STARS

Electronic Theses and Dissertations, 2004-2019

2013

Capillarity: A Theory Of Mlearning And Its Application In Emerging Markets

David Rogers
University of Central Florida

Showcase of Text, Archives, Research & Scholarship

CAPILLARITY:

A THEORY OF MLEARNING AND ITS APPLICATION IN
EMERGING MARKETS

by
DAVID ROGERS
BS Sci United States Air Force Academy, 2000

A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in the Department of Texts & Technology
in the College of Arts & Humanities
at the University of Central Florida
Orlando, Florida

Summer Term
2013

Major Professor: Kevin Meehan

ABSTRACT

The theory of capillarity is an organic metaphor invoked to explore the role of network communications as a vehicle for education in a healthy society. Capillarity is offered as a theory in two parts: a mechanism for distribution and a method for engagement.

Capillarity seeks to build an architecture that reflects radical humanism's emphasis on access and inclusion as a vehicle for classical humanism's emphasis on the individual expansion of potential and consciousness. The technical instrument whereby this program of humanist education may be deployed is mLearning.

TABLE OF CONTENTS

INTRODUCTION:

CAPILLARITY

The theory of capillarity is an organic metaphor invoked to explore the role of network communications as a vehicle for education in a healthy society. As a physical force, capillarity relies on surface tension, the adhesion of molecules, to pull fluids through the finest vessels and along the slender threads of root systems. As a biological phenomenon, capillarity is what delivers nourishment to the individual cells of an organism and distributes the ingredients essential to life throughout the whole body. These avenues, the vessels of a root system or a circulatory system, are hierarchical structures. Major arteries feed into dense networks of branching vessels before coursing on through the tiny capillaries. These vital connections that sustain living systems are a picture of the opportunity afforded by mLearning and the fact that in the near future virtually every member of the human race will have a powerful and personal telecommunications device, according to the International Telecommunications Union (ITU).

Capillarity is offered as a theory in two parts: a mechanism for distribution and a method for engagement. In the first part, the mechanism for distribution is broader than what is traditionally meant by distribution. It encompasses not only the dissemination of information, but also its creation and curation. Just as the capillaries of a living body are hierarchical, the nodes within a global communications network designed to reflect authentic human relationships must also be hierarchical. At each level, the ability to publish, distribute, and curate should be preserved.

To demonstrate this concept my engineering team has developed a software architecture to reflect the notion of capillarity. The key characteristics of this platform are that each participant starts with a library to which he can add works of his own. These libraries can be organized and presented to others as a marketplace. In this way, content can flow from publisher to reader through a series of stakeholders, each of whom is also a publisher and reader. This synthesis of author, reader, and marketplace provides an instrument for mLearning as a reconstitution of the classical humanist mode of instruction. If each marketplace can be built up over time to become an authentic reflection of an individual's engagement with a body of ideas, this repository can become a resource for future students.

Capillarity seeks to build an architecture that reflects radical humanism's emphasis on access and inclusion as a vehicle for classical humanism's emphasis on the individual expansion of potential and consciousness. The

technical instrument whereby this program of humanist education may be

deployed is mLearning.

Key Terms

Humanistic Education

According to Nimrod Aloni, the term "humanistic education" is defined as

follows:

> "a variety of educational theories and practices that are committed to the world-view and ethical code of Humanism; that is, positing the enhancement of human development, well-being, and dignity as the ultimate end of all human thought and action—beyond religious, ideological, or national ideals and values. Based on a long philosophical and moral tradition—from the ancient Biblical prophets and Greek philosophers to the United Nation's 'Universal Declaration of Human Rights and the Rights of the Child'—the commitment to Humanism further implies the fostering of the following three fundamental tenets.
>   1. The first is *philosophical*, consisting of a conception of man - men and women - as an autonomous and rational being and a fundamental respect for all humans by virtue of being endowed with freedom of will, rational thinking, moral conscience, imaginative and creative powers.
>   2. The second tenet is *socio-political*, consisting of a universal ethics of human equality, reciprocity, and solidarity and a political order of pluralistic, just and humane democracy.
>   3. The third tenet is *pedagogical*, consisting in the commitment to assist all individuals to realize and perfect their potentialities and 'to enjoy,' in the words of Mortimer Adler, 'as fully as possible all the goods that make a human life as good as it can be.'"

Of the several schools of thought within the humanist tradition, I derive my

formulation chiefly from the classical and radical conceptions. Throughout the

following chapters I will use the theory of capillarity to explore humanist education

mediated through mobile technology in cultural, historical, pedagogical,

economic, and political contexts. The breadth of this investigation is not intended

to address any one context exhaustively, but rather to present the theory of

capillarity from a series of complementary perspectives and demonstrate the

value of its application to a range of contemporary challenges.

Banking Form of Pedagogy

"Banking" as applied to education is used to characterize educational

practices that fall at the opposite end of the spectrum from the practices

encouraged by classical humanists. In 1970 the term originated with Paulo Freire

in *Pedagogy of the Oppressed*:

> "Education thus becomes an act of depositing, in which the students are
> the depositories and the teacher is the depositor. Instead of
> communicating, the teacher issues communiqués and makes deposits
> which the students patiently receive, memorize, and repeat. This is the
> "banking" concept of education, in which the scope of action allowed to the
> students extends only as far as receiving, filing, and storing the deposits"
> (72).

These two forms, banking and classical humanist, represent opposite ends of a

spectrum. In practice it would be unfair to label most classroom instruction as

falling completely in to the "banking" concept as defined by Freire. However, the

banking concept is useful to represent a tendency within education to succumb to

economic and logistical constraints that shift the classroom emphasis away from

the development of a student's critical consciousness.

mLearning

The use of mobile technology as an educational platform is an emerging field with a growing body of scholarship. My project is not directly concerned with the fast-paced technical advances that will change the shape of mLearning in years to come, but rather with the notions of universal access and connectivity. Although I explore some of the more promising methods, I offer them only as examples of what may be possible in the future. One of the best definitions of mLearning comes from Jenni Parker's *Mobile Learning Toolkit:* "The ability to develop knowledge or skills through engaging with learning materials in any environment or location" (http://www.Scribd.com). Her emphasis on mobility over technology is helpful because it is clear that technologies and methods will change. Rather than focus on the evolving techniques and media formats that comprise the varied approaches to mLearning,[1] my project defines mLearning as the use of a personal mobile device to mediate a student's experience with a holistic program of learning, both formal and informal.

Globalization

The World Health Organization offers a helpful definition of globalization: "Globalization, or the increased interconnectedness and interdependence of

---

[1] mLearning is a rapidly evolving field that encompasses approaches ranging from using text messages to promote literacy to the use of augmented reality to create interactive museum tours. As mobile devices become more sophisticated, there are multiple opportunities for using these information systems to create novel learning experiences or enhance existing ones. Some of the most established scholarship in the field is the work of the International Association for Mobile Learning, which includes scholars like David

people and countries, is generally understood to include two interrelated

elements: the opening of borders to increasingly fast flows of goods, services,

finance, people and ideas across international borders; and the changes in

institutional and policy regimes at the international and national levels that

facilitate or promote such flows. It is recognized that globalization has both

positive and negative impacts on development" (http://www.who.int/trade/

glossary/story043/en/index.html). My project seeks to demonstrate how

capillarity can be used to mitigate some of the negative impacts of globalization

by empowering local stakeholders to engage the global economy on more

favorable terms.

Emerging Markets

        The term "emerging markets" was coined by Antoine W. Van Agtmae in

the 1980s to describe economies with lower per capita income than the United

States, Western European nations, and Japan. In development discourse it

supplanted the "third world" terminology of alignment with Cold War powers.

Many have criticized its usage as being imprecise and outdated (Khanna). For

the purposes of the present discussion, I define emerging markets as economies

with the potential to, or in the process of, transition from poverty to prosperity.[2]

---

[2] Poverty and prosperity are imprecise terms, but there are ways to frame the discussion
to make the distinction between emerging and established markets more helpful for the
present discussion. Poverty can be understood as the lack of goods and services that are
commonplace in a more prosperous society. But this lack represents an opportunity. For
example, the fastest growing market in the world for mobile telephony is Africa,

Thesis and Chapter Overview

The mobile phone, as a learning appliance, can enable universal access to a mode of instruction that has historically been restricted to the elite. Classical humanist education is a mode of instruction whereby a student is equipped to critically evaluate public discourse and efficiently engage in what has been called by many societies "the pursuit of happiness." The cultivation of critical consciousness through humanist education is a key ingredient in the successful execution of the development goals for emerging markets. mLearning is the most suitable vehicle to deliver it.

In Chapter 1, I offer a definition of humanist education as the mixture of curiosity, canon, and community, explore the tension between the classical and radical school, and examine the suitability of the mobile phone as a vehicle for instruction. Much of the excitement surrounding mobile technology is concerned with novel methodologies, but my focus is on the potential for optimizing established humanist methods.

Chapter 2 examines the historical and cultural context for the use of education technology in development. A series of historical examples are drawn from practitioners and autobiographies to demonstrate the value of the humanist approach and distinguish mLearning used in this way from approaches that may

doubling nearly four times in the last decade (ITU). It would be impossible for an established market to grow this quickly, because it is already saturated.

have leaned too heavily on novelty and untested premises.

Chapter 3 investigates some of the unique affordances of the mobile platform and the relationship between literacy and critical thinking. I explore the potential applications of cognitive algorithms, the use of simulation in cultivating what James Paul Gee has called "the projective identity" (Gee 50) and reexamine the role of literacy as a powerful form of simulation.

Chapter 4 applies the concept of capillarity to globalization, and how mLearning places significance not only on the content, but the networks of communication and accountability through which content flows. A leading criticism of globalization is that it aggregates power in the hands of a few, but capillarity presents a mechanism for disaggregation by empowering networks of local stakeholders.

Chapter 5 concludes with a discussion of capillary's application to shifts in political discourse arising from globalization. If it is true that information technology has made it impossible to restrain the flow of information, civilization is presented with two choices: cultivate a broad base of critical thinkers with the capacity to participate in the global discourse with judgment and discretion or erect a new ideological apparatus to contain the inflammation of unfettered communication.

H.G. Wells has said, "Civilization is in a race between education and catastrophe" (Wells 1305). My goal is to demonstrate that in some small

measure, capillarity can help provide a theoretical framework to meet Wells's

challenge.

CHAPTER 1:

MLEARNING AND HUMANIST EDUCATION

"There was a book that started out with four pictures: first, there was a windup toy; then there was an automobile; then there was a boy riding a bicycle; then there was something else. Underneath each picture it said, 'What makes it go?'

I thought, 'I know what it is: They're going to talk about mechanics, how the springs work inside the toy; about chemistry, how the engine of the automobile works; and biology, about how the muscles work.'

It was the kind of thing my father would have talked about: 'What makes it go? Everything goes because the sun is shining.' And then we would have fun discussing it" (Feynman 297).

As a boy, one of my favorite memories was reading *Surely You're Joking, Dr. Feynman!* with my father. A physicist's memoirs may not be typical bedtime reading, but Richard Feynman's humor and insight combined with my father's dramatic presentation left its mark on me. It must have been one of the many influences that encouraged me to study physics as an undergraduate. At an early age it provided metaphors for understanding the world that extended beyond a particular academic discipline.

Feynman tells the story of the first time he had tea and cake in a formal

venue. The refreshments arrived at his table, finely presented on a paper doily.

He was impressed with the order, the atmosphere, and the aesthetic qualities of

the experience. When he got up from the table, by chance he wandered past a

corridor where a man with thick stubby fingers was struggling to peel the paper

doilies from the stack. Feynman recalls the experience:

> "He'd take these doilies, which are manufactured by some sort of
> stamping process, all stuck together, and he'd take these stubby fingers
> and try to separate the doilies to put them on the plates. I always heard
> him say, 'Damn deez Doilies!' While he was doing this, and I remember
> thinking, 'What a contrast—the person sitting at the table gets this nice
> cake on a doilied plate, while the pantry man back there with the stubby
> thumbs is saying 'Damn deez Doilies!' 'So that was the difference between
> the real world, and what it looks like'" (26).

His observation was a thread in a narrative that extended from the intensity of the

Manhattan Project to the investigation of the *Challenger* accident and led down

countless rabbit trails. But these digressions actually helped to tie the narrative

together by linking insights drawn from life and science.

And this meandering path where bits of knowledge were woven together

became my favorite way to learn. It was how my father taught me. He wove

history, science, and philosophy together. He found an issue of *Air & Space*

magazine with a story about the enormous pressure vessel built to contain the

first atomic tests in case the detonation failed to achieve fission. I immediately

recognized the context from Feynman's stories of Los Alamos.

The pressure vessel was massive and expensive and had to be carted across the country on a secret, custom-built railcar. Never utilized during the war, when they finally did employ it, it did not work. The army loaded the explosives in the bottom, but the engineers had designed it to withstand a blast from the center of the volume.[3] I had forgotten about all of this until it came time to study Boyle's law in high school. These stories provided a context for what might otherwise have been dry and seemingly irrelevant subject. These formulas were significant to me because my father had grounded them in history and relationship. They had become part of my family's mythology. I knew the parable of the general's pressure vessel and the implication that good engineers remember their formulas.

Although I did not realize it, I was being educated according to an ancient pedagogy, a style of learning called at times "classical" or "humanist" education. In an age of iPads and learning management systems, a discussion of ancient styles of learning may seem out of place. But throughout the course of my research, which has been focused on the use of mobile technology to promote learning in emerging markets, I have become convinced that the best use of new technology is to promote old styles of learning.

The holistic aim of humanist education - the cultivation of the individual, as a self-directed, independent thinker - is the highest academic outcome to

_____

[3] The early stages of nuclear testing are a fascinating period of American history. A new museum opened in collaboration with the Smithsonian has preserved much of this history (http://www.nationalatomictestingmuseum.org/).

which mLearning can aspire.[4] What is more, this outcome is essential to the

realization of economic opportunity within emerging markets. Much of

development discourse, with its emphasis on broad economic outcomes,

achieved through universal programs, has lost sight of this. As I hope to show,

critical thinking is not only an end itself, it is also a vital component of economic

progress and a corrective for many of the ills of globalization. The aim of

capillarity as a theory of education and communication is to demonstrate how

mLearning can be used to promote humanist education and to explore the

potential impact on the current debates about globalization and development.

Radical Pipe for Classical Type

      The theory of capillarity draws from both the classical and the radical

because it seeks to provide a mechanism to reconcile the goals of both - the

elevation of the individual as the means of liberation for the community.[5] The

reconciliation comes in separating classical humanism and its laudable outcomes

from a distribution mechanism that disrupts communities.

      Aloni offers a selection of salient quotes to illustrate the tension between

the classical and the radical:

---

[4] While the notion that humanist education is a valuable end in itself is a subjective claim, subsequent discussions of globalization will provide objective justifications for placing value on these outcomes. One example is that the cultivation of self-directed actors is a key component to promoting entrepreneurship and innovation in emerging markets.
[5] mLearning can allow an individual's success to benefit an entire community by providing a mechanism to participate in economic opportunities without dissolving communal relationships.

> "[The Classical School's] ultimate ideal, however, has not changed: as put in the words of the Renaissance humanist Pier Paolo Vergerio, humanistic education includes 'those studies by which we attain and practice virtue and wisdom; that education which calls forth, trains and develops those highest gifts of body and mind which ennoble man.'"

The radicals rightly respond that not everyone is invited to participate in this pursuit of the "gifts of body and mind" mentioned above. They charge that these gifts are being deliberately withheld from the greater part of humanity; therefore, the true humanistic education is the struggle for equality and access:

> "In the words of Giroux, '[Radical Humanists] would struggle collectively as transformative intellectuals… to make public schools democratic public spheres where all children, regardless of race, class, gender, and age, can learn what it means to be able to participate fully in the ongoing struggle to make democracy the medium through which they extend the potential and possibilities of what it means to be human and to live in a just society'" (Aloni).

There is a sense in which the classicalist views education as an end, while the radical sees it as a means to an end. Careful probing of these seemingly different goals reveals that they are very similar, and the difference is primarily a matter of perspective. In both cases the goal is a liberation and elevation of human spirit. Pier Paolo Vergerio's "highest gifts of body and mind" and Henry Giroux's "possibilities of what it means to be human and to live in a just society" are compatible, if not identical goals. The difference lies in the perception of the barriers that must be overcome to achieve these ends. Vergerio and the

14

classicalists see the barriers as the internal struggle of the individual against his

own ignorance; Giroux and the radicals see the struggle as an external battle

against "the larger cultural, social, and economic context" (Aloni).

Standing between the schools, it is possible to see where the theory of

capillarity might provide common ground. Classical humanism is a bit like an

exclusive fraternity. No one invited the radicals, and, not content to be excluded,

they organize a resistance movement. Capillarity is an inclusive invitation,

access, and membership. As authorship, publication, and distribution continue to

decentralize via information technology - the barrier between classical and radical

steadily erodes.

According to Aloni, "radical educators argue, 'pedagogy should become

more political and the political more pedagogical.'" But the goals of both schools

have always had been deeply political. What could be more political than Plato's

Republic or Machiavelli's *Prince*? The difference is that within classical

humanism, access to power is presumed. It is the subtext for why the student

studies in the first place, that he might wield his power with "virtue and wisdom"

(Vergerio). When Alexander sat down with Aristotle there was no need to

"struggle collectively as transformative intellectuals" (Giroux). As the heir of King

Phillip II of Macedon,[6] with the crown assured, Alexander set his sights higher.

---

[6] Alexander faced other court intrigues, and his father may have been planning to elevate
another son from a later marriage above him. These internal battles are again based on the
assumption that power is the intrinsic right rather than the fruit of a transformative
struggle.

This hints at one of the unfortunate limitations of the radical school. When one is locked in a collective struggle for what another already has, one group's ultimate goal is the point from which the other starts.

Within capillarity this tension is addressed by fighting the radical struggle with software architecture, while making the classical assumption of individual authority and agency, regardless of circumstance. External limitations of access and equity must be recognized and challenged, but elevating them above the internal struggle for "virtue and wisdom" is to become complicit in one's own oppression.[7]

Capillarity is a radical dissemination method for classical learning. By using software to circumvent the external barriers to classical humanist education, the student is able to engage in the same mode of instruction as those who did not face those barriers. The measure of the program is a simple one. In time, if the academic programs of the elite and the oppressed do not begin to closely resemble one another, it will be proof of failure. But, if the gradual expansion of access extends the benefits of classical education to all and the goal of the radicals is achieved, it will be time to turn away from the struggles of the past and embrace the opportunities of the future.

---

[7] Understanding external limitations is an essential part of humanist education. When a student adopts a philosophy that is overly deferential to these limitations, the result can be a kind of paralysis. Ryan Carson describes the essential trait of the entrepreneur as a kind of "naïve optimism" that assumes at the outset that challenges encountered along the way can be overcome.

Humanist Education

I describe humanist education as an alloy of three following elements:

1. **Curiosity:** *The self-directed impulse to understand the world.* This is considered a basic premise of all four schools.

2. **Community:** *The relationships that provide the context and motivation to guide the curious through the canon into knowledge and then wisdom.* Community features most prominently in the radical conception, as expressed by writers like Freire and Giroux.

3. **Canon:** *A collection of ideas, skillfully articulated through media.* Mortimer Adler and others in the classical school encourage students to wrestle with the masterpieces of our traditions. My definition broadens the notion of canon to include new forms of media that communicate knowledge in an artful way.[8] That is to say, capillarity will lead each community of practice

    to develop its own "canon" of digital instructional resources focused on the content of its discipline.

---

[8] Games, films, apps, and even comic books could be considered canonical within my framework, provided they possess two attributes: first, they communicate a principle in an articulate manner, and second, a community of practice has assigned value to fluency with the media.

Curiosity

Abraham Maslow ascribes a prominent role to curiosity in his work on human motivation. In his classic article, "A Theory of Human Motivation" (370), curiosity is a described as a powerful and sometimes mysterious force. While some have argued that it is a basic evolutionary response to which information and understanding can confer a survival advantage, Maslow observes:

> "Acquiring knowledge and systematizing the universe have been considered as, in part, techniques for the achievement of basic safety in the world, or, for the intelligent man, expressions of self-actualization. Also freedom of inquiry and expression have been discussed as preconditions of satisfactions of the basic needs. True though these formulations may be, they do not constitute definitive answers to the question as to the motivation role of curiosity, learning, philosophizing, experimenting, etc. They are, at best, no more than partial answers.

> This question is especially difficult because we know so little about the facts. Curiosity, exploration, desire for the facts, desire to know may certainly be observed easily enough. The fact that they often are pursued even at great cost to the individual's safety is an earnest of the partial character of our previous discussion" (Maslow).

Curiosity is one of the most basic motivations of human behavior. When education and an inquisitive spirit are aligned, a student is driven to pursue and acquire understanding. However, when there is divergence, the process of learning becomes less efficient. According to Maslow: "Thwarting of unimportant desires produces no psychopathological results; thwarting of a basically important need does produce such results. Any theory of psychopathogenesis must then be based on a sound theory of motivation. A conflict or a frustration is

18

not necessarily pathogenic. It becomes so only when it threatens or thwarts the

basic needs." The fulfillment of curiosity is just such a basic need. It is an

expression of identity and, in many ways, it is the engine of learning. But, as a

subjective expression of an individual, satisfying a student's curiosity can be

challenging for educators. In a classroom full of students, there is little chance

that each student shares precisely the same interests and motivations.

