me teaching is making art too—it is the same. The use of metaphor—making art, and making things is metaphor. We create things--it is a natural way that we think and I think it is fascinating and I am fascinated to see how our brains work with metaphor because we as humans want to make connections. We make them until we see metaphors and ….we always ascribe meaning to them. Human….

Used to be that people understood building blocks of thinking as words-language now we know it is relationships…of images

Thread …emotion… spiritual component… sense feelings of others… something transcendent….

If my brain is left to its habitual …it won't be something new…disable my defaults….

Empathy

Taking negative…art makes us persevere—go beyond parameters set---climbing over fences….

People's way of dealing though process …rationalize fears ...gets people through difficult times by creating responses

Kitchen cabinet – draw from and use ideas from all sorts of sources

Mental health—will you get in the studio mom?

The idea of the "space" where I create art applies to being an artful leader...it is where I am thinking about challenges…connecting dots…solving complex problems in art helps connect dots in other aspects of life, policy issues etc. Capture approach of creative people to help other people learn to be creative

Amazing consensus—thinking only for a couple 100 years we've thought of pure analysis and logic as thinking. A blip on the radar screen...brains are smarter than we are…they make connections—you talk about the dark side and reflection in the shower that's because connections are happening between these neuro pathways…like a squirrel (grey squirrels) start with details sit there for so long chewing, taking in the landscape longer, eventually bored, drop the half finished nut –go up a tree follow one set of branches get to the top and there's this moment when I get to jump across to another tree to it's tiny branch and these are two trees that have been growing separately but just because this spring that last little branch has grown across, I am able to make this connection to this whole tree and I go down this tree and run around and back up and then I am able to jump across to another tree. They are whole separate ecosystems …at the best moment it's the flow that we all talk about lose yourself from tree top to tree top…a perfect scenario when trying to make connections by putting disparate thoughts together and make representations of ideas previously separate just like squirrel….

As artist all dance, dance, dance but in education experiencing all the other arts how much we are connected in all the arts.

Interviewing a Russian theoretical physicist…doing same metaphor same stuff…science math describe in terms of beauty

We make understandable to the untrained eye…chaotic side make understandable

R&D stimulate

Cf. Darwin – observation is critical.

Arts responded to as disciplinary silos, even though they are more languages than subjects.

Speak to ourselves like at a 100 year trade show – need to broaden the conversation. Connect to other fields of endeavor – cf. Creativity of Einstein ….

When I am creative I think visually -- I imagine pictures and landscape.

I free associate, connect things aren't normally connected— Mystics-haven't come across any in Baltimore County but there are artists perhaps acutely more sensitive or maybe not but can put phenomena into a form….tapping into larger stream of reality not observable by science…science will be unable to pinpoint.

Science is measurement; art is not. Teaching artist has to try to stay in touch with art form and logical side so can prove that work has value. Link to measuring things. Almost harder-- brain matrix one part of you is conscious of art and another structure -- a third part is adjusting for the kids….heightened sensitivity.

Try to stay so true to so many things.

Ideas from different directions visualize, predict

Meditative state

Second session with teaching artists and some arts teachers:
Group viewed Lee Boot's film, *Euphoria*

Euphoria is written and directed by Lee Boot, and informed by a team that includes those in neuroscience, psychiatry and anthropology. The film was made in collaboration with a number of other artists and filmmakers. More information about the film, including background and how to see and/or purchase it, as well as an extensive online curriculum for teachers, counselors and parents can be found at http://theeuphoriaproject.com.

Asked the question, "How does the film, "Euphoria" point to connections between neuroscience and art education," Lee shared the following thoughts:

First by highlighting the profound importance of neuroscience to education as a whole. If young people can know the power and uniqueness of their brains, it will build self-efficacy and self-respect we know are essential for young learners to engage deeply in learning and in their lives. Specifically:

- *the sheer numbers and intricate physiology and processes involved in the brain and mind*
- *the plasticity of the mind*
- *the fact that the brain offers chemical rewards for the committed pursuit of meaning and engagement that surpass those available from shorter term euphoria-producing solutions and are sustainable*
- *no brain is exactly like any other; a rewarding process of discovery, that involves both teachers and learners, is needed to realize the potential of a mind/person.*

Second, specifically related to art education, is the film itself and the process of creating it. Here was a symbiotic relationship between those involved in neurosciences and an artist who could see the stories and human meaning not always obvious to those in the science research trenches. Under an integrated model of art education, young artists would look at the information being presented in all their classes and treat it similarly, learning it in the process, and making it affective and meaningful for themselves and other students. Such a pipeline of creating meaning from information is too rare in society, but needn't be for young people. Even more important, but sometimes difficult to grasp is that the brain responds to meaning and engagement physically which has powerful implications for learning. Consequently, if young artists use their time in school to create beauty and meaning out of the data they're asked to consume, they will build and strengthen connections in their brain that both deepen and empower their thinking. We know this because neuroscience tells us that brains react in response to meaningful and engaging challenges, and that learning that is not perceived as meaningful remains shallow and isolated. (In this way neuroscience supports a constructionist approach to education.)

Finally, that each brain is unique should almost automatically support that different modalities must be used to engage different minds (visual, auditory, etc.). Here, I think I can finally say what neuroscience experimentation needs to be done. I think experiments that show different minds responding differently to different modalities and sub-modalities would be excellent.

Notes from the discussion that followed viewing the film:
We discussed three clusters of questions focusing more on the second and third.

1. Your work as an artist and your brain:

- What do you think is happening in your mind/brain when you are creating your art and involved in your own artistic process?
- How do you think you use your mind/brain when creating and participating in your art form?
- What changes are occurring in your mind/brain as a result of your process?

2. As a teaching artist working with students and their brains:

- As you apply your experience and ways of thinking and creating to your work with students, what do you think is happening in their minds/brains?
- What do think are significant effects on students learning/thinking/ brain function as a result of the work in which you engage them?

3. Interesting questions to you as you think about the arts and learning and the brain:

- What are questions that you would like neuroscientists to explore?
- Perhaps you have theories of what takes place in students minds as you work with them—are there any which would be useful to test through research?
- Would you want to collaborate with researchers in formulating questions?

Common element from our earlier discussion –even non-visual artists see visualization as the inspirational moment. **A research question might be to look at children's ability to visualize and how does this relate to the creative process and to the verbal process? Role of visualization in the creative process?**

Visual arts create awareness of thought process very concretely. E.g. "when stuck do the opposite of what you were doing" or "throwing up on the page" or "keep working until something happens"

Often kids think of arts as craft not thinking—not conscious of how their thought process is working—making it conscious is important.

There's a great study of elementary students being asked to draw before writing…seeing the picture supporting writing. Flipping brain through changing modality.

Un-teach the things that get in the way. A child who was drawing well until going to school and coming home drawing stick figures because that was what "big kids" were doing.

How do the arts teach children how to think? Metacognition and the arts.

Irony of focusing on abstraction of math and reading

Arts ground thinking in experience.

Arts bookend – ground in touching, doing – not building skills out of thin air.

Many important and difficult things are learned in school beyond curricular areas. For example, how to resolve contradiction – learn that on the rug in Kindergarten—very hard to teach wonderment, critical thinking –arts are key.

Trusting intuition is key for artists—goes back to early experiences.
Language is the process of having an idea. It is organic and non linear in the arts.

How do we communicate?

What happens in neurological networks through creative practice?

What happens in the neurological process that builds capacity?

