

Mind Your Studies

A Multimedia Resource for the Contemporary Student

CM104 in Comparative Media Studies

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I. Necessity of a Multimedia Resource

I propose in the following section to clarify three unassailable facts about the process of learning. Firstly, that reading is not an intrinsic process, but a complex multi-step function on the part of the brain to convert a set of visual phonetics into meaning. Secondly, that the written word is not the most efficient means of instruction. Thirdly, that a multimedia resource is both the most efficient and practical tool to instruct the student.

Grappling with a written page is a common struggle. One feels one's eyes start to glaze over, one's mind redirect all through-traffic in one ear and out the other. Suddenly the trinket on the desk beside you has never seemed so utterly fascinating, the tapping of a pencil more compulsory. A lengthy page has the power to have left the stove on in the other room, perhaps, or to suddenly make it lunchtime. But there comes a moment of resignation in this recalcitrance where one is left to simply stare at the page, flip back and forth, and wonder if there could possibly *be* any more words.

Such complaints are human, congenitally human, in that they typify physical structures of the human organism. The process of reading (however romanticized, philosophized, or idealized) is a physical one, a neurological function of the human brain that converts a visual input to a computational output. Yet as writing itself has evolved from simple pictographs to an intricate system of visual phonetics, the process of converting text to meaning within the mind has become equally complex; thus susceptible, from an engineering standpoint, to failure.

(Gascoigne)

Failure on the part of the mind to convert text into meaning may occur at several points. If the words begin to blur together, or disintegrate into a series of shapes, it is a failure of recognition: the letters are not being processed as familiar code, as valid inputs. If the words themselves fail to form a thought, and you find yourself reading the same sentence over and over again, and you find yourself reading the same sentence over and over again, or reach the end of a page to be greeted by the horrifying realization that you have not understood a single word read, then it is a failure at one or multiple stages of conversion: converting the initial input into auditory sounds, stringing those sounds into words within the memory, converting those auditory memories to the objects and concepts that they represent, or connecting that series of concepts into a cogent thought. (Boulten)

“What you have discovered,” observed Plato, “is a recipe not for memory, but for reminder,” by which the reader “[calls] things to remembrance no longer from within themselves, but by means of external marks,” (at which point must I curtail the quotation, or risk offending the literate individual). (Higgins; Postman)

The purpose of writing is not as a surrogate for thought, but as an external memory bank. It is an invaluable tool - a tool by which our species has benefited unimaginably - but it is a tool nonetheless, with set bounds of utility. Hardly the appropriate tool, then, to instill comprehension, when in order to discuss the elephant in the room the author must first describe the pachyderm’s attributes (limited by extent of the author’s storytelling ability and scope of both parties’ vocabulary), then second the student sits and imagines the creature by its description, in all likelihood with outlandish results that are, by that point, beyond the original author’s power to correct. The entire exercise may in effect have not only failed to communicate the nature of an

elephant, but implanted a misconception in the foundation of the student's understanding of the subject matter that could later threaten the integrity of any conclusions built around it.

Writing, as a tool misapplied, is neither expedient nor practical. Rather than supplying the student with an implicit understanding of the nature of an object or the concept which governs it, the author has provided a riddle of the object's attributes. An object itself must by nature of existence exceed even the best description, and the author of a textbook need not necessarily be skilled with descriptive writing to begin with (they could, for instance, be prone to long-winded sentences or, even more heinously, overuse of parenthetical asides). At best, the objects have been suspended in formaldehyde for indoor observation: even captured perfectly by description, they lose the qualities that marked their life.

