We cross dirt roads and highways that mark

the will of some one and then others, who said

I need to see what's on the other side.

Praise Song for the Day

Elizabeth Alexander

Innovation Squared:

Comparison of Models by Tony Wagner and Steven Johnson

Jerry E. Fluellen Jr.
Adjunct Professor of Psychology
Edward Waters College

Future of Learning 2010 Summer Institute
Harvard Graduate School of Education

12.01.12

ABSTRACT

On the surface, Tony Wagner's model of innovation differs from Steven Johnson's. One explores the following: how might we develop a nation of innovators? The other offers seven patterns that mark environments for innovation. Drawing from triangulated data, both authors create regularities (not laws) that have new paradigm, scientific credibility. Both authors embody mindful learning. Innovation, in Wagner's view, involves play, passion and purpose. Also, parents and/or teachers often can spark innovators. In Johnson's view, a "good idea" springs from a set: slow hunch, liquid network, adjacent possible, error, serendipity, platform and exaptation. Both models shed light on the power-teaching prototype—itself a framework for innovative teaching and learning. Speaking the language of innovation from the Wagner and Johnson models can help to describe the prototype and explain how it designs, directs and delivers learner-centered instruction in a digital age.

Frank Herbert envisions a culture 10,000 years in the future. While his Fremen hold a remarkable resemblance to Native Americans, they exhibit unique cultural practices that, in turn, yield the conditions needed to create the Kwizac Haderack—a super hero no world has ever seen before the saga of Dune. Frank Herbert's imaginative power is not alone. Science fiction writers for the last 100 years have created people and ideas not yet real. And some of their ideas become so within their lifetimes. Witness Arthur Clarke's satellites. And everyone knows the sentence "Beam me up, Scotty." Now people around the globe talk with hand held devices or even speak to computers.

The work of Tony Wagner and Steven Johnson is in real time. Yet, they imagine innovation as vital to 21st Century life and beyond. In his new book, Wagner believes people can nurture innovators in homes and schools. In his recent book, Johnson believes that understanding seven patterns can help people to become more innovative. Both authors offer ideas to discuss along the lines of scientific credibility and mindful learning (in the Ellen Langer sense).

More so, while their views differ on the surface, the essential argument stays the same: the United States of America needs to become a nation of innovators now and tomorrow.

Ellen Langer, one of Tony Wagner's colleagues at Harvard University, has spent the last three decades researching mindfulness applied to psychology, education, health, the arts and, more recently, business. In her Langer Mindfulness Scale, she operationally defines mindfulness as a psychological trait hosting four factors: novelty producing, novelty seeking, flexible thinking and engagement. Of these, it is easy to see Tony Wagner as engaged in innovation.

A fellow for Innovation at Harvard University, Wagner, in the words of the Leigh Bureau website, is an "expert on how innovation can be learned." (Leigh Bureau, 2012) The site says Wagner, "served over a decade as founder and co-director of the Change Leadership Group," Harvard Graduate School of Education. His new book *Creating Innovators…* builds on the previous four as well as his experiences as a teacher, principal, professor, parent and researcher. His engagement with innovation includes both acquired knowledge and new inquiries to ponder.

At the 2011 Learning & Brain conference in Boston. Wagner talked about seven skills needed to become a nation of innovators. While the talk was quite provocative, his new book extended the view of innovation, significantly. He shifted from seven skills for developing innovators to a model of how to develop a nation of innovators.

Here were two questions about young innovators posed in his introduction: (1) "And what about the teachers whom these innovators identified as having been most important in their development—were there any similarities in their methods?" (2) "Are there colleges or graduate programs that do an excellent job of teaching the skills of innovation, and if so, how might they be different?" (Wagner, 2012)

Creating Innovators: The Making of Young People who will Change the World **appears timely for several reasons. It attends to STEM education, 150 interviews with young innovators and selected parents, teachers and experts. As a bonus, readers can watch video interviews with experts on innovation via smart phones throughout the book to engage ideas more deeply. It is actually two books in one: an in depth discussion of fostering innovators and a set of videos with selected experts including a sample of the young innovators.**

The Oxford English Dictionary app for MacBook Pro says innovation comes from two Latin origins: the prefix in- (into) and the root novare (new). Thus, innovation means "into the new." Wagner's book raises new questions and offers high tech additions. It provides a model for developing a nation of innovators in a digital age. It is into the new.

