

The New Perception: Hypermediating Interdisciplinary Cultures Through Aesthetic Education

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Abstract

The Arts and Sciences have long shared an interest in studying the world and representing an understanding of that world through their respective language and methods. Scientists use numbers and equations to prove theories and artists use paint, color, shapes and patterns to create visual representations/interpretations of the world.

However, the electronic age has challenged the way in which we define both the substance and process of our world. C. P. Snow advocates a new perception to bridge the gap between the specialized world of science (quantum theory) and the abstract world of the arts (Dada and Cubism). Aesthetic Education facilitates perception by the close study of a work of art that is opened to the viewer by participating in activities, reflection and discussion that develop the language of the art form. The new perception that C. P. Snow advocated in 1959 must embrace the latest technologies that require a new literacy that is based on hypermedia. Hypermedia is a linking apparatus that is embedded in technologies such as e-mail, electronic databases, virtual reality games, word processors, spreadsheets and numerous electronic technologies that involves a conductive method of association that leads us into the Twenty-first Century.

INTRODUCTION

In his book The Two Cultures: And a Second Look, C. P. Snow considers how intellectual life in 1959-65, seen through the eyes of Western culture, was divided into two polar groups. Snow calls attention to a serious problem he found within the arts and sciences that is most apparent between “literary intellectuals” and “scientists” who find each other’s work incomprehensible. Poets could not converse with mathematicians. Writers could not communicate with physicists. What made matters worse for Snow is that even within the field of science he found that the scientists who engaged in “pure” research had little ability or interest in communicating with the “applied” scientists. As a result of this divide Snow makes a plea to educators to develop in their students a “new perception” that opens “imaginative exploration”¹ building a bridge between this communication gap

Snow characterizes the seriousness of this gap by highlighting a rift among scientists between “pure” and “applied” science. Snow contends, “This complex dialectic between pure and applied science is one of the deepest problems in scientific history.”² While the status of “pure” research (Snow confesses this was once his own opinion) has changed little in higher education institutions as is evidenced in the course selection of many university Arts and Science schools that have little or nothing to do with the applied studies.

1 Snow, C. P., *The Two Cultures: And a Second Look*. Cambridge University Press. 1993. p. 99

2 Snow, C. P., *The Two Cultures and A Second Look*. Cambridge University Press. 1993. p. 64

However, at the time of Snow's writing there were simultaneous collaborations and interdisciplinary practices that bridged the gap. Many of these creative exceptions involved artists and scientists who utilized new perceptions that embraced interdisciplinary practices, philosophical reflection and new hybrid practices brought about through the awareness of the electronic age and its language. To elucidate this shift it is necessary to philosophically and practically explore some of the basic elements and practices that the arts and sciences share. The first task will be to suggest that the *substance* of the arts and sciences had a shared interest in the *things* of the world. Also the *method* of the arts and sciences share similar basic principles that may include observation, identification, description, experimental investigation, and theoretical explanation. This task will raise questions about interdisciplinary practices in pursuit of knowledge. *How does one's own intelligence accommodate various knowledge domains?*

At the turn of the twentieth century all this begins to change as a result of the electronic age. The very nature of the world finds limits on knowledge that challenge the history of science and the arts. The argument concludes with the suggestion that there is an interplay of the senses and reason that opens our understanding of knowledge towards a more lasting wisdom.

1. PHILOSOPHY OF SUBSTANCE: COMMON GROUND

The Substance of Art and Science

It is possible to say that the language of science and art have both evolved in ways that have become too complex for anyone to understand who has not had special training. Quantum mechanics and Dada have challenged the minds of the best thinkers. But educators find a way to unfold the complexity of the woven layers by sequencing lessons from simple to complex. So our exploration begins. *What is the language of the Arts and Sciences? What is the medium of art and science? What kind of knowledge does the language of the arts and sciences reveal?*

From the earliest times in Greek science there is a great distrust in gaining knowledge from the senses because substances or the objects of the world are always changing, there is no stability to judge their true nature. Therefore knowledge may only be grasped through the logic

and reason that yields ideas. For Aristotle the world of the mind and ideas was the only way to access truth by studying the unchangeable substances of our world.

In Aristotle's Categories he implies that *substance* is that which has an independent existence.³ The substances that make up the world, according to Aristotle,⁴ have a number of *characteristics* that can be tangibly described: *substance, quality, quantity, relation, place, time, position, state, action, and affection*. These characteristics can reveal the nature of a substance.

In aesthetic education these characteristics are what teachers should address their questions to, in order to encourage grounded observations while viewing and talking about the arts. In regards to the arts, Plato criticized representational art for deceiving the eye through illusion. According to Plato the only true knowledge is that which is gained by intelligible reason. (eg. a carpenter was more creative than an artist because the carpenter would create his own unique example of a bed from the *Form* or idea of *bedness*). The visual artist who paints a representation of life was not thought to have created anything; the artist merely copied nature.

