THE FUTURE OF LEARNING AGENTS AND DISRUPTIVE INNOVATION

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EXECUTIVE SUMMARY

The past two decades have seen increases in organizational experimentation as the open economy—with its network structures, self-organizing principles, and cooperative strategies—has unfolded across industries and society.[1] Individual's roles at work, in civic life, and even in their families are adapting to the new possibilities for connectivity, interactivity, and collaboration.

These changes have inspired new roles and functions in the traditional business environment. For example, sustainability is moving beyond a strategic imperative for energy efficiency and recycling to a fundamental design principle, affecting everything from workplace structures, transportation options and incentives, employee and workplace health programs, even leadership styles. This has encouraged the emergence of new agents of sustainability, roles and functions to support the sustainable workplace and the sustainable organization. Health care has seen a similar shift as some have called for a transition from a health care delivery system to a health and wellness support system, where it's not just doctors responsible for health but community members, employers, nutritionists, and consultants of various kinds. These agents of health have emerged in a time of disruptive innovation, and they will dramatically affect how health is managed and maintained, both by the institution and by the community. The field of education is next.

Amidst this change, the role of the teacher has remained largely static. The core of the education institution hasn't experienced radical innovation in the role and scope of the "teacher." On the fringes, we have seen teachers self-organizing to share curriculum or some schools trying to shepherd the pedagogical shift of "sage on the stage" to "guide by your side." We have seen schools more actively engage parents or others in the learning process. However, discussions have not significantly broken with traditional frameworks for thinking about teachers as classroom instructors. For example, recent discussions of merit pay assume teachers have not contributed to redefining the roles, positions, and jobs of educators to meet the needs of diverse learners in diverse learning environments. Most No Child Left Behind (NCLB) discussions assume no substantive change in the role of the teacher. In fact, many argue it is narrowing the scope of the teacher.

The changes we're seeing today open the possibility for a new framework, one that re-envisions "teachers" more broadly as agents of learning—diverse catalysts who enable and support the learning process.[2] Disruptive innovation, the dynamics altering the context of education, can frame dialogue about new roles and functions for supporting learning in a new environment. We do have pioneers for thinking about teachers in the context of the Internet, digital media, and collaborative networking. John Seeley Brown, George Siemens, Stephen Downes, and other proponents of eLearning, Learning 2.0, and School 2.0, have described possible new learning

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[1] Tom Malone, *The Future of Work: How the New Order of Business Will Shape Your Organization, Your Management Style, and Your Life* (Harvard Business School Press, 2004); Henry Chesbrough , *Open Business Models: How to Thrive in the New Innovation Landscape* by (Hardcover - Dec 6, 2006); Allison Fine, *Momentum*, Jossey-Bass, 2006.

[2] By learning agent we mean any individual that acts as a catalyst for enabling, supporting, and organizing learning.

agents, such as the concierge, curator, network administrator, and master artist. Their descriptions of these new roles for supporting learning locate the "teacher" in the emerging context of technology and media, and also in the context of new theories of learning that help to explain why these new roles, and conceptions of a "teacher" are important and how they are effective.[3] They help move us away from the constraints of current conceptions of the teacher and allow us to expand our thinking about a range of diverse learning agent roles.

The goal of this paper is to contribute to the discussion of the future of learning agents, those professionals, paraprofessionals, and other individuals who help catalyze learning in a context of disruptive innovation. Its purpose is to examine the dynamic context of change that surrounds education, and identify those forces of change that create the disruptive innovations that will shape the new roles of learning agents in an emerging educational landscape. This paper asks: what disruptive innovations will have implications for the future of learning agents? What are the implications of these disruptive innovations for agents of learning? Do they suggest new roles and functions in the organization of learning that can help catalyze a new public learning system?

This paper is organized around seven disruptive innovations that will shape the future of learning agents. By disruptive innovation we mean new concepts, phenomena, and discoveries that have the potential to create a transformative effect in education.[4] It is likely that there are more than seven, but we identify those that we think are the most significant in shaping how the future of "teaching" and learning agents will unfold. For each disruptive innovation area we describe its significance, identify the challenges it presents for organizing and supporting teaching and learning, and describe specific implications they suggest for future learning agents. In the final section we identify nine specific learning agent roles that emerge from our analysis of disruptive innovations in the broader education environment. These roles are not intended to be exhaustive, but are meant to provoke readers and encourage imagining new categories of professionals, paraprofessionals, and participants in a transformed public learning system.

[3] George Siemens, "Learning and Knowing in Networks: Changing roles for educators and designers", presented to ITFORUM for discussion, January 27, 2008.

[4] We draw heavily from the *IFTF/KWF 2006 Map of Future Forces Affecting Education,* and expert workshop conducted by IFTF in July 2007 on Learning Agents, and an updated IFTF/KWF map on future learningscapes to identify disruptive forces.

SECTION 1

DISRUPTIVE INNOVATION AREAS: FORCES SHAPING NEW AGENTS OF LEARNING

There are many driving forces shaping the future context of public education—including new discoveries in science and the diffusion of technology to demographic trends and societal issues such as increasing chronic illness, the emergence of food deserts in poor communities, and the rise of participatory culture.[5] There are economic drivers such as the decrease of middle income families, and environmental factors such as increasingly extreme urban environments. While these are all important for understanding the context of change for education, it is important to use a critical filter on forces of change and ask where will innovations emerge from these forces that will disrupt status quo structures, practices, and concepts. In particular, which disruptive innovation areas will be the source of new models, practices, and concepts that will transform the ways we think about teaching and learning and the kinds of people who participate in this activity?

This report describes seven disruptive innovation areas that will collectively create a new framework for thinking about the future agents of learning.

- *Open Education*: a bottom up and participatory, socio-technical platform for creating, sharing, and using educational resources.

- *Flexible Public Narratives*: public discourse and storytelling about public education that allows the quiet stories to rise and helps create collective meaning around public education.

- *Institutions give way to Exstitutions:* education leaves school and diffuses across an emerging ecosystem of distributed learning platforms, multiple venues, and diverse resources and pedagogical practices.

- *An Emerging Sociogogy*: emerging theories of learning in networked environments support new frameworks and strategies for teaching, learning, and knowledge creation in a collaborative, digital, and networked environment.

- *The Rise of Transliteracy*: an expansion of the concept of literacy and media that enables new kinds of knowing across digital and print media, oral and in person communication.

- *The Black Box Deconstructed*: Advances in neuroscience and our understanding of the connection between the brain, environment, and cognition expand our thinking about learning.

[5] See *KWF/IFTF Map of Future Forces Affecting Education*, www.kwfdn.org/map

- *Educitizens:* Participatory media, and smart networking enable new means of mobilizing people and resources to redefine the means for civic engagement, public voice, and collective action.

Considering the kinds of challenges and implications of these innovations, we identify nine learning agent roles that will be important for supporting teaching and learning in the future. There are likely more than nine, but we focus on these as a starting place for further discussion.

- *Community Intelligence Cartographers.* The CIC is responsible for tapping the collective intelligence of the local community. They leverage social networking strategies and mobbability (the ability to develop swarms and smart mobs) to identify emerging learning opportunities in the community, organize community members for educational purposes, and locate important community resources.

- *Personal Education Advisor.* Assigned by certified local education agencies (schools, resource centers, libraries, etc.) or selected and contracted by families, PEAs help families create, nurture, and maintain personal learning ecologies. They help students craft their own learning visions and customize learning discovery journeys.

- *Learning Fitness Instructor.* These specialists build and strengthen the basic cognitive, emotional, and social abilities essential to learning—like physical education but for the brain. The Learning Fitness Instructor, using simulations, biofeedback, and hands-on activities, helps students reduce stress, hone mental capabilities, and learn brain-friendly nutrition.

- *Learning Partner (Sociogogical Apprentice).* Beginning-of-year testing matches students with other students who test for compatible personalities but different cognitive strengths. These pairs support each other throughout the year, maintaining a constant thread in shifting peer relationships.

- *Learning Journey Mentors.* These mentors explore and co-create with their students. They work with community intelligence liaisons, brain fitness instructors, personal education designers, and assessment designers to plan and guide small groups of students through a learning itinerary.

- *Assessment Designer*. Using social networks and insights into cognitive functioning, assessment designers can create appropriate methods for evaluating media literacy, learning discovery journeys, sociogogical encounters, and other innovative instruction.

- *Social Capital Platform Developer.* The education community uses a number of social capital tracking programs to provide an accounting for contributions to open education resources, feedback on others' work, responses to inquiries, involvement in ad hoc learning experiences, and postings of links and references. These platform developers link the social capital infrastructure to teaching and learning practices and outcomes.

- *Edu-vator*. Teamed up with a small group of students who get credit for being in the "edu-vation workshop," the edu-vator identifies which innovations will be most effective for the school and how to best incorporate them. Edu-vators are the faculty members responsible for building platform prototypes, experimenting with new tools, evaluating new practices, and generally exploring innovations in the education sphere.

- *Education Sousveyor*. The Education Sousveyor emerges to keep the education process transparent and to stimulate public discussion around learning. With blog posts, pictures, podcasts, and videos, they keep education on the forefront of the public's mind.

CHAPTER 1

OPEN EDUCATION: A NEW SOCIO-TECHNICAL PLATFORM

Open education provides opportunities for attracting wider participation in the creation and sharing of educational content, curriculum, and tools to address distinct needs and interests of educators and learners. In the open economy, proprietary control over educational assets and the means to organize for learning has given way to bottom-up, collective dynamics for creating educational environments and experiences. The forces of the open economy—network structures, self-organization, and cooperative strategies—are having direct impact on three core areas of teaching and learning: the availability of open resources, do-it-yourself learning communities, and shared education commons. These innovations contribute to the democratization of teaching and learning tools and resources, making quality education possible for more children.

Open Source vs. Open Access

It is important to distinguish between open *source* and open *access* resources. Each may include courseware, curriculum, lessons, tools, and other learning assets. Both contribute greatly to expanding the set of available learning resources to educators and learners, but they imply very different types of social interactions and expectations.