The appeals to curiosity made to students, as a generic group, must often

be conveyed as generalizations or broadened to the point of being shallow. This

can frustrate the curiosity of the individual. If this basic need is frustrated

consistently enough, it can have adverse consequences.[9] However, curiosity can

be made to flourish within the context of a relationship with a respected mentor.

mLearning can be used to reduce the instructors' administrative burdens,

allowing them more time to focus on directly engaging with students as

individuals. Employing adaptive coaching algorithms and drawing from a vast

well of canonical materials, mentors can customize curricula for each student.

These affordances offer a better recipe for curiosity than approaches that treat

students as a generic mass.[10]

---

[9] A common classroom event illustrative of this tension is the "rabbit trail." In the course of instruction it often happens that a discussion strikes a vein of interest and leads in an unanticipated direction. Assuming the thread of discussion has merit, allowing it to play out is a natural affirmation of curiosity. But, when the discussion is cut short by an external agenda, for example a narrowly prescribed series of authorized topics corresponding to a standardized test, natural curiosity is sacrificed in favor of a mechanical efficiency that can alienate students and teachers.

[10] The software application *Capillary*, based on the theory of capillarity, supports this approach by providing a mentor with a convenient repository of resources that could

Community

        The subject of community means different things within the radical, classical, and my hybrid paradigm. As before, my approach is to synthesize elements of both. Within the radical school the primary emphasis on community is the coordinated struggle against a broader social, cultural, and economic context. The classical school conceives of community as participation in a great tradition through interactions with its seminal works.

        The role of community within the theory of capillarity is defined as the student's induction in a community of practice via a mentorship relationship. The radical school provides the end: that the student overcome exclusion from broader participation brought about by any number of factors. The classical school provides the means: mentorship situated in a body of canonical works. Although there are many types of communities, and community of practice is one of the most restricted forms of community, it is the type upon which capillarity is predicated. Communities of practice offer the most direct link to economic opportunity and stand to gain the most themselves from mechanisms that facilitate broader inclusion.[11]

---

encompass a range of approaches to a given topic. This would allow for differentiation in curricula based on the interests of an individual student. These resources have measurement mechanisms embedded in them, so it is unnecessary for the mentor to devote time to developing and administering formative assessments. The less time the mentor must devote to administrative duties, the more time is available for higher order interactions.

[11] Admittedly, one of the tensions in expanded inclusion within communities of practice is the increase in competition and the corresponding reduction in wages that comes when a given skill becomes more of a commodity. I contend that the benefits derived from an inclusive community of practice far outweigh the drawbacks. As communities of practice

Stalwarts of the radical school like Freire recognized the need for a system of instruction that would allow the student to become a full participant in his chosen discipline. In his *Pedagogy of the Oppressed*, Freire rejected certain educational models he described as the "banking" concept of education. These models encourage a paternalistic mode of instruction in which the teacher deposits knowledge in the student as an empty vessel (7). What Freire had in view was a colonialist approach to education intended to render native people compliant to an exploitive agenda. Freire's critique has much in common with other modes of instruction where information and practice are divided. Jean Lave discusses this approach as "internalization" where consideration of the social context of the knowledge is largely disregarded (47).

Looking to L.S. Vygotsky, Lave offers a holistic alternative to internalization. "This interpretation is based on Vygotsky's distinction between scientific and everyday concepts, and that a mature concept is achieved when the scientific and everyday versions have merged" (48). That is to say that there is a codified expression of knowledge relayed in a transmissible medium (textbook, lecture, formula, etc.), and there is a community of practice within which this knowledge has real world significance. Divorced from its social context, this knowledge has little applicability and becomes trivia.

---

expand they benefit from an increased profile (more exposure to a service often creates more demand) and a growing selection of tools and resources that benefit all members.

To illustrate the difference, consider this thought experiment: Imagine an average public school student in the District of Colombia and a private-schooled child of a senator. Imagine then both are offered the age-old civics lesson: "How a bill becomes a law." For the first student, the opportunity to find any direct application of the concepts is small, while the second may recognize the immediate relationship between the concepts and his parent's job. This social context provides two essential elements: first, a way to merge scientific and everyday concepts in to a mature concept, "Your father is working late tonight because his amendment comes up for a vote tomorrow," and, second, the expectation that the student could one day gain acceptance in that community of practice. This combination of relevance and identity provides a social context for information that is essential to motivation and achievement.

Students are often called upon to expend great effort to internalize information without the social context within which to apply this knowledge. One might suggest such efforts lay a foundation for future learning. But no architect can lay a proper foundation without understanding the manner of building it is meant to support. The social context of information provides the student with a framework that allows him to organize concepts in to something meaningful. Without this, there is no foundation - just a rough pile of bricks. Reading the *Air & Space* article about the nuclear pressure vessel with my father provided enough social context that I could assign some real world significance to Boyle's law.

But contextualization is more than a sidebar in a textbook. Our chemistry

teacher could have used the anecdote to illustrate the relevance of Boyle's law,

but, while it would have been helpful, it falls short of providing the information

with a social context. One of the great joys of learning is the sense of identity and

belonging that comes with acceptance in a community of practice. It is no

accident that many medical schools have adopted the white coat ceremony[12] as

a prelude to the intensity of their academic programs. The coat symbolizes that

the student has been received into the medical community and will be trusted

with specialized knowledge.

For the medical student, the same Boyle's law that the high school student

struggled with takes on entirely new implications as the student applies it to

respiration. The correlation between Vygotsky's scientific and everyday concepts

is so essential in the medical field that authors like Dr. John Kibble have

dedicated portions of their textbooks to "clinical correlates."[13] These correlates

are intended to serve as a bridge between a scientific concept and the manner in

which a doctor encounters it when treating patients.   According to Lave, "In

contrast with learning as internalization, learning as increasing participation in

communities of practice concerns the whole person acting in the world" (49).

---

[12] The white coat ceremony is a tradition amongst medical schools. A student is
presented with a coat symbolizing acceptance as a future medical professional. This
creates the expectation that he will master their discipline and live up to the high
expectations of the community.

[13] A clinical correlate is a real-world application of a biological principle to a common
clinical manifestation.

The process of *becoming*, of maturing into a well-developed person who makes meaningful contributions in the world is one of the greatest challenges a young person faces. It is a time characterized by emotional turmoil and even existential crisis. To navigate this troubled period we are equipped with two powerful drives: the desire to know and the desire to belong.

Belonging is not something that can be achieved by an individual; it is something that is extended by a community. Where no possibility of belonging exists, this thwarted drive finds fulfillment elsewhere and provides the impetus for the struggle of the radicals. But capillarity can serve as a mechanism for extending the opportunity for belonging to those who are currently excluded. Later chapters will discuss these mechanisms in detail and describe approaches that foster inclusion like Gee's concept of projective identity. If the barriers to participation in communities of practice can be reduced to inclination and aptitude, we can achieve the goals of both the radical and the classical, "the whole person, acting in the world" (Lave 49).

But in order to act, there must be a body of knowledge upon which to act and render services to others. The community of practice must have an object that serves as a focal point for the intellect. The final element of humanist education within my paradigm that defines communities of practice is the canon.

Canon

A "canon" is usually understood to mean an officially sanctioned list of books. For example, Mortimer Adler and Robert Hutchins were the editors of the

Britannica *Great Books of the Western World* series, an effort to create and

promote a canon for western civilization. When introducing the series in 1953,

Hutchins remarked, "This is more than a set of books, and more than a liberal

education. *Great Books of the Western World* is an act of piety. Here are the

sources of our being. Here is our heritage. This is the West. This is its meaning

for mankind" (Ashmore 336). Not all canons have such high aspirations. Often

times the role of canon is simply to demarcate the lanes of scholarship and the

ideas that govern the practice of a discipline. These concepts are not restricted to

academic disciplines but extend to all trades and professions. It is through a

student's interaction with the texts of the canon that he is initiated into the

intellectual life of a community of practice.

Adler describes the process that unfolds when a reader learns from a text,

and how the reader can learn information, but also achieve "enlightenment."

> "If you remember what an author says, you have learned something from
> reading him. If what he says is true, you have even learned something
> about the world. But whether it is a fact about the book or a fact about the
> world that you have learned, you have gained nothing but information if
> you have exercised only your memory. You have not been enlightened.
> Enlightenment is achieved only when, in addition to knowing what an
> author says, you know what he means and why he says it" (11).

Here Adler uses the word "enlightenment" not to represent the philosophical

movement of the seventeenth and eighteenth centuries, but as a robust

comprehension leading to the classical ideal of virtue and wisdom.[14] Is Adler's

enlightenment then too lofty a notion for a text on small engine repair or an

agricultural publication? The temptation is to conceive of enlightenment as a

graduated scale of complexity that shines dimly in the trades and increases in

intensity as one moves up the ladder to formal philosophical works. Often the

opposite is true. Every community is comprised of people, and over time the

shared experiences of this community provide fertile ground for enlightenment.

An engineer at a wastewater treatment plant gave me a tour of his facility.

At one point in the visit he turned to me and asked, "Do you smell that?" I did not

respond because it was obvious that I did. "That smells like money," he said. An

old joke within his community, this comment demonstrated the truth that society

is willing to pay a premium to those who are able to solve unpleasant problems. It

also communicated a certain pride that he was one of the few who had mastered

his aversion and was able to fulfill that role. An aspect of this touches on the

debate between orality and literacy in communities of practice that extends

beyond the scope of our current discussion.[15] It is sufficient for our purposes to

recognize that nearly every domain of human activity has some form of canon.

---

[14] Within this classical ideal, knowledge is just one piece of a development intended to encompass a whole person. Two students, alike in knowledge, might score the same on standardized tests and earn the same marks in a university program. But their careers may take very different paths based on their ability to exercise discernment. The classical ideal is not concerned with the bare acquisition of knowledge, but rather the application of knowledge in the face of the many tests of character that comprise a life and vocation.
[15] There is a substantive thread of scholarship that addresses the forms of learning and development achieved through literacy and orality. Within development discourse there are differences of opinion as to how much emphasis should be placed on the cultivation

Sometimes this canon is quite rigid and contained within a handful of defining works. In other cases it may be informal and fluctuate daily as new works and expressions gain favor. The former might be exemplified by the *Great Books* series, while an example of the latter could be a web forum like *Stack Overflow.* While the *Great Books* series seeks to capture the best thoughts of western civilization, *Stack Overflow* represents the best approaches to developing iPhone apps.

In both cases, communities of practice interact with the canon, though the goals of these communities are different. The motivation behind the *Great Books* series, as described by Hutchins, was a nearly spiritual desire for enlightenment. Users visit *Stack Overflow* for the instrumental motivation of writing better software. Both outcomes are valuable and, in different ways, contribute to the same ends.

While these may seem like entirely different uses, a closer inspection shows some interesting similarities Adler and Hutchins selected the volumes for inclusion in their canon based ultimately on their own discernment. Without passing judgment on their choices, the methods employed are necessarily narrow. *Stack Overflow* ranks its comments based on user feedback. Over time, the best contributors to the site are afforded more respect. Their answers and posts receive more attention from the community. In both examples, a key

of literacy where orality is dominant. I side with Walter Ong in attributing to literacy a vastly expanded capacity for achieving the developmental goals associated with humanist education (Ong 77).

characteristic of canon is that out of many contributions the best are preserved and highlighted for others.

This editorial mechanism is essential for creating a useful resource. The wheat is separated from the chaff, and this refined repository of knowledge is what attracts and maintains an audience. Readers use a canon to gain understanding. Adler provides a detailed description of how this process unfolds:

> "What are the conditions under which this kind of reading - reading for understanding - takes place? There are two. First there is *initial inequality in understanding*. The writer must be 'superior' to the reader in understanding, and his book must convey in readable form the insights he possesses and his potential readers lack. Second, the readers must be able to overcome this inequality in some degree, seldom perhaps fully, but always approaching equality with the writer. To the extent that equality is approached, clarity of communication is achieved.

> In short, we can learn only from our 'betters.' We must know who they are and how to learn from them" (Adler 10).

The mental exercise of learning from reading is often compared to physical exercise where our strength is pushed just beyond its limit so that over time the limits themselves increase. As with other forms of exercise, too little resistance yields no benefit while too much resistance may cause strain and injury. Just as our discussion of curiosity demonstrated how the motivations behind learning are unique and personal, so also are the limits of understanding. This is why the most efficient forms of physical training are facilitated through personal coaching. Accurately gauging the limits of a person's physical capacity and adjusting the resistance accordingly is a dynamic process that requires

discernment. While this may be challenging for physical training, it is more so when training the capacity to understand.[16]

Within the humanist model, the role of the teacher is not to be the lone source of instruction and understanding because this role is largely filled by the canon. Adler says that we can only learn from our "betters." Recognizing this is not elitism, but rather an appreciation for the fact that there are those who, in some area of expertise, have the gift of both articulation and understanding. When these two attributes are brought together, whether in an essay or a forum posting, the result is canonical - a resource best suited to helping the reader achieve understanding.

The direct, unaided instruction provided by any single teacher represents a rather narrow horizon when compared with the vast discourse of a canon. The canon is the aggregation of the best that all the participants in a community have to offer. Within the humanist model, the teacher's role is not to compete with canon and set himself up as the sole source of learning. The advent of digital media has made this more apparent than ever before.[17] Instead the teacher's

---

[16] Socratic dialogue and the Oxford tutor model are two examples of learning techniques that are effective for engaging the individual and applying the proper degree of "intellectual resistance."

[17] The curated digital repository is a distinct class of entity that has emerged in recent times: *Project Guttenburg* maintains a free archive of public domain classics. *Khan Academy* manages a repository of quality instructional videos. *Wikipedia* is one of the best-known publically maintained indexes of knowledge. *TED* disseminates free videos of insightful research projects. The profusion of such repositories demands a paradigm shift in the role of the teacher. Just as a scholar has a responsibility to be conversant with his discipline in order to make original contributions to his field, a teacher should avoid

role is that of a coach guiding the student towards those resources that will

provide the right level of resistance, encouraging him to push past the limits of his

understanding.

Adler states the following:

"… there is good reason to place primary emphasis on reading, and let listening become a secondary concern. The reason is that listening is learning from a teacher who is present - a living teacher - while reading is learning form one who is absent.
        If you ask a living teacher a question, he will probably answer you. If you are puzzled by what he says, you can save yourself the trouble of thinking by asking what he means. If, however, you ask a book a question, *you must answer it yourself*. In this respect a book is like nature of the world. When you question it, it answers you only to the extent that you do the work of thinking and analysis yourself" (14).

According to Adler, there are two advantages to learning from a canon.

The first is that we can learn from a collection of the best expressions of a whole

community. The second is that learning from a text engages the mind more fully

and challenges it more deeply. "The art of reading, in short, includes all of the

same skills that are involved in the art of unaided discovery: keenness of

observation, readily available memory, range of imagination, and, of course, an

intellect trained in analysis and reflection" (14).

To these observations, I can add a third. The advent of digital media has

made possible the creation of new forms of canonical works that use software to

provide interactive experiences. Game-based learning is one emerging field with

---

recreating the efforts of others and, where possible, make original contributions to these shared instructional repositories.

the potential to expand the notion of a canon. Production of these resources require teams of talented professionals that, once crafted, can be widely shared throughout a community of practice. Later portions of this dissertation will describe how mobile technology, spanning diverse forms of old and new media, expands access to a rich canon.

Capillarity and the Humanist Model

The discussion of Curiosity, Community, and Canon is filled with organic connections between inseparable entities. Curiosity is the motivating force that propels the student towards understanding. It is fed by the canon and sustained by acceptance within a broader community of practice. Teachers serve as mentors, inducting students into these communities and guiding them through a range of canonic experiences that might otherwise overwhelm and disorient. Ultimately this process is defined by its goal, which is not the acquisition of any particular set of skills, but rather the holistic development of a human being. Respect for curiosity is an acknowledgment of the student's value and identity more potent than any other affirmation. The acceptance of community is a demonstration of simultaneous concern for a realm of ideas, and those who inhabit that realm. And the canon is for each new student a body of concepts to engage, master, and ultimately shape him.

Humanist education overflows the banks of a narrowly prescribed discipline. It links the insights that are naturally acquired through any rigorous

pursuit to general principles that enable one to understand the broader world. The result is a refined capacity for critical thinking that allows the student to understand matters far beyond his "professional" expertise. This can lead to the not uncommon experience of finding multiple points of contact between a student and an author. So it was with my study of Feynman.

In one of the chapters in *Surely You're Joking, Dr. Feynman!* Feynman tells of his experiences as a member of California's Curriculum Commission. In the chapter he describes his experiences and frustrations with the quality of textbooks that were submitted for review. "My wife says that during this period it was like living over a volcano. It would be quiet for a while, but then all of a sudden, 'BLLLLLOOOOOOWWWWW!!!!' -- there would be a big explosion from the 'volcano' below. The reason was that the books were so lousy. They were false" (292).

This chapter opens with a quote where Feynman describes what finally led him to resign from the commission. In a subtle way, the passage captures his enthusiasm for learning and alludes to a classical, humanist approach. The question, "What makes it go?" is presented as a kind of mystery that draws out his curiosity. It is a question that can apply to a broad range of disciplines, yet, is all tied together by universal principles. To really understand these principles, he would investigate and spend time with his father exploring the ideas behind the

question. Here is a sample of the conduct of a lesson from Feynman's father to

him, starting with the question "What makes it go?":

> "'No, the toy goes because the spring is wound up,' I would say.
> 'How did the spring get wound up?' he would ask.
> 'I wound it up.'
> 'And how did you get moving?'
> 'From eating.'
> 'And food grows only because the sun is shining. So it's because the sun
> is shining that all these things are moving.' That would get the concept
> across that motion is simply the *transformation* of the sun's power" (297).

The dialogue illustrates a goal of my paradigm, which is to achieve understanding

not only by memorizing facts or performing rote skills but by discovering the

principles that make a domain intelligible.[18] To achieve this understanding we

must bring about Vygotsky's synthesis between abstract and everyday

knowledge. That is, the students must follow the thread from the abstract to the

practical, and go on to form their own valid extrapolations.

A Gulf between Practice and Authorship

> "I turned the page. The answer was, for the wind-up toy, 'Energy makes it
> go.' And for the boy on the bicycle, 'Energy makes it go.' For everything,
> '*Energy* makes it go.'

---

[18] Discovering these higher order principles can be extremely valuable. Cross-disciplinary thinkers often have an advantage in solving complex problems because they draw upon a range of concepts taken from other disciplines. For example, the principle of using iterative adaptations to optimize design is drawn from evolutionary biology and has been used in many engineering applications including antenna design. I believe this interrelatedness stems from an ancient conception of truth: that there are symmetries to knowledge that transcend disparate disciplines.

Now that doesn't *mean* anything. Suppose it's 'Wakalixes.' That's the general principle: 'Wakalixes makes it go.' There's no knowledge coming in. The child doesn't learn anything; it's just a *word*!" (297).

To summarize Feynman's chief criticism of the textbooks, they were created without any connection to the scientific community of practice and could not present adequate linkages between theory and practice. As a result, not only did they fail to communicate the essential principles of the discipline, they alienated the student by subjecting him to meaningless exercises. For example, speaking as a scientist, he was frustrated by the futile homework exercise of adding together the temperatures of stars because "nobody *ever* does that…" (294).

The textbooks did not align with the community of practice. The students who endured these programs were not only unprepared for entry into the discipline, many were likely dissuaded from an earnest pursuit by the irrelevant labor presented to them.

This gulf between the textbooks and the community of practice, inferred by comparing a banking model of instruction to the humanist model, produced two consequences. First, removing the student from a community that could accept him thwarts the student's desire for acceptance. Instead he is left with only a peer group, and the acceptance of school age peers is a shallow substitute for the maturity promoted by the desire to conform to and gain the acceptance of a

community of practice.[19] Today, the opportunity to assimilate into a professional environment is delayed well into adulthood, long past the period when a student's character and values are most impressionable.

The second consequence is that the content of his learning is determined, not by the practical necessities of a professional discipline, but by an artificial approximation of the discipline; and this approximation is made by those who to a lesser or greater degree are removed from the discipline. This is one of Feynman's chief criticisms of the textbook selection process. He was the only scientist on the committee, and the books had nothing to do with his discipline.

Information technology, in general, and mLearning, in particular, have the capability to address some of the structural problems that have contributed to these conditions. Advanced communications have largely eliminated the geographic constraints that separated schools from the communities of practice. Digital media has obviated the need for academic discourse that attempts to simulate and runs parallel to the discourse of a community of practice.[20]

Learning is a part of every discipline. One consequence of information technology is that the pace of innovation is increasing, meaning practitioners

---

[19] A common critique used to describe contemporary American culture is "perpetual adolescence," which reflects the notion that somehow the process of maturation has been arrested. I would suggest that one of the contributing factors is the social and cultural atomization of formal education that segregates youth from more mature influences.
[20] Just as libraries were created to solve the problem of physical scarcity of media, universities have in the past addressed the problem of a paucity of relations, serving to connect students and communities of practice. Distribution innovations have modified the role of the library; likewise, innovations in social media will modify the role of the university. Specifically, social media concentrate the influence of the community of practice and create novel pathways into these communities that are less dependent on the university.

must always be learning the latest developments in their field. In the past, geographic distribution would mandate the maintenance of separate discourses - one for students external to the community and one for practitioners internal to the community. Today it makes little sense to maintain this distinction and less sense to mandate static twelve- or sixteen-year programs of instruction to orient a student to an external discourse.

mLearning provides us with the opportunity to choose the most expeditious route to induct a student into a community of practice, within which he will always be learning. Once we recognize that education has become a perpetual state, rather than a discrete period of preparation, we can begin to adapt our programs accordingly.[21]

The old argument against this approach is that "forcing" students to choose a career field too early will limit their opportunities. Is saddling a student with debt and hoping he can make the transition from classroom to community of practice a better approach?

