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From Cellular Noise to Dark Energy: Lessons from the 21st Century

Introduction

This paper is the result of reflecting on lessons I've learned teaching in the new Millennium. The lessons are based on empirical evidence—each semester I teach 5-7 classes of composition, British Literature, and creative writing fiction and poetry. My load includes at least one of the three online courses whose shell I created. Many students in the ground classes hail from rural Missouri--often the entire class come from towns with populations fewer than 5,000 people. I also teach at a satellite campus in a rapidly growing college town with a population over 100,000.

After reflecting, I derived five lessons from the 21st century, then conducted research to provide context for the lessons. No surprise the five topics I derived had already generated, in pop culture, and professional research, an enormous amount of discussion. In poring over that discussion, five more lessons emerged—"meta-lessons." Each empirical lesson comes with a meta-lesson.

I use Marc Prensky's terms "Digital Native" and "Digital Immigrant" (4-5) to signify the divide between those who were born into a house connected to the web and those who were not. You could call Digital Natives "Millennials" as well. I do not cheerlead for machine learning nor play to learn nor would I call Digital Natives, "The Dumbest Generation."

I adhere to two bedrock principles. The first is apparent at this conference: a serious, passionate teacher can be wholly effective, whether using chalk and slate or gaming in a smart classroom. The second principle I have had since I began teaching in 1985 at an elementary school in West Oakland: Students are wholly worthy of our attention, passion, and respect. Each semester, in each class, this principle is reaffirmed.

Lesson One: The LMS is XXL or Follow the Money

The ubiquity of Learning Management Systems (LMS) is a convergence of technological advance, expectations of Digital Natives, and the rising costs of, and shrinking public commitment to, higher education. William G. Bowen, an economist and former President of

Princeton University, cites one cause of increasing the phenomenon of "cost disease." Technological innovation drives down costs because it increases productivity. Fields like education and the performing arts do not realize these gains in productivity with technology. Bowen quotes Robert Frank of Cornell University in providing an apt example: "While productivity gains have made it possible to assemble cars with only a tiny fraction of the labor that was once required, it still takes four musicians nine minutes to perform Beethoven's String Quartet No. 4 in C minor, just as it did in the 19th century" (4). If I still teach 20 people each 55 minutes, no amount of technology will make me more productive.

One way higher education has increased its revenue is by opening new markets via online education. An LMS delivers online education. My experience with an LMS is Pearson's eCollege. A note about Pearson: Pearson is a British conglomerate whose revenue in 2012 exceeded 9 billion dollars (www.pearson.com/news/2013/february/pearson-2012-results.html). Pearson markets educational products as a way decrease labor costs—by technologizing education, the cost disease disappears, along with teachers.

My experience with eCollege is a microcosm of the other issues I will discuss—it is a site where student expectations and engagement meet in a technology at odds with pedagogical goals. This can be shown in a few different ways.

The institutional control over an LMS requires the design of an online shell adhere to online "Best Practices." The term "Best Practice" is its own credential, not accompanied by research that shows how it correlates with outcomes. For example, let's take a Best Practice of breaking up large chunks of texts with images so that students retain the information more easily. My institution requires this for online courses and the demonstrational online class models it: the "Online Tools" section shows a picture of a hammer, saw, screwdriver and tape measure. Because we live in a visual age, this is what apparently *engages* students, though I doubt it makes them sophisticated viewers of visual information. In fact, empty visual reinforcement is a distraction when trying to teach focus. I adhere to Edward Tufte, the information theorist's Best Practice, "Graphical excellence is that which gives the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space" (51). Any visual element that does not provide information is ornamentation at best or junk at worst.

For my classes, I have discovered that eCollege is fairly poor at disseminating class content, but useful as a scheduler, discussion prompt, and repository of student work where I can

provide comments. Therefore, in each of the last four years I have written textbooks of class content that are written for the LMS course shell; each chapter disseminates information for a week of work. Students must closely read the textbook in order to effectively navigate the LMS (my slogan, sprinkled throughout the textbook and course shell is "Read Every Word"). In this way, the LMS does not distract students from careful reading. Setting up the online classes this way has another benefit. My institution holds the copyright to the online shell—by placing most of the content in a textbook where I hold the copyright, my proprietary material is quarantined from institutional ownership.