Open *access* repositories allow educators to tap into a broad base of materials to enrich their students' experience in the classroom. Some emphasize providing access to professionally vetted lessons and curricular activities—such as Curriki,[6] MIT Open Courseware[7], and OER Commons[8]—while others provide unstructured and unvetted materials. For example, TeacherTube[9] provides a vehicle for anyone to upload a personally created video about any topic or lesson without any external assessment. Nonprofit organizations such as museums have turned to the Internet to provide digital images, videos, and audio materials to the public. Many of these repositories build communities around shared experiences using the resources.

Open *source* resources are those that are available for reuse *and* re-mixing and modification. Open source communities form around the creative changes and re-use of the resources. Depending on licensing (e.g., CC Learn's creative commons licensing for educational resources),[10] users who remix and modify assets may be required to return their altered versions to the shared space for others to access. This creates a virtuous cycle of increasing returns, whereby users become creators of the collective resource and help grow its base. Communities that stress use of open source resources and practices, such as WikiEducator, [11] value the opportunity for continued improvement of resources and the communities of support and

[6] www.curriki.org

[7] http://ocw.mit.edu/OcwWeb/web/home/home/index.htm

[8] http://www.oercommons.org/

[9] http://www.teachertube.com/

[10] http://creativecommons.org/

[11] http://www.wikieducator.org/Main_Page

innovation that emerge around them. Currently, Curriki and OER Commons are moving in this direction, in developing their communities of users and, presumably, a licensing scheme.

Open source software projects aimed at the K-12 community range from operating systems like EduUbuntu,[12] to social networking applications like Ning[13] and Elgg,[14] to virtual learning and course management platforms like Moodle.[15] As open source tools, they provide educators with lower-cost, flexible and customizable tools that are supported by a distributed support community. Open source resources help prevent vendor exclusivity, which can lock in buyers to proprietary (and sometimes more expensive) software and services with little opportunity for affordable customization.

A key mechanism that will shape open source production of educational tools and resources is the development of Creative Commons licensing for education. CC Learn is a distinct effort focused on minimizing the legal, technical, and social barriers for sharing and reusing educational resources. One example of CC Learn's potential is the California Open Source Textbook Project, which plans to use the wikibooks open source content platform and licensing tools to develop open source textbooks that meet the California State Education frameworks for K-12 content in all disciplines, beginning with world history. Their goal is to reduce the state's $400 million annual expense for textbooks and turn textbook construction into a revenue-generating activity for the State.[16]

Do-it-yourself Communities: Networked Professional Learning

Learning communities for teachers and students have existed in education for many years either as face-to-face, geographically defined communities or as online distributed communities. New social media are expanding the possibilities for building do-it-yourself collaborative learning environments that will position eLearning as an integral component of an educator's personal toolkit.

Applications such as Tapped-In have provided educators with a digital forum, tools, and online office space for professional development since 1997. Since the mid-1980s, online global learning environments such as GlobalSchoolNet[17] and I*EARN[18] have provided teachers and students online project-based learning tools and curriculum in support of cross-cultural, collaborative learning experiences ranging from social studies to the sciences. New social software such as social networking applications (Ning), chat and IM, educational blogs, social bookmarking (de.licio.us), user-contributed content sites and communities (YouTube and Flickr), twitter, and webconferencing tools like Elluminate[19], are expanding the field of online collaborative learning toolkits with personal do-it-yourself tools for teachers and students.

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[12] http://ubuntuforums.org/

[13] http://www.ning.com/

[14] http://elgg.org/

[15] http://moodle.org/

[16] http://www.opensourcetext.org/, http://en.wikibooks.org/wiki/COSTP_World_History_Project/Project

[17] http://www.globalschoolnet.org/

[18] http://www.iearn.org/

[19] http://www.elluminate.com/

These tools facilitate self-organization among educators, learners, and parents providing a bottom-up option for collaborative learning to complement existing centrally organized and designed learning networks. Flat Classroom Project,[20] a collaborative learning experience designed by teachers Julie Lindsay and Vicki Davis, uses wikis, social networking, digital video, and self-generated curriculum to support the inter-continental collaborative exploration of themes in Thomas Friedman's book on globalization, *The World is Flat*. The growing use of these tools suggests an important shift from eLearning treated as an add-on exercise toward becoming recognized and utilized as an expansion of an educator's personal toolkit for designing learning experiences that engage both teachers and students.

New Commons: Cooperative Systems of Learning

Commons have been an important framework for collective management of natural resources that are subject to vulnerabilities and inequitable use like forests, grazing land, and irrigation systems. In the open economy, scholars such as Charlotte Hess[21] are exploring how the framework of the commons is increasingly being used as a way to protect from increasing privatization or dysfunction in public-sector activities such as health, knowledge, public space, and culture. As compared to traditional public goods, commons are identified with specific populations or groups who identify with shared resources. These people are both users and empowered players in managing and maintaining the shared resources. This identification with the shared resource helps to prevent its abuse, neglect, and dysfunction.[22] Boundaries define who has rights to use the resource commons and helps to frame rules for use and reinforce stake in the commons success. OER is attempting to create this sense of shared creation, responsibility and management of its educational resources. Cooperation and collective management of the commons is critical. If participants in OER do not contribute resources and help maintain their quality, the "commons" will not succeed, or it will not be useful (containing few, or poorly constructed, resources).

The Harlem Children's Zone[23] is one example of an emerging education commons focused on creating an integrated system of community programs, services, and centers based on deep social networks for a defined geography: a 60-block area of upper Manhattan. In this case the vision is based on deciding what resources need to be coordinated and shared to provide a rich learning commons for local families and students. UCLA's Center for Mental Health in Schools advocates an integrated system of services that creates a mental health commons for K-12 students. The commons would include services and systems that promote healthy development, early intervention, and accessible care.

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[20] http://flatclassroomproject.wikispaces.com/

[21] Charlotte Hess and Elinor Ostrom (eds), *Understanding Knowledge as a Commons: From Theory to Practice*, Cambridge MA: MIT Press, 2007

[22] Elinor Ostrom, *Governing the Commons*, 1990

[23] http://www.hcz.org/

INNOVATION CHALLENGES

Open education suggests many challenges for organizing and maintaining resources for teaching and learning. Some of the specific challenges that will shape learning agent roles are:

Turning users into cooperators. New means of creating and sharing resources will require new incentive structures and rewards to motivate contribution and cooperation to maintain the resource commons. Educators may buy into the idea of shared educational resources, but may not be willing or able to cooperate as necessary to maintain it. Users need to be converted into producers and managers of the commons. This means that the structure of participation needs to be designed to encourage contribution and care of the resource. For example, the effort required by an educator to make a contribution to a knowledge base of curriculum modules and lesson plans will have to be equal to or less than the value of what is promised in return. To create incentive for participation and system-wide benefits, individual interests must be aligned with group interests. More broadly understood value, including tangible and intangibles—status, reputation, loyalty, social network capital, and trust—are important currencies that will help shape rewards. Creating opportunities to develop trust and affiliation with larger collective processes will also facilitate participation.

Redefining boundaries and rules for participation. Successful commons have well-defined boundaries, locally relevant rules, and internal systems of governance.[24] How should membership in online resource communities be determined? What are essential roles and rules for open source educational resource creation and sharing? How does a school define its own boundaries in a community-based learning commons such as the Harlem Children's Zone? How interdependent and nested are its services with other public agencies like health and social welfare? What about the for-profit commercial sector? Defining membership in educational commons, whether online or in geographic communities, will be an important factor in creating successful commons.

Developing open economy business models in education. The open economy derives value from user participants by providing platforms for groups and individuals to create their own sources of wealth and value. The most prominent example of this is eBay, which serves as a platform for buyers and sellers to find each other. eBay itself doesn't sell anything directly to consumers. Platforms can be comprised of tools and processes, core content, software code, and intellectual property such as patents or design blueprints. Proprietary platforms have traditionally been a major revenue source for firms. But in the context of the open economy, greater value can be attained when these resources are "opened" for re-use and innovation. How do schools and districts imagine themselves as platforms for creating valued teaching and learning experiences? What do they keep to themselves or share for others to innovate?

[24] Elinor Ostrom, *Governing the Commons*, 1994.

IMPLICATIONS FOR LEARNING AGENTS

Open education challenges highlight several important implications for learning agents. Some of the qualities and skills that learning agents demonstrate must include the following:

Open Authorship: Open authorship requires a new ethos around sharing and creating collective resources from which all benefit. It requires educators to be comfortable with others re-using and modifying their contributions of lessons or media applications for which they may not receive direct or conventional remuneration. Creativity now isolated in the classroom could be aggregated and widely shared, leading to teacher innovation communities at the school and district levels.

Incentives for Sharing: Open authorship needs to be encouraged at all levels of education, from the classroom, to the school and district, and beyond. Creative reward structures will need to be implemented at schools, across districts, and at state levels to help align self-interest with the interests of the larger group.

Open Resource Community Building: Designing, managing, and participating in open source and open access communities, from software tools and media applications to lesson plans and instructional strategies, needs to be a priority activity among educators. Participation can involve various forms and levels of intensity, but it should be acknowledged that this is a new forum for professional development and innovation.

Open Source Translation and Application: To take advantage of the various creative tools and resources available for teaching and learning, educators and schools need to jump into the flow of open source resource development. A key function will be to track, assess, customize, and apply open source tools and resources to local school and classroom settings so that they generate the most utilitarian need-based value.

Open Source Teacher Training: Teachers need to have their formative teacher training experiences within an open source, participatory media learning environment to effectively operate in open education. All the above practices should be integrated into teaching colleges and other preparatory programs for educators.

CHAPTER 2

FLEXIBLE PUBLIC NARRATIVES: CREATING COLLECTIVE MEANING AROUND PUBLIC EDUCATION

Ours is an era of declining legacy institutions and emerging grassroots structures. As traditional, centralized institutions are unbundled by growing bottom-up pressures, distributed innovation, and lightweight, flexible infrastructures, their defining narratives begin to unravel. New narratives can emerge, or existing quiet narratives can gain new voice, and create multiple stories that may challenge or reinforce institutions' meaning and relevance. As new forms of networked, digital media continue to emerge and become a vehicle for bottom-up, public expression, stories of education will proliferate, creating the potential for a more widespread, organic discussion of the meaning and role of education in our society. These narratives and discussion will raise many questions that will shape the evolution of education policy and practice, and help to re-establish the social contract of the public institution of teaching and learning with society.