The real answer to this challenge is that the one-time, high-stakes selection of a career for life is outdated. There was a time when careers lasted for the majority, if not the entirety, of a person's productive years. This is no longer the case. Today there are more flexibility and volatility to the workforce.

---

[21] In my own discipline of mobile software development, each new release of an operating system from Google or Apple contains new possibilities that shift the competitive landscape. App designers constantly improve on user interface conventions and create new visualization techniques. The only way to participate in this field is to maintain learning.

Our current era is increasingly defined by mobility. Workforce mobility, economic

upward-and-downward mobility, international mobility - these are the

characteristics of our global economy. A mobile economy requires a nimble mode

of instruction that is adaptable, customizable, and responsive to the needs of the

individual. Capillarity, the delivery of humanist education, leveraging the

affordances of mLearning, is well suited to meet these challenges.

CHAPTER 2:

HISTORICAL CONTEXT FOR EDUCATION
TECHNOLOGY IN EMERGING MARKETS

The theory of capillarity is presented as a potential solution to the radical humanist's goal of equitable access and the classical humanist's goal of self-actualization. mLearning is a mechanism that can be used to pursue these goals by blending creation, content distribution, and curation in equal measure. If widely adopted by communities of practice, capillarity could be used to extend these communities and the economic opportunities they offer across social, economic, and cultural barriers.

But educational technology has a long history of high hopes and a failure to live up to expectations.[22] Before advocating another technological approach, it is important to understand previous interventions and distinguish the unique

---

[22] Educational technology is a field where new products are continually introduced, and high expectations are used to justify the purchases. Against this backdrop mLearning could be seen as an (expensive) incremental improvement to the textbook, just as the smart board is an improvement on the chalkboard. My argument is not focused primarily on the enhancements afforded by technology, but the possibilities of using the technology to effect a shift to a classical humanist pedagogy.

characteristics that may help capillarity and mLearning to succeed where others have struggled.

Instrumental Interventions

Seth Spaulding, an educator and historian who served for many years at UNESCO, has watched first-hand the development and unjustified enthusiasm that has accompanied various learning innovations. He writes, "Enthusiasts since the 1920s have projected that first educational film and educational radio, then educational television and computer-assisted instruction, and now cyberspace and virtual learning environments would change dramatically the way we educate and the way people learn" (119).

However, as Spaulding demonstrates, these aspirations rarely achieved their goals. Reflecting on a long career as a UNESCO educational historian, Spaulding highlights a particular program in the Ivory Coast that epitomized the challenges and pitfalls that perennially plague education technology programs:

> "In the end, the World Bank agreed to fund much of the investment in physical facilities, the United States agreed to advise and fund adult and nonformal education activities within the overall scheme, the Canadians agreed to fund a printing plant and technical assistance required to produce textbooks and teaching packages that would be part of the television scheme, the French agreed to advise on setting up the television production facilities and to produce the television programs that would be broadcast over the national network, and the officials in the Ivory Coast agreed to set up a unique bureaucracy to handle all of this under a minister of primary education and television (working parallel with a minister of secondary and technical education and a minister of higher education)" (125).

Problems emerged immediately. The World Bank insisted on funding dormitories that would house two students to a room, but the program participants found this objectionable and converted the rooms into single units, halving the available space. The Canadians finished the textbooks before the French started the production of the videos, so the final curriculum did not match. The United States did not coordinate with the other partners and set up their headquarters in a different region, while other participants were persuaded through political pressure to base their efforts in the president's hometown of Boake. The French deployed a sophisticated system of televisions, battery banks, and a servicing network capable of supporting elementary schools across the Ivory Coast. Spaulding records educational theorist Hilary Perraton's final commentary on the program: "a few years later, little was left that one could see" (126).

Spaulding cites this case not because it is unusual, but because it is typical - one example of many such failed interventions.[23] Successfully deploying an innovative academic program is very challenging. Creating the technological infrastructure as you go further complicates the undertaking. Deploying the program in a cross-cultural context, with an international coalition and no sustainable funding models, often proves insurmountable.

---

[23] Working first hand in aid and development in East Africa, Spaulding's example is fairly typical. Programs are conceived half a world away, and the realities on the ground (logistics, graft, and other constraints) conspire to make it difficult to achieve the original goals of the program. The temptation is to focus more on fundraising than actually achieving measurable goals.

Spaulding's ambivalent view of educational technology is entirely appropriate given the unchecked enthusiasm expressed in the past. To blithely deploy yet another gadget in a long list of gadgets, in the hopes that a *technical* innovation is going to transform education, is unwise. Spaulding concludes his essay with the observation, "As for technology in education, I suspect that much of the hype of the Web and of virtual classrooms will disappear, with the main role of the Web being to improve the communication of many different kinds of information quickly and easily" (130).

His observation is just as applicable to mLearning. Nothing is inherently different about watching an instructional video on television and watching the same video on an iPad. Uncritically suggesting that the Ivory Coast program would have been a success if mobile phones had been employed instead of televisions fails to address the underlying problems of sustainability, content creation, and local ownership that contributed to the original failures. Technology, culture, economics, and praxis all contribute to a complex function that cannot be reduced to a simple list of universal proscriptions. But we can study Spaulding's example and tease out a few reasonable observations.

One notable factor is the apparent disregard for market constraints.[24] Obviously the intent of a development program is to help a partner to overcome the constraints of limited resources. However, it is an error to view resource

---

[24] In our fieldwork it is tempting to deploy sophisticated equipment in pilot programs; but, unless the technology is available in the local marketplace, there will be no infrastructure to support the technology after the pilot. In this way the marketplace sets the pace of adoption.

constraints only as a limitation. Temporal, economic, and other constraints encourage users to make good choices when allocating a scarce resource. An interesting observation from the economies of virtual worlds and massively multiplayer games is that where no constraints exist, they are often artificially imposed to provide the user with a more compelling experience.[25]

If we consider the example of the dormitory, the whole issue of shared and private rooms is moot so long as the tenant bears the cost. Some may choose to economize and share while others can pay extra to have a single room. The problem with this is that tenants could not afford to cover the costs, which is why the World Bank was sponsoring the program in the first place. Providing participants with a choice would have gone a long way towards managing expectations.

Perhaps the selection of equipment, the production of textbooks, and the creation of content would have also benefited from some mechanism that provided an opportunity for local market-driven decisions. Some will object that the whole point of a development program is to supply goods to those who could not afford it otherwise. But as we continue to examine Spaulding's example, we find that not all costs are the same. In the 1960s the distinction between the cost of creating a textbook and the cost of publishing the textbook was a fine one.

---

[25] Game developers quickly discovered that resource allocation in virtual worlds needs to be carefully managed or else the game itself was no longer compelling. To increase participation the scarcity of goods is balanced to achieve a desired outcome. In a similar way the resource limitations encountered in the real world are not merely limitations but signposts that reveal priorities and the systems of belief that assign these values.

There was a comparatively small cost associated with the creation of the book

and a large cost associated with the publication and distribution of the book.

Creation and publication were inextricably linked. No value could be derived

without both elements. An unpublished textbook was no good to anyone. The

equation changes with a digital textbook. Ready access to creative software has

substantially reduced the cost to create a book. Even more significant is the

reduction in publication and distribution costs. What was once the most

expensive part of the process - distribution - today costs little. The expensive

system for video distribution established by the French, with high ongoing

maintenance costs, could be replaced with smart phones where the costs are

borne by the users themselves.

The technology of mLearning, from an economic perspective, offers a

substantive change from the technologies of the past. The marginal costs for

service delivery can, to a great extent, be borne by individual participants.[26]

This shift has secondary effects on the financing of educational

development programs. Although individuals may be able to cover the marginal

costs, the costs to produce and promote the digital curricula are not covered as

easily. This is an area where public development financing can be deployed most

effectively with the highest levels of accountability. Public financing can be used

to create high-quality digital curricula in accordance with best practices, where

---

[26] To put it another way, the mobile phone is the computer for the rest of the world. No one could dispute the impact of personal computers in the West, and mobile phones are extending the same economy of scale for software/service delivery to the rest of the world.

the collaboration between local stakeholders and donors has the clarity and transparence to achieve a well-defined outcome. Incorporating embedded metrics into the curricula, the analytic data will provide an authoritative record of the effectiveness of a given program. One curious source for inspiration for this model and validation that it would actually work is…media piracy. By some estimates 90% of the films distributed in India are pirated works (Karaganis 1). This would suggest that the distribution mechanisms for content financed by third parties are flourishing.[27]

It is important not to minimize the challenges associated with developing effective digital curricula, but the public-private partnership outlined above has much to recommend it. Public financing is most effective at accomplishing a clearly defined goal and least effective at consistent service provision at the local level, often referred to in various sectors as the "last-mile" problem. The last-mile is where the regional stakeholder with intimate knowledge of local conditions has the most to offer. If the development community can bear the cost of effective digital learning resources that can be deployed with little or no marginal costs, then there is room for a local entrepreneur to leverage these resources and support the service in a sustainable way at the local level.

In terms of educational praxis the model may come to resemble the tripartite structure of humanist education described earlier. Public-sector

---

[27] Instead of an illicit traffic in pirated works, public financing could be used to create educational resources released directly into the public domain. Or products that have achieved commercial success in other markets could be licensed at a national level for use in emerging markets.

financing is used to create the core of the canon. The canon can then be used by

local mentors to coach students through a program and ultimately into a

community of practice. When we consider that many of the best potential

mentors could incorporate such a program with a primary economic activity,[28] it

becomes a model with solid prospects for sustainability.

There is a stronger case to be made for this model: If the primary purpose

of education is to promote the holistic development of an individual, it is important

to consider the specific examples of individual students and not rely solely on

analysis that deals with people as generalized populations. The most prominent

discourse on education and development originates from entities committed to

the creation of broad development initiatives. A cursory exploration of World

Bank publications on education and development reveals an almost singular

emphasis on broad social and economic indicators. Such programs are designed

to achieve statistically significant progress defined by a range of objectively

measurable criteria. However, this kind of sector-level analysis deemphasizes the

role of the individual by placing a greater stress on scalable, transferable, and

ultimately impersonal institutions. While humanist education would certainly yield

measurable macroeconomic outcomes, when considering deeply personal

---

[28] Mentorship is unlikely to provide enough revenue to be a person's only economic
activity. But most of those who would be suitable mentors are either engaged in a career
or retired.

experiences like education, it is more valid to reason from the individual to general than the reverse.[29]

Adams and Armah

With education and emerging markets in view, it is useful to consider the biographical works of Henry Adams and Ayi Kwei Armah. *The Education of Henry Adams* and the *Eloquence of the Scribes* are two autobiographies with remarkable parallels. Written approximately a century apart, the authors recount their educational experiences. Adams was the son and grandson of United States' presidents, living in Massachusetts, while Armah was the grandson of an African tribal chief, living in Ghana. They both attended Harvard, and they both, for different reasons, expressed a desire for self-directed learning. The reflections and longings of Adams and Armah testify to universal aspirations within the sphere of learning. By contrasting America and Ghana at similar stages in their development as emerging markets, the juxtaposition provides an historical perspective that may offer a fresh perspective to the debates that characterize much of the contemporary discourse on education and development.

Reminiscing on his time in secondary school, Adams remarks:

"One day in June 1854 young Adams walked for the last time down the steps of Mr. Dixwell's school in Boylston Place, and felt no sensation but

---

[29] If agencies implement educational policies that are crafted to help individuals succeed, they cannot fail to impart that success to their families and community. But, if agencies focus on promoting a sector-level goal, the means employed to achieve that goal may not ultimately translate in to opportunity for individuals.

one of unqualified joy that this experience was ended. Never before or afterwards in his life did he close a period so long without some sensation of loss - some sentiment of habit - but school was what in after life he commonly heard his friends denounce as an intolerable bore. He was born too old for it" (54).

Adams describes his time at school as "an intolerable bore" and states "he was born too old for it." It is possible to dismiss such comments as petulant rebellion against maturity, as if Adams were refusing to eat his vegetables. However, if we consider his remarks in light of Maslow's comments on curiosity and the frustration of this basic drive, the substance of Adams's objection becomes clear. His summation of his time spent at Harvard further clarifies his objection:

"The four years passed at college were, for his purposes, wasted. Harvard College was a good school, but at bottom what the boy disliked most was any school at all. He did not want to be one in a hundred – one percent of an education. He regarded himself as the only person for whom his education had value, and he wanted the whole of it" (59).

Adams felt lost at Harvard in a class of one hundred students. The goal of the institution was to educate and graduate one hundred students. He was one percent. In his comments Adams inverts the ratio and longs for an education that belongs to him alone. The one percent becomes the most important student - the only student.

Such a desire may at first appear to be selfish and unrealistic. Should Harvard abandon the other ninety-nine to save a single wayward student? When approaching the question as one of resources, the selfishness is obvious. An

47

institution cannot exist solely to serve a single individual. This is not Adams's

argument: "what the boy disliked was any school at all." The contemporary

understanding of an education is that it is the product of a formal institutional

process. Within this paradigm Adams's complaint is easily dismissed. But he

argues for an entirely different definition of education. He views it instead as an

intimate relationship between himself and the world. No one is thought to be

selfish for wanting his own spouse, and for Adams education is a relationship as

intimate as marriage.

For Armah, this relationship was an abusive one. As a young student at

Achimota College, a secondary school in Accra, capital of Ghana, he quickly

learned that the role of the institution was not to foster intellectual development

but conformity to colonial ideology. He recounts an anecdote so commonly

expressed in various forms and contexts, that it represents a nearly universal

signpost of the failure of the institution to affirm the individual. Armah revisits one

school encounter between a teacher and him and Boakye, another student:

> "He was part way into one lesson when the subject turned to the goodness
> and omnipotence of God. At that point, Boakye and I began asking a
> series of questions. The way matters went, it's hard for me now to
> remember which of us asked which particular question, but the sequence
> was something like this: 'If God is omnipotent, then does he will all the evil
> in the world? If He is entirely good, does it not mean his power is limited?'
> Our questions irritated the priest. Intent on putting us down, he directed a
> barrage of rhetorical questions at Boakye and at me; 'Young man, have
> you studied theology? Have you studied philology? Have you studied
> ethics? Or philosophy?' Given our age and low status on the academic
> totem pole, we were obliged to answer no to all these heavy questions.

Satisfied with our public admission of ignorance, the priest then concluded: 'Since you know so little, you should listen, and not ask questions about issues beyond your comprehension.' There he must have expected matters to rest. Unfortunately one of us, I do not remember which, said: 'But, sir, we have been taught that Christ himself never went to a university.' The second said: 'That the apostles were simple fishermen.' The first again: 'That they did not study theology and philosophy and….' Above his long white robe the priest turned a sudden red. For a moment he seemed lost for words. Then he said: 'I tell you what, you two young men. You are playing with hell fire. Get out, And don't come back until you're ready to ask for forgiveness.' Boakye and I walked out. Outside the classroom, the morning had an unusual beauty. The sun was bright, but the air was cool. It was a pleasant surprise to find ourselves so suddenly free" (64).

One of the ironies of this passage is that if you were to ask the instructor to define his mode of instruction, he would likely assert that he was engaged in classical humanist discourse. After all, the texts under consideration were selected from the Western canon. But the instructor insisted that the students accept, without argument or discussion, his interpretation of the texts. Although the texts were classical, the mode of instruction was Freire's banking model. The students were encouraged to simply accept and memorize the instructor's opinions, not to develop opinions themselves.

The question raised by these two young men was a weighty one. This is not to say that the question was asked in earnest. Such questions are often raised not to receive an answer, but as a way of asserting intellectual independence. This makes them even more important.[30] When raised in the

---

[30] The impulse by a student to attract attention and gain approval and acceptance is a healthy one when expressed within a community of practice. It presents a problem

context of a banking model, such questions are an assault on the authority of the teacher and undermine his credibility before the eyes of the class. A power struggle ensues. It is incumbent upon the teacher to regain his authority, and this forces him to address a profound matter in a superficial way. The question raised by Armah and Boakye is known as the "Theodicy." Philosophers and theologians have wrestled with it for millennia. It is one of the most significant philosophical questions in the Western tradition. Saint Augustine pondered it on the shores of the Mediterranean in the fifth century. Godfrey Leibniz, credited with the discovery of calculus, investigated the question during the Enlightenment. Even today, some of the most influential leaders of our time have been shaped by this question. Ted Turner abandoned plans to become a missionary after struggling through the question during the illness of his sister and following her death (Dreher).

The teacher responded in a tyrannical way, because the banking model is poorly equipped to wrestle with such questions. His role is predicated on the delegation of intellectual authority, from teacher to student. However, the most meaningful questions, those that define an individual, are not subject to authority. With authority he could list a series of facts to be dutifully memorized by his students. But he had no authority to proclaim a resolution to the problem of the Theodicy.

within a banking system where the relationship between student and teacher is adversarial, and the student is looking downwards for acceptance in a peer group rather than upward in a community of practice.

But, if the banking model is ill equipped to address such questions, this is where the humanist model thrives. The question becomes an opportunity for sustained reflection, for reconciling systems of philosophical thought, historical narratives, and personal experience. In the end, the question never comes to a final resolution because it is beyond us in the same way that Adler's classics are beyond us. We can return to the question again and again and each time experience something new.

Imagine how things might have evolved had Armah and Boakye raised their questions within a classical humanist model. What would have happened if, instead of attempting to assert authority, the teacher had taken their questions seriously? The three of them could have wrestled with the question over a meal. The teacher could have shared his personal struggles with faith and belief and asked them to share their perspectives. He could have treated them as individuals, encouraged them to pursue a deeper inquiry by directing them to further reading. In short, he could have used the opportunity to help Armah and Boakye cultivate an independent, critical conscience. Instead, the constraints of the banking model led the priest to assume an authority he did not possess. Instead of steering his students to intellectual maturity, he sought to make small deposits of knowledge in their minds that were to be accepted without reflection or criticism.

Agency through Identity

One of the most compelling juxtapositions that can be drawn between the reflections of Adams and Armah is the nature of identity and education. Each expressed feelings of alienation that stemmed from experiences in formal academic settings. In different ways they demonstrated how the various programs failed to affirm them as individuals. What can we extrapolate from the autobiographies of these two men?

It is assumed that broader canonic diversity is the key to fostering a sense of inclusion. The supposition is that, if the program incorporates literature and perspectives that align with the student's' perceived identity, affirmation of the individual will result. But truth is universal, and segregating the insights of various communities from one another impoverishes us all. A striking example can be found in Armah's critique of Jane Austen:

> "Yet in Mansfield Park, Jane Austen mentions the enslavement of Africans in Antigua, the source of her protagonists' livelihood and comfort, so lightly that she gives the topic no time to leave a lasting trace on the reader's consciousness. That done, she drops it entirely…
> One thing is clear: In the author's aesthetic universe, so discriminatory is the distribution of sensitivity to human suffering that the discomfort of a couple of English sisters has more weight than the immense suffering of millions of Africans reduced to slavery" (73).

Armah's perspective on Austen is not an African argument for an African audience, but a human argument for a universal audience. The canonical works of classical humanism span almost five millennia from the earliest texts of Mesopotamia until the present day. In the centuries to come the stark divisions

52

between East and West, North and South will yield to some new set of classes and identities. Just as a contemporary reader of classical Greek literature holds no stake in the politics of ancient city-states, the global literature of our time will shed provincial affiliations and fold into the classical canon, drawn from every tribe and nation. To revisit the example of Achimota College, if the subject of the priest's indoctrination program had been traditional Ghanaian literature as opposed to European literature, would all have been well?

The shared experiences of Adams, descendant of presidents, and Armah, descendant of an African chief, suggest there is something else at work. My interpretation is that the classical humanist emphasis on "that education which calls forth, trains and develops those highest gifts of body and mind which ennoble man" (Aloni) is a more significant source of affirmation than a shared identity with the canon. That is to say, Adams and Armah may have derived more intellectual satisfaction from a humanist exploration of a foreign canon than the banking study of a familiar one.

Adams and Armah each argue for humanist models of instruction in which innate curiosity, mentorship, and literary canon and curricula are blended in unique proportions based on the needs of the individual. Perhaps such an education is an extravagance, which is why it has historically been confined to the nobility, the wealthy, and the highest tiers of the academy. Perhaps the lack of this format for learning for all peoples is a deprivation as acute as lack of material benefits such as water, food, clothing, and shelter.

Turning back to Spaulding's reflection on educational technology, what sort of program was the Ivory Coast intervention intended to deliver? Creating and distributing the curricula required a herculean effort and provided few opportunities for local curation and none for local creation. Early education technology interventions favored the monologue, and this limitation tends towards the banking model. Twenty-first century technologies like social media are dialogues, and a dialogue is where humanist education thrives.

