

Out of this world education?

Every so often something very heavy becomes lighter. I was asked on short notice if I would write something that envisions an education system designed for a Lunar or Martian settlement. This was for a symposium of the Space Studies Program, a gathering of people from multiple nations on issues of space science and policy offered by the Florida Institute of Technology (<http://cos.fit.edu/pss/>)

I started writing the essay thinking about the question "*How would you design an education system if you were part of a group colonizing a planet or satellite in our solar system?*" I immediately realized that this is a wonderful "thought problem." It calls many aspects of education into question here on Earth and, in particular, in the United States where we take a great deal for granted about our education and learning landscape.



This type of thought problem focuses us on just how limited and limiting we are with even our most ambitious reforms. A nation with so many resources and such generous foundations seems to think very narrowly about what is possible in education.

The deeper I got into the essay, the more difficult it became for me to get lift-off from this planet. I realized that we rarely go back to first principles and ask ourselves "What do we need in an education system now and for the future, and how would we get there from here?"

Instead, we spend an immense amount of time and resources trying to fix the old system. But what if the old system is not fixable, especially our high poverty cities and rural areas? So, for the essay, I contrasted a hierarchy of education control, what we have now, with a hierarchy of education processes, what we would need off the planet.

Not surprisingly, this approach seems aligned with the education transformation we need on Earth so our children can keep up with the rapid transformation in all other aspects of society. We need to constantly engage and prepare all of our young minds to be committed future citizens and innovators.

Thinking more practically about a colony, other thoughts cropped up which suddenly sounded whimsical. How would we transport all the textbooks and the white, green, black and smart boards and the desks and chairs? Would we be obliged to fund teachers' unions, schools of education, and policy forums?

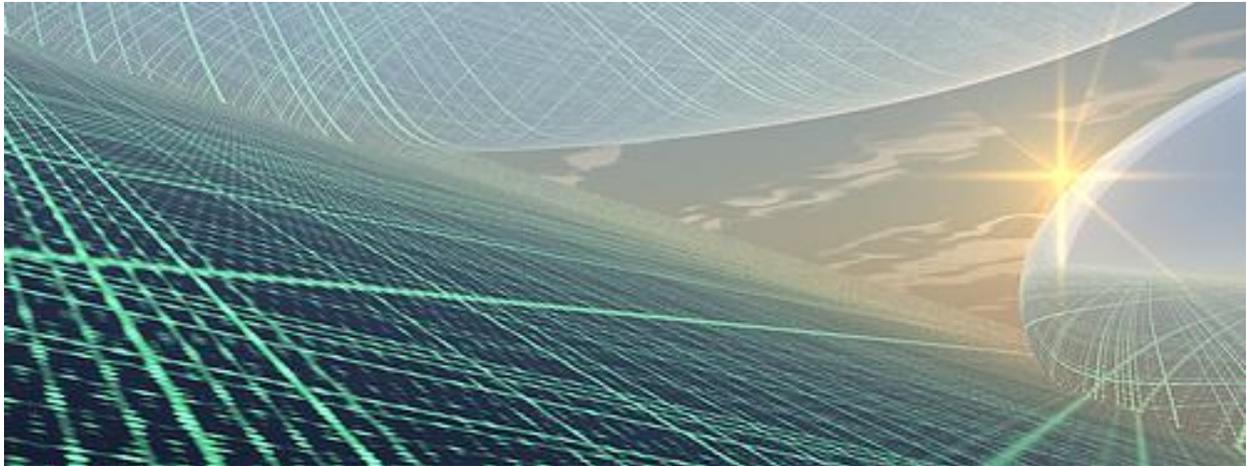
Then I started to think loosely about more whimsical questions. How would we transport all the textbooks? Would we be obliged to fund teachers' unions, schools of education, and policy forums?

This kind of thinking about moving off the planet automatically focuses us right back on the situation here, which is something that we urgently need to do before we can move on. We need a lighter, more nimble system as well. As a result, NLET will initiate a project to see if "extra-planetary education planning" can be a useful tool for us to expand our imaginations about education at home on Earth.

The full version of the essay, *Engineering Extra-Planetary Education*, captures these thoughts in greater detail and includes an exercise. Please read on...

Engineering Extra Planetary Education

This essay about planning for education on an imaginary planet or distant space station was written as an exercise in response to a request from a presenter at the 2012 International Space University Space Science Program. The author, Gordon Freedman, is president of the National Laboratory for Education Transformation, www.NLET.org, a California-based non-profit dedicated to modernizing our education systems.