Some of the existing and emerging narratives of public education include stories about health, commodification of childhood, social justice, and collective value.

A Greater Social Fabric: Education as Public Health

Nicholas Freudenberg and Jessica Ruglis write:

> *If medical researchers were to discover an elixir that could increase life expectancy, reduce the burden of illness, delay the consequences of aging, decrease risky health behavior, and shrink disparities in health, we would celebrate such a remarkable discovery. Robust epidemiological evidence suggests that education is such an elixir.* [25]

Drawing the links between public education and health, both personal and public, thrusts into the education debate a score of public health professionals who previously have been silent about education issues. Recent awareness of the "diabecity" epidemic among school-age children—their poor nutrition, and their lack of physical education opportunities at school and in communities—have helped to link the two narratives. A public health education narrative reinforces the intricate connection between education and a greater social fabric. It reminds us that eight of fourteen correlates to successful academic achievement are factors outside of school such as nutrition, literacy opportunities at home, and quality of environment (e.g., lead pollution) at home and in the community. In this narrative context, the goal of education includes healthy students, healthy communities, and sustainable systems that support them.

[25] "Reframing High School Dropout as a Public Health Issue," Nicholas Freudenberg, DrPH, Jessica Ruglis

Corporatized Childhood: Education as a Commercial Market

Public schools are caught in the middle of converging forces: constrained school budgets and funding sources, increased advertising that targets children, corporate-sponsored media, and an extreme consumer society. The result is increased commercialization of the childhood and school experience. Children's advocate Susan Linn from Harvard University has documented this in her book *Consuming Kids: The Hostile Takeover of Childhood* (New Press, 2004). She explains how these converging forces result in corporate-influenced and advertiser-supported curricula, vending machines, cafeteria food programs, sports facilities, and other school-related resources. This narrative is about school as immersive advertising for large corporations and the training ground for adult brand loyalty.

Collective Value: Education as a Commons

The commons is an age-old narrative of shared, vulnerable, natural resources and collective management. New literature on the commons (see Elinor Ostrom, Charlotte Hess, Peter Barnes) makes the case that a commons sector could be instrumental in countering the destructive or ineffective tendencies of the state and the market. Many threatened resources that public institutions were designed to protect—environment, health, and education—might be better managed as a commons within which "common wealth" becomes sustainable. The commons narrative for education tells a story of everyone benefiting from a strong system of public learning and a commitment to future generations of learners. Again, the Harlem Children's Zone is an example of such a sense of "commons" in education. The organization's Web site states, "The emphasis of our work is not just on education, social service and recreation, but on rebuilding the very fabric of community life."[26]

The Achievement Gap: Education as Social Justice

Education is a nexus of social justice debates and narratives. The events and aftermath of Hurricane Katrina exposed the broader public to the blunt reality of poverty—the "other" America. What was a daily experience for many but largely invisible at the level of public discourse was suddenly exposed. A dominant theme emerging in today's discussions of education reform is a whether the "achievement gap" is decreasing. This represents a narrative shift from equal opportunity edicts that focused on inputs, to achievement-based thinking with a focus on "measurable outputs" and standardized testing. In this narrative we have lost any sense of the relationship between impacts on learning and poverty, race, ethnicity, and cultural context. The achievement gap story is not about "equalizing resources, addressing poverty, combating segregation, or guaranteeing children an opportunity to learn."[27] The impact of this, according to James Crawford of the Institute for Language and Education Policy is "a subtle but powerful effect on how we think about accountability. It shifts the entire burden of reform from legislators and policymakers to teachers and kids and schools." However, effective program support may not be aligned with the critical needs of these stakeholders.

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[26] http://www.hcz.org/about/overview.html

[27] James Crawford, "A Diminished Vision of Civil Rights", June 7, 2007. http://www.elladvocates.org/media/NCLB/EdWeek6jun07.html

INNOVATION CHALLENGES

As networked, digital media such as YouTube, blogging, virtual worlds, and multiplayer games become vehicles for creating narratives about public education, learning agents will be challenged to develop a strong visible presence in any discussion about teaching and learning. Some specific challenges include:

Seizing the opportunity for new narratives. In many ways, education stands at the frontier of possibility. It can re-imagine itself to play different roles in society by identifying where it is strongest, where it is weakest, and how it can leverage both to best serve society. However, ineffective action or inaction can lead to education losing control over its own narrative. How do we ensure that discussions of reform and transformation remain effectively embedded in larger societal discussions of critical issues such as poverty, community resilience, and public health?

Reclaiming a meaningful public legacy. Something essential about public education is that it's *public*, meaning available to everyone. It exists to serve the common good and as such, it is offered as a public good. Not all narratives about education include this element, although equal access to education seems to be a core commitment of the public education system. How does the public legacy relate to the emerging narratives? How can schools ensure that this public role emerges in any new narrative?

Crafting a narrative for and by educators and learners. In many ways, teachers have lost their voice in telling the story of education. It is filtered through screens of "achievement," "21st century skills," "global competition," and "standardization." A recent headline in *EdWeek* read, "Teachers Seen as Making Difference in World's Top Schools." The article reports that "school system success … hinges on getting the right people to become teachers, helping them learn to teach, and crafting a system that ensures every child will get access to the teaching he needs."[28] While this may seem obvious and straightforward, the importance of teachers as suggested in this article is not reflected in the dominant education narrative. How can quiet narratives, such as the teacher retention story, become top-level themes and shape the dominant narrative? Can educators find a way to harmonize different voices and competing narratives to enrich rather than muddle discussions about education?

IMPLICATIONS FOR LEARNING AGENTS

There are several areas where new learning agents can develop skills and practices that will contribute to developing a robust set of narratives about teaching and learning.

Storytelling and Listening. Practitioners and decision makers in education need to be able to craft firsthand accounts and listen to multiple narratives to influence and be a player in the dominant narratives. Teachers can use tools like podcasts, YouTube, blogs, and other social media to spread their stories and shape the national discourse. Individual teachers have already created powerful stories that are widely circulated and used as focal points for conversations like Karl Fisch's presentation "Shift Happens" and Kansas State University professor Michael Wesch's video, "A Vision of Students Today."

[28] Bess Keller, "Teachers Seen as Making Difference in World's Top Schools", *EdWeek*, November 9, 2007.

Exploring Interstitial Spaces in Narratives. Tightly connected social networks in various disciplines and professional practice areas develop and reinforce narratives that make sense to them. But the education debate needs to escape its tightly connected networks. New understanding of narratives and entirely new stories will emerge as links form across social networks, professional groups, and disciplines and bridge groups that wouldn't normally interact within the educational realm. Networks may overlap and have interdependencies without members being consciously aware of their shared interest. It is the interstitial space between networks, what Ronald Burt refers to as "structural holes" in networks, where opportunities lie for creating new meaning.

Networking Platforms and Forums. One way to explore structural holes is to develop what Fred Turner calls network forums. A network forum is "a trading zone … where representatives of multiple disciplines come together to work, and as they do, establish contact languages for purposes of collaboration."[29] Thoughtful cross-fertilization of educational bloggers and other leaders of creative education "unconferences" with distant networks such as design, neuroscience, gaming and game design, community development, health and nutrition, and juvenile justice could provide a rich opportunity for exchanging stories from different disciplines and stakeholder perspectives. These broader, transdisciplinary discussions could help evolve new definitions and roles of teaching and learning for the 21st century by sharing insights and different ways of framing and managing dilemmas.

[29] Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism*, University of Chicago Press, 2006.

CHAPTER 3
INSTITUTIONS GIVE WAY TO EXSTITUTIONS: AN ECOSYSTEM OF TEACHING AND LEARNING

As the public school systems faces increasing criticism, political pressure, and financial strain, "education" is exiting the public school. As it exits the classroom, the playing field, the textbook, the curriculum, the schedule, and the reigning pedagogical practices, it embeds itself across a broad range of learning platforms, contexts, and venues. What emerges is an ecosystem of education *exstitutions*—systems that don't draw resources into them, but rather distribute and link them to facilitate learning.

Education Delivery: A Distributed Learning Economy

An expanding economy of education resources, services, and products is emerging to challenge the school's traditional position as an enterprise of learning. This includes a growing bottom-up system of creation and exchange of digital learning resources and online learning communities. The model of "education delivery" is shifting from a top-down, centralized, hierarchical flow of instruction to a diverse network of resources that learners navigate to create a "personal learning ecology."

School is no longer the sole mediator of education, but one of many nodes in a heterogenous web of learning. For families, schools are located in a changing landscape of alternatives and choices that range from summer camps, educational toys, and after-school lessons and activities, to mentoring, apprenticeships, and education at "home" by parents, professionals, peers, and online colleagues. A proliferation of digital information and social media, online collaborative learning practices, and Web savvy teachers and youth has transformed the Web into a robust learning environment, creating a new dimension in this landscape: eLearning 2.0. Rapid development and innovation in gaming offers immersion experiences that challenge classical notions of teaching and learning as well as formal and informal learning boundaries. Some games are specifically intended for the classroom (*Operation Climate Control*, *ElectroCity)* while others focus on teaching social issues (*Serious Games Initiative, Darfur is Dying*). Even some games not necessarily designed for "education" have powerful modules for learning practices such as leadership (*World of Warcraft*), strategy (*SimCity*), and resource management (*Age of Empires II).*

Shifting Responsibility: Personal Learning Ecologies

As learning opportunities expand beyond the borders of public school, the responsibility and work required to manage learning shifts to parents and caregivers. In a quest to provide the best for their children, families will craft personal learning ecologies—webs of people, resources, information, services, and more, designed to facilitate their child's learning. With fluid boundaries, decentralized power, and a personalized character, these ecologies function as an extended classroom and curriculum.

Learning anytime, anywhere isn't a novel concept—it's a necessary part of a child adapting to unfamiliar conditions. However, where such processes might have once been considered "personal" or "informal" parts of childhood growth, they are beginning to be recognized as explicitly *educational* and are intentionally supported, facilitated, and designed.