The gradebook feature in eCollege is another way in which an LMS can be at odds with course goals. The gradebook does not allow the use of formulas—a functionality that the most basic spreadsheet or database program has. Therefore, the teacher needs to construct assignment grades in order to fit the features of the gradebook--the tail is wagging the dog. Furthermore, when the LMS functions as an accompaniment to a ground class, students seek as much digital content as possible. And though it may be more convenient for them, at least one study indicates that posting more course content online is a disincentive to attend class (see Rodi, Kohun, and DeLorenzo).

The LMS as an online delivery system and ground class accompaniment, although opening new markets and catering to student preferences, still doesn't address "cost disease" (how does it feel to have your job diagnosed as a "disease"?). There are a number of solutions being offered. One common element in the solutions is replacing traditional classroom learning with digital delivery where the role of the professor is transformed into an academic coach, creator of content, or "help desk" occupant.

For example, Bowen rightly identifies MOOC's (Massively Open Online Classes) as having the ability "to raise productivity system-wide and lower costs" (55). In addition, he argues that ILOs (Interactive Learning Online) can accomplish the same thing. ILOs allow faculty to "either create a fully interactive, machine-guided learning environment, or to customize a course that has been created by someone else." In order to create these ILOs, "there is clearly a system-wide need for sophisticated, customizable platforms (or tool kits) that can be made widely available, maintained, upgraded, and sustained in a cost-effective matter" (56). In other words, he argues, technology ought to replace human labor as it has in nearly every other industry but string quartets.

Anya Kamanetz in a policy paper for the Third Wave think tank, "1 Trillion and Rising: A Plan for a 10k Degree" argues that "cutting costs means educating more students with fewer people on the payroll" (7). In her re-imagined institutions of higher education there are academic coaches, facilitators of educational delivery, and instructional designers (8). Like Bowen she envisions massive scalability through the use of MOOCs and automated delivery of instructional content.

One possible future for our profession is that the XXL LMS, like the transformer Megatron, will destroy the ranks of teachers and reduce the survivors to serving the mighty MOOCs or as caretakers of machine based learning. Two realities are apparent when witnessing this possible future. First, follow the money. Coursera (provider of MOOCs) is a for-profit venture. The Board of Trustees of Third Wave is overwhelmingly from Wall Street, hedge fund managers and investment bankers. Pearson is integrated to provide content delivery, as well as assessment tools (can you see how that game is run?). Bill Gates has skin in the game; the MacArthur Foundation has 50 million dollars invested. Although SB 520, the law that would outsource higher education to non and for profit institutions in California, ultimately did not pass, consider the timeline: starve institutions of higher education funding so they cannot serve their constituents, then outsource that education to cheaper, and in some cases profit-seeking, means of delivery. In 2011-12 the United States spent approximately 1.183 trillion dollars on public education, kindergarten through post-secondary (nces.ed.gov/digest/d/as/dt12_029.asp). That is an enormous market to privatize.

Second, without sounding like Pierre Abelard or Erasmus, we need to articulate the educational added value in the customizable, interactive, collaborative educational delivery system that is a human being (scalable only with strength training or diet).

Lesson Two: Cellular Noise or Yvor Winters Critiques T.S. Eliot

For the last decade or so, I have been at battle with the cell phone in the classroom (Megatron's precursors). I find that when students look at their cell phones I am distracted in the here and now. Surely this is a social phenomenon governed by information theory. I gauge whether or not the receivers have decoded my message by their demeanor. When they look at their phone, I know they have not. The problem is that whereas I think their lit cell phone is

noise garbling my message, they think that I am the noise and whatever is on their phone is the message.