Many philosophers from Aristotle to Heidegger have traditionally only been concerned with *ideas*, and the *substance* of the world only introduces variables of change that cannot undergo the test of reason. Since antiquity it was *reason* that was considered to be the method of a higher understanding of the world that can only be hindered by the senses.

The Arts from the time of Plato to Leonardo da Vinci change dramatically. Da Vinci⁵ was a great example of a fully integrated Arts and Science master. *What motivated da Vinci to study air, water and flight? What leads anyone to study molecules or write poetry? What causes a scientist to choose a subject of study? What causes an artist to choose oil paint rather than acrylic? What causes a scientist to study the atom and then decide to split it?* The “new perception” that we are concerned with would certainly have to consider the language of knowledge disciplines and the manner in which knowledge is attained.

³ Or the canvas when finished by the painter is still ready to receive the artists signature, but from the first stroke of the artist till the last, the canvas has not been changed by the its being painted and at the same time the canvas participates by establishing the space of the represented world.

⁴ Aristotle. *Categories*. The Classical Library. 2001. trans. E. M. Edghill. 2a13

⁵ Leonardo da Vinci studied and contributed to numerous fields: anatomy, botany, engineering, hydraulics, mathematics, mechanics, orbital mechanics, optics, physics, philosophy, physiology, philosophy and writing.

How Does Choosing a Medium Interact with the Individual Learning Styles of Scientists?

There are examples in history of creative scientists who explored similar ideas, each with different learning styles. Albert Einstein, Hendrick Lorentz and Henri Poincaré are all credited with developing the theory of relativity, not jointly, but each through his own proposition, method and creative disposition. Each of these scientists worked outside the conventional methods for gaining knowledge in the field of study by introducing a secondary *knowledge modality*.

How fortunate it was for the physicist, Albert Einstein,⁶ to be born and trained in Germany during the *Golden Age* of German mathematics. Early in his life, Einstein wrote about his love of mathematical thinking. It is interesting that he identified his imagination and practical ability lacking. However, his famous “thought experiments,”⁷ inspired by a dream he had when he was 16 years old, were based on intuition and imagination rather than laboratory work. This dream image was instrumental in helping Einstein understand the problem he had in defining the relationship between space time as being relative.

Jules Henri Poincaré⁸ was born in France and trained by his gifted mother and father, who was a professor of medicine. Poincaré was considered a mathematics genius, not because of his great memory or logic, but for his unique ability to visualize what he heard proved. Despite his poor eyesight, he was able to visualize relationships by a method of linking the ideas he was synthesizing. Poincaré’s logical-spatial understanding indicates an interdisciplinary learning style that allows for an interplay to occur between imagination and logic.

Hendrick Lorentz⁹ was born in the Netherlands and at the age of twenty-two received his Ph.D. in mathematics from the University of Leyden. Lorentz is particularly well known for his tenacious method of completing the unfinished work of his predecessors, preparing the groundwork for Einstein’s theory of relativity.

6 Einstein’s Legacy <http://archive.ncsa.uiuc.edu/NumRel/EinsteinLegacy.html>

7 Norton, John . Chasing a Beam of Light: Einstein’s Most Famous Thought Experiment. Department of History and Philosophy of Science University of Pittsburgh, http://www.pitt.edu/~jdnorton/Goodies/Chasing_the_light/index.html . Feb. 2005. June, 2007

8 Poincaré Biography <http://www-groups.dcs.st-and.ac.uk/~history/Mathematicians/Poincare.html>

9 Lorentz, Hendrick A.. “Biography”. Amsterdam: Elsevier Publishing Company. 2005. Nobelprize.org <http://www.nobelprize.org/physics/laureates/1902/lorentz-bio.html>

Among these scientists there is an interplay of medium, method and creative application that delineate ways of knowing outside the limits of the traditional method of science. Einstein considered space-time as largely a problem of physics using equations to study light. Poincaré saw the problem as topology using mathematics to study light. Lorentz considered space-time as a problem of physics, to be understood through the study of electromagnetic forces.¹⁰

The great imaginative leaps in science may require thinking outside a single knowledge modality. At the frontier of complexity the need to be able to describe a new quantum world and virtual world suggests a need to perceive with multi-knowledge modalities through collaborations between fields of knowledge.

How Does Choosing a Medium Interact with the Individual Learning Styles of Artists?