Diversification: Embracing a Robust Educational Ecosystem

We've already seen increased choice for learning opportunities emerge outside of the public education system through private and parochial schools, charter schools, home schooling, after-school programs, tutoring, and camps. Two key factors will drive the learning economy to expand and shape a more robust educational ecosystem. First, the knowledge economy rewards creativity and will continue to fuel a consumer desire for learning and personal development. Second, grassroots economics and networking will provide cost-effective business models for developing niche learning offerings and do-it-yourself learning platforms. This will enable families and their children to experience learning in new social settings, media formats, and relevant contexts that address their unique needs. As schools respond to increased "out-of-school" options for learning, we will see some attempt to shore up their rigid institutional boundaries while others develop more porous ones that allow for better integration with an expanding ecosystem of learning.

Some early signals of a diversifying educational ecosystem:

School as Filter: Some schools recognize that they cannot "compete" with the expanding options for learning outside of school. Their value in a diversifying web of resources is to become a discretionary filter for families and students. This may mean identifying and recommending outside courses, programs, and venues to enhance or supplement learning so that families don't have to do all the work of screening and managing options. It may also mean helping home school families in the district navigate local programs and curriculum with respect to learners' needs.

School as Neighborhood: Some schools may filter the growing learning economy options and integrate them into school curricula and activities during the academic day and in after-school or enrichment programs. Rather than filter and send students out, these schools create their own microcosms of the learning economy. With extended school days, these schools recreate "the neighborhood" within the school incorporating unstructured time for open, imaginative play, an ad hoc rule setting, conflict resolution, and intergenerational learning—just as it would happen "in the neighborhood." This school format supports children of dual working parents or from unsafe, resource-deficient neighborhoods who may not have these opportunities.

The Community as Classroom: An expanding learning economy turns the community into a distributed classroom. Public libraries, local art centers, parks, museums, local businesses, senior centers, community gardens, homeless shelters, veterans centers, and other local organizations are nodes in the learning network. These venues for learning serve schools with flexible curriculum and creative teachers as well as home-schoolers and after-school programs.

The Market as Service Provider: Increased value of learning benefits is expanding the commercial market for products and services devoted to education and individual skill development. For example, the educational toy industry, especially for toddlers, has expanded and diversified. The private tutoring industry is booming. More products and services are marketed in terms of learning experience and purchased for their educational value. From bread that promises enhanced nutrition for better learning, to educational cruises (edventures), and "skill enhancing" toys and games, the commercial market is rife with education-oriented offerings.

INNOVATION CHALLENGES

The growth of education exstitutions accelerates a distributed, network of education resources—an ecosystem from which individual families and learners will craft their own learning pathways. Some critical challenges emerge around navigating and finding value in the web of resources.

Clarifying and Maintaining a Central Position in the Educational Web. Public schools may become critical hubs in a wider web of educational experiences. However, if they do not maintain their connections throughout the network, they risk becoming mere nodes, one component of a child's diverse education. How will schools negotiate their relationship with these other services, especially if schools cease to function as the center of this network?

Assessing the Traditional Public School Models. If public schools are left behind by the learning economy, those who remain in traditional public schools the longest will suffer the most: the meek will inherit the abandoned public schools. How can public schools avoid this scenario and ensure that all students have adequate access to the education they need? Is a public institution the best format for ensuring equal access? Are there other forms of governance, such as public trusts and community-managed commons, which offer more effective alternatives?

Defining Standards in the Open Economy. Schools will have less control over what and how their students are learning. This poses challenges for centralized curricula, performance, accountability, and student tracking. With so much variance between different personal learning ecologies, how will schools, states, and/or the federal government maintain standards that are fair but not the "lowest common denominator"? Will the notion of "standard" need to change?

IMPLICATIONS FOR LEARNING AGENTS

There are many opportunities for learning agents to become important points of connections in the emerging education ecosystem. Successful learning agents will develop skills that help families make sense of the expanding learning economy, develop meaningful portfolios of learning experiences and activities, and evaluate the effectiveness of various learning pathway strategies. Learning agents could become the glue that holds an ecosystem of exstitutions together in a coherent fashion.

Sensemaking and Coordination. In the avalanche of options—school choices, after-school programs, supplemental lessons, educational software, tutors, and summer camps—many parents may feel overwhelmed or even paralyzed by decisions regarding their childrens' education. Added to these kinds of choices, are other daily decisions about food, entertainment, recreation,

and health that will increasingly be considered part of supporting a learning culture at home. Schools will need to provide support to help families nurture healthy learning ecologies. School-based learning agents will need to develop skills and strategies for navigating the expanding learning economy and for crafting, coordinating, and managing personal learning ecologies. This includes identifying the right programs and activities for particular student needs.

Tracking Complex Portfolios of Activity. School-based and other independent learning agents will need to keep track of personalized student activities both within and outside of the formal school system. A student's learning ecology may extend beyond the walls of the school into the community and onto the Web, making information difficult to aggregate and keep up to date. How can learning counselors, advisors, and support professionals responsible for the development of students be trained to visualize and manage the whole of a student's learning ecology?

Focus on Learning Ecosystems. Schools will need to decide how flexible to make their intersection with the learning economy based on the needs of their learning communities. Learning agents will need to be able to manage this intersection and the integration of learning economy programs and experiences into the school. Will the school boundaries be open and porous, networking the school into the broader learning economy or will it remain more detached?

Learning Ecology Effectiveness. If learning is becoming networked across multiple players and settings, then perhaps assessment also needs to be collectively developed across a network and communicated in multiple dimensions. Learning agents have the potential to play a critical role in developing assessment networks and designing strategies and approaches for richer assessment to match the richness of personal learning ecologies and accurately get a picture of a learner's performance and progress. How will we assess achievement outside of traditional educational institutions?

CHAPTER 4

AN EMERGING SOCIOGOGY: THE PRACTICES FOR A SOCIAL LEARNING PLATFORM

The term pedagogy comes from the ancient Greek practice of assigning a slave—literally a leader (agagos in Greek) of children—to escort boys to school and generally supervise them as they prepared for life in Greek society. This paternal teacher-student relationship, of an adult leading a child through a course of study has persisted in basic form since then. The diffusion of Internet connectivity, mobile devices, and participatory media is disrupting this long tradition. The connected, open, and social media context is creating a new context for cultivating relationships among learners and teachers. Like the Internet itself, the structure of learning relationships is flattening, becoming more peer-based and networked than hierarchical, expert dependent, and "command and control" driven. Educator-learner relationships are becoming more co-creative and self-initiated by individual learners. Many have referred to this learning relationship shift as a move from the "sage on the stage" to "guide on the side," but in fact the transformation is more fundamental. Indeed the experimentation with networked, co-creative, peer-based relationships among learners suggests a shift from "pedagogy" to "sociogogy"—in which teachers and students are learning "companions" (from the Latin "socius") leading one another. This shift entails a whole new framework for learning and co-creating knowledge.

New Learning Environments: Co-creation and Peer Mentoring

Sociogogy suggests companions or partners serving as guides or leaders for each other in the discovery, creation, and application of new knowledge and skills. The social group is the guide and the creator-learners. Sociogogy builds on concepts such as "learner-centered" or "student-centered" design of learning environments, which Steven Downes of the National Research Council of Canada believes emphasizes active, participatory learning that may even erode the distinction of student and teacher.[30] In addition to focusing on an individual student's action to center learning, sociogogy brings the connections of learners and the group into focus. Lissa Soep of Youth Radio in Oakland, California, proposes the term "collegial pedagogy" to refer to an interdependent form of peer co-creation of original work between youth and adults, emphasizing its intergenerational experience and opportunities for learning. The work practice of co-creative, socially networked learning characterizes their newsroom internship program in which youth create professional media stories with adults but have final editorial control.

Connectivism: New Learning Theories for a Complex Learning Environment

Sociogogy may indeed require new learning theories to help us organize people and resources to support more effective learning in the connected digital world. George Siemens proposes *connectivism* for learning in a digital age, which provides a new theoretical basis for understanding how "we derive our competence from forming connections" across communities

[30] Steven Downes E-Learn Magazine, *E-Learing 2.0*, http://www.elearnmag.org/subpage.cfm?section=articles&article=29-1

and sets of data. He draws from chaos and complexity theories as well as principles of self-organization and networks:

> *Unlike constructivism, which states that learners attempt to foster understanding by meaning-making tasks, chaos states that the meaning exists—the learner's challenge is to recognize the patterns which appear to be hidden. Meaning making and forming connections between specialized communities are important activities.*[31]

Furthermore, connections of people and data are critical for meaning making and for facilitating new patterns and future flows of knowledge:

> *Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database), is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing.*[32]

The significance of an emerging sociogogy, and new theories of learning like connectivism, is that it can help the education profession address new learning demands brought on by an abundant and growing world of knowledge. Siemens points out that connectivism, as compared to other learning theories such as constructivism, behaviorism, and cognitivism, may best explain learning that is complex, characterized by a rapid changing core of knowledge, and involves diverse knowledge sources.[33] Sociogogy can help forge a new framework for designing curricula, developing physical and online learning environments, preparing teachers, and utilizing new participatory media in ways that support practices for constant learning and knowledge acquisition in a dynamic and networked information world.

INNOVATION CHALLENGES

Teaching and learning strategies, practices, and roles, may upset traditional forms of authority across the institution of education and the teaching profession. There will be challenges for learning agents to assume new types of authority and perhaps share some kinds of authority more broadly, such as authority as the expert and the sole of mediator of knowledge acquisition and quality. A few specific challenges are listed below.

Adapting to Distributed Authority. An important principle in self-organizing systems is that authority gets distributed out to the edges—authority for innovation, experimentation, and decision-making. In a networked structure and theory of learning, every network participant shares authority and responsibility for participating in the learning network. Building on the

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[31] George Siemens, *Connectivism: A Learning Theory for the Digital Age*, http://www.elearnspace.org/Articles/connectivism.htm

[32] George Siemens, *Connectivism: A Learning Theory for the Digital Age*, http://www.elearnspace.org/Articles/connectivism.htm

[33] George Siemens, *Learning and Knowing in Networks: Changing roles for Educator and Designers*, presented to ITFORUM for discussion, January 27, 2008, p.11. wwwxxxx. In his table on page 11 Siemens builds on the work of Ertmer and Newby to distinguish various learning theories.

ideas of learner-centered and action-oriented learning, connectivism and sociogogy suggest elevated levels of a learner's self-initiated activities in the context of a learning network. As classrooms and schools become distributed networks of people, data, and resources, the authority to teach and learn spreads across the network. This may challenge traditional notions of power and authority in the classroom and school and suggests a new "social learning contract" among students, teachers, and parents.