Likewise, Steven Berlin Johnson has engaged innovation but with a twist: he explored the deceptively simple question "where do good ideas come from?" One YouTube video by the same title managed to squeeze all seven of Johnson's patterns of innovation into a five minute, animated mind map while keeping one pattern up front: "slow hunch." Years before he got the insight that 500 years or more of innovation can be discussed in terms of patterns, he must have had a notion that a certain environment fostered innovation. And these environments might have reoccurring features. His previous books provided fodder for the "slow hunch" that became an "adjacent possible": a best-selling book entitled *Where good ideas come from: A natural history of innovation.*

Prospect Magazine's **selection as "one of the top ten brains of the digital future," Johnson poses a critical question: "What kind of environment fosters the development of good ideas?" (Leigh Bureau, 2012)**

Together, Tony Wagner and Steven Johnson offer new ways of viewing idea-makers. What they say and how they know what they say become subject to scientific credibility.

SCIENTIFIC CREDIBILITY

"We've been a desert making species.
Now we need to become a desert greening species."
Elizabet Sahtouris

Scientific credibility holds particular interest in light of Elizabet Sahtouris's new paradigm formulation. What has counted for scientific credibility in positivism does not count in the Sahtouris model. Her basic argument is this: physics has long been held as the epitome of scientific inquiry, but its fundamental assumptions of reality no longer fit the evidence of human experience. The problem she strives to solve is the creation of a new paradigm with new assumptions that do fit the evidence countering what Fritjof Capra once termed the "Newtonian paradigm" and extending what he called the "ecological paradigm." (Sahtouris, 2009; Capra, po) Like Capra and many other scientists, Sahtouris argues for a new model. Thus, what counts as scientific credibility, in turn, must change.

Examine her reasoning more closely.

Figure 1

Old Paradigm Assumptions	New Paradigm Assumptions	Commentary
The universe evolved by chance.	The universe evolved because of intelligent design, namely God.	In the old paradigm, life emerged from dumb mud. In the new paradigm, life itself is fused with consciousness.
Science creates laws.	Science creates regularities.	For centuries physics sought laws to explain a mechanical universe. But physics itself (from Einstein's theory of relativity to string theory) has disrupted past formulations. Instead of absolute truth, the new paradigm seeks relative truth.
Human experience and consciousness don't matter. Science is objective.	Human experience and consciousness matter. Science is never fully objective and never outside of human experience.	Only God has complete knowledge of the universe. Science allows humans to experience glimpses of God's knowledge. As consciousness increases, more of God's knowledge can be understood, but as it is in the mathematical model of the asymptotic, perfect knowledge is beyond the reach of humankind.
		So what counts as scientific credibility in the new paradigm?

Sahtouris says her "model of the cosmos includes *all* human experience. The goal of this new framework for science is proposed to be a) to model a coherent and self-consistent cosmos as a public reality conforming as much as possible to necessarily private individual realities, and b) to interpret this model for the purpose of orienting humanity within the cosmos and thus permitting it to understand its particular role within the greater cosmos." (Sahtouris, 2009) Recalling Gregory Bateson, Sahtouris seeks patterns that connect: God and humanity, evolutionary chance and unfolding intelligent design, entropy and negentropy, despair and hope, science and human experience. (Sahtouris, 2009)

Recalling Thomas Kuhn, she synthesizes her model in the following passage.

We stand at a critical time in human history where the "self-evident" axiomatic "truth" of a depressingly meaningless mechanical universe running down by entropy, magically giving rise to biological creatures doomed to endless competitive struggle to get what they can while they can, is no longer defensible. Most fundamentally, we see now that this model was built on the false concept of an objective universe independent of human observers. We are also in a position to see just how this western scientific model, which overrode previous religious models of "How Things Are," has led human society astray. Our mechanistic social organizations no longer serve us, nor does the competitive economy that destroys ecosystems and impoverishes vast numbers of humans and leads to the endless warfare so basic to its model.