But many would argue that because Digital Natives experience their world, social and otherwise, through technology, we should not be surprised when they fail at decoding educational messages through channels foreign to them: dense texts and unmediated interpersonal communication. In the book, *The Future of Learning*, a report of the MacArthur Foundation's 50 million dollar initiative on Digital Media and Learning, Cathy Davidson claims that students are driven to multitask in class because they are "attention-challenged" and are easily lured away from the straw man of the "boring lecture" (75). Davidson writes that colleagues who enforce bans on the use of cellphones and laptops fail

> To address all the underlying factors pushing students to look elsewhere for sources of engagement. It addresses the symptom rather than the cause. Another way might be to seek, in novel and challenging ways, to incorporate creative technologies in the classroom. (76)

Davidson's point, shared by others, is that you need to engage students in the way they are used to being engaged. This is a "multidisciplinary learning world," Davidson writes, "where play and learning are inseparable" (22). In his essay, "Digital Natives, Digital Immigrants," Marc Prensky describes a game he made for marketers of computer aided design (CAD) software:

> So we invented and created for them a computer game in the "first person shooter" style of consumer games *Doom* and *Quake*, called *The Monkey Wrench Conspiracy*. Its player becomes an intergalactic secret agent who has to save a space station from an attack by the evil Dr. Monkey Wrench. The only way to defeat him is to employ the CAD software which the learner must employ. (9)

Prensky claims that "*Monkey Wrench* has been phenomenally successful in getting young people interested in the [CAD] software" (9).

Playing at learning is the core principle in two public schools Davidson highlights, Quest to Learn in Manhattan and The School of the Future in Philadelphia, which is involved in a partnership with Microsoft. In addition, the consultant and executive Don Tapscott notes in an essay on the values of Digital Natives that they expect to be able to play at work: "some work

sites look like playgrounds. You can play football at Microsoft's Redmond campus—or baseball on the company diamond or soccer or volleyball" (149).

For all the positive views of making learning and working environment engage Digital Natives, negatives emerge. Consider the description of *Money Wrench*. Should a student have to simulate being a first person shooter in order to learn CAD? So far, The School of the Future's test scores are below average (www.city-data.com/school/school-of-the-future-pa.html) and Quest to Learn's scores, although barely above average, are comparable to peer schools in the New York City school system (Progress Report Overview 2012-2013, Quest to Learn). Perhaps most troubling is a footnote in Tapscott's essay. While describing Digital Natives' buying habits he relates in a footnote, "Almost two-thirds of Net Genera say they take their time to find the lowest price, which isn't surprising, because many work for minimum wage or a limited salary" (157). Of course there are complex economic forces depressing the job market, but you have to wonder if play to learn and play to work is in the Digital Natives' long term best interest.

Mark Bauerlein, editor of *The Digital Divide* and author of *The Dumbest Generation* quotes Bill Joy's comment at the Aspen Institute in 2006 upon hearing the cheerleaders for play to learn:

> I'm skeptical that any of this has anything to do with learning. It sounds like a lot of encapsulated entertainment…This all, for me, for high school students sounds like a gigantic waste of time. If I was competing with the United States I would love to have students I'm competing with spending their time on this kind of crap. (qtd. in Bauerlein 109)

As I said previously, I'm not willing to write off Digital Natives as "the dumbest generation wasting their time on crap," though I do frequently confront their short attention span and inability to read closely.

Davidson rightly notes, though, that Digital Natives are good at developing peer-to-peer electronic relationships (50). I exploit this in my online classes through threaded discussions. I look to the website Reddit as a model for setting up threads. Reddit has numerous trolls and dark sub-threads of humanity, but when I first visited the website I noticed its front page. It publishes the top posts there continuously. Yes there are cute dogs, funny cats and numerous meme attempts. But threads with open-ended prompts like, "Redditors, what is the scariest thing that

ever happened to you?" generate fascinating replies. Numerous individual tales of fright follow and under each tale are comments, questions, and affirmations (with hardly a troll in sight).