I believe that mLearning can be used to lower the logistical and administrative burden associated with the delivery of these classical humanist programs, providing the means to reconstitute an accessible humanist model for education. In Chapter 4 on mLearning Praxis, specific methodologies for achieving these goals will be evaluated. I will also explore the criticisms of Paul Bennell and others who assert that the economic calculus of development experts has unduly emphasized basic educational programs that more closely resemble Freire's banking concept. As an alternative, I will suggest approaches for classical humanist mLearning programs to enhance economic development.

Would mLearning alone have changed the dynamics at Harvard University and Achimota College such that Adams and Armah would have found fulfillment in their respective academic programs? The mere transposition of text from a printed page to a digital one is a triviality. The promise of mLearning lies in the potential to transform the teacher from the sole, authoritative source of knowledge into a guide - a curator of many paths to learning. Likewise the

student must be transformed from an empty receptacle for facts into a self-directed scholar, engaging in discourse not repetition. Classical humanist instruction has always been a possibility, but a preponderance of logistical and economic factors has restricted its scalability. The affordances of mLearning have tipped the scales in favor of self-discovery.

CHAPTER 3:

MLEARNING PRAXIS

In the preceding chapter Spaulding noted that technological innovations in learning are often accompanied by unwarranted enthusiasm. My goal in this chapter is to present a few promising methods that demonstrate the novel character of mLearning and how it is uniquely suited for reconstituting humanist education. Spaulding's Ivory Coast illustration was drawn from a period when video production and distribution were very costly. The asymmetry of production and consumption reinforced Freire's banking model, because it restricted the community's engagement with knowledge to mere reception. One of the most compelling properties of mLearning is that it comes of age on the heels of a global explosion in social media, the most salient characteristic of which is dialogue.[31]

These properties, derived from social media, comprise the creation, distribution, and curation elements of capillarity. By granting authority to create

---

[31] John Seely Brown and Paul Duguid's *The Social Life of Information* is a foundational work exploring the implications of social media before the emergence of today's social networking services.

their own messages and to curate media streams, content can now be distributed via social media networks that empower local stakeholders. Significant local material can be offered on an equal footing with content received from other sources. Each of these basic facts of social media enables a shift towards the humanist model.

Many industries are defined by style and trend, and our preference for new techniques and methods can quickly devolve into the adoption of technology for its own sake. mLearning is not immune to this, and care must be taken to discern those elements that may be truly innovative, and those that merely provide convenient mechanisms for extending well-established best practices in learning.

This does not suggest mLearning is just an old concept with a new name. Rather the approach is to temper the enthusiasm for the new with the experience of the old. Moving beyond the structural elements of creation, distribution, and curation, specific innovations merit consideration. Adaptive coaching algorithms and simulation are two methods that can be employed to reduce the logistical burdens associated with humanistic education and, thereby, improve scalability. Specifically we will examine the ability to use learning algorithms like the Spacing Effect to customize review sessions, and the immersive character of simulation to cultivate what Gee calls a "projective identity" (50).

While this chapter will explore these advanced capabilities, the most powerful capabilities of mLearning are likely to be the most obvious: the promotion of literacy and connectivity within a community of practice. To highlight

the importance of these basic factors this chapter will present historical examples

of communities deprived of these elements.

The Spacing Effect

One of the most promising techniques that we have incorporated in our

mobile learning client applications are spaced repetition algorithms. Known as

the "Spacing Effect," this approach has a long history within the field of cognitive

psychology. According to Philip Pavlik,

> "Since the end of the 19th century researchers have tried to describe the best way to practice to enhance learning and retention. This work began around the time of Ebbinghaus (1913/1885), who focused on how the history of practice for items controls the future strength or retrievability of memories formed. Ebbinghaus' research helped to establish methods for the scientific study of memory and demonstrated memory effects that are still studied today. Although many of his investigations demonstrated the effects of frequency and recency, first listed as principles of association by Thomas Brown in the early 19th century (Murphy & Kovach, 1972), he is also credited with uncovering the 'spacing effect' because he discovered that by interspersing sleep periods between study sessions subsequent performance was improved compared to a contiguous session" (101).

As Pavlik notes, this research began in the nineteenth century and

continues in the present. The premise of the Spacing Effect is that when a

student first learns a piece of information, his chance of remembering that

information decays over time. The more time that passes between learning and

recalling the information, the less likely the student is to remember. If the student

has repeated interactions with the same piece of information, he is able to

remember it for longer and longer intervals. Cognitive psychologists, proposing

various permutations of this simple methodology, have been able to

demonstration significant increases in retention.   Pavlik comments as follows:

> "As frequency increases, an item becomes more stable in memory because the model implements power function forgetting[32] which results in strength from older accumulated practices decaying increasingly slowly as time passes. This increased stability with increased frequency allows more time between spaced practices as repetitions accumulate. Thus, our modeling approach has allowed us to derive that expanding spacing is the optimal solution to the scheduling problem by quantifying the theoretical relationships between recency, frequency, and spacing and their effects on final performance" (112).

A few inferences drawn from this research are pertinent to the present

discussion. The first is a recognition that ongoing research seeks to optimize

retention by deriving the most efficient algorithms and testing these algorithms

according to any number of variables of demography and subject matter. Such

research could easily continue for another century, making little to no practical

impact on educational practice unless practical models are advanced that

incorporate these findings into academic programs.

This has been very slow to happen, in large part because spacing

algorithms are primarily applicable to individuals rather than to large groups of

students. In the past there has not been an efficient mechanism for tracking and

calculating retention intervals for each piece of information or for each student.

Teachers who must instruct large groups of students do so by establishing a

syllabus and administering assessments according to a calendar. In large part,

---

[32] The phrase "power function forgetting" is shorthand for describing the process of memory decay according to a power function.

students resort to "cramming" to perform well on these assessments. In the days leading up to a test, students devote a great deal of time and energy studying the content. This content is available for recall for a short time only, and, within a month of the exam, the retention of the information falls off dramatically.

A second inference from this research is that, although a fully optimized algorithm would be ideal, perhaps even a generalized model will yield better results than the artificial conditions created by current methods of instruction, study, and assessment. That is to say, sustained engagement over time is a more efficient way to learn than an isolated exposure to information.

This leads to one of the concrete advancements offered by mLearning: the ability to schedule and deliver content at any time. A curricular package administered by a mobile device can track a student's exposure to content with absolute granularity. It can then use derivations of the spacing effect to calculate intervals for review and present the student with customized quizzes and reminders to refresh his memory at the appointed times. Such an approach offers a definitive improvement over standardized formative assessment methods in which one quiz is offered to all students. Since every student's aptitude and recall are unique, a coaching method that presents custom review sessions based on detailed records of past performance and engagement represents a meaningful advancement in instructional design.

The application of the spacing effect to a classical humanist mode of instruction is subtle but far reaching. One critique of a humanist instructional

method could be that it is not detail oriented. A certified public accounting course is largely concerned with mastering a body of regulations to achieve compliance with a standard. Compliance-oriented learning starts to look a lot like Freire's banking model, where facts must be accepted and internalized.[33]

A mature approach to any discipline recognizes the value of grammar, the rules and conventions that facilitate discourse within the discipline. Mastery of grammar is a necessary precursor for the more lofty aims of humanist education. It is also a bit tedious, a perfect task to delegate to software. Coaching algorithms and customized quizzes can automate the instruction of grammar and the drills that bring about mastery. The incorporation of metrics allows the instructor to assess performance without diving into the minutiae. If a problem presents itself, the metrics can quickly identify the deficiency, thus allowing the instructor to focus his intervention with the student more efficiently.

This approach to detail-oriented academic subjects suggests that such courses could be encapsulated within a broader humanistic program. The mentor can leverage the software as a virtual teaching assistant and focus on the higher-order aspects of mentorship.

The spacing effect also reinforces the theory of capillarity. In a vital system, nourishment is a continual process. With each beat of the heart a fresh flow of nutrients passes through the capillaries and into the cells. These flows not

---

[33] This is an area with potential application for public-financed learning resources. Compliance-based learning originates with the regulations implemented by various governing bodies. It would be reasonable to include the cost of producing learning resources with the passage of the regulations themselves.

only carry health and life to the cells, they flush out waste and toxins. The fact

that at the most basic level of memory and consciousness there is a rhythm to

knowledge suggests that learning systems have a cyclic role to play in the lives

of individuals and communities. Knowledge can only be sustained through the

perpetual refreshment that comes through engagement with a broader network of

authors, mentors, and students.

Projective Identity and the Community of Practice

Gee's book, *What Video Games Have to Teach Us About Learning and*

Literacy, explores one of the most powerful innovations made possible through

learning simulation. While playing a game called *Arcanum*, Gee created a

character and began exploring the virtual world. As he made decisions in the

game, these choices affected his character in interesting ways. Gee used this

experience to distinguish between three different identities that arise in

simulation. First, there is the player (Gee); second, there is the character in the

game; and, third, there is Gee as the character. Gee states:

> "A third identity that is at stake in playing a game like *Arcanum* is what I
> will call a projective identity, playing on two senses of the word 'project,'
> meaning both 'to project one's values and desires onto the virtual
> character'… and seeing the virtual character as one's own project in the
> making, a creature whom I imbue with a certain trajectory through time
> defined by my aspirations for what I want that character to be and
> become…" (50).

What Gee realized is that the projective identity could be used to address education in a number of novel ways. For example, a child whose mother or father is a doctor is more likely to become a doctor than a child without such a role model. One of the factors at work is the notion that the child sees the profession as more accessible because the relationship provides a framework for shared identity. Perhaps this identity can be cultivated in other ways? A child with no previous exposure to a profession can use simulation to cultivate a projective identity as a member of that of the community. He can play the role of an engineer, business leader, scientist, or doctor. Through this act of simulation he can learn both the practical elements of the profession, but also begin to identify himself as a member of that professional community.   Gee continues his examination of his experience and this idea,

> "This tripartite play of identities (a virtual identity, a real-world identity, and a projective identity) in the relationship 'player as virtual character' is quite powerful. It transcends identification with characters in novels or movies, for instance, because it is both *active* (the player actively does things) and *reflexive*, in the sense that once the player has made some choices about the virtual character, the virtual character is now developed in a way that sets certain parameters about what the player can now do. The virtual character redounds back on the player and affects his or her future actions" (54).

Simulation provides an environment within which the student can learn in the context of a virtual identity.[34] Instead of a series of seemingly arbitrary assignments, simulations can present knowledge and skills in a holistic way. This

---

[34] One advantage of this approach is that it allows the student to learn and practice social conventions behind the security of a virtual identity.

includes realistic consequences and rewards for performance within the discipline. Our lab at the Institute for Simulation and Training is currently researching the use of simulation to allow medical students to diagnose and treat virtual patients. Within the simulation, the outcomes of their choices have serious consequences and can result in either the recovery or the death of the patient. The interactions are designed to be as realistic as possible, even including real voicemail messages from the virtual patients.

These same techniques can be applied to a host of disciplines; and, because the mobile device is the portal through which we interact with the digital world, it is also an ideal vehicle for high-fidelity simulation. Where the confluence of these techniques is most powerful is when the simulation can gradually transition to real-world job performance. We are working to incorporate this technique into electronic health record systems, where the student begins training with virtual patients and uses the same systems to care for actual patients.

This approach may have the most potential to transform broad educational practice. If we anticipate a future where the lines between student and practitioner are blurred by persistent learning, a perpetual advance of practice to which the professional must devote time throughout the course of his whole career, then the purpose of education through simulation can be to orient the student to these internal discourses

As next generation social networks are adapted for professional use, the notion of the projective identity merges with the established idea of the professional identity. The separation between the simulated exercises of the student and the professional exercises of the practitioner may become quite porous.

Will established practitioners accept simulation as a suitable entry point for new members of their community? As a cadet at the Air Force Academy a well-known story was repeatedly circulated throughout the student body. It related the account of a fellow cadet who had the opportunity to fly with members of a fighter squadron. Before the flight he unwisely proclaimed himself a seasoned aviator, based on nothing more than his experiences on a desktop flight simulator. The pilots nodded in agreement with him over lunch as he described his armchair achievements. Interspersed between his proclamations of prowess, they encouraged him to have second and third helpings of spicy chili, before suiting up for his first real flight. In the many retellings of the story, the aircraft and the maneuvers sometimes change, but a common version places the cadet in a *T-38*, a trainer with a roll rate of 720 degrees a second. While in flight, the pilot demonstrated the subtle differences between simulated flight and the real thing. When the exercise was over, the cadet had to have his uniform cleaned, a result he had not experienced in the virtual world of computer simulation. Clearly simulation has the ability to instill an identity, but that identity may or may not correspond to reality. Within disciplines like software engineering, very promising

examples of how this process could gradually unfold, providing an induction

method for new members.[35]

Markus Perssen, creator of *Minecraft*, has announced a new game called

0x10c. *Minecraft* has become a huge success because it allows users to create

expansive simulated environments through a simple interface. A series of

community tools allow users to share elements they have created with one

another. These designs are assemblies of blocks that range from simple

landscapes to complex machines. With *0x10c* Perssen is raising the stakes.

Laura Parker explains:

> "The game will be set in a parallel universe where space travel is de
> rigueur for corporations and the rich, and the incorrect development of a
> deep sleep cell has rendered a number of the population asleep for longer
> than intended. Waking up in the future, the deep sleepers find a universe
> on the brink of extinction.
> 'The computer in the game is a fully functioning emulated 16 bit
> CPU that can be used to control your entire ship, or just to play games on
> while waiting for a large mining operation to finish,' Persson said on the
> game's site.
> Each ship has a generator capable of producing a fixed wattage, and
> everything you connect to it drains wattage. A cloaking field, for example,
> might require almost all the power from the generator, forcing you to turn
> off all computers and dim all lights in order to successfully cloak"
> (http://www.gamespot.com/news/minecraft-creator-reveals-new-game-
> 6369863).

---

[35] Software developers often develop tools for themselves first, and these approaches
filter in to other disciplines. For example, Agile development methodologies are gaining
traction in many disciplines. See the Software service Atlassian for an example.

In Perssen's new game, the emulated computer will require players to write real applications. The experiences gained through playing *0x10c* could genuinely prepare a student to become a software engineer.

Imagine classical humanist education for software engineers in which the canon contains such works as *Minecraft* and *0x10c*. A mentor could assign *Minecraft* to a novice and encourage him to play, building simple and then complex worlds, learning to use the forums and message boards, learning to install models created by others and to modify those models with his own designs. Once satisfied with a student's progress, the focus could change to *0x10c* and the student could begin again, except instead of blocks he builds with code. He starts by using programs written by others, then modifying those programs, and finally writing his own. These simulation-based games offer an authentic mechanism for a humanist approach to software engineering, in which critical engagement and self-directed learning gradually result in membership within a community of practice.[36]

Literacy: Reading as Simulation

In our present discussion of simulation, Gee's virtual environments and game-based simulations are primarily in view. But taking a step back it is possible to distinguish between various forms of simulation. The virtual

---

[36] The current term for this approach is "gameification." The ideas implicit in this movement to use games for education are very similar to the philosophy of classical education: identity, self-direction, and scaling the challenge to push the player ever further.

environment is a simulation that takes place external to the student, but literacy

can be understood as a form of simulation that is internal to the student.

Reading is a form of simulation where the mind compiles the source into

the original virtual environment of the imagination. To extend the analogy, the

mind acts as a processor, rendering the text into ideas that can be manipulated

like the polygons that comprise a virtual space.

The value in drawing this comparison is to establish the distinction

between participating in an external simulation and constructing an internal

simulation through the exercise of a faculty for symbolic reasoning. The analogy

is instructive: A media player requires few system resources to play even a high-

definition media file. However, to render a virtual environment requires enormous

processing power. While the media player can only regurgitate the exact

sequence of events encoded in the file, the rendering engine can produce an

infinite variety of objects and landscapes based on the original models. Both

internal simulation and external simulation are essential to education. External

modeling allows the student to project himself into a community of practice.

Internal modeling engages the student in a critical analysis of the domain

essential to understanding and extrapolation.

The capacity for analysis and symbolic reasoning cultivated by reading is

an essential component of critical thinking. Critical thinking entails the

manipulation of concepts - but, if a concept is to be manipulated, it must be

running on your own hardware.[37] According to Walter J. Ong, literacy is the

vehicle that enables the mind to efficiently perform this function. He states the

following:

> "A deeper understanding of pristine or primary orality enables us better to understand the new world of writing, what it truly is, and what functionally literate human beings really are: beings whose thought processes do not grow out of simply natural powers but out of these powers as structured, directly or indirectly, by the technology of writing. Without writing, the literate mind would not and could not think as it does, not only when engaged in writing but normally even when it is composing its thoughts in oral form. More than any other single invention, writing has transformed human consciousness" (77).

Simulation is an apt metaphor for understanding why Ong attributes such

a prominent role to literacy as technology for structuring thought. Ong recounts

an interview with an illiterate farmer in which he asked him to define a tree. The

farmer refused, observing that it was a pointless task when trees stood all around

them. Ong recognized that it was true: each actual instance of a tree was a more

complete example than could ever be expressed through text. At this point the

differences between literacy and orality become more apparent. Literacy

restructures thought to engage in a process of analysis whereby items are

reduced to a symbolic representation, not merely a pictograph, but an abstract

element susceptible to transformation. Literacy deploys a mental framework that

---

[37] Many objectives of formal education, like cultivating a sense of justice, fall into this category. The application of abstract notions to novel situations is difficult and helps explain why people in the Milgram experiment were willing to continue to the end, even though their role was to shock test subjects with electricity.

helps the mind to classify and evaluate ideas as abstracted from any specific physical or historical manifestation.

Ong states, "The evolution of consciousness through human history is marked by growth in articulate attention to the interior of the individual person as distanced - though not necessarily separated - from the communal structures in which each person is enveloped" (174). He continues this discussion with these words: "The highly interiorized stages of consciousness in which the individual is not so immersed unconsciously in communal structures are stages which, it appears, consciousness could never reach without writing" (175). Ong identifies one of the most practical outcomes of the literate, critical mind: the ability to reason at a distance from one's communal structures. A fundamental constraint for any society is the inability of its members to recognize strengths and weakness of their customs and institutions and rightly discern between preservation and reform. The root of most social and political turmoil is the uncritical impulse to preserve what has always been or, the obverse, to cast off what has always been. Literacy structures consciousness such that the mind is able to reason through social issues at a critical distance. The concept of immersion vividly captures the situation. When a person is completely submerged in his own cultural frameworks, he has no tools to evaluate other possibilities.[38] Literacy is the mechanism used to bring one to broader

---

[38] During the Milgram experiment, the highest levels of compliance were achieved by adopting a posture of authority. The facilitators wore white coats and leveraged the communal structure of respect for the scientific and medical establishment to persuade

consciousness. While this does not entail acceptance or rejection of a given

cultural framework, it does confer the ability to engage in independent analysis.

The degree to which this is possible is determined by the extent to which one's

faculties are cultivated. It is precisely these faculties that "develop those highest

gifts of body and mind which ennoble man" and "extend the potential and

possibilities of what it means to be human and to live in a just society" (Aloni).

Adler's Levels of Reading

Ong's work is helpful in establishing the significance of literacy in the

formation of consciousness and critical thinking. His efforts are complemented by

Adler's detailed examination of the process of reading. Adler's classic *How to*

Read a Book classifies four distinct levels of reading. The first level, "elementary

reading," is concerned with understanding the text in its most basic form.

Elementary reading seeks to answer the question: What does it say? Next is

"inspectional reading," quickly evaluating the content of work. The third level is

"analytical reading," the goal of which is to achieve understanding. The fourth,

and final, level of Adler's taxonomy is "syntopical reading," which applies the

analytical process to series of texts, as a basis for broader judgments. Adler

summarizes the fourth level as follows:

---

average people to administer what they thought were lethal shocks to helpless
participants.

"When reading syntopically, the reader reads many books, not just one, and places them in relation to one another and to a subject about which they all revolve. But mere comparison of texts is not enough. Syntopical reading involves more. With the help of the books read, the syntopical reader is able to construct an analysis of the subject that *may not be in any of the books*" (20).

Adler's description of the synthesis and extrapolation that can be achieved through analytic and syntopic reading provides a clear methodology for achieving the expansion of consciousness described by Ong. Adler recognizes that the process is difficult, but that the gains to be achieved are inherent in the difficultly itself. Many approaches to learning, especially those focused on capacity building in emerging markets, emphasize accessible, approachable content. While Adler recognizes the need for the simple transmission of information, the result he strives to achieve is something greater. He summarizes,

"A good book can teach you about the world and about yourself. You learn more than how to read better; you also learn more about life. You become wiser. Not just more knowledgeable – books that provide nothing but information can produce that result. But wiser, in the sense that you are more deeply aware of the great and enduring truths of human life.
There are some human problems, after all, that have no solution. There are some relationships, both among human beings and between human beings and the nonhuman world, about which no one can have the last word. This is true not only in such fields as science and philosophy, where it is obvious that final understanding about nature and its laws, and about being and becoming, has not been achieved by anyone and never will be…" (342).

Recalling the dilemma of Armah at Achimota, his debate with the professor illustrates exactly the kind of intractable human problem Adler has in

view. These problems are not intended to be solved, but within the classical

humanist tradition function like a psychic form of the young Spartan's *agoge*.

More than a mere rite-of-passage, wrestling with these questions brings about

maturity and wisdom. One solves these and moves on to the next. Rather one

struggles and is forever marked, emerging from the tent like Biblical Jacob with a

limp.[39]

Critical Thinking and Education Policy in Emerging Markets

Adler has raised a philosophical question hidden in a seemingly

uncontroversial discussion of learning methodologies, but one that casts a

shadow over the field of education and development.   International development

is characterized by desired outcomes, broadly defined, and the methods and the

programs required to achieve them. Statistical correlations are used to suggest

that one method or another will achieve one outcome or another, not in the lives

of individuals but in the trajectories of populations, regions, and continents.

