Designing the Earthstation Academy

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I had an interesting experience in mid-1998 during a trip to Chicago. I visited a Viacom store and saw they were selling graduation rings for Star Trek's Starfleet Academy. Since many of my friends think I'm from another planet anyway, I bought one of the rings as a joke. But when I put it on, a question popped to mind: What would the Starfleet Academy have to be like in order for me to be proud to wear its ring? I'm not a "Trekkie," but I've seen enough episodes and movies to have a sense of the theme. So, armed with my new talisman, I thought about our current educational system and asked if it would be able to incrementally move toward the kind of institution that would be needed to prepare people for the future of exploration described by Star Trek. In fact, I was wondering whether our existing institutions would be able to transform themselves to meet the needs of the next decade, let alone the next century.

At this point I decided to create a new post-secondary educational institution — one driven by the future, not one held slave to the past. By thinking about the future and extrapolating backward to the present, I thought that I might develop some insights that would be hidden from me if I tried to think in terms of incremental transformation. At loss for a name, I chose the Starfleet Academy (after all, someone needs to create it,) and called Patrick Stewart (the UCLA instructor and noted thespian who also starred in the Star Trek Next Generation TV series.) He was supportive of the concept but suggested that I use a different name since I had enough to do without wading through the contractual labyrinth I would encounter with Viacom. And so, with a change of name, the Earthstation Academy was born.

The parents of the Academy are challenge and opportunity: the challenge of meeting the needs of learners who will live in a world unlike that we now inhabit, and the opportunity to meet the needs of those who are finding themselves caught in the forces of change today. For example, we have made a transition into a world that values knowledge and the capacity to think. This shows up in any study of salaries over time. Our own study, based on data from the US Census bureau shows that the dollar gap between the median salaries of a high school graduate and a high school dropout in 1994 was larger than the dollar gap between a college graduate and a high school dropout in 1975. The median salary of high school dropouts leveled off

around 1987, yet the median salaries for college graduates and those with advanced degrees have been accelerating away from the pack. It is clear that what you earn is determined by what you learn.

The rapid growth of jobs that require good cognitive and technical skills has create severe job shortages in some sectors of the economy. For example, according to studies done by the Information Technology Association of America and the United States Department of Commerce, there were 346,000 vacancies in the information technology (IT) sector by mid-1998, and this number is projected to grow to 1.3 million vacancies by the year 2006. These jobs pay a median salary of about $45,000 per year — about double the median US salary in all fields. The educational requirements for jobs in this sector vary, but they do not all require a traditional four-year college degree. Even so, the number of jobs requiring two to four years of college is projected to grow from 874 thousand to 1.8 million between 1996 and 2006, while those for which a high school diploma is adequate are expected to drop from 481 thousand to 342 thousand in the same time period.

While the IT sector is not huge, it is growing and it has a big impact on the economy. According to Alan Greenspan, effective technology use is responsible for one percent of productivity growth and a one percent reduction in inflation. To grasp the impact of a shortage of workers in this area think about this: Imagine what the industrial revolution would have been like if we had run out of iron ore — pretty sad to contemplate, right? Now we are in the midst of the information revolution and we've run out of information workers.

The next big wave of development is likely to take place in the biotech arena. The field of bioinformatics — where starting salaries hit six figures — will grow rapidly as advances in biological sciences and engineering combine with advances in the information technology field to forge new areas of economic development. For example, companies like Affymetrix are developing "gene chips" that allow the identification of activity in 20,000 genes to be determined overnight at a cost of a hundred dollars. A year or so ago, this process would have taken six months and cost over $100,000. Other companies like Diversa are mining the rain forests for genetic information rather than hardwoods. Preservation of sensitive ecosystems is central to the future of such companies whose scientists collect tiny samples of biological material from the forests, test it for medicinal behavior, and determine the underlying structure of the biologically active components that can be synthesized in the laboratory. Affymetrix and Diversa are the tip of the iceberg in the newly emerging field of bioinformatics. This sector of the economy is poised for rapid growth. Where are their workers going to come from? Who is preparing students for these new jobs today?

There appears to be ample evidence that traditional colleges and universities are ill-equipped to meet the needs of those who will be learning for the rest of their lives. Most of us only hear from our colleges when they want financial donations. Neither Northwestern University nor the University of Illinois (the two schools I attended) has ever contacted me to offer courses once I left the campus. I am considered by them to be a potential donor, not a source of continuing income as a student. And yet, lifelong learning is essential for anyone wanting to thrive in the next century. Educational institutions that grasp this concept will similarly thrive.

Rather than have the Academy curriculum follow the time-honored (and hopelessly out of date) models perpetuated by the ivy-clad institutions of my youth, I decided to start by asking what skills were deemed important by those who would be hiring our graduates. In conversations with leaders from numerous companies across many industry boundaries, I identified a few needs that most potential employers had in common:

- *Collaboration*
  The day of the lone wolf is over. Most corporate projects are done by teams, and the capacity to collaborate on projects is a requirement in most companies.