Acts of creation require some *thing* to hold the expression, be it words for thoughts, sounds for music, numbers for science, or materials for art. John Dewey in his book Art as Experience insists; “Only where *material* is employed as *media* is there expression and art.”¹¹ The artist mixes oil and pigments into paint and produces a visual image of an imagined experience. However, it is not the mechanical production of materials into expression, but the manner in which the materials are used. Dewey continues, “Everything depends upon the way in which *material* is used when it operates as *medium*.”¹² This transformation from medium to media is, in Dewey’s words, “Because objects of art are expressive, they are a language. Rather they are many languages.”¹³ The individual manner of each language shows, not necessarily in its unique content but in the combination of the feel of the medium with the act of the expression. This is not to be misunderstood as an attempt to anthropomorphize artistic materials, but rather to indicate a certain agency of the materials towards a given expressive language.

10 Stephen Hawking. *A Brief History of Time*, p. 20

11 Dewey, John. *Art as Experience*. New York: Minton, Balch, 1934. p. 63

12 *Ibid.* p. 63

13 Dewey, John. *Experience & Education*. New York: Touchstone, 1938. p. 106

Dewey suggests, “For each art has its own medium and that medium is especially fitted for one kind of communication.”¹⁴ Poetry, art, science, philosophy, music, dance and theater use media that are conducive to each unique expression. Dewey continues; “Each medium says something that cannot be uttered as well or as completely in any other tongue”¹⁵ Choosing a medium to fit the *art form* requires an understanding of the characteristics of the art material as being in a relationship with the “how” of communicating with media. Alberto Giacometti’s¹⁶ skill in using clay goes beyond representing a man or woman. It is *how* he uses clay; pinching, stretching, pressing that communicates his knowledge of the world. It is *how* he structures his body language that he communicates authority. It is in the relationship of these events that we find meaning.

Vital Interest of Medium

Dewey’s notion of the arts as an *agent* of communication suggests *medium* has a relational affect on the choice of artistic discipline. Conversely, the generation of art is impeded by dictating the choice in selecting an art medium that is not in the vital interest of the artist’s manner of working. For instance, the qualities that describe different kinds of artist paints (oil, pigments, egg tempera, gauche, acrylic) might seem a choice of mere appearance but because material becomes media (language) it is formed with a touch that *marks* or *records* an artistic thought-gesture which links a certain physicality with a certain conceptuality. It is not a cliché to suggest that each artist must find his or her own medium because in our global world it is necessary to communicate in multiple mediums and in divergent languages.¹⁷

Art lessons for young students in school are often restricted to a choice of medium and led by instructions that frame or determine a project outcome. Dewey points out another important relational characteristic of art material,

14 Ibid. p.106

15 Ibid. p.106

16 Plate 1 Alberto Giacometti. Detail. Three Men Walking II. 1949 Bronze. Metropolitan Museum of Art. (photograph - John Toth

17 Dewey, John. Experience & Education. New York: Touchstone, 1938. p. 63

“Whatever narrows the boundaries of the material fit to be used in art hems in also the artistic sincerity of the individual artist. It does not give fair play and outlet to his vital interest. It forces his perception into channels previously worn into ruts and clips the wings of his imagination.”¹⁸

Literally taken, “vital interest” *implies the life between the becoming or a claim to life*. For Dewey the “vital interest” of the medium suggests that the *materials have something that matters on behalf of life*. This does not necessarily mean that materials need to be sophisticated, but that they fit the message. Dewey continues, “the universality of the art is so far away from denial of the principle of selection by means of *vital interest* that it depends upon interest.”¹⁹ In the arts, the choice of the medium itself is embedded in the vital interest of the artist’s communication.

Snow’s Second Look

These commonalities and differences that make up the language of the Arts and Sciences imply a relationship between the artist and scientist, the medium and the substance and the *how* of the generated expression and proposition. What Snow does in writing The Two Cultures: And a Second Look is introduce reflection and self-critique to his own creative process as a writer. What reflection and critique contribute to knowledge requires a philosophical awareness of *how* media functions. How do we understand and read our world?

2. AESTHETIC JUDGMENT: THE NEW PERCEPTION

Medium Becomes Aesthetic Media

By rethinking his earlier book, The Two Cultures, Snow is critically noticing his work aesthetically and hinting at a new perception. Whether we choose words, symbols, images, sounds, objects, numbers or raw materials we are exploring a language and this requires a philosophical point of view that includes the senses. *What role do the senses play in developing*

¹⁸ Ibid. 109

¹⁹ Ibid. 109

new perceptions? Immanuel Kant²⁰ claims the senses contribute to higher order reason. Kant presents the idea of *The Transcendental Doctrine of Elements*. Kant presents two ways of thinking about objects through *transcendental aesthetic* and *transcendental logic*. Instead of pitting logic against the senses, Kant acknowledges the senses as the starting point of any search for knowledge:

“*Intuition* and concepts constitute, therefore, the *elements* of all our *knowledge*, so that neither concepts without an *intuition* in some way corresponding to them, nor intuition without concepts, can yield knowledge. Both may be either *pure* or *empirical*.”²¹

In the arts and sciences, Kant suggests that any manner of gaining knowledge that relates to objects is done so by *intuition*.²² Intuition allows us to perceive specific properties of objects through our sensibilities that *receive* objects. A certain kind of *receptivity* is required for perception. And a certain kind of *projection* is required for expression. Kant suggests that the faculty of the *imagination* is responsible for forming *concepts* out of the “manifold of *intuition*” to be considered for knowledge.²³ As *intuition* senses the properties, dispositions and relationships, the *imagination* forms *concepts* to be considered for knowledge.