We often hear that Digital Natives need to make a connection between the subject matter and their lives; they need to know how the topic is relevant to them. In my online courses I use the discussion threads for what I call "Applications," where students write an account in a specific way, how the topic being discussed is relevant to them. For example, in studying Shelley and the sublime, I ask students to describe moments in their own life where they have experienced the sublime. The shared results are astonishing and contribute to peer-to-peer learning. Certainly this kind of discussion prompt leads to more meaningful communication than if I asked them to interpret the evanescent figure of beauty in Shelley's "Alastor."

Davidson is also right to note that because Digital Natives are so electronically connected, the concern about generational loneliness and isolation, "bowling alone," is unfounded (71). Again, though, it's important to follow the money. When the primary means of communication is technologically mediated, someone owns the channels and we pay toll to interact; in addition, the NSA can listen in.

In a ground class, it is a waste of a natural resource, proximity, to outsource peer-to-peer communication to electronic channels. In group discussions students are responsible to listen and respond. In our institution, individual desks have been replaced by corporate conference tables. This makes discussions difficult because students are in rows, two to a table, facing the front. Recently, I have begun moving tables to one side of the room. We arrange the chairs in a circle in the space we have opened. Then we talk to each other. As a facilitator, I use the Socratic method to make sure that each student is attentive. A learning community emerges, using proximity, and returning to direct interpersonal communication. In addition, this technique makes it impossible for them to look at their cell phones. We are all in a circle with nothing in our laps but our hands or a book.

It is important to value the proximate. Those who envision education in the future speak of "the long tail," and "individualized, customized" delivery systems. Davidson sees the future of the institution not as a place but a "mobilizing network" (171). Bowen reminds us that the ultimate platform for learning cannot be

> the sole responsibility of each individual campus. Sole reliance on purely homegrown approaches would be foolishly inefficient and simply would not work in most settings. It

> would not take advantage of the economies of scale offered by sophisticated software and that incorporates features of well-developed platforms, including elaborate feedback loops and instructive peer-to-peer interactions. (56)

Bowen's vision is that a central platform is used throughout the higher education system. No content is grown locally.

These visions of the future foresee a disappearance of the local. My experience as an online teacher has been valuable, but I've always recognized the classroom as sacrosanct, a place where enlightenment occurs in a particular here and now, among myself and students. There is value in the synchronous, in the present. The social energy generated in common endeavor, in proximity, is powerful and different from the digitally customized.

What about Yvor Winters? As an undergraduate first lit up with the fire of poetry, I tried to read everything from the 20th century. I remember reading Winters' tightly constructed formal poetry. I've never forgotten his critique of T.S. Eliot's *The Wasteland*. It's the pathetic fallacy Winters said. Just because the world is fragmented, doesn't mean poetry has to be. It's the pathetic fallacy, I hear myself saying now. Just because students spend their time connected to a screen, doesn't mean that education should imitate that. I recognize I sound like Yvor Winters on the rear guard but the truth is I've always loved *The Wasteland.*

Lesson Three: I am the Classroom Assessor or Too Much Data, Not Enough Information

When I was in graduate school I worked as a freelance writer for a communications agency. One of the clients that I wrote for was a manufacturing consultant group who were hired by companies in order to guide them to TQM—Total Quality Management. I ghostwrote manuals on how to achieve Just in Time inventory, how to focus on continuous improvement, how to integrate data from sales through delivery, and how to create a culture where the organization, from top down, was committed to achieving ever-increasing benchmarks of quality. Much of the TQM process was derived from the principles of W. Edwards Deming, who was credited with helping to develop the Japanese economic powerhouse. Much like China today, in the early 1990s, Japan was the economic bogeyman endangering American supremacy.

One of Deming's main ideas is that conducting quality control at the end of the manufacturing process is disastrous. Quality should be everyone's responsibility at all times. The Deming cycle is straightforward—Plan, Do, Check, Act. Plan carefully. Train the

principals, then begin the process. Check the process at all stages to monitor its effectiveness and act to change procedures that aren't efficient. This cycle becomes shorter and shorter as the company makes continuous improvement its singular focus.