Attention can help a student be confident.

Self-efficacy – it's about self –efficacy not self-esteem! Relationship of the arts to self-efficacy.

"He's got to find that within himself that has meaning" cf. *Euphoria*.

Neuroplasticity – what are the ramifications for the arts? Look at rewards and growth through arts.

Impact on outliers—whole issue of equity and social justice relative to access to arts education.

Grow dendrites through practice of what is taught.

In arts, thinking based on physical realities for young children (and ongoing).

The group discussed dialogue between scientists and arts educators:

Teachers are in the real world—connect to human development, which is actually very difficult. Various models --Irony of corporate model applied to education (accountability especially) given today's economic crisis. Business and transference – not so good!! At one point Japan was the model (because of the last economic crisis) maybe time for a change -- a new model!

When neuroscientists are talking to artists and teachers they need to look at our whole endeavor—re-contextualize.

We ask unanswerable questions—scientists look for answerable questions.

In arts process is key not answerable question. Value for science in touching teachers' reality – cultural implications of research.

There is value in allowing the uncontrollable—which is what artists do.

How are neuroplasticity, cognitive growth and other capacities affected in children who face many challenges? There is a real need for helping these children

Interesting questions about real life needs/possible applications and grant potential ("How do we get the grant?" as motivation for selection of research questions). What do funders value?

Dissemination linked to applicability. Arts educators as pathway for dissemination and application of research. Implication of research for classroom. Why how the brain works matters—impact on lives of kids in classrooms.

Art of teaching and science of the brain.
Impact of challenges on brain growth—capacities of challenged vs. non-challenged students.

How does the cognitive growth of poor children compare to that of children from wealthy families? and how do the arts affect it?

Manipulating the world through the arts changes neuro-pathways – difference between kids who do that vs. those that do not have the opportunity.

Role of intuition—culture on learning

Relationship of emotional connection to learning.

Sciences – intersections of different fields is where the action is—artists gravitate towards intersections—translating whatever is culturally meaningful.

Artists live for juxtaposition

Measure impact of engaging American culture on student capacities. Interpreting /translating.

Arts--Connect how people think and act and construct narratives

Times optimal—changes abound—Values shifting.

Understanding impact of arts on the brain under pinning educational reform.

Neuroscientists' brains compared to artists brains!!!!

How arts impact education profession?

Conversation with arts teachers:

Clusters of questions:

1. <u>Your work as an arts teacher and your brain:</u>

- What do you think is happening in your mind/brain when you are creating and teaching as an arts teacher?
- How do you think you use your mind/brain when creating and participating in art forms and your arts teaching?
- What changes are occurring in your mind/brain as a result of your process?

2. <u>As an arts teacher working with students and their brains:</u>

- As you apply your experience and ways of thinking and creating to your work with students, what do you think is happening in their minds/brains?
- What do think are significant effects on students learning/thinking/ brain function as a result of the work in which you engage them?

3. <u>Interesting questions to you as you think about the arts and learning and the brain:</u>

- What are questions that you would like neuroscientists to explore?
- Perhaps you have theories of what takes place in students minds as you work with them—are there any which would be useful to test through research?
- Would you want to collaborate with researchers in formulating questions?

Written comments:

Teacher #1

Re: Lab School students (an independent school for students with disabilities)

Thinking outside the box is irrelevant for these kids; there is no box

Teacher #2

Teacher retention—Does brain based instruction impact teacher retention?

Teacher views towards students?

Arts education – Does curriculum that's rigorous and challenging and holistic produce longer-term learning?

Parents – How do we train parents to extend learning using arts and cultural resources?

Brain science – how does it support dispositional thinking (MICA adds dispositional thinking to its lesson plan format)—sensitivity, metacognition, motivational, compare and contrast, persuasive, critical, metaphoric thinking.

Notes from general discussion:

Which skills are most critical for brain development?

Strategies/methodologies that are best for reaching those skills?

Early childhood – more time

Parents role – what can they do? What's the impact of family experiences?

How to consume art? Arts in home

Longevity of teacher retention in schools with arts?

Arts and discovery learning.

Everyone can learn to be creative.

Brain study – look at – how acquisition of creative process happens? Unlocking (Grades 2-5).

How do you accelerate that?

What about the teacher who thinks they can't learn the arts?

Eric Jensen identifies biological need for the arts.

Music in early years supports math.

JHU CTY uses a spatial learning test – what are results relative to arts experiences?

Arts integration seems normal.

Longitudinal study of teachers – impact of training in which the arts are integral vs. conventional training.

American University-- arts are critical to special education teacher training (the late Sally Smith of the Lab School established the AU program).

Loyola and Goucher – relationship with Lab School

Long-term memory and special needs students – role of arts and multi sensory stimuli.

Special needs students at Lab School-- involvement of whole body they are "doing" as in "I remember that thing that we did." Or "I can't believe Stanley did that."

Art therapy relationship to arts education-arts therapeutic while learning.

Express themselves—student wants to be in the room in the experience

It's a release. It opens them (students**). Educational purpose is primary; psychological aspect is therapeutic – happening also.**

Look at the young developing brain and the aging brain cf. Oliver Sacks

Teacher with 4 schools and 4 different cultures—one with arts and entertainment district connection and faculty relationships with artists.

The child's understanding of their own learning helps them to be better advocates for themselves.

Habits of mind (Dick Deasy's writings) demonstrate value-added of the arts beyond other project-based learning.

Arts allow students to find fit on team-- effective esp. in middle schools.

Dance team at Western – importance for students of belonging to something.

Therapeutic/psychological interface with higher cognition?

Responsibility of team role impact on other performance in school?

Niche—feel comfortable in building.

Support from others on team.

Arts team—part of something-- still express themselves uniquely.

Club methodology of the lab school—academic club using the arts

> Chronological—Cave –littlest kids, Gods—mythologies, Knights and ladies – Medieval, Renaissance (Galileo, Dante etc.), Museum – eastern hemisphere, Industrial – American history /economics (board meetings)

Lab School Abstract to the concrete (e.g. flight before wings)
Brainstorming to get ideas.

Art connects.

Arts as process for engagement.

Kids wowed by concrete outcomes and ownership– "Can we take it home?"

Talk about how they can continue outside school—own the art making process.

"Be an artist" – write artist's statement—self-awareness and awareness of art making process.

Karen Bernstein
Professional Dancer

Your work as an artist and your brain:

What do you think is happening in your mind/brain when you are creating your art and involved in your own artistic process?

- Since dancers use their body as an instrument in their art, their whole body and soul is involved. This physical involvement sets us apart from other art forms. It also shortens our life as a performer. It is not our brain that holds us back; it is the restraints of our body.
- When the dance I am performing is sad or happy I experience these emotions on a larger scale. My whole body experiences it.
- Dance makes me more alert and alive.
- Every time I perform a dance it is different. The stage, audience, my feelings, etc. can change each performance drastically.
- As a duet, you need to respect and trust your partner. As an ensemble, you always feel the other dancers on stage.
- As a choreographer you are only as good as the dancers you choose. Unlike visual art where you are in total control, as a choreographer you must create movement that fits the body and temperament of the dancer you are working with.

How do you think you use your mind/brain when creating and participating in your art form?