In its place, happily, we can construct a new scientific model on the far more self-evident truths outlined above, one that takes into account the entire gamut of human experience and recognizes the cosmos as fundamentally conscious and alive. Much progress has already been made by myself and many other scientists to flesh it out.

The new model offers a holistic view of life in which biology and physics are mutually compatible and consistent. The new axiomatic definitions and assumptions given here for this model of a living universe sees it not as a collection of accidental biological entities evolving on rare planets of a non-living universe through the mechanics of natural selection, but as a holarchic, evolving, intelligent, process intrinsic to the cosmos itself—in short, as the natural process of the cosmos itself, as self-organizing expressions of a cosmic field of consciousness. (Sahtouris, 2009)

So the question upon us is what counts as scientific credibility in light of a new paradigm? Proposed here are three features of scientific credibility: (1) science creates regularities from observations; (2) science offers conditional ideas within the present context; (3) triangulation of data increases credibility but never proves anything. Given the three patterns above, it is possible to discuss the core ideas of Tony Wagner and Steven Johnson in terms of scientific credibility in a digital age.

Before examining the Wager and Johnson models along the lines of three patterns drawn from the new paradigm, a conflict might shed light on paradigm shifts. By contrasting the old and new, the value of a new paradigm view of scientific credibility becomes even clearer.

Howard Gardner introduced multiple when he published *Frames of Mind* (1983) in the wake of *A Nation At Risk.* Psychologists at the time were primarily wed to the Newtonian paradigm. Intelligence had an established set of psychometric perspectives, and his theory that human beings across cultures had seven intellectual capacities was outside of the box. They rejected the theory of multiple intelligences.

The view that intelligence is an IQ still persists. A recent article arguing that decade-by-decade IQ scores of whole populations have been increasing during the 20th Century. The "Flynn Effect" says James Folger, claims that humans are becoming smarter than their ancestors. At the heart of the assertion is the acceptance of IQ defined psychometrically on a WISC or other standardized instrument. (Folger, 2012) Note that the Flynn Effect fails to account for wisdom.

In the 1940s, Thomas Kuhn had already described how anomalies not accounted for lead to formulations of a new paradigm—one that is first rejected by the established community, and then later might become an established idea. (Kuhn, 1962). Someday, psychologists might accept the family of teachable intelligence theories emerging along with Gardner's MI theory. (Fluellen, 2005)

In contrast to psychologists, many educators had long since realized that an IQ driven view of intelligence failed to describe what they were actually seeing in their classrooms. Students were using more than the traditional verbal linguistic and logical mathematical

intelligences to 'solve problems" or "fashion intellectual products" (cornerstones of Gardner's definition of intelligence). (Gardner, 1983)

Multiple intelligences theory created regularities that cohered with eight criteria and a conceptual definition of what counts as intelligence. Originally, the theory spelled out seven different capacities that were open to further research and disconfirmation. Three decades later MI theory joins a family of theories that extend beyond the borders of a traditional view of intelligence and take a view of human potential. These theories of teachable intelligence represent a shift in paradigm and cohere with the Sahtouris belief of a new model in science.

For MI theory, triangulated data from Harvard Project Zero Research Center and universities around the globe added value to ideas springing from its assumption that IQ can change because of teaching, coaching and parenting as well as the realization that much of what now counts as intelligence cannot be represented in a single score but instead resides in performances in naturalistic settings. Yet nothing has been proven—though no discussion of intelligence in the 21st Century can ignore the Gardner conceptualization or several other

views of "teachable intelligence" including Triarchic Theory of Intelligence by Robert Sternberg, mindfulness theory by Ellen Langer, learnable intelligence theory by David Perkins, and most recently, a theory of neurodevelopment from neuroscience. (Fluellen, 2005) Tokuhama-Espinosa, 2010)

Similarly, while Gardner's creative inquiry had been what counts as human intelligence, Wagner's model posed the following: How might we develop a nation of innovators? Wagner's implied hypothesis was play, passion and purpose characterize people who have been later recognized as innovators. He discovered this pattern—this regularity--from interviewing 150 young people designated as innovators. He interviewed many of their parents and teachers. He examined primary documents about innovation. Then, the play, passion and purpose triangle stood out. However, his regularity becomes fodder for further investigation and the model for increasing the number of people in our nation who become innovators remains incomplete. Certainly, nothing has been proven—his book is less than six months old.