As educators in quest of a way to bridge the gap between the arts and sciences we can understand the importance of prolonged noticing, reflection and generative transformation that reveals differences, similarities and growth through a network of experiences. This is the kind of critical thinking that opens perception.

Kant continues, “... intuition which is in relation to the object through sensation, is entitled *empirical*, [and] the undetermined object of an *empirical* intuition is entitled *appearance*.”²⁴ An object of experience which corresponds to *sensation* refers to its *matter* and is empirical and that which cannot be determined describes the variations of *appearance* that refers to its *form*. The physical appearance of matter is given to us *a posteriori* and limited to the

20 Immanuel Kant, *The Critique of Pure Reason*, B-102

21 *ibid.*, B74

22 *ibid.* B34

23 Immanuel Kant, *The Critique of Pure Reason*, B-102

24 *Ibid.*, B34

senses while the *appearance of form* is given *a priori* in the mind, ready for knowledge. Because *form* is represented prior to the senses, Kant calls this form pure (in a transcendental sense). The “... *pure form* of sensibility may be called *pure intuition*.”²⁵ The science of all *a priori* sensibility, Kant defines as *transcendental aesthetic*. One can begin to see how the world of *appearance* can embrace the sensibility of experience and the *form* of the subject encourages pure thought. Kant summarizes the transcendental aesthetic as this, “The understanding can intuit nothing, the senses can think nothing. Only through their union can knowledge arise.”²⁶

Kant and the Work of Art

The importance of these differences that Kant brings to the notion of intuition and imagination is crucial. Applied to a work of art, such as Alberto Giacometti’s *Three Men Walking*²⁷, the conflict arises around an issue that directly relates to Kant’s understanding of the role of *substance* and *form*. John Dewey concurs, “All language, whatever its medium, involves *what* is said and *how* it is said, or substance and form.”²⁸

The conflict often goes like this: on one side, a viewer is commenting on the nature of the sculptures *matter* or *material* of the work of art as representing a skinny, frail, bumpy, stretch-out, boney, emaciated, skeletal body. This is a good phenomenological or empirical description of the physical *appearance* of the sculpture. According to Maxine Greene *aesthetic reflection* sets mental powers into action by the medium/media of the work of art.

“The noticing I have in mind also involves an awareness of the medium, the material out of which the particular work of art is made... The qualities of each medium depend for their disclosure upon someone singling them out, identifying them for a particular kind of attention.”²⁹

The next viewer notices a conceptual understanding of the sculpture’s *form* that communicates an idea through the body language of the subject. By concretely reading the characteristics of the sculpture’s *form*, intuition limits understanding till it becomes an object of

25 Immanuel Kant, *The Critique of Pure Reason*, B-35

26 *Ibid.* B-35

27 Plate 2. Alberto Giacometti. *Three Men Walking II*. 1949 Bronze. Metropolitan Museum of Art. (photograph - John Toth)

28 Dewey, John. *Experience & Education*. New York: Touchstone, 1938. p. 106

29 Greene, Maxine. *Variations on a Blue Guitar*. New York: Teachers College Press, 2001, p. 14

imagination. On this side of the argument are viewers who use their imagination to interpret the *form* of the sculpture. Here students will synthesize meaning based on associations between the figures authoritative body language, psychological expression or sense of urgency. The sculpture's *form* triggers a conceptually intuited response. Both the intuited topology and the conceptual reading of *form* are conditionally correct. The true genius of Giacometti's sculpture is the presentation of two diametrically opposed understandings of these differences. The imagination synthesizes this complex relation between the intuited understanding of the material nature of the sculpture and its conceptual counterpart that projects its contradiction into the present life of the viewer.

A Language for What Has Yet to Come

The uncertainty of describing human experience in words can be seen as a part of a condition that William Carlos Williams³⁰ describes, "Now I am not what I was when the word was forming to say what I am."³¹ The condition, of always *becoming* must be considered as something about to be given. It is necessary to recognize the uncertainty that accompanies our understanding. The ethical test of reason may be as simple as *sensing while thinking, or asking how does this idea feel? How does reflection create an awareness of this process of accumulating experiences? How does process construct meanings? How does a period of activity and production interface with reflection and what are some criteria for evaluation?* Deconstructionists pose the problem as a void that is created in language as it is over analyzed. Walter Benjamin hints at a suggestion to shift knowledge modalities for a new understanding,

"Only images in the mind vitalize the will. The mere word, by contrast, at most inflames it, to leave it smoldering, blasted. There is no intact will without exact pictorial imagination. No imagination without innervations."³²

30 William Carlos Williams. *Imaginations*. from *The Great American Novel*, It is William's distrust of words as carriers of meaning that makes him so important, as he engages all the senses towards a place of understanding.