- I must have full concentration with no outside distractions when performing. I always found a quiet place before I went on stage to clear my mind to be ready for what I was about to perform.
- The hardest thing to do as a performer is to stay in the moment and not think ahead. A true artist loses themselves in the movement in order to portray what the choreographer is trying to say.
- Choreography allows you to tell an important story you want to share, remember your past, and help you work through problems. It can also be an outlet for frustration.
- If you are going through a hard time emotionally or physically, it is very difficult to keep your mind where it needs to be as a choreographer or performer.

What changes are occurring in your mind/brain as a result of your artistic process?

- My art allows me to see and feel things differently.
- Since I am physically and mentally involved, it makes the process richer.
- My mind works very differently as a choreographer and performer. It also works very different when performing solos, duets or ensemble works.
- My art allows me to work problems out physically.
- It is my therapy.
- I love the whole process as a performing artist: the creative process, the fine-tuning, rehearsing to perfection, and performing on stage. Each process works my brain in a different way.

As a teaching artist working with students and their brains:

As you apply your experience and ways of thinking and creating to your work with students, what do you think is happening in their minds/brains?

- There is no question that movement and sensory experiences play an important part in brain development and growth. Movement uses all the senses.
- Words can be understood more clearly when they provoke some kind of image in a students' mind. Involving all the senses, emotions and movement help to engage the learner fully.
- Movement changes the environment of the class into an active kinesthetic experience; allowing the children to think and learn differently.
- Dance gets the children out of the seats to get their circulation going, changing their spatial reference, connecting them to the other children in the classroom, and stimulating the release of body's natural motivators.
- Movement wakes up the learner, increases their energy level, improves their information storage and retrieval, and helps them feel good.
- With creative movement the children can't be wrong. This gives them a feeling of self worth. It creates an environment for learning.
- Helps them reach a part of their brain that they normally do not reach.
- Movement is important for everyone. It makes the children more alert and ready for anything.
- Movement brings the curriculum to life, encourages active learning while embracing the learning styles, abilities and needs of all students. You will reach those students who are usually unreachable and challenge those students already considered successful

<u>What do you think are significant effects on students learning/thinking/ brain function as a result of the work in which you engage them?</u>

- Muscle memory – a child will remember a word if they create a movement to go with it. This is especially evident with poems and any sequence of words (like life cycle, water cycle, elements of a folk tale, etc)
- Physically experiencing a lesson creates a better opportunity for a deeper learning experience and meaning. They will remember these lessons in years to come.
- I encourage my students to take risks, explore new things, and to respect and trust themselves and others.
- Instead of just reading a history book, they actually climb inside history to experience what they experienced. This provokes thoughtful questions.
- BrainDance was created by Anne Green Gilbert. It has been proven that humans are programmed to move through certain movement tasks in the first year of their lives. These fundamental movements wire the central nervous system. When these movements are missed due to birth trauma, illness, head injury, etc, there may be gaps in a person's neurological development. These may appear as learning disabilities, behavior disorders, memory problems, sleep disorders, speech, or balance problems that disrupt normal childhood development. It is believed that if you perform these 8 patterns (breath, tactile, core/distal, head/tail, upper/lower, body side, cross lateral, and vestibular) on a daily basis you may correct these flaws and reorganize the central nervous system.
- From <u>Smart Moves</u> by Carla Hannaford.
    - The body plays on integral part in all our intellectual processes from our earliest moment in utero right through to old age. It is our body's senses that feed the brain environmental information with which to form an understanding of the world and from which to draw when creating new possibilities. And it is our movements that not only express knowledge and facilitate greater cognitive function; they actually grow the brain as they increase in complexity. Our entire

brain structure is intimately connected to and grown by the movement mechanisms within our body.

- In 1995, many of America's foremost brain researchers gathered in Chicago to examine the link between movement and learning. It activates major growth of neurons and nerve nets in the basal ganglion, cerebellum and corpus callosum of the brain. Coordinated series of movement, done slowly with balance produces increased neurotrophins (natural neural growth factors) and a greater number of connections among neurons and even new nerve cell growth, especially in the hippocampus and frontal lobes of the brain. US News and World Report 1995
- Movement activates the neural wiring throughout the body, making the whole body the instrument of learning. It profoundly improves not only learning, but also creativity, stress management and health. Two examples:
    - 10 year old who was brain damaged from physical abuse at 6 weeks of age. After just 5 months with Brain Gym, soccer, art, music and playing with other children she showed remarkable changes in her reading, after the year she was reading at grade level. She had been in school for five years with excellent resource teachers, but only showed this progress through movement.
    - Brandy Binder at age 6 had the entire right hemisphere of her brain removed due to severe seizures. Between the ages of 6 and 18 she spent a lot of time with brain gym consultants, in very active sensory-motor integrative play and stimulation. By age 18 she could dance, sing, ride a horse, walk and hike without a limp
- Movement and stimulation of balance greatly assist attention disorders and improve reading. Mosse, H.L. *A Complete Handbook of Children's Reading Disorders*
- Integrated Cross-lateral movement stimulates and develops the cerebellar/vestibular system. Singer, Dorothy, Journal of Perinatal Education
- Integrated movement activates the vestibular system, large areas of the motor cortex, and frontal eye field area of the frontal lobes, and produce chemicals, such as dopamine which assist enthusiastic learning and memory.
- Consistent frequent movement promotes nerve-net elaboration, growth and myelination into the rest of the frontal lobe including the pre-motor and superior pre-frontal cortex for high-level thinking and creativity as well as more grace, balance, and control of all our muscles

- In Arts Integration the teacher becomes a facilitator for the learning not the dispenser of knowledge with lectures and control.
- Children learn dance best by observing a dancer model the movement and guided practice, with the dancer and student working simultaneously. When the student sees a dancer performing the movement it gives them a "perceptual blueprint" or a standard on how it should be done.
- Movement not only engages and inspires students in learning, but also helps them gain meaning.
- Through movement, students bring the curriculum to life. Movement is an embodiment of the lesson. They discuss and physically experience their lesson.
- Students learn best by seeing, hearing, and doing for a synergetic learning experience. The children hear the lesson, see the visuals, and embody the characters for a deeper learning experience.
- The children learn from each other
- The creative process builds teamwork, spatial awareness and self esteem.

- Studies show that students with high levels of arts participation outperform "arts-poor" students by virtually every measure. (Champions for Change)
- Studies show arts participation and SAT scores co-vary - that is, they tend to increase linearly, the more arts classes, the higher the scores. **2005 College-Bound Senior: Total Group Profile Report, the College*
- In Minnesota, student's achievement in 3rd and 5th grade reading and math improved significantly through arts integration. Arts integration is associated with meaningful change in how teachers teach, change in how teachers perceive their students capacities, and significant improvements in student learning. *~from Summative Evaluation Report by the University of Minnesota's Center for Applied Research and Education*
- Movement helps the children to create new ideas and to bring these ideas to life. They also need to communicate their ideas not only through movement, but also words.
- Movement reflects the natural language of children. The children love to interpret, express and analyze ideas through movement.
- I give the children the physical and emotional space to explore their inner parts without their being told they are right or wrong. This gives them the opportunity to integrate their sense of self with the curriculum they are learning. This process heightens their self-respect and provides a deep, personal space for exploration of self and the world. (From Minds in Motion)

Interesting questions to you as you think about arts, learning and the brain:

What are questions that you would like neuroscientists to explore?

- Exactly how does muscle memory work? What is the process the brain goes through when trying to memorize while sitting or trying to memorize while creating movement?
- What changes take place in the brain when learning happens while working creatively in teams vs. alone?
- Why is movement the natural language for children?