Likewise Steven Berlin Johnson offered a model of seven patterns that seemed essential to the development of innovation. In part, his patterns can be illustrated in fiction. Jack, a main character in Ken Follett's *The Pillars of the Earth,* studied under master builder Tom. By Tom's untimely death, Jack, 17, had used his genius to absorb his stepfather's knowledge of building a cathedral. Later, Jack traveled to Spain and then to France to examine new ideas in cathedral building. He returned to Kingsbridge, England to finish the church his stepfather had started. All along, Jack carried an idea of a new cathedral design in his imagination. That idea was a slow hunch in the language of Johnson. The idea interacted with several examples of new architectural designs in Spain and France as well as talks with several master builders and a study of Euclidian geometry. That was Johnson's liquid network in which slow hunches interacted with other slow hunches. Jack's return home to England to construct a new cathedral in the ruins of the old was the "adjacent possible"(creating an innovative design). Jack had seen errors in church designs as well

and knew that such mistakes were part of the process of innovation. So when he discovered that the top part of his church was strong enough to hold its weight normally but not in the tempest (hurricane) winds, he had to correct the error as part of the innovation process. Johnson makes the role of error clear in his model. No error, no into the new.

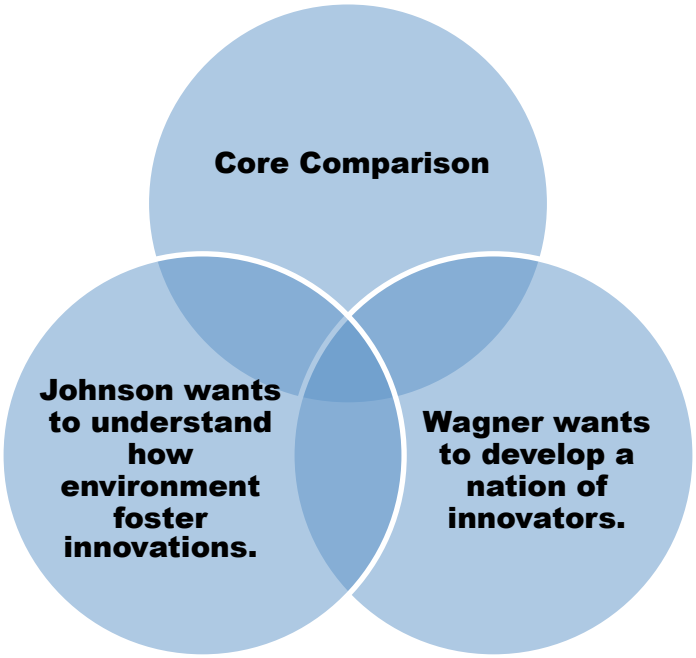
Additionally, it was "serendipity" that led Jack to discover the many efforts to build monuments to God in lands very different than his home in 12th Century England. The church grounds became a "platform" for engaging the innovation true to Johnson's assertion that good ideas happen in a physical space. Lastly, exaptation—a brand new use on innovation that different from the original intent (bird feathers intended for warmth become tools of flying), becomes clear in Jack's use of architectural features combined from Spanish and French cathedrals to create a first of its kind cathedral (albeit fictional) at Kingsbridge, England.

Like Wagner, Johnson relied primarily on interviews with experts and examinations of primary documents to create his pattern of regularities. Unlike Wagner, readers don't know how many people were interviewed nor was the question investigated explicit--though implicitly, he seemed to explore the idea that people can become more innovative if their environments foster the seven patterns.

Given the second and third item of evaluation, it appears that Johnson's model is conditional within the context of the digital age, and he does triangulate his data. Wagner examined several perspectives—the samples of 150 innovators interviewed plus selected parents, teachers, experts and primary documents. Johnson, in contrast, interviewed experts and examined primary documents plus a healthy dose of intuition rooted in his previous books. That's still triangulation. So on the surface, it appears that the Wagner model has more scientific credibility than the Johnson model but both add significant value to our view of innovation.