- *Cultural diversity*
  The global marketplace requires an understanding and appreciation of cultures different from our own. This makes the capacity to work well across cultural boundaries important for all workers in the next century.

- *Technological fluency*
  It is not enough to just know that computers and communication tools are useful — today's workers must be fluent in the use of these tools. This means knowing how to use the tools to gather information, prepare reports and presentations, and analyze data with the same ease that we read the morning newspaper.

- *Systemic thinking*
  The rapid increase in complexity and the collapse of time between cause and effect requires the capacity to think in terms of whole systems. Patchwork solutions to problems that fail to consider a larger context will fail, long term, and are more likely to produce disastrous consequences now than in previous times.

- *High tech/high touch*
  While employers want technologically fluent employees, they also want employees who lead balanced lives. Workers who lack people skills and lack hobbies or interests outside of work also lack the creativity and depth needed to thrive in the marketplace of tomorrow.

- *Excellence*
  As the value of a product relies more on its informational content, excellence in design, service, and in the relationship between producers and customers will be a major determinant of success for most businesses. Workers need to have a deep sense of what constitutes excellence and strive to deliver excellent service at all times.

- *Pride/loyalty/ethics*
  As most people will have multiple careers in their lifetime, a core set of standards becomes the one constant that moves with them from job to job. Pride in craftsmanship, loyalty to a project team and ethical behavior are all attributes that make it easy to move from career to career during a lifetime.

I found it interesting that this list of attributes is the same one reflected in Star Trek scripts!

The Academy will pay close attention to this list of needs as we design our curriculum. In addition, we will work to insure that every educational activity is both rigorous and relevant. The balance of rigor and relevance has been explored by Bill Daggett and his colleagues at the International Center for Leadership in Education. Traditionally, the curriculum in US schools has focused on rigor without also demanding high levels of relevance. This results in people who have abstract skills in some fields, but who may not know when these skills should be applied to problems they encounter in the world outside of school. For too many years our educational system has operated as if we believed that content was king. In fact, in our world of exponentially growing information, *context* is king. An educational program that provides learners with a highly contextualized learning opportunity will have high levels of both rigor and relevance. It is this combination that is sorely needed by today's employers, and will be needed even more in the future.

The Earthstation Academy will exist to meet the needs of its students and will provide a balanced instructional program that prepares them for life outside of the classroom. The overarching theme of the Academy will be communications: Communication through writing, oral presentation, storytelling and other traditional ways that humans share information and ideas with each other in a variety of languages across the planet. We will also explore the communication of mathematical concepts, with special focus on the twentieth-century mathematics of complexity, chaos and fractals — mathematical domains that are increasingly finding application outside the cloistered halls of academia. Other communication domains of interest include those built from the zeroes and ones of computers and the bases A, C, T, and G which form the alphabet for DNA and the language of genes. This

communication focus balances the human aspect of communication with the world of science and high tech — a balance that is sorely needed.

This balance is one of several components of the Academy's instructional model:

- *Humanities/Technology balance*
  Unlike traditional trade schools, the Academy will have a broader focus in which math and myth will be on equal footings. This will address one of the needs we hear time and again from corporate leaders.

- *Certified, not accredited*
  Current post-secondary accreditation, in my opinion, is one of the factors impeding educational progress. I will consider the Academy to have failed if I find that it qualifies for accreditation under the current standards. Instead, our courses of study will be certified. This means that corporate leaders will be asked what skills and habits of mind they need in new hires. If we claim to have Academy members who have achieved these skills, then they should be virtually guaranteed placement in any company who has contributed to the certification process.

- *Lifelong, not 2-4 years*
  Unlike traditional post-secondary institutions, the Academy plans on keeping its students for life. Academy members will always be invited to take part in new courses or activities throughout their career.

- *Just in Time, not Just in Case*
  Courses will be designed so that all learning is context-driven. Nothing will be taught without a clear connection to relevance in the learner's life. This stands in sharp contrast to the "Just in Case" model of education commonplace in my youth where we were taught things "just in case" we needed them later.

- *Learning constant, time variable*
  The Academy will operate on the assumption that our students learn at different rates from each other. The only grade a student can receive for a course is "Excellent." If a student is able to achieve excellence in a few weeks, that's great. If it takes a year, that's great as well.

- *Learner focused*
  The requirement of achieving excellence also encourages instructional designers to consider various learning styles and dominant intelligences among the learner population. The pedagogical work of Gardner, Piaget, Vygotsky and others will be reflected in all aspects of the instructional program. In fact, our approach will be project-based and it is more

accurate to think of replacing the concept of instruction with co-construction or co-creation with the faculty and students learning together.