What would it mean to concur with Adler that there are "no solutions" to

climate change, "no solutions" to hunger, "no solutions" to the global conflicts of

our day? The funding appeals that underlie international development programs

are predicated on providing s*olutions*. One current trend is to sponsor "Grand

Challenges" that reward the innovators proposing bold solutions to pernicious

---

[39] In Genesis the story of the Jewish patriarch Jacob is recounted. At a moment of great crisis he spends a night wrestling with God and is wounded in the encounter. When he comes out of the tent in the morning, he has a new name and lives as a changed person. The story reflects a very different perspective of knowledge as the fruit of a personal struggle rather than mere intellectual assent to a proposition.

global problems. If an intervention fails to achieve a desired outcome, rarely does

one suppose that the outcome is impossible, but rather that the methods were

flawed. Some new program will be devised and succeed where the other fell

short. A rallying cry for solutions is the successful eradication of smallpox in the

1970s. While this was certainly a tremendous achievement in 1979, Adler's point

is instructive.

I understand Adler's objection that some human problems have no

solution, to mean that there is no solution *in the aggregate.* When it comes to the

notion of solutions, we use words like "poverty" and "education" in an imprecise

way. Such problems are not homogeneous concepts like temperature, which

assumes a volume of indistinguishable molecules. They are the result of an

infinite array of events and decisions, each of which is entirely unique and

personal.

The assumption implicit in many solutions is that human beings are the

molecules, and the desired outcomes are achieved through the right programs

and policies. This line of reasoning is at the core of a chorus of critiques of

certain education policies of the World Bank. Responding to the World Bank's

1995 Educational Sector Review, Paul Bennell writes:

> "The *Review* reiterates (at least six times) the now conventional wisdom
> concerning the relative profitability of the three main levels of education: 'In
> general, in economies with less than universal basic education, rates of
> return are highest for primary education, followed by secondary and then
> higher education (21). Consequently, basic education should usually be

given priority for public spending on education in those countries that have yet to achieve near-universal enrolment in basic education.' With most governments already committing well over three-quarters of their recurrent education budgets to primary and secondary education, it could be argued that this policy recommendation amounts to little more than preaching to the converted'" (238).

According to Bennell, the conventional wisdom is that investments in basic education yield the highest macro-economic returns. Therefore, the reasonable solution is to focus investment on basic education. Much like the administration of the smallpox vaccine, students are organized and basic education is imparted In the aggregate, the problem of education becomes a question of infrastructure and resource allocation.[40]

We may be tempted to dismiss the complaints of Feynman, Adams, and Armah as the anecdotal observations of social misfits, not indicative of a broadly applicable critique. Perhaps their yearning for self-direction in learning highlights a systemic inequity within some development-driven education programs. In *Pedagogy of the Oppressed,* Freire described in some detail the instructional methodologies he identifies as actively harmful.

> "A careful analysis of the teacher-student relationship at any level, inside or outside the school, reveals its fundamentally *narrative* character. This relationship involves a narrating subject (the teacher) and patient, listening objects (the students). The contents, whether values or empirical dimensions of reality, tend in the process of being narrated to become lifeless and petrified. Education is suffering from narration sickness.

---

[40] Basic education is essential to early stage development for individuals. But in terms of the economic development of a community, a handful of entrepreneurs, classically trained to critically evaluate opportunities, will likely make a very different contribution to the communities' growth. These approaches are complementary; both are needed.

The teacher talks about reality as if it were motionless, static, compartmentalized, and predictable. Or else he expounds on a topic completely alien to the existential experience of the students. His task is to 'fill' the students with the contents of his narration - contents which are detached from reality, disconnected from the totality that engendered them and could give them significance. Words are emptied of their concreteness and become a hollow, alienated, and alienating verbosity" (71).

Freire's comments could have readily been made of Adams's academic experiences prior to Harvard. His observation that the topics are "detached from reality" aligns with Feynman's critique of textbooks exercises that are irrelevant to their disciplines. As Freire's critique continues, there are clear echoes of Armah's experience at Achimota, where the expectation was that he would become an empty vessel.

In a sense, the banking mode of instruction reverses the expansion of consciousness described by Ong that occurs when the individual is able to distance himself from his communal structures. Instead the individual is submerged in a relationship within which knowledge is derived from authority. Freire elaborates,

"Narration (with the teacher as narrator) leads the students to memorize mechanically the narrated content. Worse yet, it turns them into 'containers,' into 'receptacles' to be 'filled' by the teacher. The more completely she fills the receptacles, the better a teacher she is. The more meekly the receptacles permit themselves to be filled, the better students they are.
Education thus becomes an act of depositing, in which the students are the depositories and the teacher is the depositor. Instead of communicating, the teacher issues communiqués and makes deposits which the students patiently receive, memorize, and repeat. This is the

'banking' concept of education, in which the scope of action allowed to the students extends only as far as receiving, filing, and storing the deposits" (72).

He concludes his definition of the "banking" mode of instruction with this assessment: "It is not surprising that the banking concept of education regards men as adaptable, manageable beings. The more students work at storing the deposits entrusted to them, the less they develop the critical consciousness which would result from their intervention in the world as transformers of that world" (73). Freire laments that the banking concept of education prevents students from acting "in the world as transformers of that world" (73). His observations arise from recognition that educational structures can be used to restrain rather than empower. The motivations for exercising this restraint can be as diverse as economic protectionism or the consolidation of political power.

To understand these mechanisms of restraint more clearly, it is instructive to examine a case where vibrant transformers were reduced to shattered conformists. At periods in history the vital connections that sustain communities have been forcibly severed with violence, fear, and repression. One such incident was the dress rehearsal for China's Cultural Revolution.

Mao's School at Yenan

Perhaps the clearest historical example of pedagogy of oppression was Mao Tse-Tung's Chinese Communist Party (CCP) indoctrination program at Yenan in the early 1940s (Chang, Ch. 23).

Over the course of two years Mao was able to bring a large number of idealistic young recruits into absolute conformity. Upon arrival, they were zealous for the Chinese Communist Party's (CCP) cause and eager to be part of the revolution. But, by the time the program of indoctrination was complete, Mao had created a unified machine bereft of humanity. Chang describes one gathering of revolutionaries,

> "They were tremendously excited when they first reached what had been portrayed as a revolutionary Mecca. One young volunteer described his feelings when he arrived: 'At last we saw the heights of Yenan city. We were so excited we wept. We cheered from our truck… We started to sing the 'Internationale' and Russia's 'Motherland March'" (Ch. 23).

Shortly after the recruits arrived, there were signs of discontent, and a young man named Shi-wei was bold enough to voice these concerns. Many were attracted to the CCP because it promised to advocate for justice and equality, but when they arrived in Yenan, they found a system of institutionalized privilege that was hypocritical. There were levels of food, levels of clothing, and even in the hospitals food was withheld from the sick former peasants. Shi-wei wrote 'the sick can't even have a sip of noodle soup [while] some quite healthy big shots are indulging in extremely unnecessary and unjustified perks" (Ch. 23). A turning point came when Mao was confronted with a poster by Shi-wei that read:

> "Justice must be established in the Party. Injustice must be done away with … Ask yourselves, comrades … Are you scared of telling the 'big shots' what's on your mind…? Or are you the kind that is good at persecuting the 'little men' with trumped-up crimes?" (Ch. 23).

Mao responded by trotting out the old Stalinist charge that Shi-wei was a Trotskyite. He was taken into custody and tortured until he issued a recantation before the media. Chang notes one reporter's observations: "When he mentioned his past 'mistakes,' his expression was severe to the point of frightening… In my observation, his mind has been badly disturbed…" (Ch. 23). A few years later, the young idealist was executed and his body was thrown down a well. The threat posed by Shi-wei's comments was clear: he encouraged the rank-and-file members to think for themselves and judge whether the conduct of the CCP was in accordance with its stated principles.

The exercise of independent judgment can yield unpredictable and unmanageable outcomes. When people are free to use their capacity for critical thinking, they are free to pursue their own self-interest and free to subordinate that interest to the pursuit of an ideal. This was the case of those who joined the CCP. Chang records that She-wei wrote,

> "'young people…have come here to be in the revolution, and they are committed to self-sacrifice. But if the cause is unworthy of such dedication, independent thinkers will realize this and withdraw their support. Mao had decided that he did not want active, willing cooperation (willingness, after all, could be withdrawn). He did not want volunteers. He needed a machine, so that when he pressed the button, all its cogs would operate in unison. And he got it'" (Ch. 23).

This outcome was achieved through absolute suppression of independent thought, implementing two primary avenues of attack. Using the constant threat of being denounced as a spy, the indoctrination program sought to eliminate

interpersonal communication and freedom of expression. By requiring everyone

to constantly report all conversations to the authorities, it became too risky to

engage in any meaningful form of communication. Chang describes one such

incident involving speaking out, "One man at the Administration College, which

was the place where aversion was most outspoken, took a small but brave step

to protest by quipping: 'Do we have to write down our pillow talk with our wives at

night?'" (Ch. 23). He was later denounced as a spy.

Controlling the communication between individuals was only part of the

process. A more complete suppression of consciousness was achieved by

essentially making creativity illegal. "Mao had not only banned irony and satire

(officially, since spring 1942), but criminalized humor itself. The regime invented

a new catch-all offense – 'Speaking Weird Words' – under which anything from

skepticism to complaining to simply wise-cracking could lead to being labeled a

spy" (Ch. 23). Chang continues this examination of China and its young radicals,

> "Two years of this type of indoctrination and terror turned the lively young volunteers from passionate exponents of justice and equality into robots. When outside journalists were allowed into Yenan for the first time after many years in June 1944, a Chongqing correspondent observed an eerie uniformity: 'if you ask the same question of twenty or thirty people, from intellectuals to workers [on any topic] their replies are always more or less the same… Even questions about love, there seems to be a point of view that has been decided by meetings.' And not surprisingly 'they unanimously and firmly deny the Party had any direct control over their thoughts'" (Ch. 23).

The example of Mao's program of indoctrination is extreme, but the narrative is more familiar than might first appear. The wall poster that doomed She-wei, by exposing the hypocrisy of the CCP, echoes Luther's posting of the *Ninety-five Theses* to his bishop on October 31, 1517, and in so doing initiating the Protestant Reformation.[41] It is a manifestation of the process that Ong described as an interiorized stage of consciousness where the individual is able to reason independently of his communal structure. It is no accident that literacy plays such a key role in these expressions. The symbolic reasoning made possible by literacy allows the mind to reason through an experience according to a set of abstract principles. Like a geometric proof, a syllogism compares principle and practice and reveals accordance and disparity. Apart from these syntactic structures disparate experiences are difficult to characterize in a definitive way. The primary value of literacy is not merely communicating ideas but evaluating them.

The sharp critique of Freire and the historical illustration of Yenan, where the suppression of critical thinking had been taken to extremes, may overshadow the observation that in one sense, conformity of thought in education is one of its most valuable outcomes. Not all conformity is oppressive. Without conformity to collaborative structures such as, for example, grammar and spelling rules, it would be impossible to communicate.

---

[41] There were doubtless many individuals that formed similar conclusions to She-wei and Luther. But these men risked their lives to express these ideas publically. Humanist education emphasizes the whole person acting in the world.

The argument thus far has not been in favor of a feral approach to education, but rather to illustrate the dangers of achieving conformity by extinguishing the capacity for critical thinking. The most desirable outcome for any program of education, and broadly speaking for civilization itself, is that the student is able to critically evaluate the ideas and institutions that comprise society and voluntarily conform to them. The cultivation of critical faculties then enables the student to offer constructive critiques throughout the course of his career, breathing vitality and relevance into his institutions. The failure of a nation is the failure to achieve this adoption, either through coercion, in which critical thinking is expunged, or through cynicism and rejection of ideals.

The most effective way to achieve this vitality is by offering the student the promise implicit in classical humanist education: the opportunity to assimilate into a community of practice that shares common goals and provides transparent avenues for merit-based advancement. Where these structures exist, institutions will prosper. Where they are absent, institutions will wither as they focus on protecting their privileges, while young people abandon them, taking refuge in cynicism.

Two major restrictions implemented by Mao to stifle critical thought were to limit freedom to communicate and access to information. The central purpose of mobile devices is to serve as portals for media and communication. Implicit in mobility is the notion of self-direction.

Mobile devices alone cannot promote critical thinking, nor establish healthy, prosperous societies. They are merely an instrument, an instrument that could as easily diminish critical thinking through vain amusements, alienate communities through private media consumption, or inhibit freedom of movement through telemetric monitoring. Any powerful tool offers potentials both terrible and wonderful.[42]

Capillarity is a hopeful expression of the future of mobile technology -- one that views the use of mobile devices as a vehicle for humanist education as an authentic opportunity to *Wei renmin fuwu.*[43]

---

[42] Adorno and Horkheimer, writing in the aftermath of World War II, offer a strong criticism of how technology has contributed to inhumanity rather than the reverse.
[43] "Serve the People," was one of the leading slogans of the Cultural Revolution and is still used today.

CHAPTER 4:

CAPILLARITY AND GLOBALIZATION

A discussion of education and development would not be complete without acknowledging the substantive arguments of what Joseph Stiglitz has called "globalization's discontents" (1). Understanding the objections to the globalizing influences of information technology can lead to understanding how capillarity may serve as an antidote. For example, one dimension of the debate is that globalization undermines local communities by aggregating power and influence in the hands of a small number of international organizations. The solution to this problem, at least where education is concerned, is to offer a more flexible mode of delivery, empowering local stakeholders with editorial and administrative privileges.

Throughout my argument I have discussed the relationship between community and humanist education as the relationship between a student and a mentor, a student and a community of practice, and the radical conception of communities as an organized struggle against exclusive social, economic, and political systems. While examining the consequences and responses to globalization, it will be helpful to develop the concept of community as a

mLearning network used to facilitate humanist education.[44] Capillarity seeks to diminish the distinction between the consumption and production of ideas and replace the authority of distribution with the authority of community.

In other words, our mLearning applications have been developed to allow stakeholders at any level to select curricula or create their own. As opposed to relying on a centralized distribution method for content or submitting to the geographic constraints of physical institutions, communities are free at any level to make their own choices. The practical implication of this method is that each community can decide for itself which courses they wish their students to take and which books they wish to promote. This method allows students to gain entry to communities of practice based on affinity and aptitude rather than geography.

One of the consequences of globalization is that, along with other flows of resources, international students are often caught up in a kind of educational diaspora. Empowering local stakeholders provides a necessary corrective to globalization's tendency to concentrate not only economic power and physical resources, but also human capital. Capillarity works to exempt humans from being regarded as just another form of capital by attenuating the linkages between geography and community of practice.

---

[44] One of the key differences in this formulation is that these communities of practice are often more directly invested in and focused on some form of enterprise. Education in that context may offer a more direct economic incentive, because it will be tied to an economic goal established by leaders within the community.

Opposition to Globalization

Issa G. Shivji, in his essay "Globalization and Popular Resistance,"

observes, "The dominant discourse on globalization is essentially celebratory"

(2). Instead of doing the difficult work of engaging critically with the many

examples of disastrous consequences brought about through policies

encouraged by globalization, advocates are perceived as mouthpieces for the

International Monetary Fund, the World Trade Organization, and the World Bank.

Giroux is more explicit in his critique of neoliberalism.

> With the advent of neoliberalism, or what some call free-market
> fundamentalism, we have witnessed the production and widespread
> adoption throughout society of what I want to call the politics of economic
> Darwinism. As a theater of cruelty and a mode of public pedagogy,
> economic Darwinism undermines all forms of solidarity while
> simultaneously promoting the logic of unrestricted individual
> responsibility... The harsh values of this new social order can be seen in
> the increasing incarceration of young people, the modeling of public
> schools after prisons and state policies that bail out investment bankers,
> but leave the middle and working classes in a state of poverty, despair and
> insecurity. But it can also be seen in the practice of socialism for the rich.
> This is a practice in which government supports for the poor, unemployed,
> sick and elderly are derided because they either contribute to an increase
> in the growing deficit or they undermine the market-driven notion of
> individual responsibility. And yet, the same critics defend, without irony,
> government support for the rich, the bankers, the permanent war
> economy, or any number of subsidies for corporations as essential to the
> life of the nation, which is simply an argument that benefits the rich and
> powerful and legitimates the deregulated wild west of casino capitalism"
> (Giroux).

Giroux is right to point out the hypocrisy that would lead a society to condemn social programs for the poor because they encourage dependency, while embracing entitlement programs for the wealthiest institutions, because they are too big to fail.[45] But as a neoliberal advocate of free markets, I do not argue for an elimination of social safety nets or for the expansion of corporate bailouts. Instead I contend that free markets have the potential to create more economic opportunity than the alternatives.

Characterizing the seemingly oblivious advocacy of free-market deregulation in the face of the recent economic catastrophe, Giroux quotes Robert Herbert:

> "And, yet, in light of what Bob Herbert calls 'the most painful evidence imaginable of the failure of laissez-faire economics and the destructive force of the alliance of big business and government against the interests of ordinary Americans,' the Tea Party movement wants to abolish government and expand even more the deregulated capitalism that has unsettled the lives of so many of its members" (Giroux).

The chosen quotation is instructive because it reveals a misunderstanding of a central debate within the neoliberal camp. "Laissez-faire economics" are wholly incompatible with the "alliance of big business and government." Economic failure arose from one or the other, but not from both simultaneously as the two are antithetical. Free market means a market free of government

---

[45] The expression "too big to fail" was popularized in the 1980s by Congressman McKinney during testimony on the FDIC. It has since evolved into a popular expression denoting the kind of corporate welfare Giroux objects to in his essay.

intervention.   Either we find fault with "the alliance of business and government,"

which is a form of mercantilism or even feudalism in some degenerate cases, or

we lay the blame on free-market capitalism - the theoretical foundations of the

two economic systems stand in opposition to one another.

Advocates and opponents for both can be found within the neoliberal

sphere of development discourse. As I will subsequently expand, my position

within neoliberalism embraces and applies laissez-faire principles to education

and stands as strongly opposed to mercantile and feudal alliances between state

and industry as any opponent to globalization.

Misunderstandings of "Free-market Fundamentalism"

Admittedly, it is difficult to substantiate the distinction between laissez-faire

economics and the alliance of business and government in practice. This

difficulty provides ample opportunities for misunderstanding.[46] In much the same

way Marxists often denounce each practical manifestation of Communist

ideology (Leninism, Stalinism, etc.) as a corruption of the core ideals, the

alliances between government and business interests which continually arise

from free market conditions are nevertheless a corruption of the laissez-faire

ideal. While many quotes could be chosen to illustrate this point, this selection

---

[46] Small, innovative businesses are disruptive to established business because they
introduce new products or undercut the costs of existing services. Established businesses
have the capital to invest in political alliances that will discourage innovation and thereby
protect existing business models. This is one contributing factor to a perpetual cycle of
business-government alliance. Just as nation states benefit from term limits and stagnate
under the prolonged leadership of a single dogmatic person, corporations should
encourage turn-over to leaders who can embrace new ideas rather than simply protect old
ones.

from Andrew Jackson's Farewell Address on March 4, 1837, carries a special irony, "But you must remember, my fellow-citizens, that eternal vigilance by the people is the price of liberty, and that you must pay the price if you wish to secure the blessing. It behooves you, therefore, to be watchful in your States as well as in the Federal Government." Jackson encourages vigilance in his final address and yet some of the innovations of his office like the "spoils system" evolved into the most egregious examples of government corruption. One must be vigilant indeed.

The principle behind laissez-faire economics is that individuals should be free to make mutually beneficial trades with one another. When objections are raised against this model, it is almost always corruptions of the model that are at issue. With asymmetries of information the transaction may become fraudulent. Asymmetries of influence render it coercive. In both cases the ideal of the free market has been compromised.

The purpose of drawing out these distinctions is to illustrate that what may be perceived as a neoliberal monolith advancing a common agenda for globalization is actually a deeply contested ideological landscape. I suggest that the overwhelming majority of objections directed towards globalization are more precisely oriented towards those who advocate the close alliance between state and corporate interests. In fact the true proponents of the free market are aligned with Shivji's "Popular Resistance" to a mercantile globalist agenda (2). To further

illustrate this affinity it is important to address Giroux's equation of neoliberalism with anti-intellectualism.

A central premise of the free market is that the individual is the safest trustee of his own self-interest. As Feodor Dostoevsky skillfully illustrates in *The Brothers Karamazov*, this is not always the case. Dimitri acted as his own worst enemy. Dostoevsky used this character to introduce a concept Freud identified as powerfully descriptive of human nature, that of "self-laceration" (Ch. 5). But what is the alternative? Who else can be trusted to safeguard the well-being of the individual?