At a deep structure level, both models are equally compelling. Both models are new and open minds to creative inquiries yet spoken. Now that the ideas are in the air, around the world, further exploration is sure to come. But absolute proof will never emerge.

Figure 2



MINDFUL LEARNING

> **"A mindful approach to any activity has three characteristics: the continuous creation of new categories; openness to new information; and an implicit awareness of more than one perspective. Mindlessness, in contrast, is characterized by an entrapment in old categories by automatic behavior that precludes attending to new signals; and by action that operates from a single perspective." p4 (Langer, 1997)**

To what degree did Wagner and Johnson engage mindful learning? Drawn from three decades of research on mindfulness theory, Ellen Langer's concept of mindful learning provides another lens for comparing the two models of innovation. Three questions emerge from Langer's conceptual definition: (1) Did they "create new categories" on innovation? (2) Did they demonstrate an "openness to new information?" and, (3) Did they demonstrate an "implicit awareness of more than one perspective?"

Examining the Wagner and Johnson models from Langer's view provides what 20th Century systems thinker Gregory Batson once called "double description." If two or more views cohere, the idea might have merit. Mindful learning, then, might add value to scientific credibility.

Both models represent new categories combined into regularities. Both authors seemed open to new information, but neither pointed to examples of people who don't believe their basic assertions. However, both examined multiple perspectives related to the development of their respective models. Both authors were mindful learners.

POSTSCRIPT

> "An explosion of innovation has been transforming how we think about learning and how we organize talent and resources for learning experiences and has effectively unbundled 'school' as we knew it. The tightly bound relationships and resources flows that used to deliver instruction, develop curriculum, perform assessment, grant credentials, and provide professional development are dissolving. Teaching and learning have become uncoupled from traditional educational institutions and are now available through and enhanced by a vibrant learning ecosystem." (Knowledge Works, 2012: Recombinant Education: Regenerating the Learning Ecosystem)

Tom knew that one day he would build a cathedral. All his joy and suffering (including birth of his baby boy and death of his wife Agnes in childbirth as he delivered the infant himself on the forest floor by a fireside in the dead of an English winter and watched Agnes bleed out on the cold ground), all the hustles his family would make to survive a homeless winter, all of his service as a master builder would prepare him to envision a monument to God his stepson, Jack, would one day finish.

While *The Pillars of the Earth* is a landmark novel in Ken Follett's career, Power Teaching is a landmark prototype for teaching and learning in my career. Without details of hardships such as overcoming prostate cancer and managing congestive heart failure,

there is the story of how the prototype came to past--how a handful of once stand-alone ideas about innovative instruction would connect into a metaphorical equation stated simply as P=fm/c (where P= power teaching, f=future of learning, m=Mind, Brain, Education Science, and c=context). (Armstrong-West, S. & Fluellen, J. (2012)

Yesterday is a good place to start. Dartmouth had offered the first college course in neuroscience in 1968. In all that time psychology, education and neuroscience had been converging into a new discipline, namely, Mind, Brain, Education (MBE) Science. In all that time no course in the new discipline had ever been offered at a small college in the urban South--even though it had huge implications for teaching and learning in a digital age. The 2012 spring Theories of Learning seminar offered a chance to give students uncommon instruction. Already two professors had introduced MBE science as a topic during the previous two semesters so a critical mass of students had been primed. In fact, 19 of the original 28 students enrolled in Theories of Learning, spring 2012, had prior knowledge of MBE science from previous coursework. (Tokuhama-Espinosa, 2010; Fluellen, 2012)