Gauging Impacts on Assessment and Standards. Standards for learning outcomes and assessment tools for measuring those outcomes will need to evolve into a broader toolset to address the new sociogogy. Identifying, tracking, and evaluating the network activities and mobility of learners will need to become a part of any accountability program. If, according to connectivism, learning is largely self-initiated—following passion-based inquiry as John Seely Brown describes—and resides across networks of people, data, and institutions, then learning can happen at any time in many different contexts. Systems will need to be developed to help evaluate and make learning visible in this new context. Learning agents will need to be able to design, utilize, and assess learning with these tools.

IT Platforms versus Social Learning Platforms. In his seminal article on eLearning, Stephen Downes highlights that Web 2.0 represents a social revolution, not a technical one. The tools and media underlying the emergence of sociogogy should be evaluated in terms of the social, participatory, and open interactive learning goals established by a school or district rather than technical specifications or discrete functionality. IT departments, technology coordinators, curriculum developers, educators, and other critical learning agents in schools and districts need to strategically plan for a social learning platform. In an interview with education technology consultant Steve Hargadon, Chris Lehman of Philadelphia Science Leadership Academy explains that pedagogy comes first, then technology.[34] Tomorrow's sociogogy will require a flexible, open, social media platform for enabling 21st century learning.

IMPLICATIONS FOR LEARNING AGENTS

Amplified Educators. Learning agents will need to be amplified to effectively teach in a connected, networked learning environment, which involves the development of many new skills. A recent IFTF report exploring the concept of the *amplified individual* identified several critical future work skills that apply to educators.[35] Some key ones for future educators include:

- *Mobbability*—the ability to work in large groups and to organize and collaborate with many people simultaneously.
- *Ping quotient*—responsiveness to other people's requests for engagement and the propensity to reach out to others in the network.
- *Open authorship*—ease with creating content for immediate public consumption and modification.
- *Cooperation radar*—the ability to sense who would make the best collaborators on a particular project.

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[34] http://www.stevehargadon.com/2007/01/interview-with-science-leadership.html

[35] "The Amplified Individual," IFTF report SR-1092A *Future of Work Perspectives*

- *Signal/noise management*—filtering meaningful information, patterns, and commonalities from massively multiple streams of data and advice.

Focus on Experience and Functionality. IT coordinators and decision makers need to work hand-in-hand with classroom-based and out-of-school learning agents to develop social, collaborative learning platforms. This shifts the basis of design decisions and media choices from technical functionality to social experience and learning objectives. Typically IT coordinators and decision-makers are responsible for keeping systems operational and secure. This does not always, or often, equate with knowledge of human interface and affordances. IT is often evaluated on cost, ease of installation, maintenance, and ease of use. How will social learning systems be designed and managed for the best results?

Immersive Training Experiences for Educators. Sociogogy needs to take hold in teacher training and development programs for them to be able to be effective co-learners with their students. As National Commission on Teaching and America's Future (NCTAF) president Tom Carroll pointed out during IFTF's expert workshop on learning agents, we may be preparing our teachers for a world that doesn't exist. The world of teacher training and the connected-media world of their students are not the same. Opportunities for immersive experiences in networking, collaborative media creation, and distributed, collective problem solving are examples of areas that would provide educators with a sense of teaching and learning in a connected world. New and existing, teachers need to develop skills and cultivate experiences in social and creative network cultivation, management, and navigation.

CHAPTER 5

THE RISE OF TRANSLITERACY: A NEW WAY OF KNOWING

As cyberspace ceases to be a distinct domain of social and economic life, the fusion of the digital and physical worlds will usher in a new period of *transliteracy*. Sue Thomas and her colleagues at DeMontfort University's Institute of Creative Technology define transliteracy as "the capacity to read, write, and interact across a range of platforms, tools, and media from signing and orality through handwriting, print, TV, radio, and film, to digital social networks."[36] Just as the books, magazines, billboards, signs, graffiti, and labels around us place us in an immersive text environment, we are at the early stages of living in an immersive digital world with computing and connectivity embedded into the fabric of daily life.[37] Thomas and colleagues propose that transliteracy move beyond the usual debate of old versus new media. Instead, they frame the discussion in terms of a "unifying ecology of media and literacies relevant to reading, writing, interaction, and culture, both past and present." Innovations in media keep the ecology dynamic and perpetually evolving. Developing transliterate creative production practices and communication across multiple platforms represents a sensory and cultural explosion that will frame new kinds of experience and knowing and help situate them in the context of older, perhaps more familiar, modes.

Transliterating Social and Creative Life: New Skills Emerge

Transliteracy suggests innovative kinds of skills and practices for moving across media and modes of creation, such as writing to be seen and heard rather than simply read. As new relations of creative production emerge, transliterating social and creative life requires a renewal of social and political understandings. Collective authorship and collective intelligence are modes of active learning and discovery that present new dynamics between individuals and groups with respect to knowledge. Roles of authority and expertise shift when information and experience are created and aggregated in blogs, chat, and online group discussion lists and forums. Ownership of content in a remix context, and for a public audience, present new ways of understanding ideas, knowledge, people, and perspectives.

Natives vs. Immigrants: Bridging the Generational Gap

Thinking about digital media in terms of transliteracy helps us understand the shortcomings of the terms "digital native" and "digital immigrant," often used to describe a gap between adults and students.[38] Henry Jenkins points out that we have experienced digital native-ness many times over the past century, every time a new technology has emerged with which youth quickly developed creative proficiency. As Thomas explains transliteracy, she emphasizes its reach across history to include pre-digital media as part of a dynamic media ecology, thus offering a way to bring the generations together. Additionally, use of the term digital native often neglects class differences associated with the digital divide and the participation gap associated with the

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[36] *Transliteracy: Crossing Divides*, Sue Thomas et al, DeMontfort University.

[37] See Mark Weiser on ubiquitous computing, http://www.ubiq.com/hypertext/weiser/SciAmDraft3.html

[38] Henry Jenkins 2007. Interview with Lissa Soep and Youth Radio.

social and cultural participatory practices afforded in new digital media. Transliteracy focuses specifically on "social skills and cultural competencies"[39] associated with various media and how they change as one moves across media.

Human civilization has always experienced evolutionary transformation upon discovering new ways of sensing the world. Ultimately, transliteracy offers a broader palette for how we process the world and make meaning. In a traditional media world, cognitive behaviors such as dyslexia, attention deficit disorder, and synaesthesia are considered "dysfunctions." In a transliterate media world they may not be perceived as deficiencies, but may illustrate new competencies, or at least not be considered as problematic.[40] This opens up many alternate pathways of learning for an increasingly diverse student population with a range of learning needs (see also The Black Box Deconstructed).

INNOVATION CHALLENGES

Transliteracy offers new ways of communicating and knowing, challenging many assumptions about the language of learning, the dominance of text-based learning, and evaluating performance.

Reconciling the Language of School and Youth. Many educators and adults lament the fact that young people can't focus. However, as Mark Prensky and other critics point out, kids are clearly able to focus—look at how long they can play video games! The classroom simply isn't offering a compelling multimedia experience. When students step into the classroom, they literally start speaking another language. At the same time, there is a need for attention training and a broader understanding of how various media environments contribute to or diminish the ability for focused attention. Currently there is an assumption that focused learning competes with the diffuse, multi-focused, multi-tasking environment afforded by laptops and Internet access. This may or may not be true. It's not that multitasking is bad, but that there is no clear understanding and internalization of when it is effective and when it is ineffective. How will we reconcile the language of outside life with the language of school?

Resolving the Disjuncture Between Text-based and Transliterate Teaching. Most teaching methods and styles today are text based, but students' experience outside of school is not. If teaching practices do not evolve to incorporate other media and transliteracy practices, a disconnect between in-school and out-of-school experiences will grow. This may create a divide not only between students and "teachers," but between learning agents who are transliterate and those who are not. One of the primary reasons that students drop out is the irrelevance of the experience, including content, context, and method of learning. Transliteracy could be a good bridge between teachers and students because it doesn't pit one medium against another. It is also a necessary strategy for developing young adults who can participate in a broader civic and economic society that "talks" in more languages than the written word. How can educational organizations, and the learning agents who work there, become more transliterate?

[39] Jenkins interview.

[40] Sue Thomas, Transliteracy paper for First Monday, 2007.

Overcoming Irrelevant Standards and Assessment. Today's standards and assessment discussions are exclusively focused on measuring performance with standardized tests—a text-based, linear media format that may exclude various other kinds of knowing. This format is even difficult for assessing other text-based activities such as written essays. How will the standards and assessment discussion incorporate multimedia and transliterate practices and activities? How will we assess the rigor and relevance of student work in multiple media forms and across media modes?

IMPLICATIONS FOR LEARNING AGENTS

Learning agents will need to develop more robust media literacies at minimum, and strive to develop a more transliterate appreciation and fluency for how to express and communicate.

Educator Training in Media Literacy. To avoid a dysfunctional disconnect between educators and students, the education community must correct the current asymmetry in the classroom around media literacy. Moreover, cultural modes of communication are changing outside classroom walls, and to adequately prepare students to engage in meaningful dialogue across multiple media, educators must become transliterate. Only then can they better teach students to become critical consumers and conversers in new media.

Old Literacies Remain Important. While multimedia experiences are becoming more important, classical, text-based instruction is still essential. Communication and coordination still occurs in written words, and a rich vocabulary and textual literacy hasn't become obsolete. Indeed, as society navigates its way among these new modes of communication, it will need to draw on the insights of communication modes that have matured through centuries of use. If textual literacy isn't fostered outside the classroom that's simply more reason it should be given attention in the classroom. Educators must still realize, however, that students are not coming in with the textually literate foundation they once may have had.

Assessing New Literacies. The education system has methods for evaluating reading and writing (although the efficacy of such methods is still in debate), but it has no methods of evaluating new kinds of literacies. To help educators refine their instruction and to help students identify their own strengths and weaknesses, schools need to find ways to assess performance and ability in a transliterate landscape.