I started at my current academic job in 1994 and soon thereafter, during presentations for faculty in-services, and discussions of education reform in the media, I began to hear the same language about education that I had used when writing about manufacturing.

The architect of No Child Left Behind, which calls for states to report on progress towards outcomes via mandated quantitative assessments, was Margaret Spellings. After being named Bush's second Secretary of Education, Spellings convened a commission on higher education. The resultant report, *A Test of Leadership: Charting the Future of U.S. Higher Education* speaks with private sector vocabulary in arguing for higher education. The report castigates colleges and universities for not being entrepreneurial enough and encourages new paradigms, "from for-profit universities to distance learning" (xi). Furthermore, in noting that the cost of higher education is subsidized by public funds and private donors, the report comments:

> These third-party payments tend to insulate what economists would call producers—colleges and universities—from the consequences of their own spending decisions, while consumers—students—also lack incentives to make decisions based on their own limited resources. (11)

I bristle when hearing education described as delivering a product to consumers. I've always searched for analogies: Is a doctor a producer for the consumer-patient? Is a priest the producer for the consumer-parishioner? I understand that my critique of this language is rear-guard. The doctor, the priest, and the teacher, are members of institutions that are pre-capitalist and it is the habit of market capitalism to appropriate every institution in culture so that all institutions, colleges and universities, for example, serve its values. (If we follow the money we find Spellings currently in an advisory role with the United States Chamber of Commerce.)

No Child Left Behind, and higher education reform, attempt to achieve quality through continual assessment. How could we know if educational institutions were effective if we were not assessing their quality? Legislators, while cutting subsidies, demand that institutions show tax money being used effectively. Spellings's view of the importance of assessment was highlighted in a sentence that was heard frequently during her commission's summit, "If it's not

measured it didn't happen." (Of course, if we think about this on the quantum level, reality is precisely the opposite—when we measure, we stop it from happening!)

The idea that we must quantify students' work towards outcomes in order to assess our quality has prevailed and demands a significant amount of our institution's time and resources. In light of this, four realities have become apparent.

First, I accept that my resistance to quantitative assessment is a medieval response. As if I were in Paris in the 12th century, I believe my sheepskin and purple hood grant me the license to teach as long as students populate my classroom.

Second, I'm not sure the assessment movement as it has evolved really gets what Deming was after. It's a mistake to assess the quality of the final product because the resources have already been spent producing it. True assessment is a shared enterprise that happens continually, at all stages. Administrators, teachers, and students should always be checking themselves and acting to make each moment of education more effective. You would be right to say, "Don't teachers do that all the time?" Yes, they do. But Rule One of the current assessment paradigm is that what we do as teachers to assess students in the classroom does not count. That is why with No Child Left Behind, and perhaps coming to a college near you, standardized assessments are required. Consider a corporation like Pearson that is integrated vertically. If they provide ways to automate outcomes, they can design delivery systems to teach towards those outcomes, and then provide the assessment tools to test whether those outcomes are achieved. It's a profitable corner in a 1.18 trillion dollar market.

Furthermore, students are not really "consumers" of an educational product. They are producers as well and therefore are also responsible for quality. I rarely hear of students being brought in the assessment cycle. In composition, for example, we are not manufacturers producing student-widgets; we are managing student workers who are producing essay-widgets. If we assess essay-widgets, why aren't the students in on the institutional assessment process? Why aren't they making the process more efficient?

The third thing I've realized about assessment is practical. I'll use my own experience in the Language and Literature Division as an example. Currently we spend two full days a semester on assessment wherein we grade sample artifacts from developmental courses, Comp I and Comp II, and, on a rotating basis, the various literature classes. We diligently record

numbers, seek common problems, propose solutions and move on. As comp teachers, tireless drudges that we are, we seem to believe that we can grade ourselves out of any problem. The reality is that we never finish grading the artifacts we have; the numbers are not collected in a database or spreadsheet to compare longitudinally, and even if they were, my suspicion is that our sampling methods are inadequate. As more requirements come from the state and federal government, I foresee more outcomes being mandated by the state and a greater push for one-size-fits all assessments.