The course delivered MBE science as disciplinary content synthesizing past theories of learning from behaviorism and constructivism in three ways: (1) students studied Tracey Tokuhama-Espinosa's book on MBE science history and engaged daily writing/thinking activities to practice synthesizing ideas; (2) students conducted personalized literature reviews of topics drawn from MBE science and presented power point talks from personalized literature reviews at an end of semester mini conference; and, (3) facilitating the course used five MBE science solid research findings in the actual learner centered instructional sequence. Such a three-fold approach helped the young psychology majors to engage five, graded experiences in argumentative discourse including the power point talks in mini conferences and a GRE-like final examination of writing and thinking. In spite of that rigor, 24 out of 25 students passed the course with grades of A, B, or C—a 96% passing rate. And only three had dropped he course by midterm. Factors of the power-teaching prototype (P=fm/c) designed, directed and delivered learner centered instruction. (Fluellen, 2012)

It was Steven Johnson who said one way to think about what counts as an innovation is to see how many jobs the innovation does. YouTube did more jobs than HDTV, therefore, was more innovative. P=fm/c solves generic teaching and learning problems: (1) TfU handles large scale planning in terms of designing whole courses while it uses Gardner's MI approach for small scale planning of day by day class sessions; (2) design includes the best use of the physical space with cooperative learning strategies and game-based learning. (Marzano, 2001; Horizon Report 2012, Higher Education)

Additionally, as context, learner centered design requires developing digital media literacy with appropriate instructional learning technologies (Moodle, power point presentation, YouTube, Mind Maps, web sites, tablets, desk top computers, smart phones etc.); (3) Gardner's five minds for the future and Langer's mindfulness theory deal with the direction of instruction (by the end of the semester learners had engaged all five minds for the future, particularly the synthesizing mind, and they practiced mindful learning; (4) MBE science delivered the actual instruction, demanding

a learner centered approach set in an understanding of five solid research ideas such as "new information connects with old." (Fluellen, 2012; Tokuhama-Espinosa, 2010)

Note that Tracey Tokuhama-Espinosa defines "learner centered education" as the following: a "classroom in which students are encouraged to choose their own learning goals and projects. This approach is based on the belief that students have a natural inclination to learn, learn better when they work on real or authentic tasks, benefit from interacting with diverse groups of people, and learn best when teachers understand and value the differences in how each student learns. Learners are responsible for identifying knowledge gaps, actively participating in filling them, and keeping track of their learning gains." Tokuhama-Espinosa, 2010)

In all, power teaching wove stand-alone ideas into a whole, a patchwork quilt in which each idea retained its beauty yet created something new as a whole. So another one of the prototype's jobs was synthesizing research-based ideas.

The DC story

2006. The District of Columbia Public Schools faced massive change in the same year: new Superintendent, standards, textbooks and standardized tests. Regarded as one of the worst school districts in the nation, Superintendent Janey's job was to implement change all at once including a new strategic plan. Educators were overwhelmed.

2007. A collaboration with a Superintendent's literacy coach, a classroom teacher, a principal of new high tech high school, a professor at Howard University and a teacher consultant in the District of Columbia Area Writing Project became a slow hunch swimming in a liquid network and emerging as the first generation of the power teaching prototype. That first generation prototype designed, directed and delivered Mars 2030, a yearlong, interdisciplinary research project for five 10th Grade classes in a STEM school. That was five out of six 10th grade classes at the new high tech high school so their "proficient" scores on the citywide tests based on the new standards carried the school. In fact, the DCPS School Board gave accolades to the students, teacher, teacher consultant, principal and parents of the

135 students in the project. A 10 document occasional paper series later traced the growth of the power teaching prototype over the next six years as it traveled from DC to Jacksonville by 2012. An 11th paper synthesized its connection with Harvard University's Future of Learning 2010 Summer Institute and the 2012 Theories of Learning seminar at a small college in the urban South. To date, seven generations of the prototype mark its evolution as an "adjacent possible."

Today, it's clear that "error" has played a key role in the prototype. The first generation of power teaching connected new standards, multiple intelligences theory, the Tishman, Perkins and Jay model for thinking and cultural relativism into a whole. These proved to be too much and too disconnected. But by the 7th generation, it became clear that the problem power teaching had to solve was integrating sustainable ideas enabling the design, direction and delivery of instruction now and in decades to come. The ideas needed to be global and foster both research-based practice and practice based research.