This is not to neglect the fact that for much of history, the written word has been the most practical, if not the only, means of communicating certain ideas. Darwin could not bring the Galapagos to England, any more than he could realistically bring the population of England to the Galapagos. There is, however, a key point of distinction: Darwin sailed to the Galapagos no fewer than 183 years ago. One-hundred and eighty-three years ago, the notion that what was to Darwin a four-year expedition could be broadcast to the home in three 50-minute episodes would have been utterly fantastic (this 175 years subsequent publication of *Origin of the Species*). (White; "Galapagos Episode Guide")

Contemporary technology furnishes the modern intellectual with unprecedented educational opportunities -beyond the capacity of the written page- by functioning as catalyst to the innate process of multisensory information uptake. (Neo) To communicate via any combination of audio, visual, rhythmic, written or any other stimuli maximizes cognitive

function; to do so using a combination of media is here defined as a multimedia approach. (Neo; Gardner)

The benefits of a multimedia approach are a physically observable phenomenon. Utilization “for even a relatively short period of time can change brain activity patterns and enhance function,” concluded Dr. Gary Small, author of a 2009 UCLA study. (Champeau)¹ It is unsurprising, therefore, that “the use of multimedia in industries has been extensive, as it has been effective in increasing productivity and retention rates, where research has shown that people remember 20% of what they see, 40% of what they see and hear, but about 75% of what they see and hear and do simultaneously (Lindstrom, 1994)”

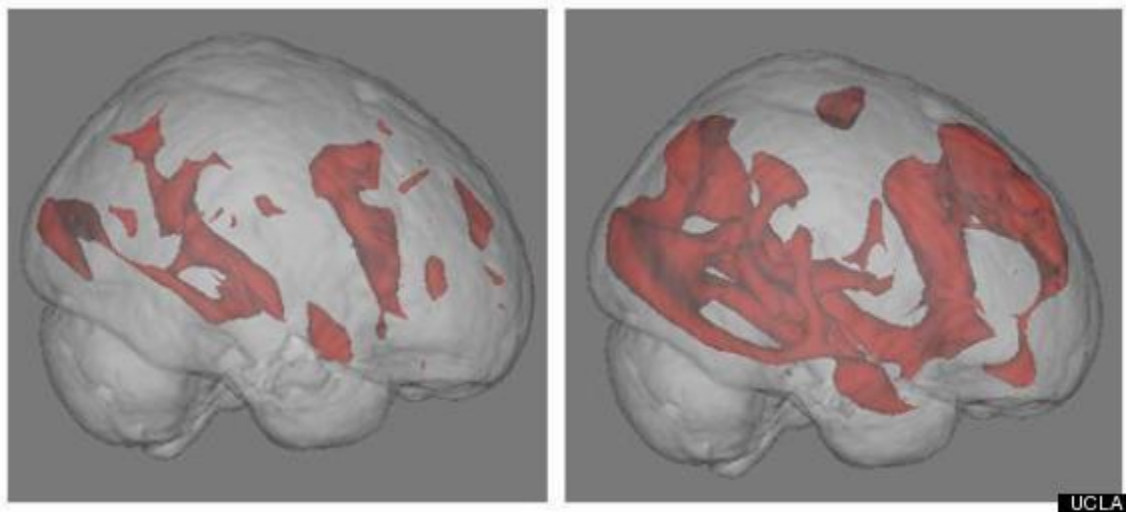


Figure 1: MRI of brain while reading (left), versus surfing the internet (right)

(Champeau) In layman’s terms, students characterize a multimedia approach as more engaging, which correlates to greater interest in and retention of the information being presented.

Yet there persists a disconnect between the technologies available and those made available to the student. In a world in which microsurgeries can be rehearsed in a virtual

¹ For the purposes of the study, multimedia utilization entailed internet surfing for set periods.

anatomical atlas, the contemporary student is equipped with the most cutting-edge 15th century technology. (“Voxel Man”; Morris). Faced with such a gap, one must conclude that an updated resource is necessary; a resource that implements current neuroanatomical, psychological, and technological advances in order to maximize the student’s comprehension and retention of subject matter. With such a resource, we can expect an (above-stated) 20-55% on-average increase in information retention, correlating to a proportional increase in GPA (assuming that a grade is an accurate indicator of knowledge, an issue expanded later). Theoretically, a boost of at least two letter-grades: a figure which speaks for itself, when several lavishly funded experiments in literally throwing money at the problem by paying inner-city students for good grades, have had next to no effect on academic performance (Contis; Scheie).