Proponents of laissez-faire assert that the individual is the best custodian of this trust. The assertion is not made without some qualifications. There are clear advantages from participating in unions, standards bodies, and other organizations. But such participation in representative bodies should be voluntary. I voluntarily delegate varied functions to financial and legal representatives. My ability to grant and withdraw consent from these relationships best ensure they represent my interests. Obviously I can be deceived. However, if the choice is between the risk of deception and the risk of coercion…at least in education there is a remedy for deception.[47]

Following this line of reasoning, it becomes apparent that democracy itself rests on the same foundation of voluntary association and choice of

---

[47] It is difficult to balance the contributions of expert opinions against the threat of advancing self-interest. Those with domain expertise in a given field are likely to have a conflict of interest and often advocate regulation favorable to their industry.

representation. Giroux insists that democracy and the free market are in opposition to one another in the sphere of education: "The anti-democratic values that drive free-market fundamentalism are embodied in policies now attempting to shape diverse levels of higher education all over the globe."

Giroux's accusations of anti-intellectualism are far reaching, and in some quarters well deserved. However, the so-called anti-intellectualism that favors Adams's "unseen hand" over the machinations of "learned experts" is readily defensible. Shivji cites the example of "NAFCO Versus the Barabaig," a common parable of development. An external agency embarks on a project dislocating tribal peoples from their homeland and fails to accomplish their goal -- in this case wheat farming (8).

These projects, which are often cited as evidence of the failures of the free-market are illustrations of the opposite. Consider Shivji's example: An alliance of government and corporate entities appropriate land without permission or compensation of the owners to embark on a state-sponsored project to grow wheat. There is not a single point of contact between the program as described and any principle associated with "free-market fundamentalism." In fact, the impetus for such projects is misplaced regard for the opinions of intellectual development experts against the unified and collective objections of "uneducated" members of the community.

In practical economic matters the wisdom of the crowds is more reliable than that of a given development expert for an important reason: Development

experts never have access to as much information upon which to base their decisions as the aggregate of an entire population. A helpful metaphor from computer science is the difference between a blazing fast central processing unit (CPU) and a massively parallel processor. The CPU may be quite powerful, but it can never match the computational power of a vast number of slower processors working in parallel. Respecting the decision-making abilities of individuals is not an anti-intellectual stance. It is an accurate recognition of the limitations of experts to grasp all the dimensions of a given problem. Physicists work with hydrogen atoms and geneticists work with fruit fly genomes for a reason. Even the soundest premise can only yield predictable results when the number of variables is constrained.

If the individual is to be trusted with political agency, why not trust him with economic and academic agency as well? How can this trust be considered "anti-democratic" if the agencies arise from the same premise? Part of the answer lies in the complex relationship between knowledge and authority in formal academics. Academics cannot be conducted as a private transaction for the sole benefit of the student, because the ultimate goal is not only knowledge but also induction into a community of practice. These communities form the economic engine of the world, comprise the tax base of developed nations, and are fiercely courted and cultivated by states. mLearning can be used to sever the relationship between the state and the community of practice by eliminating geographic constraints. Reducing these complex dependencies upsets the alliance of state

and corporate interests rightly opposed by Giroux and others. Market-based education solutions can thrive once these barriers are removed, and students are free to learn and practice without being forced to choose between physical and professional communities.

Critical Thinking Versus Instrumentality in Free-market Education

Perhaps the strongest critique offered against the transition to market-based education is the fact that such programs encourage an instrumental approach to learning at the expense of critical thinking.[48] Central to my premise is the notion that humanist education is essential to sustainable development, yet market-based approaches would seem to favor instrumentalism. According to Giroux:

> "Since the 1970s, we have witnessed the forces of market fundamentalism strip education of its public values, critical content and civic responsibilities as part of its broader goal of creating new subjects wedded to the logic of privatization, efficiency, flexibility, consumerism and the destruction of the social state. Tied largely to instrumental purposes and measurable paradigms, many institutions of higher education are now committed almost exclusively to economic growth, instrumental rationality and preparing students for the workforce.... Moreover, as the university becomes more corporatized, intellectual and critical thought is transformed into a commodity to be sold to the highest bidder" (Giroux).

Giroux's assertion that market forces generally emphasize training and work-force development at the expense of education must be conceded. There are

---

[48] One of the most serious challenges is the current rise of "diploma mills" that take advantage of generous federal loan programs while offering students a thin academic program.

important caveats to add. First, it would be wrong to disparage practical instruction for the majority of individuals who need to acquire skills quickly and affordably to support themselves and their families. It is not elitist to suppose that, for many, employment is perceived to be a higher priority than the cultivation of critical consciousness. The two are not as opposed as it might appear. By meeting the individual's more basic needs of employment and sustenance, training programs can serve as bridges to deeper educational experiences where critical thinking can be cultivated. One of the goals of capillarity is to situate even the most humble training program in a humanist paradigm. As previously discussed, playing a simple game like *Minecraft* can become the first step towards an advanced engineering career.

However, Giroux's warning is well taken: Instrumental programs can become tools by which students are conditioned to perform a role in a quasi-feudalistic enterprise. Once again an important distinction arises. In the free market the individual chooses the product or service. Purely instrumental education presupposes compulsion rather than election. The very act of election is an empowering exercise of critical thought whereby the student chooses a program of study to further his own interests. Pure instrumentality in education exists only when the student is coercively prepared to serve another's interests instead of his own.

One reason for hope in the face of Giroux's critique is the evidence that critical engagement may arise spontaneously out of free market agency.[49] Rather than focusing on narrow self-interest, this engagement often supports the "public good." Giroux's prediction is the opposite: "As the language of privatization, deregulation and commodification replaces the discourse of the public good, all things public, including public schools, libraries and public services, are viewed either as a drain on the market or as a pathology" (Giroux).

The Royal Society for the Encouragement of Arts, Manufactures, and Commerce recently produced a video entitled *Drive.* The short film discusses research on the nature of human motivation and presents some interesting conclusions. According to their findings, three of the strongest motivational elements for employees are autonomy, mastery, and purpose. Autonomy lays the foundation for the other motivations by empowering the individual to achieve. This empowerment naturally encourages the individual to pursue mastery of his discipline. As skills develop, the individual seeks an outlet or purpose whereby his skills can benefit others.

More sophisticated examples include Wikipedia, Linux, the Open Source movement, and Creative Commons. These "crowd-sourced" efforts powerfully illustrate that far from perceiving public services as a pathology, the public has never been more engaged in the creation of public goods. mLearning rides atop

---

[49] For an example of the evolution of critical consciousness arising from an instrumental foundation, consider the debates surrounding privacy in software services (Electronic Frontier Foundation).

the crest of this wave, leveraging media and software tools freely created by

countless scores of professionals for the benefit of others.

But, despite the well-intentioned contributions of millions of individuals, the

dominant narrative of globalization remains one of conquest and exploitation.

Shivji summarizes a survey of critical perspectives: "In a word these critical

perspectives argue that the single central element of the process of globalization

is the globalizing of poverty and the concentration of wealth, power and control

over production and communication in the hands of a few hundred giant

corporations (4). Shivji's assessment describes how the process has unfolded

for many populations. In numerous instances global competition for resources

and production has collapsed local economies, further impoverishing many

people. Shivji goes on to quote "Insurgente Marcos," *nom de guerre* of a Mexican

army *subcommandante* in the 1900s Zapatista Army of National Liberation,

"Modern globalization, neo-liberalism as a global system, should be understood

as a new war of conquest for territories" (5).

If we grant that premise we must recognize two sides to this "war." My

intention is to promote mLearning as a decentralized approach to education that

acts as a bulwark against the consolidation of power "in the hands of a few

hundred giant corporations," instead promoting local autonomy. According to

Giroux,

"Academics have not only a moral and pedagogical responsibility to unsettle and oppose all orthodoxies, to make problematic the commonsense assumptions that often shape students' lives and their understanding of the world, but also to energize them to come to terms with their own power as individual and social agents. Higher education, in this instance, as Pierre Bourdieu, Paulo Freire, Stanley Aronowitz, and other intellectuals have reminded us, cannot be removed from the hard realities of those political, economic and social forces that both support it and consistently, though in diverse ways, attempt to shape its sense of mission and purpose."

One method that can be used to achieve these ends is the theory of Capillarity. Giroux reminds us that higher education cannot be separated from political, economic, and social realities; but this is precisely what happens to students of the African diaspora. First at Achimota and then at Harvard, Armah was subjected to an academic program that sought to sever his intellectual, cultural, and economic connections.

Capillarity represents the network of stakeholders through which information passes. The economic, political, and social context of that information is determined by the network. Consider the simple illustration of a course on negotiation: though the content of the course is identical, the outcome of the knowledge is very different, based on the context. A student trained abroad in negotiation may find employment where his most marketable skill is the ability to extract concessions from his community; whereas a student trained at home, may deploy the very same skills to defend his community's interests. Almost like the Janissaries of the Ottoman Empire, students of the African diaspora may be called to subordinate the interests of their community to a foreign agenda. Thus the context of information can be used to reinforce or attenuate cultural identity.

This is often the practical outcome of international education programs when subsequent opportunities offered to foreign students entice them to invest their time and talents abroad rather than at home. Individuals must be free to make their own choices, but often the impact of these international academic opportunities is to pluck out the brightest leaders and encourage them to build up the developed world. Much of the objection to globalization focuses on the improper allocation of physical resources, but these flows of human capital present an equally serious challenge.

Returning to the example of the negotiation course, mLearning creates the possibility of offering academic opportunity without mandating a specific political, cultural, or social context. Instead, academic resources can be passed along through Capillarity by incorporating a network of stakeholders who act to advance the interests of their own community, rather than sacrificing community for opportunity. Ivy League knowledge can be acquired without Ivy League strings.

The vision of a world where mLearning permits anyone go to Harvard and stay home to serve as leader in his community is an optimistic one.[50] In development circles optimism has a poor track record. Perhaps a bifurcated approach, reconciling centralization of technical infrastructure with the decentralization of editorial control and free market choices, can succeed where other approaches have not.

---

[50] MIT X is one of many Open Courseware approaches moving in this direction.

Hayek, Pralahad, and mLearning

As the debates surrounding globalization continue, within neoliberal proponents disagreement exists between two camps: the visionaries who can solve any problem if only they had the money and the skeptics who point out that the visionaries' efforts often fail to accomplish their goals:

Jeffrey D. Sachs makes a bold declaration in "The End of Poverty: Brother, Can You Spare $195 Billion?" Sachs's idea is summarized by Daniel Drezner, the author of the article: "He argues that if the wealthy countries of the world were to increase their combined foreign aid budgets to between $135 billion and $195 billion for the next decade, and properly allocate that money, extreme global poverty - defined by the World Bank as an income of less than a dollar a day - could be eliminated by 2025" (Drezner).

But, according to the skeptics, such plans have a poor track record. Many nations receiving substantial aid over the past four decades have seen a decline in gross domestic product (Easterly 137). Likewise deadlines for the 2015 Millennium Development goals are fast approaching; and, due to poor implementation, the expectation is these goals will not be met like similar goals in the past. William Easterly comments on the poor performance of such programs, however well intentioned, "Unfortunately, the West already has a bad track record of previous beautiful goals. A UN summit in 1990, for example, set as a goal for the year 2000 universal primary-school enrollment. A previous summit, in

1977, set 1990 as the deadline for realizing the goal of universal access to water and sanitation. Nobody was held accountable for these missed goals" (9).

However, it would be unfair to dismiss the efforts of the visionaries. In the 1950s an average of fifty million people died each year from smallpox. After a thirty-year campaign, the World Health Organization certified in 1979 that the disease had been eradicated. Polio might well be the next disease to be eliminated. Such clear demonstrations of success provide hope that one day HIV and malaria might also be overcome. There is good reason for hope that these "big plans" can deliver, and perhaps Capillarity is an approach to rural development through education that can reconcile Sachs's optimism and Eastman's realism. Applying F.A. Hayek's understanding of decentralization and C.K. Pralahad's use of the market to educate are the keys to making progress on this perennial problem.

Hayek's *Road to Serfdom* provides two essential concepts for theorists of rural development. First, the development process depends upon such a vast number of variables that no team of planners has sufficient information or insight to make the right decisions. Instead decisions must be made quickly and as close to the problem as possible. The role of the market is to decentralize decision-making by empowering individuals to make their own choices. Recent advances in computing and social networks demonstrate the potential of these methods to achieve remarkable results. Crowdsourcing and parallel processing are two examples from computer science that demonstrate how decentralization provides

alternative models for solving problems. The operative principle is that broader participation in decision-making yields better results.

Hayek's second contribution is the proper understanding of incentives. Centralized planning often fails because the planners' incentives are rarely tied to the successes of their efforts. In fact circumstances often arise in which the planners' incentives are antithetical to their responsibilities. The collapse of the Zimbabwean economy under Mugabe and the Zimbabwe African National Union – Popular Front (ZANU-PF) is a painful example of this phenomenon. To preserve political power the senior leadership consciously undermined Zimbabwe's economic foundation. They destroyed the agricultural sector and much of the middle class, and with it their ability to mount an effective political challenge (Clemens 4).

The Mugabe and ZANU-PF solution is an extreme example of a problem affecting development efforts for some time: The incentive for a planner is not to solve a problem but to use it to his own advantage. An aphorism states, "the poor are a goldmine." Anyone who has worked long in the field of international development knows how subtle this temptation can be. When the most comfortable place in an impoverished rural village is the passenger seat of a new air-conditioned Toyota land cruiser, development projects tend to require a lot of vehicles. An honest accounting of the resources consumed by "overhead" in efforts to serve the poor might even shock Luther's bishop.

Hayek's theories predict that the acquisition and maintenance of the political power of a central planner create a perverse incentive to establish an infrastructure that maintains rather than relieves the conditions of inequity. Paolo Freire labels it "false generosity." To a large extent this drift in mission and purpose arises from ill-defined goals and inadequate feedback mechanisms. Without feedback, it is very difficult to reward performance or to hold people accountable for failure. The generational scale of academic programs that makes it difficult to implement sufficient feedback mechanisms is worth noting.

The most effective feedback mechanism ever devised is money, which leads us to Pralahad's contribution. Pralahad's *Fortune at the Bottom of the Pyramid* demonstrates a simple but powerful idea. The best way to serve the poor is through business, by creating affordable products and establishing the conditions where entrepreneurialism can thrive. One illustration of Pralahad's theory in action is the "Q-drum," a plastic container that can be rolled instead of carried (Smith 51). Large-scale water projects can be difficult to finance and implement, whereas a plastic jug with a better design can be sold in local markets. While this jug will not provide a family with clean running water, it will reduce the time and effort it takes to collect water from a well, a practical and inexpensive alternative. The most significant aspect of this approach is that it empowers the poor to choose their own solutions, rather than relying on an external entity to provide them. Unless customers are willing to buy the drum, the

program cannot move forward. This approach provides the development entrepreneur with robust feedback and properly aligns his incentives to make genuine improvements in the lives of his customers.

A theory of development that balances Sachs's call for expert intervention with Easterly's warning against utopian fantasies should tie the incentives for development entrepreneurs directly to the beneficiaries of the service. In other words, service delivery for the poor should be market based, just as it is for the rich. The obvious obstacle is that the poor lack the resources to incentivize entrepreneurs. The cost of delivering services to the world's poor is so high that there is no way to generate a profit.

This was the case in developed markets before the modern system of highways, ports, and railways brought costs down. In a knowledge economy, where transactions are based on information rather than physical goods and services, telecommunications offer a substitution to physical infrastructure. Instead of spending billions of dollars for highways, ports, and railways, a fiber-optic cable and a few cellular towers can connect the rural poor to the global economy and make market-based service delivery a reality.

Education is one of many services that can be delivered on this new architecture. The nature of this transition is worth exploring to understand how Capillarity can counterbalance the consolidating forces of globalization.

mLearning and Rural Development

Each year innovation drives the adoption of new technologies, some of which represent incremental improvements while others provide entirely new capabilities. Occasionally a technology is so transformative it redefines the economy and perhaps even the social order. Historians discuss how a small invention like the longbow contributed to the decline of Feudalism. The English victory at Agincourt in 1415 made the knight obsolete and with him went a whole socio-economic system.

While it may be a stretch to ascribe such a broad economic shift to a bent sapling, consider the role of the internal combustion engine (ICE) in the twentieth century. The ICE made today's global economy possible. ICEs made movement so efficient their use transformed cities and neighborhoods, centralized the workforce and academic institutions, and changed the nature of warfare. Even the shift towards the nuclear family can be attributed to the engine. It is difficult to understate the impact this technology had on the twentieth century and continues to have today as environmental considerations drive the demand for alternatives.

If the ICEs defined the twentieth century, perhaps the twenty-first century will be defined by the mobile phone. The mobile phone is used as a signifier, the most visible element of a global telecommunications infrastructure, just as the engine represents highways, suburbs, and heavy manufacturing. The engine encouraged industrial centralization and social atomization. People came together to work and drifted apart to live. The mobile phone encourages social

integration and industrial decentralization.[51] The engine took you to work; the phone takes the work to you.

The implications of this shift for rural development are profound. Theorists have long predicted telecommunications would distribute the work force, but these predictions have been slow to materialize. This is due to a combination of factors. The first is that truly useful collaborative tools are still in their infancy. The second is that the centralized economic infrastructure developed over the last century has tremendous inertia in terms of established practice and physical infrastructure.

However, rural development in emerging markets is not "burdened" with the physical and cultural infrastructure of a petroleum-based economy. This can either be viewed as a serious limitation or an opportunity to leapfrog more established economies. Many aid projects are focused on the latter, addressing deficiencies in physical infrastructure. It would seem prudent to evaluate what can also be accomplished with investments in the new virtual infrastructure made possible by the mobile phone.

Many regions in need of rural development are sustained in large part by remittances sent by family members who left home to find employment. Each job that can be shifted back to the rural areas is a major victory for rural

---

[51] The other side of this argument is that mobile computing absorbs its users into the virtual world of social networking software and insulates them from their surroundings, increasing social alienation. There is certainly a danger of this, but our vantage point is one of transition. New social spaces like hacker spaces and shared workspace incubators are evolving to capitalize on the affordances of mobile technology.

development. But, as we have discussed, the most coveted jobs are professional positions that exist within a formal community of practice. These fields tend to be tightly integrated with the academic institutions that serve as the gatekeepers. Can such closely guarded positions make the transition to emerging markets?

Apps for Emerging Markets

People in emerging markets spend the highest percentage of their income on telecommunications, according to Nicholas P. Sullivan (11). One reason they make this investment is that mobile phones overcome the limitations of inadequate physical infrastructure with a virtual alternative. Poorly maintained roads make travel difficult and expensive, so a service that can be provided over a mobile phone saves substantial time and money. These savings are proportionally greater for the poor in emerging markets because they have access to fewer alternatives. In developed economies the physical infrastructure is so well streamlined that the advantages of distributed infrastructure can be less apparent. This is the reason one of the leading mobile banking services is not based in the more developed nations, but in Kenya. Safaricom's MPesa service has become a model for mBanking initiatives all over the world and has succeeded in extending banking services to tens of millions in rural areas.

The MPesa service is an example of a successful initiative that meets the suggested criteria for mobile technology in rural development. A commercial service, it aligns incentives with user satisfaction and solves an important problem facing rural entrepreneurs. The success of MPesa prompts us to

consider how it can be replicated in other areas and how the approach can be modified to deliver other services. As ideas begin to form as to how medical, educational, and other commercial services can be affordably delivered over mobile phones, it is possible to overlook the most essential component of this new mobile infrastructure. The key innovation is not any one solution in particular but rather an incentive structure to attract more and better solutions.

The most revolutionary innovation behind Apple's iPhone™ is not the capacitive touch screen, but the business process that in a short time led to the creation of hundreds of thousands of mobile applications. Apple's App Store motivated vast numbers of developers to unleash their creativity, producing an enormous catalogue of mobile applications.

The same approach can be used to mobilize a global development community to create apps for emerging markets. Most of the apps available in Apple's marketplace are rather trivial entertainment-oriented applications that sell for less than two dollars. Even so, Apple's App store's revenue for 2009 was approximately $2.4 billion (Malik). This revenue stream provided a sufficient incentive for thousands of software developers to devote time and energy towards mobile application development for audiences in developed markets. But by 2013 Informa estimates there will be more than half a billion subscribers to mobile banking services. The transaction fees alone on those transfers could amount to more than $20 billion a year, just one of many possible revenue streams in mBanking applications.

When you compare the demand for mobile applications in the developed

world with the potential demand in emerging markets, the opportunity is

staggering. The $2.4 billion in iPhone App Store revenue is the aggregate of

twenty categories of applications. But a single revenue stream (transaction fees

from mBanking) from a single application targeted towards emerging markets

could provide more than ten times that revenue. Clearly substantial rewards can

be realized by providing mobile services to the world's poor. Mobile technology

aggregates the purchasing power of the poor and proves there really is a fortune

at the bottom of the pyramid, waiting to be claimed by whichever entrepreneur

can most effectively meet the needs. On the surface this may seem opportunistic

or even exploitive, but it is the opposite - it is empowering. Aggregated demand

places the poor on equal footing with the rich, giving them "the power of the

purse."

Consider the case of Vertu, a luxury phone manufacturer. Vertu produces

handsets for the wealthy elite. The devices may cost tens of thousands of dollars

apiece; and, yet, any consumer can purchase a budget device for under a

hundred dollars that is superior in every respect save the vanity of physical

construction. Aggregated demand provides the "poor" with revolutionary new

technologies and capabilities, while providing the rich with leopard skin cases.