Perhaps you have theories of what takes place in students' minds as you work with them—are there any which would be useful to test through research?

- I think the most significant accomplishment with learning through the arts is that it captures the attention of the children. All children want to work creatively-- not just the kinesthetic students. Why are the arts such a significant part of being human?

Would you want to collaborate with researchers in formulating questions?

- YES

Art in my mind...
Maria Barbosa
Visual Artist

What is happening in my brain when I am creating art?
When I am creating art, the art work is a continuation of my body, every muscle, every cell, every neuron. Thinking and feeling are in perfect synchrony. I see with my eyes closed. I start with a problem, a question, or uncomfortable sensation. At first, I am anxious and vacillate. When I touch my tools, materials, my computer key or tablet, I step into the "art space," a very private space, a protective bubble that filters out all possible distractions. Memory, logic, impulse, anxiety, curiosity, courage, intuition, sight, craftsmanship, determination, personal doubts and self-assurance all combine into sensations of wonder, frustration, and realization. During the art process my brain is:
Converting the 2-D image captured by the retina into 3-D relationships
Receiving and translating impulses received from a hierarchical arrangement of cells in the eye, into the perception of color, contrast, and brightness.
Translating information received from the eye into the perception of scale, proportion, size, distance, proximity, openness, closure, continuity, Gestalt, shape, simplicity, complexity, texture, similarities, differences, motion, contour, corners, positive and negative, etc.
Releasing and receiving neurotransmitters that affect our perceptions and mood
Accessing personal memories, archetypes, experiences, and knowledge
Using neuro-pathways to organize logical, critical thoughts and ideas
Establishing new neuro-pathways required for understanding and storing new facts and experiences

How I use my brain when creating?
When creating art, I access the many convolutions of my brain for information (personal memory, learned facts and techniques), logical and critical thought, physical responses from my the five senses, and all kinds of feelings.

What changes are occurring in my brain as a result of my artistic process?
As a result of my artistic process, different areas of my brain are active. New neuronal pathways are established. My brain stores new information, feelings, develops complex connections, and progress towards its potential.

Eileen Cave, Interrelated Elementary Art Teacher
Prince George's County Public Schools

Your work as an arts teacher and your brain:
What do you think is happening in your mind/brain when you are creating and teaching as an arts teacher?
The teaching process keeps my brain muscles exercising. When I am recalling and teaching technical art-making processes, while engaging in a creative shared process with students, I often gain new design solutions/approaches from students using standard lessons.

How do you think you use your mind/brain when creating and participating in art forms and your arts teaching?
The teaching process relies on brain efficiency-memory during guided practice, and then there is additional stimulation that comes from the interactions with students during guided practice. They say that there are 30 visual areas in the brain. I challenge myself to tie into as many of those visual areas as possible (by applying the elements and principles of art).

What changes are occurring in your mind/brain as a result of your process?
Physically the enrichment process has been shown to build or change the neuron structure of the brain, and I believe the daily teaching process, which involves constantly creating models, and demonstrating techniques is "building" my brain. I am a working visual artist, and the teaching process and use of new materials through vendors and lesson exchanges has had a positive effect on my own creative work. I am more interested in trying new and different styles, techniques, etc.

As an arts teacher working with students and their brains:
As you apply your experience and ways of thinking and creating to your work with students, what do you think is happening in their minds/brains?
During the course of a school year (at four elementary schools each receiving four rotations), I think students' brains continue to grow stronger from the creative process and their confidence in pursuing self-expression is stronger. Their recall and desire to "practice" their artful experience is most evident at the Pre-K and K grades according to classroom teachers.

What do you think are significant effects on students learning/thinking/ brain function as a result of the work in which you engage them?
Scientists have the data that shows physical brain development results from arts enrichment. What I see is the power of art to reach and positively impact all ranges of students from the basic /underachiever to the "talented and gifted." In today's classroom the greatest challenge is to provide differentiated arts instruction when you must complete a project/arts lesson in 75 minutes. Students certainly voice their desire for more artful experiences, as the positive experience becomes one that they want with greater frequency; therefore, I conclude that they have been positively stimulated.

Interesting questions to you as you think about the arts and learning and the brain:
What are questions that you would like neuroscientists to explore?

Do we have assessment tests or methodology that assess the creativity factor?

Can it be proven that a multiple combination of lessons in the arts—visual arts combined with music, or dance, etc. has a greater "brain building" effect, versus a single arts lesson?

Artists with Alzheimer's often remain able to paint, long after other memories have faded. Why? And what connection does the senior brain and arts retention have to do with the stimulation of young minds (building/stimulating art-making skills through a life cycle).

Perhaps you have theories of what takes place in students minds as you work with them—are there any which would be useful to test through research?
My belief – "*Anyone*" can be trained in the art-making creative process, if they are stimulated sufficiently to connect with all those visual learning areas in their brain. If a curriculum targets development of "all 30 of the visual areas of the brain," can scientists document the physical brain development compared to a brain deprived of those 30 VA stimuli?

Would you want to collaborate with researchers in formulating questions?
Yes

Pam Land
Director of Theatre Arts - River Hill High School
The Howard County Public School System

Your work as an arts teacher and your brain:

What do you think is happening in your mind/brain when you are creating and teaching as an arts teacher?

I have been teaching for 18 years, so I feel that at this point there is a bit of muscle memory that kicks in when I am teaching. Certain basics like classroom management--I think I use that part of my brain that is routine. That being said, I teach some units that I have been teaching for years, but never the same way because each new group of students is a new set of stimuli that affects both the delivery and the outcome. I think in the creating of a lesson and the teaching of the lesson there is a back and forth between both sides of the brain. But--eventually in a well planned, creative lesson -- there is a flow that begins to happen--but because everything that I teach has an interactive/performance based component--my impulses are fed by the X factor--the X factor being what the students bring to the process.

How do you think you use your mind/brain when creating and participating in art forms and your arts teaching?

Theatre is an all-encompassing art form. We talk about "the page to the stage". We begin with the script (the text)--we begin with reading and analysis--from this analysis comes the interpretation. We discuss how we see the play interpreted--how the set looks, how the costumes look, the props--etc. Then we talk about how the characters behave and respond to the set, the costume, the props and each other and the situations in which they are placed. With students much of how they respond best is to begin with the physical/visceral approach to things. From this movement comes the emotions/feelings that might be attached. So--how do I see my brain working--fully--in Theatre--collaboration is key--listening and responding and extending and building on the ideas of yourself as well as others--this is for everyone in the process from the designer to the director to the actor.

What changes are occurring in your mind/brain as a result of your process?

The big change that happens for me is that in Theatre we start by *doing* and the goal in the end is *being*---so, ideally the change happens from reacting and responding and "existing" (can't think of a better word) from moment to moment. Not sure how to equate this to brain function.

As an arts teacher working with students and their brains:

As you apply your experience and ways of thinking and creating to your work with students, what do you think is happening in their minds/brains?

I think all students begin with a desire to succeed and please. The tricky thing in Theatre is that there is no right or wrong. There is interpretation, reaction, and interaction. Many students are baffled when they are asked to experiment or to risk--they are very used to that part of the brain that uses checklists and rubrics. Having said this, once they understand that the freer they are and the less judgment they allow into the process--they seem to relax and embrace the flow that comes from collaboration and creativity.

What do you think are significant effects on students learning/thinking/ brain function as a

result of the work in which you engage them?