The approach of throwing money at a problem brings us to the issue of expense. In 2014, Montgomery County Public Schools MD allocated \$5,775,867 to instructional materials for high school alone, with \$1,791,962 earmarked specifically for textbooks. (“Montgomery County Public Schools, Rockville, Maryland, FY 2014 Program Budget” 59) By contrast, generous estimates have placed the cost per download of a book-length digital file at \$.000000000001 each. (Burdick) Given 45,257 high-school students currently enrolled in the MCPS system, allocation of funds for textbooks alone comes to \$39.60 per year per student. (“Montgomery County Public Schools: About Us”). Were the budget for textbooks to be dispensed with entirely in favor of a digital multimedia resource (an unrealistic expectation, but a figurative one) then even if each student should download as many as one-thousand digital books, the total cost would come to \$0.0017921772, one-tenth of a cent off the original highschool textbook budget of \$1,791,962 , to accumulate every fiscal year. Given, these are rough numbers (the author is by no means a qualified financier), and exclude production cost. However, finance is certainly a

consideration, and the figures here are considerable. Which indirectly answers the question of accessibility, as a portion of these savings could be allocated to bolstering in-school computer labs countywide. (Neo)

Yet the issue must be addressed of whether a multimedia resource truly preps students for the real world, where information does not strive to make itself engaging and one is expected, in many cases, to adhere to a written source. To a certain degree, this concern bears merit: taxes aren't filed in illustration (though such a proposal does warrant pursuit). But for the most part, the world at large is more flexible than current scholastics. Beyond school and higher-education - both of which make commodity of learning- the individual may pursue avenues of knowledge via any number of media. A working adult does not get penalized for watching the film rather than reading the book.

At this point, I must draw a distinction. The resource here proposed is exactly that: a resource, available to students to supplement their own understanding and by no means to be misinterpreted to come in place of traditional resources, or even in alteration of current curricula. The advent of an era of technological innovation does not mean an eclipse of traditional resources, but the opening of an entirely new frontier for expansion. Ultimately, the goal of education is the communication of knowledge to the student, and the student's subsequent comprehension. The resources available should be those that will facilitate student learning to the greatest degree of their potential. A multimedia resource has the capacity to do exactly that.

II. A Resource Crafted for the Brain

The first organ removed from an Egyptian mummy was the brain, which was considered to be of very little importance and was often thrown out. One thought with the heart, you see.

(“Egyptian Mummies”) Our understanding of the human mind has evolved alongside our access to it. Current educational practices are predicated around a General Intelligence model proposed by English psychologist Charles Spearman, in which intelligence is considered an innate biological attribute and can be identified by a single number along a bell-shaped curve.

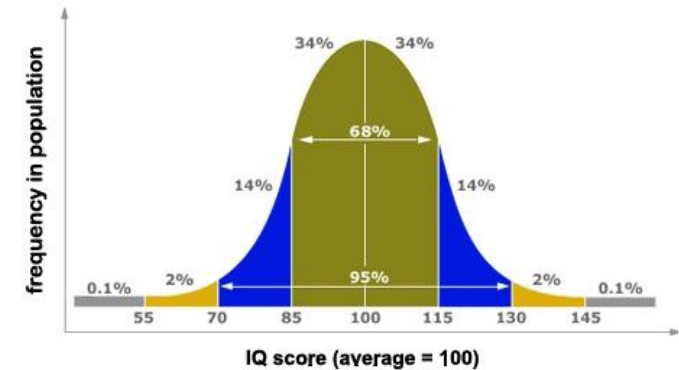
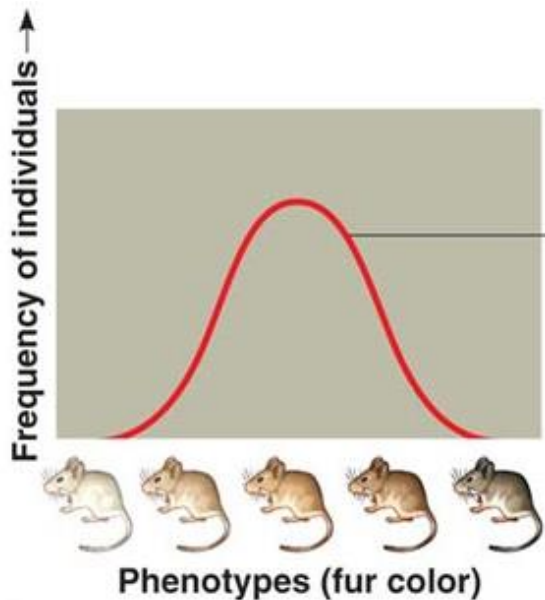