31 *Ibid.* 158

32 Benjamin, Walter (1892-1940). *Reflection: Essays, Aphorisms, Autobiographical Writings*. "One-way Street." New York: Harcourt Brace Jovanovich, 1978. p. 75

There is another side to Plato that seems to agree by saying that seeing gives rise to language; noticing the revolution of years gives rise to numbers or math/logic and inquiry about the universe gives rise to science. *How can sight give rise to knowledge modalities and at the same time give rise to illusion? Is there possibly another way of viewing the senses in a relationship to knowledge?*

The Limits of Knowledge: Substance and the Senses

If we look at science, which achieves knowledge by logic and reason, as the absolute of knowledge we will surely be misled. After all, it was Aristotle who believed all the laws that governed the universe could be understood by thought alone. It wasn't until a thousand years later that Galileo demonstrated that Aristotle was wrong when he observed that bodies of different weight fell at exactly the same speed.³³ The senses may play a far more important role than is currently acknowledged.

In the world of education, the senses are all we have at first. If seeing and naming the things of the world gives rise to language and observing the stars gives rise to science, then science by the concepts that it observes creates a body of understanding for reason to organize towards knowledge. Knowledge cannot be an end in itself. As new observations, calculations, and criticisms reveal new understanding our current knowledge must be adjusted or done away with altogether if need be. When knowledge reflects on life critically, wisdom emerges.

Understanding the limits of knowledge is a subject of interest for Tim Simpson who describes the limits of Socrates' method of logical and reason. Simpson suggests:

“When confronted with defining a *Form* or idea, Socrates often resorts to non-propositional efforts to access the issue in question. He attempts to bridge complex matters not with assertions of logical propositions but with non-discursive means. In the *Republic*, when asked to give an account of the highest intelligible object, the *Form* of

³³ Stephen Hawking, *A Brief History of Time* 1988, p. 15

the Good, Socrates cannot proceed through the ordinary assertion but offers a simile, namely the Sun.”³⁴

It is in complexity that the traditional methods of attaining knowledge may reach a limit and in that *void* another sense awakens. For Socrates, this would be an impure practice but his goal is to prove the idea. Bringing the problem to a truthful conclusion is what matters. Socrates’ simile of the “Sun” shows his understanding of the link between medium and media. The substance of sun (warmth, power, order, passion) communicates something through the senses that aligns the senses to receive the idea. The interplay of logic, simile, calculations, analogy, data, metaphor and dreams may not be the first method of choice for Socrates, however, as educators we must move beyond knowledge (not data) offering a new path to wisdom.

Simpson further addresses this issue of the limits of knowledge in search of wisdom by turning to Plato. Simpson adds,

“Rather, through the recognition of the limits of knowledge Plato suggests a pedagogy of desire. It is through this paradoxical self-knowledge of our limit and limitlessness, a “learned ignorance,” that philosophy, for Plato, is not a possession of wisdom but is a *love of wisdom*.”³⁵

If we are to agree to a pedagogy of desire (or love of wisdom) for the Arts and Sciences it would address the learners’ desire for the substance that is the focus of our intended knowledge in the hope that it draws students into a love of wisdom. The task of finding a medium of study and expression may be different for every learner.

Aesthetic Education: The Art of Active Reflection

34 Simpson, Tim, “The Limits of Knowledge and the Desire for Wisdom,” University of Illinois, Urban/Champaign. 2002. (p. 67) Ohio Valley Philosophy of Education Society. May, 2007.

35 Simpson, Tim, “The Limits of Knowledge and the Desire for Wisdom,” University of Illinois, Urban/Champaign. 2002. (p. 67) Ohio Valley Philosophy of Education Society. May, 2007.

Aesthetic education since the early seventies has placed philosophy at the center of its pedagogy. Immanuel Kant, John Dewey, Elliott Eisner and Maxine Greene have all written of the relationship that the arts create between reason and imagination. According to Greene, “for us, education signifies the nurture of a special kind of reflectiveness and expressiveness, a reaching out for meanings, a learning to learn.”³⁶ As a space/place of learning, aesthetic education may provide a philosophy that addresses a diverse world through a process that opens new associations between concepts and methods through a close study of a work of art. Activity and reflection guided by inquiry and experimentation are developed from specific details that make up the functioning elements in the work of art. Aesthetic judgment allows action and reflection through art activities and inquiry. By focusing both on the thinking process and technical process found in the work of art, students find new associations between the elements that make up the language of the arts and meaning. According to Dewey, “It is a way of seeing and feeling things as they compose an integral whole... It is the large and generous blending of interests at the point where the mind comes in contact with the world.”³⁷ This is a *process* where *imagination* and *reason* are in “*fidelity*” to a shared event with the work of art.