I think the biggest effect on students' brain function is knowing that they can think outside the box because there is no box to begin with. Theatre (like all Art) is about solving problems in a creative way--but my way isn't necessarily you way and vice versa. Once this light goes on for students---they grow leaps and bounds. Very often, this causes an energy increase that translates into a work ethic and can affect other areas of study. For example--analysis of a period play can enhance their work in History class.

<u>Interesting questions to you as you think about the arts and learning and the brain:</u>

What are questions that you would like neuroscientists to explore?
What is the connection between physical movement and emotion?
How does the way the brain is used affect movement and emotion?
How is the brain used when one is "playing" a character? Are there changes?

Perhaps you have theories of what takes place in students' minds as you work with them—are there any which would be useful to test through research?

Would you want to collaborate with researchers in formulating questions?
Yes

Responses developed from Theatre Arts Teachers' discussion during a Professional Development Day
Howard County Public School System

Your work as an arts teacher and your brain:

What do you think is happening in your mind/brain when you are creating and teaching as an arts teacher?
Many things - multiple intelligences
From multiple perspectives: director, actor, and teacher
Connecting theatre to other subjects and disciplines like history, English, Math (for design purposes)
Stagecraft if skills based, but coupled with design elements
Training for Musical Theatre is divergent
Assessment must be divergent as well--tests, reflections, performances

How do you think you use your mind/brain when creating and participating in art forms and your arts teaching?
We always connect to prior knowledge
We plan in chronological order; i.e. rehearsal schedules, production schedules
For acting--eventually the analytical shuts down and the goal is to do and be in the moment-seeking a natural responsive place
We use the "magic if"--the what-ifs to connect to characters and make discoveries about the set and props, etc.
We seek 3 dimensional characters--going from the page to the stage--we work to create a full life for characters and stories

What changes are occurring in your mind/brain as a result of your process?

As an arts teacher working with students and their brains:

As you apply your experience and ways of thinking and creating to your work with students, what do you think is happening in their minds/brains?

What do think are significant effects on students' learning/thinking/ brain function as a result of the work in which you engage them?

The effects on student brain functions as they work in theatre arts are that students engage in all the multiple intelligences. Theatre nurtures students' empathy and compassion for others. Additionally, they are using both sides of the brain. They use the creative side as well as the mathematical/problem solving side. Respectively, they create a character and problem solving skill when they design sets or light plots or props or costumes. Actors also need big time memorizations skills---using this part of the brain.

Interesting questions to you as you think about the arts and learning and the brain:

What are questions that you would like neuroscientists to explore?

What parts of the brain are used in script analysis for actors, designers, and directors?

What happens in the brain form the idea to the text, then from the text to the stage, then how

does the audience's reception of the final product affect those who are responsible for the performance?

Perhaps you have theories of what takes place in students' minds as you work with them—are there any which would be useful to test through research?

Is technology changing the way the audience reacts to theatre?
Does that affect students' desire to see a show? Or perform in a show?

Does the brain behave differently while sitting in a theatre with other audience members as opposed to watching a movie or videotape alone?

How does the brain of the actor work differently (or does it) when the actor is rehearsing or performing with just the cast and director than it does when an audience is present?

Would you want to collaborate with researchers in formulating questions?

Michelle McDonald, Dance Education Instructional Specialist
Prince George's County Public Schools

Your work as an arts teacher and your brain:

What do you think is happening in your mind/brain when you are creating and teaching as an arts teacher? What I think happens in your mind/brain when you are creating and teaching in dance is that the mind/brain continues in the development and growth process.

How do you think you use your mind/brain when creating and participating in art forms and your arts teaching? I believe the mind/brain functions like a file cabinet and a food processor. The file cabinet serves as a storage place whereby you take all your life and dance experiences and compile them into groups or categories. The food processor sometimes has to chop, slice, puree, knead or juice that information in order to provide proper delivery to the students.

What changes are occurring in your mind/brain as a result of your process?
The changes that occur in your mind/brain as a result of your process are evolutionary.
As a dancer and as a dance instructor you are looking at the complete person. The physical, mental, and the emotional aspects of the human being, which are all, initiated from the mind/brain.

As an arts teacher working with students and their brains:

As you apply your experience and ways of thinking and creating to your work with students, what do you think is happening in their minds/brains?
The students are trying to process what you have given them verbally, emotionally and physically in their own minds. How do I take what the dance teacher has given me and apply it to my person? What is interesting is during the process the students are not all interpreting it in the same way.

What do think are significant effects on students' learning/thinking/ brain function as a result of the work in which you engage them?
What is a significant effect is that the students are able to relate their arts experience to life experiences and vice versa.

Interesting questions to you as you think about the arts and learning and the brain:

What are questions that you would like neuroscientists to explore?
Why is it that some are able to master the physical, emotional, and mental aspects of dance?
What is the difference between a person who dances and a dancer?

Perhaps you have theories of what takes place in students' minds as you work with them—are there any which would be useful to test through research? The arts help to develop the complete person.

Would you want to collaborate with researchers in formulating questions?
Yes, if time and schedule permits.

Dr. Richard L. Roberts
Music Teacher, Howard County Public School System

One of the bright spots in educational thinking of the twentieth-century must be ascribed to Howard Gardner whose book *Frames of Mind: The theory of multiple intelligences* is a ground-breaking work. Gardner posits his thesis in the introduction:

> In the heyday of the psychometric and behaviorist eras, it was generally believed that intelligence was a single entity that was inherited; and that human beings - initially a blank slate - could be trained to learn anything, provided that it was presented in an appropriate way. Nowadays an increasing number of researchers believe precisely the opposite; that there exists a multitude of intelligences, quite independent of each other; that each intelligence has its own strengths and constraints; that the mind is far from unencumbered at birth; and that it is unexpectedly difficult to teach things that go against early 'naive' theories of that challenge the natural lines of force within an intelligence and its matching domains. (Gardner 1993: xxiii)

Much has been done in the field of education to try to bring Gardner's theories to practice. However, it is with some trepidation that we do so for, upon further study and integration, it seems that, although the concept of multiple intelligence is a strong model for brain function, the notion that these intelligences are independent of each other and the notion that teaching practices which might "go against" what he considers to be the "natural lines" and specific domains of ones' intelligence (and are therefore ineffective with some learners) seems less plausible. In fact, Gardner himself viewed the final two intelligences (inter- and intra-personal intelligences) as working interdependently with the other five. That being said, it would seem more likely that <u>all</u> of these intelligences work together to form the whole being, intellectually speaking.

Gardner's definition of intelligence is 'the capacity to solve problems or to fashion products that are valued in one or more cultural setting' (Gardner & Hatch, 1989). We view education as a series of tasks that are introduced, practiced, and performed until mastered. The goal of education, therefore, in a Gardner-based setting, is to provide tasks or learning opportunities that resonate with an identified intelligence in a way that promotes problem solving and creativity. View, if you will, each one of these intelligences as a pillar. In Gardner's theory, each of these pillars is at a different level. In the accepted (and in our view short-sighted) educational application of this theory, the teacher works to find and utilize the path to cognitive development by focusing on that portion of the intelligence makeup that is strongest in the learner. However, we think that by working on strengthening <u>all</u> of the pillars, one can increase the overall ability of the learner to solve problems and create solutions in all settings, thereby increasing overall intelligence. By focusing on only one or two of those pillars, the mind is unbalanced. We've all seen it, the talented athlete who has difficulty communicating effectively, the nerdy computer geek with the same problem!