Education is a service that meets many of the criteria for sustainable

delivery to the rural poor. It is not a physical good, but a form of communication

and thus suitable for delivery via mobile devices. Educational apps can

aggregate demand to provide services at a lower marginal cost. But, as useful as

mLearning applications may be, there is obviously more to education than

accessible content. The promise of education is that the student may climb the

rungs of the global economic ladder, and secure a better future for himself and

his community. According to Angela Little,

> "Our analysis of the literature on globalization and development suggested that globalization has changed the terms of development in important ways, including through increasing the importance of trade, foreign investment and technology transfer. These changes make education and skills increasingly central to the process of development. Countries which have been the most 'successful' in globalization hitherto have been those which have achieved the most favorable terms of engagement with the global economy. Education, we suggest, has been an essential precondition for this" (166).

Beyond Basic Education

If we are to advocate an approach to mLearning that will empower the

rural poor, it is essential to understand what sort of education is a precondition for

negotiating the "most favorable terms of engagement with the global economy."

Responding to the 1995 World Bank publication *Priorities and Strategies for

Education*, Jon Lauglo criticizes the report's emphasis on basic education. As

discussed previously, no one would credibly dispute the value of basic education,

but it is possible to place an undue emphasis on forms of learning that are not

conducive to leadership. Freire rejected the "banking" concept of education,

which encourages a paternalistic mode of instruction in which the teacher

deposits knowledge in the student as an empty vessel. Rote learning can be a valuable component of a broader educational program, but is less valuable in isolation. Special care must be exercised when such programs arise in response to an external initiative.

Basic education alone does not equip leaders with the capability to obtain favorable terms of engagement within the global economy. This kind of leadership requires the critical thinking skills cultivated through higher education. Not surprisingly, the institutions of higher learning that prepare the lion's share of global leaders are overwhelmingly confined to the developed nations. According to the *Financial Times*, out of the top one hundred business schools ninety-nine are located in North America or Western Europe. In the global South there are only five ranked business schools. Emphasizing basic education in emerging markets, while retaining the infrastructure for global economic leadership in developed nations, sends a clear message. Lauglo summarizes some objections to these educational development policies: "There are other voices from research who argue that formal schooling can have undesirable effects, e.g. that it alienates young people from their cultural origins, that its selection function serves to legitimate social injustice, that it can be a tool used to render politically restive populations more docile" (221).

In practice this imbalance erodes the human capital of emerging markets. The most promising students enter the diaspora to gain access to the higher tiers of the global economy, and this draw enervates the pool of local leadership. This

is one of the primary mechanisms for undercutting a society's ability to engage the forces of globalization on favorable terms.

A corollary to this problem can be a disregard for local knowledge. Jean-Bertrand Aristide recalls an incident that serves as a parable for externally directed development efforts that ignore contributions from local agricultural leaders. In the 1980s foreign rural development experts decided that the Creole pig was an inefficient choice for Haitian farmers, and a Western breed would be more suitable for export. The farmers were encouraged to cull their local stocks to prevent diseases from infecting the transplanted livestock. But these new pigs were too sensitive to Haitian conditions. The animals struggled to adapt to an environment in which the Creole pigs thrived. In the end the Haitians returned to the traditional method, but not before incurring an estimated loss of $600 million (15). The Creole pig is one example that demonstrates the value of indigenous knowledge systems. Anders Breidlid argues that "the lack of respect for local or indigenous knowledge and the assumption by many Western scientists about the superiority of Western epistemology and scientific discourse is a serious obstacle to sustainable development in light of their apparent failure…" (140).

With respect to development, education can be used either to empower or to enervate. The role education played in the stories of successful globalization, economies like Botswana and Singapore, was to train leaders who then carved out successful niches in agriculture and finance for their communities in the global economy. It is not that these leaders studied different subjects or adopted

different philosophies, but rather they preserved a communal agency that deployed their human capital to further their own rather than an external interest. The difference is not found in the content, but the network.

Manuel Castells's work *The Network Society*, prompts us to study not only the text but also the networks through which they are shared and composed. One of Castells's most valuable analytical tools is the concept of the "space of flows" which he distinguishes from the "space of places." Historically, physical proximity has been the most significant factor in communication, making place central to discourse. Flows, however, connect people in different ways and create the opportunity for new topologies. Castells elaborates as follows: "The purpose of [contrasting place and flow] is to draw the profile of this new spatial process, the space of flows, that is becoming the dominant spatial manifestation of power and function in our societies" (409).

Place-mediated texts like a local newspaper and flow-mediated texts like a twitter feed engage the reader in different ways by allowing the formation of new affinity groups. One testimony to this shift in discourse in the early twenty-first century is the explosion of social networking and the corresponding collapse of local newspapers. As flows supplant place as the dominant architecture, the social and cultural landscape are redefined. Castells observes, "If we would need one word to characterize, in social terms, in terms of values and organization, our world, it is the growing juxtaposition of individualism and communalism" (Castells). In the age of print, to understand a text one considered primarily the

author and the reader, with the mode of distribution considered as an afterthought. That Dickens's novels were published as serials is an observation of passing significance to the narrative.[52] What mattered to students and scholars was the text itself. However, in the age of hypertext, the mode of distribution is more central. The authors and readers of hyper-textual media form the nodes through which the information flows. These nodes constitute a new form of social organization. Jacques Derrida's assertion that "reading and writing are one" (Derrida, 69) as important as the messages relayed across it.

---

[52] Amazon has just reintroduced the concept of serial publishing on Kindle.

CHAPTER 5:

THE DEATH OF THE PRINCE

My argument opened with a quote from Wells that described civilization as the race between education and catastrophe. It is a dramatic statement, somewhat hyperbolic. Why is ignorance a threat to civilization?

In the past the answer might have been predicated on the assumption that there exist two kinds of places, a "civilized" world where education is a commonplace activity and an "uncivilized" one where it is a rarity. In the past the threat may have been dismissed (or in some cases embraced[53]) as merely a barrier to those who dream of moving from one world to the other.

The previous chapter discussed how the notion of capillarity could serve as a mechanism for increasing the agency and educational opportunities of communities disrupted by globalization. The arguments examined were primarily focused on the consequences of globalization for emerging markets. It is time to consider the obverse: at the intersection of telecommunications and globalization,

---

[53] Much political rhetoric surrounding outsourcing is predicated on the assumption that labor rates be artificially maintained through various forms of protectionism.

what are the consequences for developed markets? Is there more to Wells's race

than a rhetorical appeal to invest in education?

I suggest that without the vital flows of humanistic education, pulsing

through the arteries of the academy, down into the capillaries of communities to

nourish the relationships between mentors and students - without capillarity,

governance that respects liberty of thought and action will pass away, cease to

exist. The intersection of telecommunications and globalization has brought

about a level of transparency and immanence to political leadership that

undermines the artifice upon which existing forms of governance are based and

operated.

Machiavelli versus Twitter

"Every one admits how praiseworthy it is in a prince to keep faith, and to
live with integrity and not with craft. Nevertheless our experience has been
that those princes who have done great things have held good faith of little
account, and have known how to circumvent the intellect of men by craft,
and in the end have overcome those who have relied on their word"
(Machiavelli 72).

It is odd how the modern world holds such reverence for democracy and

such disdain for those democratically elected. Democracy is considered to be a

sublime force for legitimacy; and, yet, those chosen to rule are vilified as crooks,

despots, or worse.[54] In *The Brother's Karamazov,* Dostoevsky captured this

---

[54] There has always been political satire, but there have not always been camera phones.
Recent scandals including the revelations of affairs, illegitimate children, and naked
photographs of public figures undermine crafted public personas in ways that were not
possible before.

tension in the character Peter Misov, who considered himself a great humanitarian at large, but he could not stand any human in particular. Likewise democracy is a beautiful ideal, but an ideal that can never find an adequate expression in any of its champions. Seemingly, the role of the prince is one unfit for human shoulders, impossible to fulfill.

Perhaps this is why governments from earliest history through today have sought to cloak their leaders in divinity. In the early empires this deification was a literal induction into the pantheon of gods. Pharaohs and Caesars ruled with divine authority. This aura of infallibility was cultivated through many forms and trappings that endure to this day. Palaces, ceremonial processions, honorifics, and, of course, obeisance - these rituals instill in the subject a sense of majesty and awe for the leader.

I remember touring the governor's palace in Colonial Williamsburg, Virginia. The edifice was decorated with grand mosaics comprised not of colored glass, but of muskets, swords, and bayonets. A supplicant who entered these halls of power could not help but recognize the message: The governor wielded authority over life and death. These displays have thankfully undergone some measure of refinement since the practices of the ancient Assyrians,[55] but the message has maintained its consistency for millennia.

While not all rituals have such a martial nature, they have a common purpose: to instill obedience (if not devotion) by masking the frailties of human

---

[55] The Assyrians would often set up great stones at the gates of the cities they had sacked and affix the bodies of their victims to them as a warning.

rulers in the divine authority of the State. Over time these rituals have adopted an increasingly secular tone in keeping with modern attitudes. In the West outright divinity was gradually replaced with divine right. Today authority is derived from the *vox populi*, but the ability to hold and wield this authority is still predicated on an external perception of virtue and majesty.

Niccolo Machiavelli's cynical treatise, *The Prince*, offers a classic exposition of the role of public virtue and private vice in political life. A good prince is one who appears virtuous and noble without actually being burdened with these attributes. Machiavelli provides a definition of this paragon of deceit,

> "But it is necessary to know well how to disguise this characteristic, and to be a great pretender and dissembler; and men are so simple, and so subject to present necessities, that he who seeks to deceive will always find someone who will allow himself to be deceived.
>
> Therefore it is unnecessary for a prince to have all the good qualities I have enumerated, but it is very necessary to appear to have them. And I shall dare to say this also, that to have them and always to observe them is injurious, and that to appear to have them is useful; to appear merciful, faithful, humane, religious, upright, and to be so, but with a mind so framed that should you require not to be so, you may be able and know how to change to the opposite" (73).

According to Machiavelli, the cornerstone of governance is the manipulation of public perception. The ruler must appear to possess admirable traits, but the exercise of power requires traits that are despicable. To bluntly state such a hypocritical philosophy is disturbing, more so as we consider the full

implications of his thesis.

Machiavelli's exhortation is not born of villainy, but pragmatism. It is not

immoral, but amoral. The difference between these two stances cuts to the core

of democracy and reveals a critical fault that threatens to undermine twenty-first

century governance. The presumption behind Machiavelli's advice is one of

distinct classes: those who govern and those who are governed.

Those who govern live "behind the curtain;" the governed class is

characterized primarily by ignorance. The ruling class is privy to the authentic

political discourse and is trusted to act in accordance with pragmatism. They see

through the trappings of divinity and recognize the external displays of virtue and

majesty for what they are, a parallel discourse intended to manage rather than

inform the governed.[56]

An analysis of *The Prince* is only possible because of the democratization

of political discourse. When Machiavelli's work was first published, books were

transcribed by hand and such works were practically restricted to the ruling class

for whom the message was intended. Though Guttenberg's press had been

invented almost a century earlier, it had yet to come in to common usage. The

first copy of *the Prince* was not published until after Machiavelli's death. In a

world of hand-written manuscripts, the ruling class could rely on illiteracy, the

economics of media distribution, and a tiered educational system to preserve the

---

[56] Increasingly the general public participates in a meta-political discourse that is descending into farce as tiers of commentators deconstruct speeches, events, and each other.

distinctions between them and those they governed. Consistent in his approach,

Machiavelli continues:

> There is nothing more necessary to appear to have [virtue] inasmuch as men judge generally more by the eye than by the hand, because it belongs to everybody to see you, to few to come in touch with you. Every one sees what you appear to be, few really know what you are, and those few dare not oppose themselves to the opinion of the many, who have the majesty of the state to defend them; and in the actions of all men, and especially of princes, which it is not prudent to challenge, one judges by the result (74).

Machiavelli's philosophy of governance is based on the assumption that

education and information will be restricted to a small percentage of the

population. And his advice is sound provided that the following occurs:

1.   Everyone sees the cultivated public persona.

2.   Few know the true nature of the Prince.

3.   The few that do dare not oppose the opinions of the many.

4.   The Prince can rely on the majesty of the State to defend his

       public persona.

His conclusion follows naturally from these assumptions:

> "For that reason, let a prince have the credit of conquering and holding his state, the means will always be considered honest, and he will be praised by everybody; because the vulgar are always taken by what a thing seems to be and by what comes of it; and in the world there are only the vulgar…" (74).

Machiavelli's vulgar class is the inevitable consequence of disparities in education and information. Education equips the student with critical thinking skills, and these skills are used to evaluate information and form independent decisions. Until modern times, the distinction between vulgar and ruling classes was a natural consequence of economic factors. Historically, access to education and information were luxuries with no practical mode for broad dissemination.

In time, information technology would pierce this veil - an early example was the Protestant Reformation. The pamphlets of the reformers, coupled with the advent of the press, were perhaps the agents of the first time the barrier between political classes was fully breached. The result was a period of great political and cultural instability as old structures of governance were torn down and new edifices erected. The current transition in information technology shows similar destabilizing characteristics. Many who have ruled by Machiavelli, have been overthrown by Twitter.

The Death of the Prince and the Birth of the ISA

Roland G. Barthes's classic essay, "The Death of the Author," received a widespread reception because it recognized a shift in literary criticism that placed the burden of constructing meaning not on the author, but the reader. The same metaphor aptly describes the current state of political discourse.[57] In the past the Prince's power was derived from the ability to control public perception, to control

---

[57] The rise of a new class of political commentators has created a situation in which meaning no longer resides in the communications from political leaders but in the interpretation of these messages by the commentary class.

opinion, and to rely on the State to defend his public persona. Through the proliferation of new media and the ubiquity of information technology, the Prince has lost his monopoly and with it the ability to enforce a preferred interpretation, his interpretation.

If we use Machiavelli's criteria as a guide we can see clearly how modern communications have undermined the Prince's power. Instead of the cultivated public persona, increasingly social media reveals the Prince's authentic persona. Virtually every act of indiscretion can be recorded and every comment intended for the ruling class can be instantly exposed to the vulgar class. A hot mike, a forwarded email, a roving phone camera - modern technology has breached the Prince's defenses and left no mechanism to distinguish his public and private persona. The result is an endless string of tawdry scandals, as the wall between public and private is eroded.

Exposure to these breaches can no longer be contained to a few. The many avenues of opinion opened by digital communications embolden the few to oppose the many. The fractious nature of modern dialogue encourages this opposition. While the Prince's actions cannot be concealed, opposition can be expressed with anonymity. The result is that the majestic drapes of the State have worn threadbare. Today's political figures stand exposed as the mere men and women they have always been.

This gulf between the expectations and reality of governance has profound implications for social order. Machiavelli's political clones the world over regard

Twitter as an existential threat, while the "vulgar" embrace revolution - trading

one tyranny for another. The Prince seeks to restore his historic privilege; the

vulgar searches in vain for political divinity. The one choice ends in tyranny while

the other leads to a chaotic blend of cynicism and anger.

Louis Pierre Althusser's concept of the Ideological State Apparatus (ISA)

provides an insight into mechanisms that can be employed to reestablish the

Prince's control of public perception. The ISA is a convergence of systems that

together form a bounded environment for public discourse. The boundaries of

this receptacle once more exempt the nature of the Prince's power and authority

from public view. The ISA restores the veil.

According to Althusser,

"The reproduction of labor power requires not only a reproduction of its skills, but also, at the same time, a reproduction of its submission to the rules of the established order, i.e. a reproduction of submission to the ruling ideology for the workers, and a reproduction of the ability to manipulate the ruling ideology correctly for the agents of exploitation and repression, so that they, too, will provide for the domination of the ruling class 'in words.'"

Perhaps the most complete ISA ever established was Mao's Cultural

Revolution. A nearly total control over literature, communication, and personal

expression was achieved and enforced on hundreds of millions of people. Some

commentators and privacy activists fear a future where Mao's methods will be

perfected through the use of technology.[58] Others see a softer coercion in a

public discourse confined to two perpetually opposing camps, designed to

channel discontent away from the ruling class.

Is there an alternative to these dystopic visions? I am optimistic that

another solution to the challenge of contemporary political discourse can be

found. There is an alternative to hard ISAs that rely on force and coercion, soft

ISAs driven by demagoguery, and the instability of broad disaffection. Rather

than attempt to restore the division between the ruling and vulgar classes, I

believe there is room "behind the curtain" for everyone. Capillarity can overcome

the economic and logistical barriers to education required for admission to the

"ruling class." The requisite skills for critical thinking can now be widely cultivated,

eliminating the need for the empty spectacle of the Prince.

Conclusion

Reflecting on the wave of revolutions that have swept across North Africa

in what has been called "The Arab Spring," there are doubtless those who,

behind closed doors, are searching for the new ISA that will quiet the tempest

brought on by social media. While some work consciously to maintain or restore

---

[58] The Electronic Frontier Foundation has done extraordinary work on highlighting the potential threats to freedom that arise from the misuse of technology. Many of the breaches concern the use of personal information for purposes other than what the user intended. Given the ubiquity of connected devices, more and more information is being collected. Without strong safeguards, these stores of data could be one day be used for coercive purposes.

the boundary between the Prince and his vulgar subjects, many more coordinate in an unconscious way to protect historic privilege. Against these planners stands a generation for whom the eighteenth century freedom of press was but a dim foreshadowing of the power inherent in digital media. This great torrent of freedom will consume and destroy unless bounded by a discerning intellect that demands not divinity but accountability from its political leaders.

The way forward is to cultivate critical consciousness more broadly than ever before and eliminate the need for a curtain to separate the governed and their rulers. The way back is to restrain through distraction, amusement, and ultimately repression, or what has Ong has called the submersion of consciousness in communal structures. This is the race between education and catastrophe.

The basis of all complex living systems is the ability to move nutrients between the individual cells. The capillaries in the roots of redwoods and the vessels of the human body sustain and nourish each infinitesimal member of the whole. Capillarity is the key to healthy, vital systems, and suggests the mechanism whereby services like education can be most equitably distributed.

Self-organizing communities of practice, freed from geographic constraints, must use the capillaries of telecommunications not only to sustain their members, but also to induct new ones. mLearning becomes the vehicle for this process, an accessible mechanism whereby the curious gain access to the community, and through mastery of the canon, become members themselves.

The choice between living networks of free agents and a managed human herd is a stark one. Global communications has released a flood too powerful to flow without channels. Either it will flow through narrow capillaries bringing life and health to each member, or it will be drained away into a vast network of moats to keep out all the angry peasants.

APPENDIX: SAMPLE MOBILE APPLICATIONS

**Application 1:** *Kenyan Digital Textbooks and the Spacing Effect*

My first mLearning project was to create a next generation digital textbook. Current iterations of digital textbooks focused primarily on transposing the content into a new environment. My approach tried to take the next step by incorporating customizable coaching algorithms based on the Spacing Effect, a phenomenon of memory where spaced repetition encourages long-term retention.

The application contained all the standard elements of a digital textbook, including text-based chapters and images. It also included a coaching feature that allowed the user to set a projected completion date and then take daily quizzes generated by a spacing algorithm. These quizzes would adapt to the users' responses to refresh their exposure to key concepts at intervals demonstrated to enhance long-term retention.

As one of my earliest projects, these apps were developed well before my theory of capillarity. This work made a few important contributions. I realized that some of the most time-consuming elements of formative assessments, the generation, administration, and grading of quizzes and other interventions, could be automated with nothing lost in the process. In fact, tailored formative assessments administered daily provide much more detailed information both for the student and the teacher than the sporadic administration of undifferentiated quizzes to a class as a whole.