3. HYPERMEDIA: THE NEW LITERACY

Electronic Substance: Electronic Media

Electronic technology opens the arts to another way of thinking about the art of communication. Marcel Duchamp inspired artists around the world who developed a new art form called Intermedia art. The instrument of this new art form today is mostly the computer. Electronic technology opens new ways of thinking about how, why, where and when knowledge, meaning or expression is transmitted. The process of this new media is called *hypermedia*, because it is media that has the capability of linking to related contextual sources. Hypermedia is embedded in technologies such as e-mail, electronic databases, virtual reality games, word processors, spreadsheets and numerous electronic technologies. Using hypermedia requires new systems of logic that are discovered beyond the bounds of the traditional model of literacy.

³⁶ Greene, Maxine. *Variations on a Blue Guitar*. New York: Teachers College Press, 2001, p. 7

³⁷ Dewey, John. *Experience & Education*. New York: Touchstone, 1938. p. 34

Hypermedia is a form of intermediation that facilitates the process of integrating multiple knowledge modalities.

Duchamp's numerous experimentations with media, diverse ways of thinking and facility across disciplines epitomizes interdisciplinarity. By thinking in a variety of media Duchamp maintains a sense of play as he develops a visual idea. All media is subject for thought, from physical properties to four dimension theories on space time that Duchamp understood through conversations he had with his close friend Maurice Princet, a mathematics theorist. Duchamp's visual understanding of space-time is apparent in his 1913 painting, *Nude Descending a Staircase*.³⁸ Through transparent and opaque repetitions of fragments of a body, the illusion of a person moving through time is presented. Duchamp's painting, *Network of Stoppages*³⁹ is another good example of his experimentation with space-time reality in which a diagrammatic schemata (matheme) of a four-dimension space-time situation is presented. In his *Readymade* artworks the four dimensional space-time situation occurs in the mind and lingers in play like the strategic thinking one engages in during a chess game.

In 1968 Duchamp collaborated with John Cage in creating an electronic chess board that triggered sounds as each chess piece is moved. The chess game becomes a musical score. To record his chess games Duchamp made little stamps to print the "game moves" in his notebooks. Duchamp reveals throughout his life the ability to shift between knowledge modalities to create and transform his art through an interdisciplinary process. Collaboration of this sort is not just a purely intellectual experience because the thinking is seated in an active medium. The context of medium for Duchamp and Cage, on the other hand is a matter of thinking that is set into play by imaginatively considering new relationships in the elements across disciplines.

In the hands of music composer John Cage, a fascination for numbers occurs from chance operations and indeterminacy. Cage finds in Duchamp an artist who thinks outside the elements of his domain, thinking through media outside the conventional methods of a discipline.

38 Plate 3. Duchamp, Marcel. *Nude Descending a staircase*. 1913. Museum of Modern Art (photo; John Toth)

39 Marcel Duchamp, *Network of Stoppages*. 1914. Oil and pastel on Canvas. Museum of Modern Art. (Photograph – John Toth)

Cage organizes sound with the throw of a dice or a computer program that generates random numbers. Chance operations as a compositional choice, allows Cage to explore networks as a compositional process. *HPSCHD*⁴⁰ by John Cage and Lejaren Hiller utilized multiple concurrent harpsichord performances through a large environment of projection screens displaying 40 simultaneous films and 40 sequencing slide projectors with images generated from NASA and public media. Many artists from Dada and Surrealism, through the 1950-60, have pioneered electronic artworks that generated collaborations across modalities.

Hypermedia as Apparatus: Media Literacy

The book as a media system introduces us to the term *literacy*. *How do systems of learning transform over time?* Prior to written languages, dance, music, drawing, painting, sculpture and architecture signified the knowledge and history of the past. When spoken language was first recorded it was scribed into pictographs that symbolically reflected a history of experience. Prior to written history, knowledge was transferred from generation to generation by oral recitation. It took a thousand years for written language to become available to the masses. *How did the invention of the printing press effect literacy? How does the mass ownership of books by individuals affect social relationships?* Through Guttenberg's printing press the great books of knowledge could be copied or translated to multiple languages and be sold across the world. World knowledge became available in a new way.