CHAPTER 6

THE BLACK BOX DECONSTRUCTED: NEW CONNECTIONS BETWEEN BRAIN AND ENVIRONMENT

A nexus of new discoveries, technologies, and resources is converging to render obsolete the reigning models of the brain, mind, and learning. The science showing evidence of continued neurogenesis—the growth of new neurons, long believed to stop after infancy—has galvanized researchers, investors, and entrepreneurs to construct theories, practices, and industries around brain health. Neural imaging enables deeper, focused investigations into neural activity and brain behavior. Online programs and gaming platforms allow for brain exercises that are engaging, widely used, and easily assessed. Finally, market demand, mostly from aging populations but also from health care, education, and corporations, is providing financial fuel for these developments. This conflux of forces is helping to deconstruct the black box of learning.

Ultimately, this is forcing a re-examination of how education practices foster—or depress—the learning process. Many aspects of education implicitly approach learning in terms of inputs and outputs and as a wholly intellectual activity. New discoveries are exploding these models. What emerges is a multi-dimensional conception of mental activity, including the brain, behavior, nutrition, the environment, stress, and emotional abilities. Many aspects of school once siloed apart—learning, classroom space, behavior and discipline, intelligence—are being seen as intricately interwoven. Learning doesn't happen in an isolated mind, but in a matrix of dynamic factors that must be addressed. This new knowledge is paving the way for a more consciously designed education system in accordance with how the brain functions.

Neurogenesis: Striding to the Center of Scientific Debate

The scientific community is abuzz with research suggesting that our brains are not wholly constituted just as we're entering our first classroom. The brain constantly regenerates new neurons, forms new connections, and essentially remakes itself. Morevoer, how it remakes itself is profoundly affected by the environment—emotional, social, and physical. For example, when highly stressed, the body releases a class of steroid called glucocorticoids, which put the body on a heightened state of alert. Unfortunately, glucocorticoids are toxic to the brain, slowing, even halting neurogenesis.

Researchers at Stanford are discovering that many students from violent neighborhoods present symptoms of Post-traumatic Stress Disorder (PTSD). Most often, these students are identified as "problem students," disrespectful and disruptive in class, usually scolded and punished, and often diagnosed with attention deficit hyperactivity disorder (ADHD). PTSD does not merely cripple one's emotional balance or social cognizance. If the neuroscience is accurate, PTSD writes itself deeply into the brain, crippling learning capabilities as well. These effects would not be limited to the extremes of PTSD: numerous factors of living in disadvantaged families and neighborhoods can contribute to high levels of stress, thus hindering healthy neurogenesis. These recent findings seem to provide neurological evidence for some of the conclusions of the classic

1966 Coleman report[41] that community context matters for successful learning.

Researchers have also discovered that the immediate environment affects rates of neurogenesis in primates. Visually complex surroundings stimulated neurogenesis, while plain dull ones retarded it. Playing with toys and hiding food also stimulate neurogenesis. The brain is in a constant dynamic dance with the legacy of past experience, circumstance, and immediate engagements of the physical world. Forcing the mind to interact with the world not only creates memories of events but also fundamentally changes the brain.

Rethinking Intelligence: Learning as a Skill, not a Talent

Many elements of the educational system treat intelligence as innate—rarely do schools, especially at the secondary level, focus on *how* to learn, as if the basic pattern-recognition and connection-forming abilities of the mind are set when the student walks into the classroom. Currently, teaching of learning skills is limited to instructional specialists and special education programs rather than being applied to the design of the whole class, yearly curriculum, and physical learning environment.

While the correlation between brain fitness regimes and the science of neurogenesis is still unproven, the possibility of a connection has stoked a flurry of interest. A score of brain fitness programs have sprung up, promising to keep the brain healthy, agile, and strong. The brain fitness industry exploded from $70 million in 2003 to $225 million in 2007.[42] Looking to stay sharp as they age, baby boomers have driven much of this activity. But a carryover to education has also begun, specifically in the field of early-age learning disabilities. Parents are just starting to request these kinds of regimens, and new pedagogical models could begin incorporating them.

The arsenal of tools for building mental and emotional capacity is diverse, ranging from online mental exercises to biofeedback programs to immersive video games. Most are technological and can generally be plotted on two axes: scientifically sound, from untested to clinically proven; and engaging, from sterile and boring to exciting and playful. *Fast ForWord*, developed by Scientific Learning, is one of the most popular such programs in the education field today. The *Fast ForWord* software bundle develops sets of cognitive skills essential for learning and reading success. User data and case studies have shown this software is successful at building and strengthening reading capacity.

Many of these programs have been around for over a decade, but the convergence of social, economic, and technological forces is bringing these practices to center stage. The trend is poised to ripple through the education community.

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[41] http://www.icpsr.umich.edu/cocoon/ICPSR/STUDY/06389.xml

[42] Market estimate by Alvaro Hernandez and SharpBrains: http://www.sharpbrains.com/blog/2007/11/02/neurotechnology-trends-neurosoftware-and-the-brain-fitness-market/ cited in http://www.latimes.com/features/health/la-he-mindgames15oct15,1,7286265.story?coll=la-headlines-health&ctrack=1&cset=true

Ideal Environments: Designed for Learning

Wide acceptance of neurogenesis will alter the field of educational design by providing new design points and principles. Since physical surroundings so profoundly affect the learning process, environments can be structured to facilitate learning, increase sense of safety, and encourage collaboration. DesignShare[43], an international forum for innovative schools, proposes several design principles for creating healthy, stimulating environments for learning that schools can integrate into their design and planning processes. The principles include factors such as light and color, linking movement of indoor and outdoor space, and the use of displays and iconic symbols in public spaces to stimulate the brain. Educational design will be another strategic tool for schools in impoverished and extremely volatile districts (VUCA communities)[44] to create a healthy, safe zone for their students.

INNOVATION CHALLENGES

New insights into neurogenesis may provide learning agents a richer picture of how people learn and what kinds of factors can affect the brain's fitness and readiness for learning. Translating these insights into practical strategies remains a challenge for educators and schools.

Maintaining realistic expectations. The field of education has been set into turmoil by science in the past, e.g., the phonics versus whole language debate. The link between existing research on neurogenesis and how exactly the young human mind works in the classroom is still uncertain, and the hype around the promise of neurogenesis could be creating a bubble of expectation. Can education integrate these practices cautiously and effectively, recognizing and rejecting the cognitive snake oil?

Strategies for incorporating brain fitness. If schools incorporate brain fitness regimens into standard curriculum, they will need to have informed and effective strategies. The opportunities for new practices and curricula are vast and many. Schools could approach brain fitness like physical education, integrating hands-on activities with education about the brain and focusing on development of different brain functions. Will schools want to track brain fitness? Would standards and assessment be fair?

IMPLICATIONS FOR LEARNING AGENTS

Insights into neurogenesis have the potential to alter the places and practices of learning agents.

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[43] http://www.designshare.com/Research/BrainBasedLearn98.htm

[44] VUCA communities (volatile, uncertain, complex, ambiguous) are urban locales that face compromised environmental conditions, declining measures of health, uncharted social challenges, and few shared norms to guide action. These communities will be looking for ways to pioneer security, safety, and sustainability. http://www.kwfdn.org/map/map.aspx

ERGONOMICS FOR THE BRAIN

Integrating insights about brain fitness and cognition with architecture creates a sort of "pattern language" for learning spaces—a framework for thinking about the design of coherent, meaningful, and cognitively supportive spaces.[45] Just as we design office workspaces for optimum productivity, collaboration, and physical health, schools can be designed for optimum cognitive performance.

Redesigning the School Day. Given new insights into brain function, health, and fatigue, schools can restructure the flow of activities and interactions of the school day to create the most stimulating and healthy learning environment for students. This may include matching curriculum to parts of the school day and particular physical places.

Re-contextualizing Curriculum. How we teach specific students and subjects can now be informed by a new understanding of the brain and cognition. Restructuring lessons with activities to prepare the brain for certain kinds of thinking and mental tasks could enhance outcomes. To meet the needs of diverse students, thinking about how particular media can exercise the brain in a specific way to improve or maintain its performance could be a useful strategy.

Attention Training. Teachers and students need to become more experienced across a range of focused and diffused cognitive activities. Teachers, curriculum designers, social learning platform designers need to become more versed in how to recognize and design for a range of attention modes. Learners also need to be more aware of attention modes and when focused or diffused, multi-task modes of operating are effective and desirable.[46]

[45] Christopher Alexander, *A Pattern Language*, Oxford University Press, 1077. Alexander and his colleagues pioneered the concept of pattern language for architecture in 1977 to better understand people and their interactions, and experiences of physical places.

[46] See Howard Rheingold's Web page "Channeling the Back Channel" at https://www.socialtext.net/medialiteracy/index.cgi?chat_channeling_the_backchannel

CHAPTER 7

EDUCITIZENS: NEW MEANS OF MOBILIZATION AND AGENCY

In her book *Momentum*, Allison Fine states that for large-scale social change to happen in meaningful and sustainable ways, "activist organizations must change the way they view themselves and their members; they must start to act as part of networks of activists, not as soloists."[47] New means of mobilizing resources and catalyzing collective action will create the broader scope of agency among stakeholders in education—particularly among parents and community—necessary for them to stop thinking narrowly about education and start acting like a network. The result will be a growing number of individuals and groups with the capacity to organize for change and impact in an expanding public space.

Howard Rheingold describes the power of ad hoc groups called "smart mobs" to self organize around political issues, elections, and civic matters and make change. Beth Noveck, a professor at New York Law School, extends the idea of emergent collectives to explain the newly found agency of groups beyond corporations and political leaders to which it was formerly reserved. She advocates a way to protect the rights of groups to "associate, own assets, make decisions—and to protect against malevolent groups." She describes these new communities of action as "an agglomeration of people with the affirmative purpose of bringing about change." Through the use of new media technologies they are enabled "not only to create community but also to wield power and create rules to govern their own affairs." Furthermore:

> *"With networks and new computer–based tools now ordinary people can become a group even without the benefit of a corporation or organization. They can make decisions, own and sell assets, accomplish tasks by exploiting the technology available. They no longer need to rely on a politician to make decisions. They can exercise meaningful power themselves about national, state and local — indeed global — issues."* [48]

While advocacy groups in education are not new—there have always been PTAs, school board campaign groups, etc.—the Web now provides an open public space for these groups to see each other and cross-fertilize. Formerly isolated grassroots groups will become visible and will gain exposure to other groups and subcultures in the broad world of education. The result is development of more sophisticated rationales and persuasive power.