Now imagine those pillars in a ring, each touching the other. In our model of a more interdependent overall intelligence, these intelligences work together to solve or create. One cannot paint without the kinesthetic OR the mathematical OR the intra-personal. One cannot reproduce music without the same. We would also suggest, in this model, that the solution of mathematical equations is dependent upon musical or artistic intelligence. When the learner has a solid understanding in each of these areas, the resulting overall intelligence soars. Without a "building up" of intelligence in all areas we are limited. Though the learner might

achieve greatness in a single domain because of determination and hard work, to develop a greater overall intelligence, we suggest that each of these pillars needs to be strengthened.

This abstract model of the pillars of intelligence in a ring also allows us to incorporate what we consider to be another integral part of the intelligence puzzle: concentration. Concentration is the fluid in the midst of those pillars that connects them together. So, even though we don't consider concentration to be "intelligence" in the way that Gardner has codified his intelligences, it's an indispensable part of the learning process. We can certainly provide anecdotal evidence about what happens when concentration is lost. As musicians we see this all the time: the student loses an understanding of the sense of rhythm (the mathematical), loses concentration, and stops playing. The student loses sense of how their part fits into the whole (inter-personal), loses concentration, and stops playing. The student plays a wrong note because they missed the key signature (linguistic) or because they put the wrong fingering down (kinesthetic), loses concentration, and stops playing. The student loses the sense of where the musical line is (musical), loses concentration, and stops playing. It's as if the level of concentration is directly tied to the level of proficiency in each one of those areas of intelligence. In our abstract model, the size of one pillar is reduced and the result is that the concentration fluid comes spilling out through the space in the ring created by that deficiency, resulting in failure.

Interestingly enough, when the level of concentration fluid is sufficiently high because of proficiency in all domains, the outcome is a transcendent state of doing. All of the task-mastery and individual skills that the learner exhibits in a specific domain are eliminated and we are left with something truly remarkable: an aesthetic experience. All of the intelligences work interdependently with each other through this concentrated transcendent state to create something beautiful: a painting, a correctly-balanced equation, a musical phrase, a perfectly-placed tennis shot, an idea. In the arts this is a concept that is not just pleasant serendipity, it's an absolutely essential outcome. We, as artists, are involved in providing, attending to, and creating aesthetic experiences all the time. The aesthetic experience is one that connects invisible, internal, and hidden objects within the individual and can connect individuals with each other through a common appreciation of those elements. Our understanding of the emotional connection between things that on the surface seem disparate is what makes us artists. Therefore, if an aesthetic experience is the result from the highest level of interplay between intelligences, then perhaps a learning theory based upon providing aesthetic experiences in every domain might provide the answer to more efficient teaching and learning.

Notes from conversations with individuals
Visual Artist

Synesthesia—a neurological condition where one sees colors when hearing music. Crossing of neurological pathways—is an example of the interface of the brain with the arts

For children or for artists working with clay:
Same process-- hands and eyes touch the material and manipulate it
Brain trying to make sense of it-tries to name it, to identify it
Symbiotic the more one handles it the more the brain tries to identify what it is and give meaning.

That is a cognitive intellectual process—you don't shove the clay in through your ear to get it to your brain!!

Working with class of 12 --3 year olds—told a story about clay (the rocks rolling down the mountain breaking and getting washed into fine bits and making clay to be dug out of the river). Told them they could pinch it and poke it -- whatever they wanted— provided a few tools like chopsticks and plastic forks. Didn't tell them what to do or that it should represent anything or ask them what it was. The children initiated the "what it is" themselves. They named their clay piece—a man, a rug, my dog, a leaf, a garden ….

One drew lines in the clay with a chopstick and then named each a family member.

6 year olds construe their work as a gift—"I want to give this piece to my mother…"

In my own work—functional pottery—there is a connection between jazz improvisation and varying a serious of pots.

Once one attains mastery of a material then comes freedom -- not struggling with material and trying to force a concept into it.

Educator #1:

Important not to underestimate students' capacities in the arts—even when very young they are engaging in the arts as symbol systems. E.g. 3rd and 4th graders suggestibility is high. And their capacity to navigate in the arts is greater than adults may think. Given multiple prompts in composing lines of poetry they can deliver.

Teachers need training in children's brain development to understand that students' capabilities in learning in the arts change rapidly as they develop.

For example, 3rd-4th and 5th graders are uninhibited by social consciousness and critique each other's work quite freely—that changes.

When evaluating learning—do you evaluate only whether what was intended as the focus of the lesson was accomplished or do you look more broadly-holistically—ask what happened?

Educator #2:

Students access large quantities of information from multiple sources utilizing the internet and other means; which is like artists gathering disparate input. The synthesis of all of the information requires deep concentration akin to the flow state that artists describe.

Artist
We already know enough to guide policy—not the absolute truth a researcher might want--iron clad causality–but pragmatically-- based on existing research --can make a case for the arts as better than kill and drill…that is assuming you like children and want them to enjoy their years in school. Perhaps it's a strategy issue.

Reflections from multiple conversations:

Research – look at confirming and better describing ways the arts support development of multiple capacities (e.g. developing 21st Century Skills and Knowledge).

Metaphors for understanding teaching and learning—kids as blank slates vs. coming equipped with hardware and some software which can be effectively catalyzed/engaged/put in gear through the arts. How much can teachers pull out that is latent capacity in students?

Arts validate experience as students use arts to create meaning out of their experience.

We often focus on how arts provide students with multiple avenues to demonstrate learning and to express themselves, affording students who may be challenged in traditional academic languages verbal and numeric a chance to succeed. Concomitant is the opportunity to master new challenges through the arts—including for students who enjoy mastery of verbal and/or numeric literacy.

RESEARCH IMPACT OF ARTS INTEGRATION APPROACH ON TEACHERS AND TEACHING!! From meeting with artist teachers

Learning as constructing meaning—have to care about whatever the meaning is being constructed around…arts are good at getting you to care.

On disabling defaults…in many ways education is a default setting practice. This can be valuable as it facilitates organizing and retaining information. On the other hand it can be a barrier to looking at information and manipulating ideas in fresh ways.

Math and visual art—explore relationship of students' capacity to visualize (enhanced through visual arts training) and understanding math. What can math teachers do to take advantage of visual learners' capacities?

Specifically looking at the capacity to visualize in relationship to creativity, are there ways to enhance student creativity though building their visualization skills?

A further digression-we say we know things in our "gut"…not really but certainly a different part of the brain than the one(s) where consciousness is verbal and linear. Where does intuition live inside our brains? And what about the heart as the seat of feelings and muscle memory?

Do thoughts have to be sentences to count with Chomsky? Or just words. Strings of. Or single words. Or just punctuation!!!

Really interesting to learn that artists across disciplines are often inspired by visual images—non-verbal leaping off points for creative process even for poets who then find the words to describe.

Creative process can leap off and obsessively rework a stream of connected ideas…and then there is the grunt work phase---which in turn can become background physical activity for thinking and imagining just like running//shower//driving//listening to music.

Dark light vs. right left—seeking metaphor for phases/sides of creating…

Busy fingers—cf. Recent report about better concentration when doodling--people seem to need to use their hands.

Arts build the effectiveness of teachers—give them tools for communicating and drawing from students.

Cultural evidence that we are hardwired for the arts—generally seems to be confirmation--different pathways for different arts activities.

Consider whether engagement in the arts supports more supportive parent/child relationships.