Figure 2 Human IQ Scores by Frequency of Individuals (Smith)

Figure 3 Mouse Fur Color by Frequency of Individuals (Krempels)

An IQ score, a standardized test, an SAT, a one-size-fits-all book-of-text; the expectation is simple, and failure to comply marks stupidity. The problem lies in the fact that this theory is 110 years old. (Davis)

The advent of the MRI in 1977 marked neural anatomy –and, subsequently, psychology– as we know it today (Wehrum). Current consensus characterizes the human mind not as innate or unidimensional, but rather as a plastic collective cobbled together out of multiple faculties. Understanding comes of touch, sight, smell, movement, vocalization, memory, emotion,

reason... and it is out of these parts and infinite variations of proportion and exposure that a consciousness is formed. (Gardner; Bolte-Taylor²)

Most recently, as of 2011 the Human Connectome Project has made several breakthroughs in neural mapping through use of the innovative 3T Connectome Scanner (3 Tesla MRI platform, for greater sensitivity than its predecessors), contributing to a LONI Probabilistic Brain Atlas that currently identifies over 56³ distinct brain structures, and their respective functions (“Human Connectome Project: About”). In the interest of space, I will here elaborate on only four well-known anatomical structures. Implications of neuroanatomical and psychological theories on a multimedia student resource are by no means limited to these. It is of note that the titles given below are those relating to Gardner’s Theory of Multiple Intelligences, but I have expanded them to include anatomical definitions.

Visual-Spatial:

The Occipital Lobe processes visual data and routes it to other parts of the brain for identification and storage. (Gamon) The visual area (rear bottom of occipital lobe) is responsible for combining visual images, as well as for visual recognition of objects (Shier). Humans that rely heavily on the Visual-Spatial faculty tend to “think in terms of physical space” and are “very aware of their environments”. Materials that would instruct via this pathway are predominately “drawings, verbal and physical imagery. Tools include models, graphics, charts, photographs, drawings, 3-D modeling, video, videoconferencing, television, multimedia, texts with pictures/charts/graphs.” (Lane)

Bodily-Kinesthetic:

² Here referenced, but also source for conceptual understanding of brain function throughout.

³ As of LPBA-40

The Cerebellum are two peach-size mounds of folded tissue located at the top of the brain stem. (Gamon) Motor areas of the cerebellum are involved with the control of voluntary muscles (Shier). Students that draw heavily from the Bodily-Kinesthetic pathway “communicate well through body language and be taught through physical activity, hands-on learning, acting out, role playing. Tools include equipment and real objects.” (Lane)

Musical:

At the top of the temporal lobe there is an auditory area responsible for interpretation of auditory patterns (Shier). To draw from the Musical pathway is not necessarily to be musically inclined, but to “show sensitivity to rhythm and sound”, and respond positively to “turning lessons into lyrics, speaking rhythmically, tapping out time. Tools include musical instruments, music, radio, stereo, CD-ROM, multimedia.” (Lane)

Linguistic:

As mentioned previously, a complex neural pathway is responsible for speech and interpretation of the written word. No single definitive structure is entirely responsible for linguistic function. It is known, however, that the “Temporal Lobe controls memory storage area, emotion, hearing, and, on the left side, language”, (Gamon) Sensory and Motor speech centers are Wernicke’s area and Broca’s area respectively (Shier). Learners with highly developed auditory skills “...often think in words,” and can be “...taught by encouraging them to say and see words, read books together,” at the younger age, or via games, books, and lecture toward the higher levels. (Lane)

Given an understanding of the physical structures of the human brain and their basic function, what follows is an analysis of several candidates for instructional media that would communicate information directly through these intrinsic channels of information uptake.