- *Futures oriented*
  According to James Bailey (as reported in his excellent book, *After Thought*), the major change in K-12 math instruction in the past several hundred years has been the translation of the textbooks from Latin to English. Our courses will build on the knowledge of the past that remains relevant, but will have a strong emphasis on the kinds of things that we believe people should understand in the future. This is less risky than it seems, since the overarching skill set needed to thrive in a world of rapid change is far easier to specify than the detailed events of the future itself. For example, it is a safe bet that disruptive technologies will emerge at a rapid rate, even if we can't tell in advance what these technologies will be.

While courses will be offered in many subject areas, there is an overarching structure to the courses that we will follow:

- *What I hope to learn*
  This is a short presentation describing what the learner hopes to learn from this class. It might take the form of a written paper, an audio recording, or it may use multimedia.

- *Concept map of current level of understanding*
  Concept mapping is a tool for concisely expressing what you know about a topic in a graphical manner.

- *Context-driven course activities*
  Each course will have an overarching question that can be resolved by mastering the course content. As with everything in the Academy, context is key.

- *Final project*
  The learner will create a final presentation addressing the main question asked in the course and share this presentation with a wide audience of faculty and peers.

- *Final concept map*
  The final concept map will be compared with the initial one so the learner can see the amount of growth of understanding that has taken place as a result of the course activities.

- *Evaluation (What did I learn and how do I know I learned it?)*

A final presentation evaluates the course and measures it against the learner's initial concept. Any bugs or flaws in the course can be described so they can be repaired.

While my original thought was that the Academy would have a physical location (In San Francisco in sight of the Golden Gate Bridge, for those who know their Star Trek), we will be launching our effort in a more ambitious manner to take advantage of the fact that this is the first time in history that the student, teacher, and content do not have to be in the same place at the same time. We will launch the Academy on the Web, thus making the entire globe our campus. (We will also be taking into consideration the needs of learners on the international space station and on Mars as those projects come to fruition.)

The decision to place the Academy on the Web seems obvious in some respects — the Web is the fastest growing communication technology in history. There are several challenges to Web-based education, however. The first is that there are many things that need to be learned in the physical company of others. We will have to address this through the creation of local study groups.

The second, and greater, challenge of Web-based education is to avoid putting old wine in new bottles. The Web is still in its infancy and our challenge is to find the new metaphors and tools needed to turn the Web into a useful educational tool. Toward this end, we are currently exploring three primordial learning environments whose analogs must be found before the Web can aspire to being an educational domain. These environments are the campfire, the watering hole, and the cave.

Campfires are the home of didactic instruction — the home of the storytellers who share their views with an audience of learners. In many cultures these stories were told around the campfire. Now that the campfire has turned into the glow of a CRT, we must insure that the new stories are as compelling as the old ones.

The watering hole is the home of peer-to-peer interaction — the place where people gather to share what they have learned in their village. In the domain of the Web, contextual chat environments created using tools like The Palace might meet this need.

The cave is home to introspection — the place where concepts are developed and ideas are synthesized into a meaningful whole.

Campfires are informational spaces; watering holes are conversational spaces, and caves are conceptual spaces. Any educational system — physical or virtual — that fails to address these three spaces in a balanced way will fail to

meet the needs of learners. The Academy will pay close attention to this, and this aspect of the Academy is currently occupying a significant fraction of our time.

How does one gain entrance to the Earthstation Academy?

Entry will be granted to anyone in the world who successfully completes two free introductory courses. These courses are not arbitrary hurdles to entry; they are courses designed to build two foundational skills that will be needed for every other course in the catalog: Concept Mapping and Information Literacy.

The Concept Mapping course provides the background information needed to understand the technique, along with an introduction to some computer programs that facilitate and extend this tool.

The Information Literacy course addresses three questions:

1. How do you find information?
2. How do you determine if what you found is relevant to the task at hand?
3. How do you determine if what you found is accurate?

The context for this course deals with the Alan Hill meteorite found in Antarctica. A micrograph of this rock seems to show evidence for fossilized bacteria — a discovery of great interest since this rock sample originated on Mars. Course participants will be expected to conduct research on the debate surrounding this discovery and to then formulate a position on whether or not this rock provides evidence for extraterrestrial life. This position must be backed up by reference to the numerous research papers that have been written on this discovery. This is an example of how abstract skills can be learned through a highly contextualized project.

While I have no firm date for the opening of the Academy, I hope to get part of it launched within a year. In the meantime, I hope that educators at all levels will think about ways that some of what we are doing might relate to changes appropriate for their schools at any level.

The task is too big for any one organization to handle by itself. My dream is that any good ideas we generate will be replicated far and wide by others for the benefit of all learners throughout the world.