A few concluding thoughts:

Hopefully this collection provides an array of perspectives on how the minds of artists, teachers and students are engaged when they are involved in the arts.

Threaded through are many ideas for researchers—neuroscientists, education researchers and classroom teachers involved in their own enquiry. There is clearly support from the arts education field for research that helps understanding of how students learn through greater depth of knowledge about brain function. Further, there is a sense of the importance of definitions of mind/brain function as encompassing emotional, sensory and kinesthetic aspects of being.

A number of opportunities emerge as particularly useful and/or promising to me.

One is the exploration of the relationship of the arts to the acquisition of skills in creativity—this is fascinating for arts educators and is also of keen interest in the context of the 21st Century skills and knowledge identified as priorities by many leaders in education and public policy. Further the public support for fostering the imagination through education is powerfully revealed in the Celinda Lake polling data collected last year (www.theimaginenation.net).

Other 21st Century skills such as communication, collaboration and critical thinking and problem solving are closely connected to arts learning and like creativity merit focus to make those connections transparent and to inform instructional practice.

Throughout the discussions, particularly with the artist/teachers trained in arts integration, I was struck by the degree to which teachers are transformed by training in how to use the arts in their teaching. Not only do they talk about being creative in their teaching, it is evident that they see their students differently in profound ways. It seems that there would be considerable value in research about teachers and these transformations that they describe. Concomitant with that inquiry should be analysis of the effect any transformation in teaching produces on students. There are interesting questions about the impact of arts integration on student engagement, motivation, memory, capacity to make connections across disciplinary lines, and to comprehend texts.

Another area that seems particularly compelling for Maryland is in the area of special needs students. The presence of Kennedy Krieger, the Lab School and the strengths in the field of neuroscience here would suggest that important work could be done in that area.

A final reflection: watching an artist – whether a teacher or a student -- at work, an observer may see a process that appears fluid and natural, and may thus assume that it is easy and only intuitive, without grasping how complex it really is and how deeply interwoven it is with all that makes us human. Research that reveals that complexity and its value would be a great contribution to all.

Finally, I have been overwhelmed by the enthusiasm and willingness to participate of the arts educators that I have approached during this process. They are eager to be part of the conversation being initiated at this Summit. They would be delighted to partner with researchers and to learn more about how they can be even more creative and effective in serving their students.

Appendix

Reflections on visual arts and the brain:

While drawing responses from arts educators on their perceptions about their art form, students' brain function and potentially interesting questions for researchers, I began keeping a journal of reflections on how my mind works when I am making visual art. I have been concerned that there is very little research on the visual arts and learning. While I am not sure that anything can be generalized from my personal experience, I offer it in case it stimulates some ideas.

Creating art integrates the sensory, physical, intellectual and emotional. As a visual artist, I experience mental activity that is non-verbal and non linear. It is not governed by syntax nor organized grammatically. Ideas in the course of my work in the studio are articulated and refined visually using processes of drawing and model making using the media that come to hand. The evolution of the idea is intertwined with the physical manipulation of materials and my perception of the results. It is an intellectual process leavened with emotions and, as I am a sculptor, impacted by the laws of physics-especially gravity -and the properties of materials and my motor capacities.

Actually, for a sculptor to say "visual thinking" to describe their thought process limits understanding of what happens. As a sculptor, physicality and multi-sensory qualities are parts of having ideas. Emotions are very important as well—a feeling emerges into a form.

Talking or writing about non-verbal thinking is something that visual artists do –sometimes reluctantly as we believe the work "speaks" for itself. When I talk about visual thinking in connection with my work— visualizing an image or form for example-- wrapping words around it as description is a separate process from having the initial idea.

Certain schools of philosophy posit that all thoughts are by definition verbal. A thought to them is a verbal construct -- a series of words; it is linear and syntactic. The tree perceived falling in the forest doesn't exist as thought save in a sentence.

As a visual artist my process is not only non-verbal; it is also non-linear. It involves intuitive leaps on the one hand and, on the other, pursuing multiple strands simultaneously—rubbing them against each other. After the fact I can construct a verbal and thus linear description but the conceptualization is non-verbal. If I have ever described an idea verbally and then drawn it, it is almost invariably unoriginal and less than satisfying. I resist talking about my ideas even to myself before I have an opportunity to explore them by manipulating media. Ideas must be tested before being translated into words.

Unlike using words, the ongoing visual/physical ideation is "all over", in all directions simultaneously. While executing the steps in constructing a model may be in a particular sequence, the analysis and response is continually "all over." And any planned sequence is subject to continual editing and adaptation.

I have found it rare that an idea that appears full-blown and complete initially is either unique or particularly good; it is usually based on a memory, something that I have seen. The process of finding the bit of it that is really appealing and rubbing that against other bits from other thoughts is an important part of my creative process. Putting together disparate ideas, which have some resonance is a way of finding meaning. As a visual artist, these ideas may

be shapes or allusions to shapes. Sometimes the edge of a curve may evoke images and feelings. I understand this as the brain seeking to recognize shapes and forms and relate them to images in memory and attendant experiences and emotions. I think that this is a profoundly important mental process and is the basis for metaphor.

I was drawn to being an artist –specifically a sculptor because I felt that it drew upon all my capacities—intellectual, physical, emotional, empathetic, esthetic, and spiritual. I believe that being an artist entails an exploitation of one's capacities. And what is particularly satisfying is the extent to which they are synthesized. For example, one internalizes phenomena in the physical world either through movement or the sense of outside forces such as gravity or centrifugal force acting on our physical bodies in some ways. Then in creating a sculpture, if I want to capture and convey a particular feeling of energy I draw on the relationship of the physical sense whether of one's own sense of muscle flexing or contracting or the sweeping angle of a sailboat heeling before wind. As an artist I try to hone in on and heighten what it is to be alive, sensate -- a physical as well as mental state. Images are likewise grist to evoke particular feelings and/or serve as metaphors. Inherent is the leap of faith that what I draw from and where it takes me has some resonance with the experience of others. At the same time the concreteness of sculpture very literally grounds me. When a work is successful it is because all of its aspects are of a piece.

In the work in the studio, if I am drawing for example, I consciously seek a less self-conscious state. Ironically, in facing the blank canvas I will start by lowering my expectations to be less daunted and so start by "playing". The first lines will be familiar—comfortable ones…muscle memory and comfortable images that are from my "vocabulary" are starting points. Then the work evolves as a "dialogue with a canvas"—I respond to marks, but also, trick myself into making marks that are unfamiliar—so that as many possibilities present themselves…per Emily Dickinson to "dwell in possibility"…

Ideas can be obsessions that need to be exorcised—gotten out of my system!!

In thinking about what drives me or other people to make art -- it seems more than a consequence of acquired layers of culture. Surely considering the consistency of art making across time and continents would support that art is primal. If one applies an evolutionary perspective it leads to questions of the function of art. Is there an evolutionary value to beauty or to the process of making art?

What is the functionality of art? Of art making? Humans seem devoted to functional activities…they like to use tools and they like to acquire. Art making involves utility and materialism—in my studio I surround myself with all kinds of materials and stuff. Also, I surround myself with images and odd bits of visual notation – never sure how something might be seized upon in the process of art making.

The experience is highly sensual—desire and appetite for shapes or a particular color. The sense of wanting an earthy yellow streak doesn't come through verbal analysis – it is a compulsion that leads me to reach for that spot of pigment.