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[47] Allison Fine, *Momentum*, Jossey-Bass, 2006.

[48] "A Democracy of Groups", Beth Simone Noveck, *First Monday*, http://www.firstmonday.org/issues/issue10_11/noveck/

Advancing the Network: New Platforms for Civic Action

As a result of participatory media tools, parents, teachers, and community members will be more likely to cross traditional boundaries and coalesce as groups around particular affinities to take action on behalf of their children's education and learning. Their efforts will be enabled by wikis, blogs, MeetUps, social networking applications, social bookmarking, and other participatory media that helps groups coordinate, collaborate, and visualize group action. Homeschool networks have emerged for sharing curriculum, offering advice, and organizing for community learning opportunities—and their networking doesn't stop at curriculum. They also use platforms such as MeetUp to organize politically. For example, rallying behind Republican Congressman Ron Paul's run for the Republican presidential nomination, the Homeschoolers for Ron Paul hosted MeetUps in seven states. MomsRising.org is a citizen advocacy network started by Joan Blades, the founder of MoveOn.org, which serves as a hub for information and a catalyst for civic and political action related to issues concerning mothers including afterschool programs, excellent childcare, and health care for kids. They have even published a Motherhood Manifesto. Such sites engage the community in a peer-to-peer (or parent-to-parent) fashion, creating a bottom-up portrait of community life and opening avenues for coordinated community action.

Educitizens: Defining Citizenship Through Shared Educational Rights

Parents and families engaged in education-related community action and concerned about their children's education are articulating their citizenship through educational and learning concerns—special learning needs (English as second language, dyslexic children, poor readers, etc.); school funding issues; lack of green spaces and grocery stores in a neighborhood; charter school development; or political campaigns. This civic-minded identity will help frame major issues and fuel collaboration at all levels. The health industry has seen the effects of this mobilization through the emergence of biocitizens (citizens organized together through shared chronic illnesses into vocal interest groups).

Educitizens are not far behind. Educitizens differ from traditional PTA members or booster club fundraising by defining their civic rights and expressing their civic identity through education. Educitizens are creating an entirely new civic identity and voice through networked media and distributed collective action. MomsRising.org members, for example, communicate a platform of issues for which they believe the social contract has been broken and public institutions addressing these needs no longer function. For educitizens, their civic identity and sense of rights are intimately linked to education.

INNOVATION CHALLENGES

A new civic sphere, catalyzed through participatory media, may challenge power structures by making educational issues and decisions more visible and meaningful at a grassroots level.

Operating under Extreme Transparency. An explosion of personal mobile devices for monitoring, documenting, and broadcasting will make the reality of school life on the ground transparent to the public. Teacher blogs, YouTube, and increased and insistent parent involvement will contribute to various forms of educational *sousveillance*, or bottom-up

observation. Many companies and institutions have already felt the pressures of radical transparency; how will schools cope with this new visible world?

Establishing a Distributed Power Structure. For an organization used to closed-door decision-making, transparency can be paralyzing. The boundaries of authority in the schools will widen to include self-organized interest groups. Schools that adapt to the new decision-making model will enjoy access to an immense wealth of intellectual, social, and community resources. But how can schools be prepared to move from behind-the-door decision making to models that include an active network?

IMPLICATIONS FOR LEARNING AGENTS

Together with their students, learning agents have the potential for being leaders of a new civic sphere.

Civic Engagement 2.0. Schools already provide tools and preparation for civic engagement—knowledge of government and the political process, volunteering and community service, etc. However, an emerging model of civic action based on participatory media requires a different set of skills. Schools will need to co-create new forms of civic engagement to reinvigorate the social contract between education and the community. Comparisons of school systems across the world show that a key indicator of success is the status that teachers have in society. New platforms for civic engagement can allow teachers and other kinds of educators to become more visible and vocal in taking action for the local community.

Leveraging Networked Individualism. Many digital youth function in a mode of "networked individualism" in which they are more or less continuously in touch with what University of Southern California Research Scientist Mimi Ito and her colleagues call their "full-time intimate social network." Individual youths are never more than a click or a "ping" away from their close personal network—people they can turn to for support or to influence. These personal networks can be catalyzed for learning experiences or for intentional civic action. Leveraging this form of collaboration (a specific task-oriented variety of collective action) will be an important 21st century civic skill.

SECTION 2

FUTURE ROLES FOR ENABLING AGENCY IN LEARNING

Looking across these disruption areas, the challenges and the needs and functions they raise, we identified several learning agent roles. Imagine these roles as the building blocks for individual positions and career paths within a public learning system. One person may focus on one of these roles, while others may combine two or three roles to meet specific needs and leverage individual talents. Imagine these roles across a diverse learning ecosystem of community organizations and venues, including and extending beyond traditional schools.

Community Intelligence Cartographer (CIC)

The CIC is responsible for tapping the collective intelligence of the local community, making it visible, and setting a stage for individuals and groups to craft meaningful learning environments. CICs engage in making the collective intelligence of a community public and accessible to other learning agents. CICs may be associated directly with a school or district. They may be co-located at a school or have a physical public presence in the community, perhaps with a Chamber of Commerce or Mayor's office. They interact with other CICs, creating a community-wide knowledge base, often visual, of learning resources, assets, stakeholders, and opportunities.

CICs initiate community asset mapping efforts, such as GoogleMaps mashups that illustrate the location of potential learning venues, available employer internships or co-learning opportunities, retired professionals willing to participate in learning journeys, or other community assets. They develop platforms and catalyze community members to participate in contributing to this knowledge commons. CICs are learning advocates for the community. Their activism supports the creation of community learning oases (fertile learning habitats) and elimination of learning deserts (barren learning habitats). Since community landscapes are in flux, CICs are constantly scanning and evaluating the community for learning conditions and updating their maps, visualizations, and other public resources.

CICs are not passive documenters. They leverage social networking strategies and mobbability (the ability to develop swarms and smart mobs) to identify emerging learning opportunities in the community and connect learning agents and families to community resources. They work closely with Personal Education Advisors in charting new pathways and adventures through the physical and digital learning terrain. The CIC helps the community feel integrally involved in learning and educational practices by publicizing opportunities for participation, volunteering, contributions, and other forms of grassroots support for learning. Schools or other learning organizations enjoy formal and informal community support from CICs.

CICs are significant to the community through their infrastructure building and ability to make learning assets visible. Communities that organize around education and learning have more positive impacts on educational transformation and CICs will play an increasingly important role

in this kind of activity.[49]

Interface Infrastructure: As the boundaries between school and community begin to blur, the CIC will build necessary infrastructure to facilitate sharing, multiple connections, and transparency. The more networked the school and community become, the more quickly information can flow—enabling ad hoc learning experiences and rapid mobilization of resources. This infrastructure will also establish more trust between community and school, as people can depend on communication and connection.

Leveraging Local Resources: The local community possesses an abundance of learning resources—community events, experience and expertise, retirees interested in mentorship—which can greatly enhance learning. Educators can tailor their learning strategies to local opportunities, and the local community can contribute to the learning process. Ultimately, this leads not just to student learning but also to *community learning*.

Personal Education Advisor (PEA)

Personal education advisors mediate the broader learning ecosystem and the needs of individual learners. Amid the avalanche of options offered by the expanded learning economy, someone needs to have a higher-order sense of strategy and development for learners and their families. Personal Education Advisors help families create, nurture, and maintain personal learning ecologies that fit with their children's needs and the family's values and constraints. They help students craft their own learning visions and customize learning discovery journeys. They serve as coaches, advocates, and counselors, taking a holistic and systemic approach to a student's development, identifying areas of strength and weakness, and encouraging students to consider particular learning options. They connect families to tutors, resources, and networks that will help the learning process. Every student registered through a public school as an on-site student, home-, or community-based student may select and work with a PEA that is a member of the district's PEA network at no charge. Families may also choose their own PEA in private practice.

Personal education advisors are critical advocates for young learners in an open education ecosystem in which there are highly differentiated paths and options available and a growing range of student needs, resource bases, and learning philosophies. PEAs help learners and their families sort through a rapidly changing learning landscape and develop a learning narrative and approach that is student centered and meaningful to distinct families.

Empowering Students in an Open Environment: The PEA helps students create and manage their own schedules in the absence of a top-down universal approach to learning. PEAs help assess quality and relevance of options, programs, professional and para-professional learning relationships, taking into account the educational, health, civic, and emotional development of the learner.

Incorporating the Family: The family is an essential component of the learning process, and the PEA focuses specifically on drawing them in as learning contributors, participants, and

[49] *Organized Communities, Stronger Schools*, Annenberg Institute for Reform, Brown University, Providence, Rhode Island, 2008.

resources. For those families that want to get further involved in their child's education, this gives them appropriate space; for those families that feel a little lost or overwhelmed, the PEA gives them support any way that they can. PEAs help define a broad spectrum of possibilities for how families can participate in their children's education, ranging from traditional classroom participation to co-learning activities in which the parent is an active learning partner with their kids. As such, PEAs help cultivate a learning ethos within the context of the family's distinct context.

Learning Fitness Instructors (LFI)

For 30 minutes a day, students interact with Learning Fitness Instructors to build and strengthen the basic cognitive, emotional, and social abilities essential to learning—like physical education, but for the brain. The Learning Fitness Instructor, using simulations, biofeedback, and hands-on activities, helps students reduce stress, hone mental capabilities, and learn brain-friendly nutrition. Meanwhile, they learn about the brain and the learning process, and collaborative exercises teach them new kinds of teamwork.

The Learning Fitness Instructor's objective is to work with students in whatever capacity (providing emotional, social, and neurologically-based activities) to make sure that each student is prepared to learn. They work closely with PEAs to develop fitness programs tailored to individual student needs. They also collaborate with classroom-based learning agents and other school-based staff such as administrators, space designers, and technology and media designers to make sure that both physical environments and virtual spaces are conducive to learning experiences. Students entering a school take a learning fitness inventory to assess their cognitive, emotional, and social status. This includes understanding home environment, neighborhood, and other potential sources of stress, shock, or support that need to be considered in designing a learning fitness plan.