“Serendipity” placed the author of power teaching into several “platforms” that allowed refinements to the model. One was Harvard’s Future of Learning Summer Institute that introduced Mind, Brain, Education Science as an emerging discipline, not just an interesting innovation. Also, the concept future of learning with a relatively long use in the ERIC database as a search term became a factor to organize four levels speaking to the design and direction of instruction. And the Harvard Institute gave birth to the idea that context (globalization and digital revolution) might be considered as a factor in the prototype. Thus, P=fm/c used future of learning as an “exaptation” as well as MBE Science. The C-factor, context, in the seventh generation of the prototype became the Sahtouris model for science and digital media literacy. Exaptation of the 7th generation came when educators from a college in the urban South presented an interactive talk (“P=fm/c: Fostering Innovative Teaching and Learning in a Digital Age”) at the 19th faculty development conference for HBCUs (Historically Black Colleges and Universities) in Orlando,

Florida, The power teaching prototype had been released—to fly amongst 105 HBCUs. (Armstrong-West & Fluellen, 2012)

Jacksonville Story

Meanwhile, the prototype will design, direct and deliver a new course never before offered in the contest of a theories of learning seminar: "Connectome: Now and Tomorrow."

Figure 3

Theories of Learning Draft Course Design Spring 2013	***Edward Waters College 2013***	**"Education must not simply teach work—it must teach life." W. E. B. DuBois**
Harvard's Teaching for Understanding Framework (TfU)	Generative Topic	Connectome: Now and tomorrow
	Throughline	"The brain connects new information to old." (Tokuhama-Espinosa, 2010)
Core primary sources: Seung, S. (2012). *Connectome.* : *How the brain's wiring makes us who we are.* Boston: Houghton Mifflin Harcourt. www.humanconnectomeproject.org www.lumosity.org Does systematic instruction with the power-teaching prototype improve mindfulness? That creative inquiry will guide the professor's reflections on the course.	Understanding Goals Understanding Performances Ongoing assessments	1. Synthesize scholarly ideas about how the brain learns. 2. Engage analytical thinking and digital media literacy. 3. Create a collective around the essential question below: **How might the connectome explain human learning now and in decades to come?** 1. Reflect on creative inquiries. 2. Use all five minds for the future when engaging graded experiences. (midterm essay, revision, research based power point talk in a mini conference; GRE like final examination of writing and thinking about the human connectome) 3. Brain train online with Lumosity to increase "Brain Performance Index." (Improve memory, attention, speed, flexibility, problem solving) and awareness of your own learning. Engage feedback and self-evaluation on daily writing/thinking activities as well as graded experiences.
		1. Feedback on reflections

Here Wagner's model becomes evident. The course will feature game-based learning. Students "play" games for thinking and writing, strategically placed in the instructional sequence as they explore the connectome—new directions in neuroscience as well as a deeper look at MBE science. Once a week, they will engage the Harvard 3-2-1 game for writing and thinking to tap prior knowledge, pose creative inquiries and create metaphors that deepen understanding, forming stronger neuronal networks in brains. Three times a semester, students will play Harvard's critical squares games for critical thinking (Starting Block, Connection Cube and Reflection Cube). These will serve as informal assessments and ways of synthesizing content. Outside of class, students will engage Lumosity video games for enhancing memory, attention, speed, flexibility and problem solving.

In all, the sequence will encourage them to find a passion and research it. The sequence will nurture those students who also find a purpose. Thus, the seminar will honor Tony Wagner's quest to develop a nation of innovators one classroom at a time. (Wagner, 2012; Horizon Report 2012, Higher Education: Game based learning)

Finally, the new seminar reaches for depth instead of coverage, examining a revolutionary idea, connectome, within the larger context of MBE science, which, in turn, synthesizes traditional and new paradigm theories of learning. The seminar holds power--teaching as its deep structure, connecting context, the future of learning and solid research based ideas from MBE science. And it allows the professor to reflect on the following creative inquiry: Does systematic implementation of the power-teaching prototype improve mindfulness? The new seminar, then, embodies the words of W. E. B. Du Bois: "Education must not simply teach work—it must teach life."