In thinking about what one aspires to in art making: connection to others--it matters that forms and images are meaningful, exciting, stimulating first to oneself and then to others….I wonder how much of the qualitative lens is from our specific culture and moment in history and how much is primal, from a deeper place in being a human. From an esthetic standpoint—it

seems important that art is visually satisfying and beyond that has some magic (artist as shaman). Newness is important—uniqueness. Is it rooted in human acquisitiveness?

There are days I want to simplify down to the barest minimum—finding the most essential exquisite form that I can – other days that is akin to peeling the onion (Peer Gynt) and I want to layer and construct something much more complex.

Metaphors seem to be built into how our brains work. Metaphor and evolution---how we see and remember the tree that looks like a galloping horse's head which is a landmark---what is the distance between useful function of eye and brain and an image becoming a symbol in a more abstract way. And through abstraction— one moves to more general and universal metaphors. Art in its use of metaphor is fundamental to our species.

Drawing combines observation with manual coordination. Practicing develops muscle memory along with visual acuity – a key aspect of translation is rescaling to preserve proportions. Drawing involves a feedback loop in constantly looking at the subject, drawing, and looking at the line and making judgments about it. While it may seem to be quite mechanical there is a highly expressive aspect—the feel of a line. The feeling may be part of a deliberate intention of the artist to describe a subject—as in a portrait to capture the sitter's personality. It may be a function of what an artist wishes to transmit directly as feeling—so it can be related or unrelated to recognizable imagery. And it happens whether willful or not. Often an artist's own portrait is a presence in their portrait of someone else. This happens even when the likeness of the sitter seems very precise. I suspect it has to do with having internalized our own features and that our personalities affect our breathing, heartbeat and the sweep of our arm holding a brush…. I have been struck at very young children's self-portraits really capturing their physical essence even though they are untrained in drawing techniques and unpracticed. Practicing is important, through the act of practicing we develop muscle memory for how to limn a limb or an eye. At the same time, to the extent that drawing is an extension of gesture, it captures the artist's emotional state even without that intent.

An artist will sometimes want to break through the remembered gestures, the lines that habitually flow, and force themselves to find new lines with different expressive qualities. We find ways to do that whether by deliberately seeking awkward modes of drawing or ways of looking. Discovery can come from looking at a drawing or sculpture upside down, in a mirror, from on top of a ladder. Part of this is knowing that, in addition to the habits of our hands, there are habits of our brains, ways that we conflate images and see them with sets of assumptions. So as an artist you want a fresh way to see what you are doing. Sometimes another person who articulates what their new eyes see can be useful. Going away from the work and coming back later can disable default postures of our seeing (eyes and brain). Self-awareness about seeing and feeling is a vital tool for the artist.

Linear versus many things happening at once (perception response decision): What is really happening as I watch my hand reaching with the brush for the red paint and making a particular stroke on a painting? I just know that it is going to help me move the work along. Why does a particular curve snap into place for me as I file the edge of a form? It feels intuitive. Obsessively I may return and test it but it surprises me how often that moment of rightness proves sustainable. There is a state of mind where creating seems to work best, to flow…Self-awareness versus self-consciousness is an important distinction– one is flowing; the other makes one acutely awkward and impedes clean functioning. I try to manipulate myself to take advantage of, to exploit my emotions/state of mind.

Being non-linear—encouraging my mind to jump around and rub things together in new ways applies to more than making art— helps with other facets of life. Free association/brain storming are descriptions that have a basis in what we do…trying to get beyond of pre-conceived ideas – disabling the defaults….

In thinking about the expressive and esthetic appeal of work, it is an article of faith that what I experience during the process of creating the work even as that experience shapes and drives the process and the work, is shared and resonates with viewers –some if not all. In sculpture the physicality is related to our experience of the real world. So balance of a work is connected to our experience of gravity from the moment of birth on if not in utero. Our sense of physical properties of materials and forces is intuitive and profoundly embedded in our bodies. I had the experience of designing a sculpture with great arcs suspended in space that was inspired in part by seeing suspension bridges—the Verrazano Narrows Bridge in particular. When conferring with the engineers on the project they asked if the five arcs in the work were catenary curves. I explained that while the catenary curves of suspension bridges were the inspiration I had drawn the curves freehand and then made them symmetrical before cutting them for the model. The engineer left the room and came back with a light chain, which he proceeded to hold up next to each of the five arcs. Each arc followed almost precisely the catenary curves formed by the chain when suspended from their end points. This in spite of the fact that the arcs in the model varied considerably in terms of how deep or shallow they were. I was myself surprised that I had clearly internalized the forms of the catenary curves so deeply.

In this work as with others, I started the design process with drawing. While much of my process is developing models through cutting and forming sheet materials, I start with drawing. Even when working in three dimensions; it is the line, the cut edge that determines much of the form and the way shapes come together to create three-dimensional forms. No matter the instrument, the edge that I carve, whether a line on paper or a cut by a torch in metal is carving across a plane bending in space. How the line/edge of a form is controlled determines a great deal about a form and how it is read as emerging from the space around it.

Clouds:

I was struck one day by the visual effects of clouds moving rapidly across the sky. What was unusual this particular day was that the high clouds, which were stretched out were moving in the opposite direction from the lower level clouds, which were more cumulous and slower but still clearly moving. The dynamic of the constantly shifting composition was striking to me.

Subsequently in the studio, I wanted to do something with what I had seen and felt—not to reproduce it, I would have used a camera for that -- but rather to respond and use the effect of the experience on me. I chose paper and drawing implements and through layering linear and elements and areas of color and then working with collage to create more layers I got at what I was after. I had worked with the technique before but the clouds gave me an intensely felt way to realize the potential of the technique--layers with different directions of motion to create dynamism. I also was able to pursue another idea beyond that– randomness. When working in collage there is a great deal of decision-making about composition – the arranging of everything…when it goes well things “snap” when I put them in the right place, they feel right – but what was wonderful in looking at the clouds was the randomness and the freedom…so by being much more casual—literally tossing things around I forced myself out of the carefully learned ways of constructing pleasing compositions…the pieces wound up being quite satisfying.

Satisfying—what makes art pleasing? Esthetics are important but there is also the delight in seeing the new—the "aha" moment--perhaps that is a pleasure for the human species because as our brains developed, those who had the capacity to make new connections were evolutionarily advantaged. Why do we crave novelty?

Visual arts and optimizing decision-making:

In creating art one makes thousands of decisions all of which are about maximizing the intent of the work. The decisions are simultaneously about intention, meaning, materials, process, expression, emotion, sensation, memory, narrative, imagery, responses to the artist's train of thought, personal life/development, consideration of the ultimate audience, design and esthetic and formal considerations of scale, balance, use of color, line, shape/form. If the work is intended for a particular site or purpose, there are decisions about the relationship of the work to site, audience, function of the site, safety and maintenance, transportation, installation, and budget.

The artist is juggling the trade-offs: "If I change this aspect, it will look better from these angles but it may sacrifice something from yet another angle." "If I use pink here, that changes this other color relationship." Much of the decision-making happens intuitively and fluidly in the course of the work. Stages of the artist's process may be a discovery process -- experimental, trial and error, testing, discarding, refining and so on. Some stages of the process involve research in the sense of gathering ideas and information, organizing and sequencing ideas and physical processes in order to realize a result. Some stages evolve into very conscious problem solving—at that point other languages—math or verbal may come into play.

To what extent do these ways of experimenting, optimizing, and organizing build life skills that are useful in other endeavors?

Mary Ann Mears