Hyper-literacy in the twenty-first century provides a new world perspective that is immediate and lived in the moment through a new electronic apparatus. *How does the use of electronic media, further transform literacy?* Literacy as we know it is being transformed by electronic media. A professor of English, Gregory Ulmer has a name for the new literacy called "*electracy*" and in his book Heuretics: The Logic of Invention he describes how knowledge is transmitted through the medium of electricity. This novel way of approaching knowledge requires some new considerations. The invention of the camera becomes the apparatus that begins to displace literacy. "A picture is worth a thousand words,"⁴¹ makes such a claim. Ulmer believes this shift does not replace literacy but exists alongside or perhaps we are living in a

40 HPSCHD by John Cage and Lejaren Hiller. 1960

41 anonymous. Chinese proverb

hybrid state. *Electracy* as a process of knowledge uses computers as a means of generating a virtual or hyper-reality. The *letter* is to literacy as the *e-mail* is to hypermedia. Hypermedia as such is different from the *letter* in that it takes days to deliver through manual carriers, while the e-mail is sent, for all practical purposes, instantly. The medium of hypermedia is electrons, particles and light, but its real contribution as an information system or language is that it has as its main property, an ability to explore knowledge instantly. Hypermedia is present and available through the Internet.

Ulmer suggests that the use of the *image* carries an important role as an *icon* in the language of computer technology. Ulmer is seeking to define a method for creativity in Benjamin's work, specifically *The Arcades Project*. Ulmer's search for a creative method considers Benjamin's notion of the "composers card box"⁴² which he sees as a pre-writing database: "the user of the database, that is, encounters in principle the full paradigm of possibilities through which a multitude of paths may be traced." Ulmer compares this difference in the way information is organized. Ulmer contrasts *academic writing*, largely, as a *cause and effect* logic of argumentation that follows a linear path towards a deduced or *right-answer*. While in the use of *hypermedia*, a database (information) is organized in a network. Meaning is constructed through a conductive associational logic that occurs through a non-linear method. In *hypermedia* there are usually many solutions to a problem, the truth in any one given interpretation destabilizes any totality and what remains are multiple points of view. Academic literacy favors the product and hypermedia favors the process.

Because each layer of a hypermedia is a unique history any one narrative could not express a sense of a whole event. Instead, icons, sounds, animations and networks of different points of view are available for inquiry; information is actively experienced in hypermedia rather than passively absorbed as in a lecture.

Hypermediating the Image

In his book One Way Street Benjamin attacks the notion of languages as the best choice of *medium* in communication. His inclination is towards the *image* rather than the text:

42 Gregory Ulmer, *Heuristics: The Logic of Invention*, p. 38

“Only images in the mind vitalize the will. The mere word, by contrast, at most inflames it, to leave it smoldering, blasted. There is no intact will, without exact pictorial imagination. No imagination without innervations.”⁴³

This mental image of new possibilities is precisely what happens when we read books. We picture in our mind with great detail what the language evokes. The development of the use of image in the 19th century through photography lead Benjamin to consider the possibilities of a history of communication through photographic images. Susan Buck-Morss presents Benjamin’s theories in his Passagen-Werk. Benjamin uses historical images to construct philosophical ideas.⁴⁴ Benjamin presents a

“...historical construction of philosophy that is simultaneously (dialectally) a philosophical reconstruction of history, one in which philosophy’s ideational elements are expressed as changing meanings within historical images that themselves are discontinuous - such a project is not best discussed in generalities. It needs to be shown.”⁴⁵

This description is such a good example of the Internet’s global network of histories, all simultaneously accessible as little packets of binary data expressed as 1’s and 0’s. Like Duchamp’s world, Benjamin’s media also acts like a montage activated by the associational noticing through the network of thought images.

Ulmer says this shift is a destabilization of “*language as literacy*” as we enter hypermedia as literacy and together they coexist as carriers of knowledge. Just as oral history as a carrier of knowledge was not replaced by written history; there is a certain practical advantage to written history. In discovering associations among the multiple perspectives of a network of experiences, the conductive logic of hypermedia supplements the coherency of the narrative logic of academic literacy by opening unexpected relationships and discoveries. Through the

⁴³ Walter Benjamin’s idea in his book, *One Way Street*, p.75

⁴⁴ Buck-Morss, Susan. *The Dialectics of Seeing. Walter Benjamin and the Arcades Project*. Cambridge: The MIT Press. 1989.

, p. 55

⁴⁵ Ibid.

Internet and electronic technologies distance is relative. Space and time are open to the present knowledge in a new virtual way. It is not enough to gather knowledge; one must generate something from this knowledge.