WORKING BIBLIOGRAPHY

Armstrong-West, S. & Fluellen, J. (2012). P=fm/c (7th Generation): Fostering Innovative Teaching and Learning in a Digital Age. Presentation at the 19th HBCU conference for faculty development, Orlando, FL.

Blythe, T. (1998). The teaching for understanding guide. San Francisco: Jossey--Bass.

Capra, F. & Steindl-Rast. D. (1992). *Belonging to the universe: Explorations on the frontiers of science and spirituality.* San Francisco: Harper.

Eger, J. (2011). Pleasure, beauty, and wonder: Educating for the knowledge age. The Futurist 45(1) 18--20.

Fisher, K et al. (2011). Why mind brain education? Why now? Retrieved from Google March 1, 2011.

Fluellen, J. (2005). Convergence: Human intelligence the next 100 years. ED490417

Fluellen, J. (2010a) Power Teaching: New Paradigm Education. (Education Summit Featured Talk) Boston, Massachusetts: Westin Riverfront Hotel July 8, 2010: World Future Society.

Fluellen, J. (2010b). Fieldnotes for the Future of Learning Summer Institute (unpublished). Cambridge, Massachusetts: Harvard Graduate School of Education.

Fluellen, J. (2012) P=fm: Fostering Innovative Teaching and Learning in a Digital Age. ED532693

Folger, T. (2012). Can we keep getting smarter? *Scientific American* 307(3) 44-47

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences.* New York: Basic Books.

Gardner, H. (1999b). MI approach. In C. Reigeluth (Ed.) Instructional-- design theories and models: A new paradigm of instructional theory. Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers.

Gardner, H. (2010a). *Five minds for the future*. Boston, Massachusetts: Harvard Business School Press.

Gardner, H. (2010b). Five minds for the future (Plenary Session One) Future of Learning Summer Institute. Cambridge, Massachusetts: Harvard Graduate School of Education.

Horizon Report-Higher Education. (2012).

Johnson, S. (2010). *Where good ideas come from: A natural history of innovation.* New York: Riverhead Books.

Langer, E. (1989). *Mindfulness.* Boston: Addison Wesley.

Langer, E. (1997). *Mindful Learning.* Boston: Addison Wesley.

Johnson, S. (2011) Where good ideas come from? Retrieved from Youtube March 1, 2011.

Kuhn, T. (1962). *The structure of scientific revolutions*. Chicago: University of Chicago Press.

Marzano, R. et al. (2001). A handbook for classroom instruction that works. Upper Saddle River, New Jersey: Pearson/Merrill Prentice Hall

Perkins, D. (1998). What is understanding? In Teaching for understanding: Linking research with practice. Martha Stone Wiske, editor. Jossey-- Bass Inc. San Francisco.

Perkins, D. (2009). Making learning whole. San Francisco: Jossey--Bass. Perkins, D. (2010). Educating for the known and unknown. (Plenary Session Two) Future of Learning Summer Institute. Cambridge, Massachusetts: Harvard Graduate School of Education.

Perkins, D. and Unger, C. (1999). Teaching and learning for understanding. In C. Reigeluth (Ed.) ***Instructional--design theories and models: A new paradigm of instructional theory*****. Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers.**

Perrone, V. (1998). Why do we need pedagogy of understanding? In Teaching for understanding: Linking research with practice. Martha Stone Wiske, editor. Jossey-- Bass Inc. San Francisco.

Recombinant Education: Regenerating the Learning Ecosystem (2012). KnowledgeWorks Foundation and Institute of the Future. Cincinnati, Ohio and Palo Alto, California.

Seung, S. (2012). *Connectome: How the brain's wiring makes us who we are.* Boston: Houghton Mifflin Harcourt.

Tokuhama--Espinosa, T. (2010) Mind, brain, and education science: A comprehensive guide to the new brain based teaching. New York: W. W. Norton & Company.

2020 Forecast: Creating the Future of Learning KnowledgeWorks Foundation and Institute of the Future. Cincinnati, Ohio and Palo Alto, California.

Wagner, T. (2012) *Creating innovators: The making of young people who will change the world*. New York: Scribner, a Division of Simon & Schuster.