Video:

Video "...has become so prolific," in the lives of students that "...some colleges even include video submissions as part of their application process". ("Teaching & Learning with Multimedia") PBS recommends that video not be employed continuously, rather that selection of clips and segments "...most relevant to the curricular topic addressed in the lesson," are most valuable. Viewing a segment multiple times for understanding is also encouraged. ("PBS Teachers: Why Should I Integrate Multimedia Resources into My Teaching?")

Realia:

According to Gardner, Realia are defined as tangible objects that may be employed tactilely. It is of note, from a practical standpoint, that Realia may be used in groups. Though the concept of Realia does not directly correspond to a digital resource, one could readily provide instructions to the student for constructing Realia out of readily available materials. (Lane)

Color:

According to Gardner, color need only be a consideration "...if an object's color is relevant to what is being learned", employing color effectively, however, may ease differentiation or association of disparate concepts, and should thus be taken into consideration wherever possible (Lane).

Internet:

Surfing the web has been demonstrated to improve cognitive function. It is important to take into consideration navigability of the sites and time it will take the students to find the information (“PBS Teachers: Why Should I Integrate Multimedia Resources into My Teaching?”; Champeau)

Audio:

Audio includes but is not limited to music, rhythm, and songs. Podcasts are also a practical application of auditory stimulus.

Motion:

Motion is by nature difficult to prescribe. Dance and physical demonstrations, however, are indispensable for the Bodily-Kinetic aspect of learning, and as such either demonstrations (via illustration or video) or instructions should be incorporated. “Visual media which portray motion are best to show psychomotor or cognitive domain expectations by showing the skill as a model against which students can measure their performance.” (Lane; “Introduction to Dance as Storytelling”)

Sign Language:

Recent studies have concluded that “Native-ASL students consistently grasped spatial concepts better, in geography in particular and in several tests.” However, ASL as a viable teaching method with non-native ASL speakers is inconclusive, and warrants further research prior to implementation. (Goudarzi)

One cannot advocate a Multimedia Approach without addressing the issue of Cognitive Load. Cognitive Load refers colloquially to the theory that “students presented a split source of information will need to expend a portion of their cognitive resources mentally integrating the different sources of information” which “reduces the cognitive resources available for learning”. A multimedia approach may appear overwhelmingly, perhaps even distractingly, in violation of the theory of Cognitive Load. In reality, however, “an integrated format clearly demonstrates the relation between text and diagrams, thus reducing the cognitive load required to process the total information presented within the example”. The key, therefore, is integration, which most nearly mimics reality. The ultimate goal is to expend less energy fighting the materials, so that there is more energy available to put toward comprehension of the subject matter. A common misconception in this regard is that “the brain is a muscle” that you have to “exercise”. While neuroplasticity is a factor, less mental capacity devoted to a task does not correlate to decreased understanding. The human brain is not a muscle but an organ, with a fixed influx of nutrients and processing speed. Fewer resources appointed to deciphering the medium correlates to greater available resources to comprehension and application of what is being conveyed. (Cooper) In the end, a multimedia resource is aligned with the principle of Occam’s Razor: the most effective way to instruct about an elephant, is to get as close to the real thing as you can.

III. Implications of a Multimedia Resource

Ultimately, the proposed resource is that which, to the extent of current neuroanatomical knowledge, is the one best suited to the physical structure of the brain. To communicate via any combination of audio, visual, rhythmic, written or any other stimuli maximizes cognitive function; which is the multimedia approach. The goal of production of a multimedia resource is

an accessible, cost-effective, comprehensive and engaging supplement for independent study, available in a digital format. The impact of such a resource, widely implemented, cannot be numerically predicted with any confidence, for the very nature of having not yet been attempted.⁴