Incorporating Cognitive Fitness: Brain health is central to education, both because it directly affects the learning process and because sound cognition is an essential life skill. To best serve students in this way, the Learning Fitness Instructor will build specific space in the school day to focus on cognitive fitness. This will help relax students, empower them to learn more proactively, and give them life-long knowledge of how to maintain brain health. This also includes activities to perform at home and at any time in order to help students develop a brain health practice that will support their lifelong learning.

Learning Partner (Sociogogical Apprentice)

Students themselves are learning agents. In the networked, producer-oriented media environment, students can demonstrate personal agency in their own education and learning. Studies have described how youth engage in new media activities such as multiplayer games, simulations, mash-up media activities, and other creative, problem-solving activities are inspired and motivated to seek out, create, and share knowledge. Learning Partners (or Sociogogical Apprentices) co-create and co-learn with each other in environments that are structured to tap into passion-based inquiry.[50] Each year, students are paired together as each other's Sociogogical Apprentices for the school year or sometimes longer. Beginning-of-year testing matches students

[50] *Minds on Fire*, John Seeley Brown and Richard Adler, 2008

with other students who test for compatible personalities but different cognitive strengths. These pairs support each other throughout the year, maintaining a constant thread in shifting peer relationships. They are responsible for teaching each other basic content: for example, each might learn different areas of a subject or field and then impart that to the other so that through the peer relationship they can learn and experience a broad range of content. They are buddies in a crafted learning journey that is intended to provide open-ended but semi-structured learning inquiries that cross disciplines and skill domains. Periodically, they check in with their Learning Journey Mentor.

Learning Partner relationships emphasize the value of everyone being a teacher and a learner. They offer an opportunity for collaborative learning that matters, as learning partners need each other to complete assignments and projects, as well as to fully learn concepts and skills.

Collaborative Learning Structure: Collaboration is a student norm—students learn by doing *with each other*. Learning Partners are a formalization of this principle, allowing students to build social and intellectual relationships with peers. Students will inspire each other, learning more quickly and effectively, and learning on their own terms.

Empowering the Educator: A single educator cannot co-create and co-learn one-on-one with every student. The Learning Partner model lets every student enjoy this rich learning experience, and it frees up the educator to support, facilitate, and intervene only when necessary.

Learning Journey Mentors (LJM)

Many kinds of professional and paraprofessional educators, specialists, and community members may engage directly with learners to explore and co-create as a Learning Journey Mentor. LJMs work with Community Intelligence Liaisons, Brain Fitness Instructors, Personal Education Designers, and Assessment Designers to plan and guide small groups of learners through a learning itinerary. Small groups of Learning Partners are formed and function almost as solidarity circles that help each other meet learning objectives and reflect on their experiences. Learning Journey Mentors are well-versed in collaborative digital media, and they build effective social learning environments for their students. They often join up with other LJMs online in massive collaborative learning events and collective problem-solving exercises.

LJMs model effective learning strategies, approaches, and practices. Through their own professional or experienced-based authority LJMs provide an example of ways of becoming a learner and practitioner in distinct fields (scientist, artist, author, etc.).

LJMs are critical learning agents because they show by example ways of learning and how to lead a life as a learner in many different kinds of contexts.

Integrating the Multiple Dimensions of Learning: As students engage in a variety of dynamic learning experiences, ranging from cognitive fitness exercises to immersions, the LJM will provide a sense of stability and trust. They will help the student discern high level intellectual patterns and personal growth across their multi-dimensional education.

Maintaining the Interpersonal: The LJM will maintain and protect the essential interpersonal component of learning. They will help personally inspire and challenge their students, giving a human voice to the student's varied learning opportunities. And this mentorship can serve as the strong backbone of learning process.

Assessment Designer

Several forces are converging to highlight the need for a new approach to assessment: new understanding about neurogenesis, new media learning platforms, new learning theories, increasingly diverse learning populations, unbundled learning experiences and programs, and open education resources. As curricula change to embrace these forces, new forms of assessment will be necessary to provide effective guidance and strategic decision-making to parents, learners, families, schools, and districts. Assessment design needs to evolve from a one-time activity to an ongoing relationship between learners and learning agents in the evolving learning ecosystem. Stephen Downes proposes a new approach for thinking about assessment as an open, community-based process rather than a closed, proprietary one.[51] He points to e-portfolios in which learners can showcase their work, task-based online games with equests and levels. These are systems by which players (learners) demonstrate their skill, make their performance public, and allow for a community of peers to recognize and even critique performance. In many creative learning fields, such as art, design, dance, theatre, martial arts, industrial arts, and other project oriented fields quantitative "tests" that measure skill are less effective and informative than public charrettes and critique processes, demonstrations, master-apprentice activities, and other reflective activities.

Assessment Designers are critical to establishing a new basis for teaching and learning in the open economy because they will help make assessment a dynamic process that informs achievement, instructional design and practice, and innovation in education.

Assessment Innovation: New forms of teaching and learning will require new assessment models. What is rhetoric, clarity, and consistency in a transliterate world? What are effective sociogogical activities? In a connectivist approach to learning, when has something been *learned*? The Assessment Designer will provide insight into how to develop student abilities in an environment of new learning strategies.

Modular Assessment: In an environment of personal learning journeys—for both students and educators—assessment approaches cannot be completely uniform. To best allow students to evaluate themselves and educators to evaluate their own teaching, the Assessment Designer can synthesize across learning experiences to craft assessment modules, which are flexible enough to enable self-evaluation in different contexts.

Rudder for Innovation: The open economy of education will invite rapid prototyping of learning strategies and curriculum. Amidst this constant change, the Assessment Designer will help guide the innovation process, helping identify which iterations are most effective and which should be re-examined.

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[51] *Open Source Assessment*, Stephen Downes, June 6, 2007. http://halfanhour.blogspot.com/2007/06/open-source-assessment.html

Social Capital Platform Developer

The open economy operates on connectedness, collective action, and the creation of shared resources. This means that technology infrastructures need to shift from a technical focus to a social one. Educational organizations like schools and districts need to design and develop social, collaborative platforms that have mechanisms for building profiles, social capital, and reputation—the currencies for exchange, interaction, and assessment in the open education economy. Social Capital Platform Developers are skilled in designing environments and architecting systems that allow collaborative work to be visible and documented, provide low barriers to contribute to collective activities, and aggregate contributions from many into higher value learning assets for the broader learning community. Social capital platforms track contributions to open education resources, feedback on others' work, responses to inquiries, involvement in ad hoc learning experiences, helpful links, and references, documenting them in a public format that helps build reputations and status within a learning community. Accrued social capital is currency for further favors, requests, and contributions from other learners and educators, such as requests to contribute to a data collecting project or commentary on a piece of writing or media creation. The system doesn't discourage new users because teaching another person to use the system awards the highest points of all.

Social Capital Platform Designers are instrumental in creating systems that make learning interactions and relationships visible. This enables a new basis for assessment activities and new distributed learning settings.

A New Basis for Assessment: Social capital could become a new metric for assessing a learner's performance in a learning community. Platforms that are self-documenting (such as a wikis' public revision history that archives contributors edits) provide a window into the detailed interactions of learners in the process of learning.

A Structure for Distributed Learning: Social capital platform design is essential for keeping large decentralized learning communities connected and active. As education leaves institutions and locates in exstitutions and becomes integrated in online spaces, social capital will be an important form of trust and reputation holding learning systems and communities together.

Edu-vator

Edu-vators are the faculty members at the school and district level responsible for educational innovation. They run a kind of 'idea lab' for learning, building platform prototypes (social and technological), experimenting with new tools, evaluating new practices, and generally exploring innovations in the education sphere. They help identify which innovations are most viable, given the schools internal and community resources. Many learning agents will be adapting their strategies as they go, but an Edu-vator scans the fringes. The Edu-vator can help connect educators with radically new curricula; students with new gaming platforms; Assessment Designers with new assessment models. Brain fitness principles, open-source tools, assessment dashboards, educator networks—many enter school classrooms because the Edu-vator had the time to review them, and design and execute an adoption approach.

Teamed up with a small group of students who get credit for being in an "edu-vation workshop,"

the Edu-vator identifies which innovations will be most effective for the school and how to best incorporate them.

Edu-vators are critical for addressing the general lack of distributed innovation and experimentation across educational environments. They help address the gap between innovation in academic silos and experimentation and testing of new ideas in real learning environments. Educational innovation tends to be concentrated rather than distributed, and there are few mechanisms to allow innovation lessons to flow in and out of learning environments.

A Lab for Innovation: As dominant learning strategies disaggregate and many educators experiment and remix shared curriculum, someone will need to focus on harvesting all the new ideas and incorporating those that are most effective. The Edu-vator will identify which innovations are more promising and appropriate given local community resources and school student ability.

Letting Educators Focus: In an environment of rapid change and ubiquitous information, attention becomes its own invaluable resources. Learning agents only have so much attention to allocate to students, curriculum, collaborating, etc. The Edu-vator removes the burden of searching for innovations, allowing educators to focus more on students and the learning process.

Education Sousveyors

*Sur*veillance is watching from above, *sous*veillance is watching from below, and the Education *Sousveyors* help monitor the state of education from the bottom up. They are a mix of citizen-journalists, documentary filmmakers, bloggers, students, and other edu-citizens who help raise to public consciousness the previously untold stories and silenced voices in education. Proficient in multiple media and connected to diverse networks, they aim to stimulate public discourse around education on the local, regional, and national level. Flickr streams, blog posts, social network profiles, podcasts, and other participatory media streams can all help provoke critical discussion about what education means, what is just and unjust, and what should be done in response.

In an environment of distributed learning, community integration, and multiple learning agents, there are more stakeholders involved in the learning process and in the learning discourse. Information—in the form of stories, analysis, videos—helps them act effectively to hold society accountable for education and for shaping the public narratives around it. In helping make the education system and the learning process more transparent, they ultimately empower others to be genuine *agents* of learning.

Making the Invisible Visible: The Education Sousveyors will help shore wide the best learning practices and make known possible abuses. This opens the possibility of system feedback—more information in the hands of more people can produce a deeper understanding of how education can improve.

A New Space in Public Discourse: The Education Sousveyors will help education articulate its vision and purpose to wider society. This can help raise community awareness, stimulate political pressure, and raise education on society's agenda. Ultimately, they will help craft new narratives for education and ensure that those narratives are heard.