The real issue is having something to say and understanding how and why we choose literacy (words) or hypermedia (icons) for generating communication. New technologies of the twenty first century will certainly continue to become more computerized, more networked and more virtual. The media of this electronic age is termed *hypermedia*. To engage with hypermedia involves a conductive method of association. Hypermedia is said to *jump* to new locations and to destinations over an electronic network. The process of hypermedia is like Søren Kierkegaard's leap into the faith of the event. This leap is not a leap of blind faith, but more a leap into a fidelity to the natural process of life. Hypermedia has its own vocabulary that facilitates communication on a global scale through an icon driven navigation system. Single words become icons that indicate more than they say. Words as icons act as portals that reveal choices that we expect to be there: FILE: open, close, save, save as, print, properties. Syntax is spelled out at every step of the process. Pre-linguistic children navigate through icons, attentive to hyper-syntax, and they are ready to explore the kinds of imaginative explorations that C. P. Snow is talking about.

The fulfillment of the Internet's potential may be seen in the work of Ted Nelson, who coined the term hypertext. Nelson describes his vision: "The Xanadu model has always been very simple: make content available with certain permissions; then distribute and maintain documents simply as lists of these contents, to be filled in by the browser."⁴⁶ Nelson claims that Xanadu would be democracies' most complete library offering two-way communication between media and the public.

⁴⁶ Nelson, Ted. Deep Hypertext: The Xanadu Model. Jan. 14, 2007. June 2007
URL: <http://xanadu.com/xuTheModel/index.html>

4. ASSESSMENT: HYPERMEDIATING INTERDISCIPLINARY CULTURES THROUGH AESTHETIC EDUCATION

Conclusions

Aesthetic reflection of the beauty and sublime reveals the threshold of both the senses and reason that restores a balance between the Arts and Sciences. The task of teachers is to create a space for learning that is conducive to each learner. This boundary can only be defined by teachers who attend each student's learning style through a medium that vitalizes his or her own life. This philosophic awareness of the limited and unlimited capacity of the individual as a learner is what makes the arts particularly useful as a learning apparatus. The arts taken as a whole creates the framework for a definition of a contributing citizen. Because we are *singular* beings living in a *plural* world, the goal of education should not be directed to conformity to ANY ideal but rather to the ethical construction of the individual's event of truth. This development describes the event of learning as a creative continuum between the empirical and the theoretical (being in the moment).

If education is the way of understanding that prepares young students, then it would make sense, from the perspective of Kant, to place the Arts at the center of the early childhood learning environment where aesthetic reflection creates life-long learners who pursue their own freedom and choose to be contributing citizens or not. When Kant drafted the first philosophy for the modern university system civilization was at the beginning of the Industrial Revolution. The advantages of specialization produced a creative space for discovery and invention that changed the course of history. The twentieth century was an age of specialization that was advantageous for the kind of deep focus that produced great works of science.

In a post-modern age the requirements of education have changed radically while the education system seems to be still training individuals for an industrial era that has long gone by. The need for a new educational philosophy must rise from a desire to embrace the moment, not simply what worked in the past. New technologies have changed the way we perceive and think about our world. Hypermedia, virtual reality, artificial intelligence, quantum mechanics and the Internet are only a small example of this new age of being that brings with it new languages and new means of communicating. What we do to prepare young learners to enter into a future world

can only be determined by an imagination that senses where the lesson can go. Our history does remind us that we must be ready for change and we can always count on uncertainty. How we project a future possibility can only happen through our imagination in the moment and the freedom to go where we please. Only a philosophy that embraces a world point of view will define whom we are and what we dare to create.

The new perception that CP Snow calls upon to open communication requires a philosophical shift towards aesthetic education that enables learners to think critically using their own judgment in determining an outcome of their creative choice. Aesthetic education since the early 1970's has placed a philosophy of perception at the center of its pedagogy. This aesthetic process is defined by philosophers, such as, Immanuel Kant, John Dewey, Elliott Eisner and Maxine Greene. They have all spoken of the relationship that the arts create between reason and imagination. This is what makes the arts so suitable for bridging knowledge domains. This aesthetic process includes activities and reflection that form a seamless bridge between theory and practice.

The new perception also requires a shift in thinking from physical practice to virtual practice. The cultural shift to technology brought about by science presents a new reality that shifts perception to the conceptual and virtual thereby opening a new electronic literacy. The goal of education in the age of hypermedia should be restated as aesthetic reflection that sets mental powers into action by physically and virtually acting on the media of life. Using hypermedia (Internet, Blackboard, Podcasts and U-Tube) opens individuals to a world community that can share ideas, creative production and global research.

And finally, Snow's wish for an "imaginative experience"⁴⁷ in the Arts and Sciences is happening through hypermedia that is fueled by the Internet, Google, digital photography, the Hubble Telescope and a variety of new media. This is a practical and engaging means of bringing the arts and sciences into new ways of experiencing discovery, invention, skills, math, literacy, creative production, data generation, analysis and social awareness.

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⁴⁷ *ibid.* p. 100

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<p><u>Nude Descending a Staircase, No. 2 (1912)</u>. Marcel Duchamp. Oil on canvas. 57 7/8" x 35 1/8". Philadelphia Museum of Art.</p>	
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