The bright spot in assessment, though, is that the process has helped align our department grading. Where assessing hundreds of artifacts is spinning in a wheel, the first part of each assessment session is undeniably valuable. As a universal practice, we normalize our grading first. We take sample artifacts, grade according to rubrics; then discuss our reasoning. Over time, we've discovered that our grading is generally in synch. And, to a person, we'd agree that the time normalizing was efficiently spent. Indeed, normalizing, looking together closely at a process, providing feedback about that process and then bringing what we've learned back into the classroom, is closer to the Deming quest for quality than is grading 200 developmental essays in an afternoon.

The last reality about assessment I've realized is that as educators it's important to remind people that "measurability" is not an ontological necessity. There are all kinds of experiences we have that are not measurable: esthetic, risible, epistemological, spiritual, etc. They happen all the time, even (and sometimes especially) in the classroom. In fact, those unmeasurable experiences probably are the reasons we teach. How can we assess the qualitative value of higher education? Perhaps ethnography can help. Certainly, when you ask a graduate to assess their experience, I wager they'd tell a story about an unmeasurable moment of insight they had in a class. We need to work towards finding ways to make these experiences happen in assessment because they belong uniquely to the student in the classroom, and not the economy.

One of the recommendations of the Spellings Commission was to create a searchable database of institutional assessment so that the consumer-students can make an informed choice. That searchable database has not yet been built. This is similar my own institution—there is no searchable central site to track all the assessment activities. My fear is that the matter is so complex that institutions will be tempted to look to entities like Pearson for solutions (which cannot even program gradebooks to do formulas).

In a larger sense, this is symptomatic of research in the field. There is so much data, much of it contradictory, that it is difficult to discover what all that data mean. This essay's composition is no different. Most data is cherrypicked in reports because there is every kind of datum available--you can easily find data that supports your thesis. The field of educational research is populated with individuals, think tanks, mobilized networks, which conduct surveys, meta-analyze studies, construct graphs and make reports for their stakeholders. This is replicated institutionally wherein each department generates more and more undigested data in order to serve assessment.

What we experience locally is echoed globally, we generate more data than we can derive meaningful information from. I am reminded of a line from Shelley's "A Defense of Poetry," "our calculations have outrun conception; we have eaten more than we can digest." Shelley argues that only the creative imagination can make the necessary synthesis of conception from fact, but how do you quantitatively assess the creative imagination? How do we show it happening? Yet this is precisely what most of us try to make happen in the classroom—data into information into knowledge, or should I say "knowledge-widgets"?

Lesson Four: Reading is Lamarckian or What is the Foucauldian Brain?

You cannot read a text about education without finding an allusion to neuroscience. From here on in, I'll call the rhetorical use of neuroscience, the "brain trope." The brain trope is used similarly to the way data is used in arguments about education—it is marshalled to support almost any position.

The Spellings Commission's Report, for example, derides the fact that, "little of the significant research of the past decade in areas such as cognitive science, neurosciences, and organizational theory, is making it into American classroom practice" (15). Spellings's point signifies one motif—that education ought to be tailored to specific neural processes.

Marc Prensky's essay, "Do They Really *Think* Differently," demonstrates another brain trope motif. He indicates that his advocacy for game-based learning, "comes from neurobiology, social psychology, and from studies done on children using games for learning" (13). Prensky's point, and it is shared by many other advocates for digital learning, is that the brains of Digital Natives are wired more by digital technology than by an activities like reading, which shaped the brains of the Digital Immigrants.

A third brain trope motif is that of warning. Spending too much time in front of the screen has deleterious effects on the brains of the Digital Natives. In fact, that is the point of Bauerlein's screed—too much screen time has rendered Digital Natives dumb. Nicholas Carr asks, "Is Google Making Us Stupid?" and the American Association of Pediatrics cautions, "studies have shown that excessive media can lead to attention problems, school difficulties, sleep and eating disorders, and obesity" (www.aap.org/aap-health-initiatives/pages/Media-and-Children.html).