However, the theoretical implications of a widespread multimedia resource are far-reaching in every profession. To be limited in study to the materials to which you have an inclination definitionally restricts the fields of study. Philosophers to literature, mechanics to engineering, and so forth. It is difficult to imagine a world in which this is not so. Yet, a few dazzling examples exist of individuals that have superceded the bounds of their fields. For example: Lewis Carroll, author of “Through the Looking-Glass”, was a math teacher at Oxford. (Leyden) Theoreticals are best explained in hypotheticals, therefore take for instance a Mechanic. She has always had an affinity for the way that the world functions. She could peer down at a wristwatch and instantaneously comprehend its workings, as though its blueprints were etched into her memory. She was undeniably clever, yet she did poorly at school. Every word went in one ear and out the other without ever once making a scrap of sense. So the Mechanic went to a trade school, then on to a fulfilling career as a mechanic, and the world turned on unchanged. But imagine, for one moment if, in her schooling, the Mechanic was presented diagrams of the human body like schematics. The most brilliantly logical machine the Mechanic had ever encountered. Look- the arm socket is so very like a CV joint! The Mechanic would have comprehended it instantly, and with the right mindset may have excelled to the profession of medicine as readily as she might have that of mechanic. The field of Biology is definitionally inhabited by biologists, with a set and standardized pattern of thought that is well-

⁴ It is of note that a project out of Harvard, Project Spectrum, initiated a study based on the work of contemporary psychologists, but the study was exempted from the preceding statement because of the nature of the lessons, the age group tested, and the sample size. (Krechevsky)

attuned to the subjects of Biology. Our Mechanic would approach a problem very differently. She could take one look at a problem that a host of Biologists couldn't solve and see the answer clear as day. Our Mechanic could innovate a new tool in the OR, or an entirely new concept for prostheses. But she would never know, unless the information were put into her hands, rather than placed on a shelf out of reach.

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Davis, Katie, et al. "The Theory of Multiple Intelligences." *Harvard* (1993): 1-37. PDF file. In

this all-encompassing publication, Gardner establishes his criteria for an intelligence in the Multiple Intelligences (MI) spectrum, and briefly describes the eight candidates

Gardner ultimately considered (he rejected one, for failing to meet the aforementioned criteria). The publication concerns itself primarily with the academic place of the MI

Theory, relative to opposing and succeeding theories of intelligence, and to a lesser extent introduces the ongoing debate between "general intelligence," or, "the classic

model," and the theories of Gardner and several of his contemporaries (which are cited,

but not summarized). Included is an anticipation of or response to critical reception, as well as outlook onto the MI Theory's future as an educational tool. It is this segment,

"Research on MI as an Educational Intervention", that bears the most relevance to a research paper with the goal of producing viable educational options. But as Gardner

stresses several times the MI Theory itself is not rooted in hard statistical fact. It is argued by defining (or redefining) key words such as "intelligence", rather than by clinical

examination of the brain's function. The most useful feature of the publication is the expansive works cited: six pages of relevant theories and studies, each fully identified.

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Gardner's widely popularized seminal work "Frames of Mind," which proposed the

somewhat radical Theory of Multiple Intelligences (MI). Drawn from a number of essays

written throughout the 90's (cited), this book explores a myriad of themes and

controversies that arose in the wake of the original MI Theory (pub. 1993), and their

implications for the 21st century. Of note for my research are chapters dealing with the

formerly undisputed models of intelligence "Before MI", as well as the applications of

the MI Theory "In the Schools" (Gardner). The book is a valuable resource for analysis of

the MI Theory, coming directly from the author himself. But by the same token, there is

inherent bias in an author defending his own work. Also to be taken into consideration is

that the MI Theory is merely that: a theory. Most importantly, is that the arguments and

tone of this revisit rely heavily on the ethos of fame accumulated by the distribution of

the original. To be cited as fact, the assertions present must be linked with subsequent

studies by independent firms.

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author asserts that "when assessment is part of natural activities, a child's skills can be seen in an integrated real-world context", which may have implications in my argument for the value of teaching to students' natural inclinations. Overall, a valuable source, if dated. I will have to contact Project Spectrum themselves to inquire after more recent statistics. Thus far, it seems Project Spectrum is the only group generating statistics in this field.