This project was one of the first that made it clear to me that there was

value in leveraging digital media to free teachers to focus on higher order tasks of

coaching and mentorship.
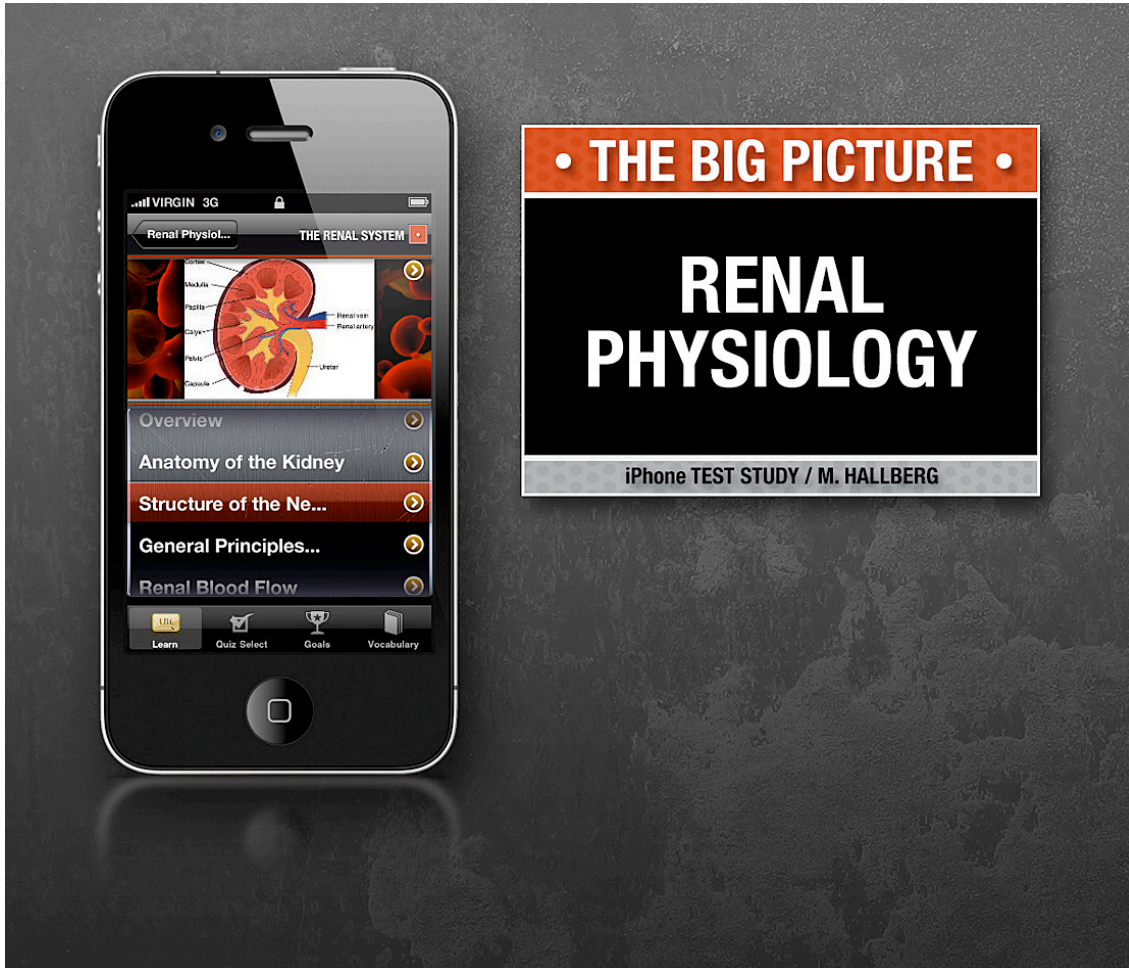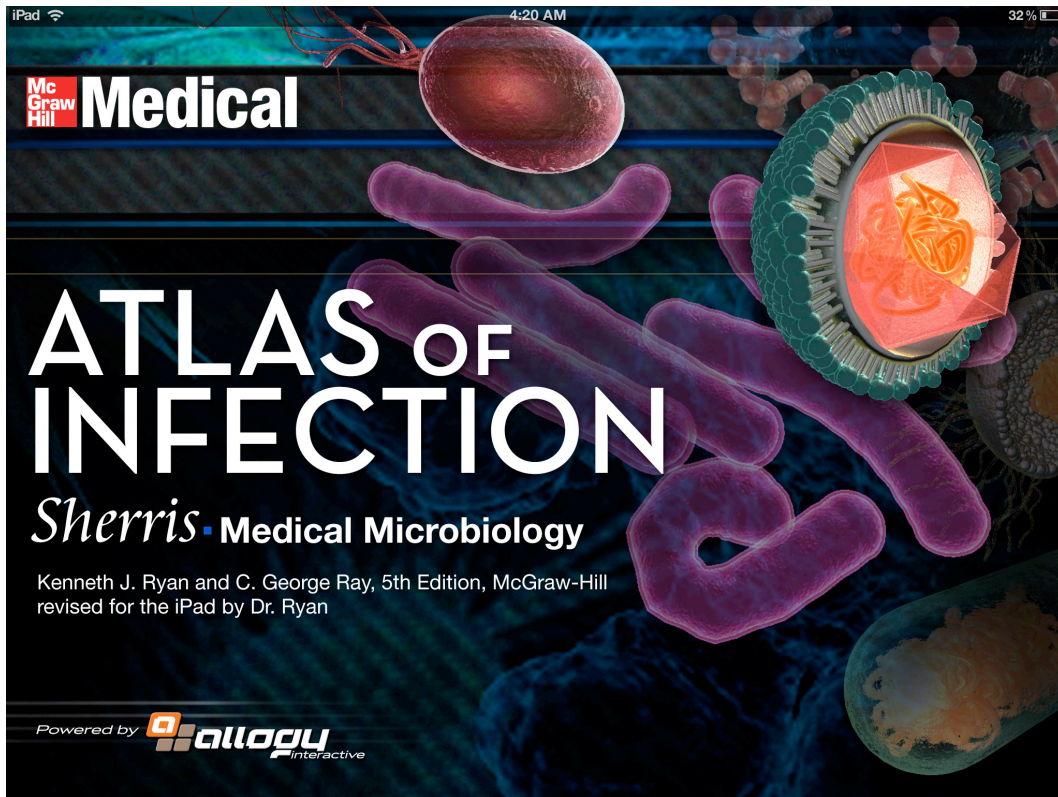
Application 2: *Kenyan mLearning Trial*

In 2009 I worked with academic partners and community leaders in Kenya to conduct two trial deployments of a mLearning application we had developed specifically for use in emerging markets. The first trial focused primarily on adult learners in the urban setting of Nairobi. The second trial took place in rural areas outside of Mombasa on the Kenyan coast.

The goal of the trial was to leverage mobile technology to validate a new model for demand-side financing of education that offers greater access and scalability. To our knowledge, this was the first time microfinance was used to sustain a mLearning program. Our payment system integrated with M-Pesa

which allowed students to make payments and then receive an unlock code via a text message that would allow them to complete the next training module.

This project was a major step forward in the development of the theory of capillarity. We fielded a mLearning program that illustrated the potential of some of the core concepts. A core team of certified instructors developed the curriculum. It was distributed to remote areas on mLearning devices, low cost Huawei phones. The economic models were proven by demonstrating that the program, including the cost of the smart phones and data, was less expensive for the student than attendance at a three- to five-day workshop in Nairobi. For semester-long courses, it provided dramatic savings and the potential to reach students who would not be able to attend classroom sessions.

Serious limitations to this early implementation included few feedback mechanisms and limited engagement for students with each other and with instructors. Also there was no way to modify or customize the curricula for different users, regions, and languages - from a technical perspective, a burdensome process of manually formatting course content and manually updating memory cards for distribution limited scalability. This approach limited the scale of deployments to a few thousand users, which, while reaching further than a classroom program, fell short of the scope needed to achieve sustainability. The lessons learned from this deployment led to the development of a next-generation system that reflected more fully the theory of capillarity.

Allogy Platform
as used in the
Kenya Trial

Application 3: *The Federal Register*

The iPad Application, *The Federal Register*, was created as a collaboration between the University of Central Florida, the Government Printing Office, and Data.gov. Drawing inspiration from Derrida's *Glas,* the application was designed to dynamically combine various forms of media to create layouts that are more visually compelling, as well as creating the opportunity for the reader to derive new interpretations from the juxtaposition of elements.

The initial version of the application composites feeds from the Federal Register with images from various government social media sites. In 2011 Information Week selected it as one of the top ten government apps.

With respect to the theory of capillarity, *Federal Register* makes an important contribution. There are many aggregation services that dynamically composite feeds into a presentable format. *Flipboard* is one of the leading

examples of this approach. They differ from a traditional journal or magazine in that the user selects the news domains he wants to follow and the publication adapts accordingly. *Federal Register* was designed to leverage similar techniques while maintaining its focus on the subject of federal announcements.

This technique of dynamic composition of periodicals, restricted to a specific domain, could become a helpful example of capillarity within communities of practice. One of the problems to be addressed in twenty-first century communication is managing the volume of information, specifically within ever-expanding disciplines. An explosion of journals leads to narrower specialization, encouraging fragmentation of the communities. However, some approaches can balance editorial review and customization to provide a diverse readership with articles that foster a common discourse and appeal to narrow subspecialties.

Application 4: *Capillarity*

My most recent application is an attempt to directly reflect the notion of capillarity in software. Taking what has been learned over the past five years, we have built mLearning architecture that has the flexibility and hierarchical distribution channels called for by capillarity. The application has many pieces: a cloud-based repository hosted in Amazon Web Services, a web-based editor and marketplace manager, and client applications for HTML-5, iOS, and Android mobile devices.

The heart of the system is the notion of cascading marketplaces. For example, a large multinational organization is likely to have many bodies, regions, and subgroups. At the top level of such organizations ideas need to be communicated to each member. As we flow down the branches there are new ideas relevant only to subgroups, and the high-level ideas could often benefit from increased contextualization. The web editor of *Capillary* accomplishes this

by combining the functions of content creation, modification, and publication in to the same tool. When a user creates a digital book, he can preview it on the web to check his formatting and presentation on sample mobile devices. Once the book is ready to be published, he has the ability to choose licensing options like creative commons that will allow downstream edits of his book by other authors. He can even designate paragraph by paragraph with a small lock icon, indicating which portions of the work can be modified.

A published book can only be seen if another user chooses to place it in his "marketplace." The notion of marketplace in *Capillary* is very different than a traditional ecommerce marketplace. Organizations can create marketplaces of books much like one might find in the Apple App store or Google Play, but *Capillary* also allows any user to present his library as a marketplace. This is intended to facilitate a cascading kind of mentorship where students choose mentors, subscribe to their marketplaces, and gain access to the books that shaped them, essentially following in their footsteps according to a classical humanist method.

The software suite *Capillary* is intended to be a distribution platform that embodies the radical humanist notions of equality of access and voice for a classical humanist method that encourages personal mentorship and self-directed students. Much work remains to be done, but we are in the process of developing reporting mechanisms that would help the systems serve as a viable

training platform in settings ranging from Kenyan primary schools to trauma
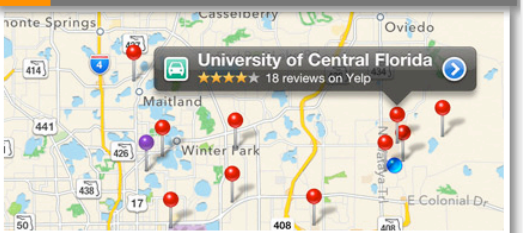
surgeon residencies.

REFERENCES

Adams, Henry. The Education of Henry Adams. London, UK: Constable & Company, Ltd., 1928.

Adler, Mortimer and Van Doren, Charles. *How to Read a Book*. New York, NY: Simon and Schuster, 2011.

Adorno, Theodor W., and Horkheimer, Max. *Dialectic of Enlightenment* (translated by John Cumming). New York, NY: Herder & Herder, 1972.

Aloni, Nimrod. *Humanistic Education*. In *Encyclopaedia of Philosophy of Education*, M. Peters, P. Ghiraldelli, B. Žarnić, and A. Gibbons (eds.), 1999. Retrieved March 14, 2013, from http://www.ffst.hr/ENCYCLOPAEDIA/doku.php?id=humanistic_education.

Althusser, Louis Pierre. "Ideology and ideological state apparatuses" (1970). Marxists.org. Web. 2009.

Armah, Ayi Kwei. *The Eloquence of the Scribes, a Memoir of the Sources and Resources of African Literature.* Popenguine, Senegal: Per Ankh, 2006.

Aristide, Jean-Bertrand. "Globalization and Creole Pigs." *Earth Island Journal*, 16.2, Web. 2001.

Ashmore, Harry. *Unseasonable Truths: The Life of Robert Maynard Hutchins.* New York, NY: Little, Brown, 1989.

Bandura, A. *Social Learning Theory*. New York, NY: General Learning Press, 1977.

Barthes, Roland. "Death of the Author." Deathoftheauthor.com. Web. 2010.

Benjamin, Walter (1998). "The work of art in the age of mechanical reproduction 1935." UCLA School of Theater, Film and Television (transcribed: by Andy Blunden).

Bennell, Paul. "Using and abusing rates of return: A critique of the World Bank's 1995 education sector review." *International Journal of Educational*

Development, World Bank's Education Sector Review: Priorities and Strategies for Education, 16.3 (1996): 235-248.

Breidlid, Anders. "Culture, indigenous knowledge systems and sustainable development: A critical view of education in an African context". *International Journal of Educational Development, Education and Sustainable Development,* 29.2 (2009): 140-148.

Bolter, J. David. *Writing Space: Computers, Hypertext, and the Remediation of Print* (2nd edition). Mahwah, NJ: Lawrence Erlbaum Associates, 2001.

Borgatti, Stephen, and Cross, Rob. "A relational view of information seeking and learning in social networks." *Management Science*, 49, No. 4, Special Issue on Managing Knowledge in Organizations: Creating, Retaining, and Transferring Knowledge (April 2003): 432-445.

Brown, John Seely, and Duguid, Paul. *The Social Life of Information*. Boston, MA: Harvard Business School Press, 2000.

Carson, Ryan. *The Naïve Optimist*. Web. April 1, 2010.

Castells, Manuel. *The Rise of the Network Society* (2nd edition). Malden, MA: Blackwell Publishers, 2000.

Interview with Harry Kreisler. *Conversations with History.* 2001. Web.

Chang, Jung, and Halliday, Jon. *Mao: The Untold Story.* New York, NY: Vintage Books, 2007. Kindle AZW File.

Clemens, Michael and Moss, Todd. "Costs and causes of Zimbabwe's crisis." Center for Global Development (July 2005). PDF File.

Collier, Paul. *The Bottom Billion: Why the Poorest Countries are Failing and What Can Be Done About It.* Oxford, UK: Oxford University Press, 2007.

Csikszentmihalyi, Mihaly, and LeFevre, Judith. "Optimal experience in work and leisure." *Journal of Personality and Social Psychology*, 56 (5) (May 1989): 815-822.

Derrida, Jacques. *Dissemination*. New York, NY: Continuum International Publishing Group, 2004.

Derrida, Jacques. *Glas*. Lincoln, NE: University of Nebraska Press, 1986.

Dostoevsky, Feodor. *The Brothers Karamzov*. London, UK: Macmillan, 1922.

Dreher, Rod (February 11, 2003). "God bless Ted Turner." *National Review Online*. Available: http://www.nationalreview.com/articles/205878/god-bless-ted-turner-rod-dreher.

Drezner, Daniel. "The end of poverty: Brother, can you spare $195 billion?" *New York Times*, April 24, 2005.

Easterly, William. *The White Man's Burden.* New York, NY: Penguin Press, 2006.

El-Seoud, Samir, and El-Sofany, Hosam. "Towards the development of an m-Learning system: A new stage to enhance higher education." *International Journal of Interactive Mobile Technologies*, 3.3 (2009): 4-9.

Feynman, Richard P. *Surely You're Joking, Mr. Feynman!* New York, NY: W.W. Norton & Company, 1985.

Financial Times (2009). "Global MBA Rankings." Available: http://www.rankings.ft.com/businessschoolrankings/global-mba-rankings.

Foucault, Michel. *Discipline & Punish, The Birth of the Prison*. New York, NY: Random House Publishers, 1995.

Freire, Paulo. *Pedagogy of the Oppressed*. New York, NY: Continuum Publishing Company, 1970.

Gee, James Paul. *What Video Games Have to Teach Us about Learning and Literacy*. New York, NY: Palgrave Macmillan, 2004.

Giroux, Henry. "The disappearing intellectual in the age of economic Darwinism." Truthout. Web. July 12, 2010.

Hayek, F.A. *The Road to Serfdom*. London, UK: Routledge Press, 2001.

Hayles, N. Katherine. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. Chicago, IL: University of Chicago Press, 1999.

Heyneman, S. P. "The history and problems in the making of education policy at the World Bank 1960-2000." *International Journal of Educational Development*, 23.3 (2003): 315-337.

Hoppe, H; Joiner, R., Milrad, M., and Sharples, M. "Guest editorial: wireless and mobile technologies in education." *Journal of Computer Assisted Learning*, 19.3 (2003): 255-259.

Huizenga, J. W.; Admiraal, S.; and Akkerman, G. ten Dam**. "**Mobile game-based learning in secondary education: engagement, motivation and learning in a mobile city game." *Journal of Computer Assisted Learning*, 25.4 (2009): 332-344.

"Mobile payments and banking: worldwide market analysis, strategic outlook & forecasts to 2013." Informa. Web. 2009.

Jackson, Andrew (March 4, 1837). "Farewell address." Available: http://www. presidency.ucsb.edu/ws/?pid=67087

Jamison, Dean, et al. "Education and economic growth." *Education Next Spring,* 8.2 (2008).

Karaganis, Joe. "Media piracy in emerging economies report" (2011). Available: http://piracy.americanassembly.org/the-report/.

Khanna, Taurn, et al. (May 27, 2010). "How to define emerging markets." *Forbes*. Available: http://www.forbes.com/2010/05/27/winning-in-emerging-markets-opinions-book-excerpts-khanna-palepu.html.

Kirshner, David, and Whitson, James. *Situated Cognition: Social, Semiotic, and Psychological Perspectives*. New York, NY: Routledge Press, 1997.

Lauglo, Jon. "Banking on education and the uses of research. A critique of World Bank priorities and strategies for education." *International Journal of Educational Development, World Bank's Education Sector Review: Priorities and Strategies for Education*, 16.3 (1996): 221-233.

Lave, Jean, and Wenger, Etienne. *Situated Learning: Legitimate Peripheral Participation.* Cambridge, UK: Cambridge University Press, 1991.

Lessig, Lawrence. *Free Culture: How Big Media Uses Technology and the Law to Lock Down Culture and Control Creativity*. New York, NY: Penguin, 2004.

Little, Angela, and Green, Andy. "Successful globalization, education and sustainable development." *International Journal of Educational Development, Education and Sustainable Development*, 29.2 (2009): 166-174.

Machiavelli, Niccolo. *The Prince.* Rockville, MD: Arc Manor LLC, 2007.

Malik, Om. "How big is the Apple iPhone app economy? The answer might surprise you." Gigaom. Web. 2009.

Maslow, Abraham. "A Theory of Human Motivation." *Psychological Review*, 50 (1943): 370-396. *Psychclassics, York University*. Web. 2009.

McLuhan, Marshall, (with Eric McLuhan and Frank Zingrone). *Essential McLuhan*. New York, NY: Basic Books, 1996.

Miller, J. Hillis. "Literary theory, telecommunications, and the making of history." *Scholarship and Technology in the Humanities*, London 1991, 11-20.

Ngugi wa Thiong'o. "The language of African literature." *Decolonising the Mind: The Politics of Language in African Literature*. London, UK: Heinemann, 1986, 4-33.

Norman, Donald A. *The Design of Everyday Things*. New York, NY: Doubleday, 1990.

NPR. *Harvard Grade Inflation.* Available: http://www.npr.org/templates/story/story.php?storyId=1133702

Ong, Walter J. *Orality and Literacy: The Technologizing of the Word.* London, UK: Methuen, 1982.

Parker, Jenni. *Mobile Learning Toolkit*. Scribd.com. July 2011.

Parker, Laura (April 3, 2012). "Minecraft creator reveals new game." Available: http://www.gamespot.com/news/minecraft-creator-reveals-new-game-6369863.

Patrinos, Harry. "Demand-side financing in education." *Education Policy Series, International Institute for Educational Planning* 2007.

Pavlik, Philip, and Anderson, John. "Using a model to compute the optimal schedule of practice." *Journal of Experimental Psychology: Applied*, 14.2 (2008): 101-117.

Prahalad, C.K. *The Fortune at the Bottom of the Pyramid: Eradicating Poverty Through Profits.* Philadelphia, PA: Wharton School Publishing, 2006.

Rogers, C.R. *Freedom to Learn*. Columbus, OH: Merrill, 1969.

Rushkoff, Douglas. *Coercion, Why We Listen to What "They" Say*. New York, NY: Riverhead Books, 1999.

Samoff, Joel. "Education sector analysis in Africa: Limited national control and even less national ownership." *International Journal of Educational Development*, 19.4-5 (1999): 249-272.

Samoff, Joel. "Which priorities and strategies for education?" *International Journal of Educational Development, World Bank's Education Sector Review: Priorities and Strategies for Education*, 16.3 (1996): 249-271.

Sharples, Mike, et al. (2005). "Towards a theory of mobile learning." Published in *Proceedings of mLearn 2005 Conference*.

Shivji, Issa. "Globalisation and popular resistance." *Local Perspectives on Globalisation: The African Case*. J. Semboja, J. Mwapachu, and E. Jensen (eds.). Dar es Salaam, Tanzania: Mkuki na Nyota Publishers, 2002, 1-14.

Smith, Cynthia. *Design for the Other 90%.* Exhibit at Cooper-Hewitt National Design Museum, Smithsonian Organization, September 30, 2007.

Spaulding, Seth. "Distance education, broadcast media, virtual reality, and cyberspace: Is the future passing us by?" *Comparative Education Review*, 46, No. 1, Special Issue on the Meanings of Globalization for Educational Change (February 2002): 119-130.

Stiglitz, Joseph. *Globalization and Its Discontents.* New York, NY: W.W. Norton & Company, 2002.

Sullivan, Nicholas P. *You Can Hear Me Now: How Microloans and Cell Phones Are Connecting the World's Poor to the Global Economy.* San Francisco, CA: Jossey-Bass, 2007.

USAID, Policy Roundtable Series. Strategies for U.S. - Developing Country Collaboration in Distance Education, October 24-25, 2002.

United Nations. 55/2. *United Nations Millennium Declaration*. September 8, 2000.

United Nations. "Universal declaration of human rights." United Nations Department of Public Information, 2008.

Vygotsky, L.S. *Mind in Society*. Cambridge, MA: Harvard University Press, 1978.

Wellek, René. "Destroying literary studies." *New Criterion*, 2:4 (December 1983).

Wells, H.G. *The Outline of History*. London, UK: George Newnes, 1919.

World Health Organization [homepage on the Internet]. Geneva, Switzerland: The World Health Organization; c2006 [cited June 1, 2006]. Available: http://www.who.int/trade/glossary/story043/en/index.html

Yunus, Muhammad. *Creating a World without Poverty: Social Business and the Future of Capitalism*. New York, NY: Public Affairs, 2007.