Whether the brain trope is used to support digital immersion or warn against it, it is described in such a way that indicates it is a *fait accompli*. The train of thought goes--the Digital Natives' brains are re-wired and that re-wiring will proceed into the future. Although subtle, I detect a Lamarckian reading of evolution in the use of the brain trope (although it's explicit in an essay by Gary Small and Gigi Vorgan entitled, "Your Brain is Evolving Right Now"). The idea, used to amplify the significance of our digital world (positively or negatively), is that the way the brain is being re-wired will be passed down. Of course, that's not true. We pass down the *culture* that privileges the digital, not the brain wiring itself.

Why is the brain trope so pervasive currently? What would be a Focauldian reading of the trope? I see it is a natural progression of an instrumentalist view of education. The purpose of education is not only instrumentalist in that it should train a student for a specific role in the economy, but it ought to make something very specific happen in the student's brain. It assumes the ultimate materialist, and behaviorist, position—there is a specific correspondent brain reaction that we can enact through pedagogy. This assumption is based, I believe, on a vision of the brain as a computational device that can be seamlessly interfaced with its younger step-brother—the digital computer. The two threads come together in a vision where higher education trains students at a computer workstation for a career at a computer workstation.

The Lamarckian aspect of the brain trope often conceals the reality of the brain's operation—the brain is remarkably, gloriously plastic. There is nothing about brain rewiring that cannot be changed by a reprioritizing of social values. If screen-time has too much influence in determining brain wiring, there is a very simple way to reverse its effects—close reading.

Digital Immigrants spend much more time looking at a screen than they do looking at a book. In the latest American Time Use Survey (2013), conducted by the Bureau of Labor Statistics, those who are aged 15-19 spent, at least, 2.8 hours a day on screen time, as opposed to

15 minutes reading. Those who are aged 20-24 spent at least 2.67 hours a day on screen time, and though time spent reading was unavailable for this group, if previous years' results are any indication, it was less than 20 minutes.

The consequence of so much screen-time is that attention spans shorten and engagement in a text or interpersonal communication becomes more challenging to achieve. Prensky doesn't see this as problematic, "As a result of their experiences Digital Natives crave *interactivity*—an immediate response to their each and every action" (18). The problem is that the immediate responses they seek often have little meaning, "Yo!" or "Liked!"

I'll engage in a little brain trope myself in order to describe why they crave interactivity and why their interactivity is frequently empty. Our eyes really don't "scan" anything. They move in short ballistic movements, little jerks, called "saccades." The movements of saccades are high velocity and you can see the evolutionary advantage—the brain manages to construct a coherent, and relatively accurate, picture of reality by gathering information from each saccade. As a fascinating aside, the intentional placement of an eye saccade seems to be the shortest act of will—potential into actual—that a human being is capable of. So seeking immediate responses from visual data is hard-wired into our perceptual apparatus. As I mentioned in the lesson on the LMS, the problem is that in our responses to visual culture often carry little useful information and are more distractions than interactions.

> Davidson sees the "reading" habits of Digital Natives as exploratory and positive:
>
> We browse, scan, connect in mid-paragraph, if not mid-sentence to related material, look up information relevant or related to what we're reading. Sometimes this mode of relational reading might draw us away from the original text, hypertextually streaming us into completely new threads and pathways. (54)

Yet when Jakob Nielsen, an influential web usability consultant, tested internet browsing habits he discovered that people, "fail to readjust their content interpretation to compensate for changing contexts. For example, when users jump from one information architecture to another, they continue to think that the information addresses the previous topic" (56). As browsers "hypertextually" jumped around, the context of each piece of new information was elided. This problem is even worse for Digital Natives who Nielsen has found to have "poor reading skills, less sophisticated research strategies, and a dramatically lower patience level" (48). Poor

reading, the inability to effectively research, and lacking the patience to do either does not add up to an engaged or successful student.