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possibly be encompassed by my SIP. In addition, Lucas is not known as a novelist, but as an essayist, publishing histories dealing with different themes annually. There is bias, too, in the distinctly Western cant of the locations and universities chosen to represent each time period. However, as my project deals with American education, and will likely only ever be read in English, the absence of Eastern history might prove useful in the synthesis of such extensive information into more manageable chunks.

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Spearman, C. "'General Intelligence,' Objectively Determined and Measured." *American Journal of Psychology* 15 (1904): 201-93. Print. This exhaustive work, pub. 1904, is still considered to be the single authoritative work on the subject of general (or "g") intelligence. The current multinational educational system, as well as the field of cognitive psychology, are founded on Spearman's original conclusion that intellect can be measured on a basic numerical scale. The book reads not like a theory, but as a scientific line of inquiry, outlining procedural experimentation testing several variables, and the implications of any statistically significant results. Understanding this work (though rife with technical jargon far above my pay-grade) will be key to the construction of my argument, as this is the defining work on traditional intelligence, which I intend to refute with contemporary data.

Strauss, Valerie. "Howard Gardner: 'Multiple intelligences' are not 'learning styles'." *The Washington Post*. The Washington Post, 16 Oct. 2013. Web. 29 May 2014.

<<http://www.washingtonpost.com/blogs/answer-sheet/wp/2013/10/16/howard-gardner-multiple-intelligences-are-not-learning-styles/>>. As the title implies, the news article makes an important clarification between the terms "intelligence", "learning style", and "senses" with regards to Gardner's Theory of Multiple Intelligences (Gardner). While the article itself provides only cursory information as to the Theory itself, the distinction between intelligence and learning styles specifically is one that I myself had overlooked; a distinction which the framer of the theory considered important enough to directly address the public, and therefore one that should be taken into consideration while developing a research paper rooted around the MI Theory. However, there are quite a few liberties taken in the callous dismissal of what Gardner considers to be popular misconceptions: "not coherent," and "that's their prerogative," alongside other such gems, which take body of proof for granted, and border on the fallacious (Gardner). In addition, the article should by no means be taken as an independent proponent of the MI Theory, written, as it was, by Gardner himself.

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Thelin, John R. *A History of American Higher Education*. Baltimore: Johns Hopkins UP, 2004. Print. Thelin's book provides a history of higher education. Specifically, of American universities from the seventeenth century onward, with a focus on the last hundred years. Thelin approaches the subject with the intent of gleaning insight into the precedents of and solutions to what he considers to be the major problems facing colleges today.

Though apparently unrelated in theme, this source is valuable to my line of inquiry due to its explorations into what Thelin calls the "element of change in Universities", and most especially the insights into the relationship between historical institutions and tradition. The tendency to "avoid or deny controversial episodes," which Thelin notes as a trend among Universities may offer explanation for the MI Theory's failure to take hold in higher education. Thelin is a widely accepted historian, and is considered a definitive voice in the field of the History of Higher Education, cited by nearly every article dealing with American higher education.

Veenema, Shirley, Lois Hetland, and Karen Chalfen. "Multiple Intelligences: The Research Perspective." *The Project Zero Classroom: Approaches to Thinking and Understanding* (1999): n. pag. Print. This article effectively summarizes Gardner's Theory of Multiple Intelligences (MI) in order to provide context for the introduction of Project Spectrum, an experimental real-world study in the efficacy of the MI Theory's applications in early academics. This article stands out as a valuable resource because of and despite its brevity: though it does not examine the principals of either project at length, its summary function allows it to transition smoothly into the real-world applications of the theory by Project Spectrum. The article cites specific classroom exercises keyed to aspects of the MI Theory, which readily lend themselves to direct comparison with the classical model of early education ("treasure hunt" and "happy birthday for spatial and rhythmic intelligences, respectively). It is important to note that this article is a summary, and as such is vulnerable to misrepresentation or gross oversimplification of both Gardner's theory and Project Spectrum's studies. Further research will be required as followup.

Overall, however, a fair transition from the pragmatic -Gardner- to the practical: Project Spectrum.

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