In addition to gathering the world through saccades, the visual-motor process has another function that allows us to gain information from the world—its ability to focus. We focus by utilizing a cone-rich notch in the retina, close to the optic nerve called the fovea. We direct the fovea when we need to attend to a particularly information-rich aspect of our environment, for example, when we read.

Nielsen discovered that when Digital Natives confront text on a screen, they skim it (Bauerlein 148) as opposed to reading it. My students also tell me that when preparing for standardized tests that No Child Left Behind demands, they learn to skim texts to look for key terms to answer multiple choice questions. So by the time Digital Natives are in college, they may be literate, but they are not expert readers.

Fortunately there is a technology that can help lengthen attention span, sharpen focus, and encourage reflection—close reading. Maryanne Wolf's book, *Proust and the Squid*, is a "natural history" of reading which chronicles how we gain "the reading brain." Wolf argues that close reading can help us manage a future whose radical changes are accelerating exponentially:

> If the species is to progress in the fullest sense, such preparations require singular capacities for attention and decision making that incorporate a desire for the common good. In other words, to prepare for what comes next demands the absolute best of what we possess in the present adaptation of the reading brain. (213)

It is part of our responsibility as educators to resist substituting power points for pages, pictures for words, videos for books. By encouraging students to read every word we counteract cultural forces that would have our students move rapidly through information that they cannot understand, contextualize, or reflect on.

Lesson Five: Dark Energy and the Future

Although this essay has been based on experiences of the past fourteen years, I cannot help but think that it also encouraged me to witness possible futures for higher education. In many of the future scenarios, faculty ranks are diminished, replaced by more technocratic workers who help manage learning systems that deliver education electronically. I imagine that

some brick and mortar institutions will remain to educate the elite who desire to have the full social college experience.

The drumbeats for the future focus on lowering costs and accommodating the epistemological habits of Digital Natives. The subtext is also capitalist—the private sector has its eyes on the 1.18 trillion dollars of public expenditures. This paradigm has institutions of higher education acquiesce to the market, rather than serving as countervailing value to the profit-driven economy.

I believe it is imperative that we promulgate a different value. We need to explain the benefits of reflection. The unexamined life is still not worth living, in spite of the endless distractions of the internet. Reflection is unmediated and we need to model it for, and stress it to, our students: "Hello class, meet your frontal lobe. I'll give you some time to get to know each other better today."

I've always been sanguine about the future, yet, increasingly, when I see students bound to their screens, I can't help but envision a dark future of machine dominance. An easy way to combat the dependence on the screen is to encourage students to interact with each other, sans machines, when they are proximate to each other—in the classroom, for example. Interpersonal communication focuses attention and generates engagement.

I was amazed last semester when I asked students how many did not have to read texts for classes. Nearly a third of the class indicated that instead of reading textbook chapters, they just review power point slides that had been used in class. Those slides were then uploaded to the LMS for the students. Essentially, their teachers do the reading and digesting for them. We need to redefine close reading as a technology that develops critical thinking, reflection, and counteracts the endlessly distracting culture our students live in.

In fact, the classroom of the future for me looks familiar but instead of being a site where culture is transmitted, it is a site where the deleterious effects of culture are mitigated, where students read without distraction, communicate without typing, and reflect without anything but their own thoughts. This doesn't cure the "cost disease" but uses it as therapy for a culture that needs some healing.

Physicists indicate that of all matter and energy in the universe, only around 5% of it is visible. The rest is composed of dark matter and dark energy. I've always thought about dark energy analogically. Imagine that dark energy is what's possible. It becomes visible when it's

actualized. Dark energy is greater than visible energy because there's always more potential outcomes than the outcome that occurs. The data that shows poor performance of students, the experience of their distraction and disengagement, is only a small part of education. Many, many times in the classroom there is a flash of insight, a fellowship of community, bright moments of exploration and discovery—the expression of intellectual energy where none was visible before. This is what the educator works at realizing and it is these moments that make me hopeful in the classroom. It is our responsibility to argue that these moments, although unmeasurable, must have a fundamental role in the future of higher education.

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