PART ONE: Education Here on Planet Earth

For those of us dedicated to changing education on our patch of planet Earth, we are rarely presented with the big questions about architecting a future system. No-one asks, *“what would you do if you could start over again and build an education system more suited for the times we live in and for the type of young people we have today?”*

If such questions were asked in earnest, we could open the aperture of imagination and increase the attention given to what employers and society need from our young people. Instead, we contemplate pushing more students through the current system with higher success rates at the same time as trying to “fix” the traditional structures. *Fixing* is just not cutting it.

There has been no truly significant change over decades of reform and improvement schemes in education. The best we can hope for out of the current regime of school data collection, national standards, and the need to go to college is that we will train the system – *not necessarily the students nor employers* – to comply with a more uniform and somewhat better set of standards. Such a system will produce marginal gains in communities with sufficient funds, but it will not address our deepest rooted questions tied to inner cities and poor rural areas, or tied to wealthier areas not interested in learning math or how to write well; and it won’t fix the fact that we are not attracting an intellectually diverse and highly qualified base of teachers.

So, when Caroline Hardman, NLET’s volunteer Project Coordinator, phoned up and said she was presenting at the International Space University Space Science Program 2012 at the Florida Institute of Technology, I was all ears. She posed the question that never gets asked: *“What might an education system look like that could service an advanced extra-planetary outpost?”* This question is not just intriguing as a science non-fiction exercise — the same question should be asked here on Earth.

Humans have a marked tendency to hold on to current reality, outlooks and practices, and only under duress do they seem to change. Education from pre-K through community college is a public enterprise that is not overseen by any single organization, and it has come to represent a set of inter-locking interests that do not scan the horizon for necessary changes to better serve the society in which they operate. In fact, education is not organized to do this. We run schools almost separately and apart from the rapid changes that sweep through civilization every few decades. On a small human outpost elsewhere in the solar system we could not afford a structural disconnect between what is learned and what is needed. There would be no place for promotion and graduation failure rates in middle school, high school and college at the phenomenal rates we have in the United States, the wealthiest nation on Earth. And, the varying notions of purpose in our schools and colleges undoubtedly would not make sense in a new setting.

If our schools, in their current form, were replicated on a Moon or Mars base, I suspect we would begin to plant the seeds for habitat destruction and population collapse. If you have to rely on the transfer of knowledge between human minds from one generation to the next to survive, you would have to do so in such a way that there is very little slippage between mission and output. Otherwise, you can imagine the scenario one might encounter of a civilization unable to replicate itself because its education system could not sustain the vital and flexible minds needed in an environment of rapidly changing variables and the need to anticipate and respond to a wide range of threats.

If we consider the unemployment rate in the U.S. and elsewhere in the world and the number of jobs that are being engulfed by technology, it could be said we are already in such a world today, one where our education systems are misaligned with the realities outside of the formal education “bubble.” This bubble is like an outpost in our current society, operating under old rules and technology in a very new, vibrant and unpredictable world.

Also, the problems with education on Earth are large, but most of the people who grapple with large policy questions do not have direct contact with urban and rural poverty nor with the education realities in those communities. To them, the statistics do the talking, not the actual experience of a family on government subsistence trying to maintain a learning environment for their children. To the policymakers, the collapse is not readily apparent. However, carrying those who cannot meaningfully participate in the economy and social stability raises the costs for those with jobs and good education. On an extra-planetary base, this situation could not arise as it would surely be disastrous to the fragile interior economy and polity. There would be no margin for error. On Earth, there are safety nets.

Extra-Planetary Base Planning

Space travel until now has been entirely technical. While some social innovations were necessary to create the organizations to build space delivery systems, the planners of yesterday did not have to consider the social architecture necessary to support societies away from Earth. I can remember when my oldest son was in a special science program that had, as a penultimate project, the construction of cities of the future. He made a wonderful world under multiple domes. I told him it looked great, but I asked a question. “What happens if someone breaks the law?” He looked at me in a way that made me instantly realize that I might have burst his fourth grade sense of human reality. Technical systems will pale in comparison to social systems in the future. What will the culture of the early space ports be? How will education and learning play a role? Will they learn the history of Earth, study World War II, or recite the Greek poets?



Education and learning systems undoubtedly have common elements on Earth as they would elsewhere. However, these common elements are difficult to discern from our current perspective. They tend to be buried in plain sight, cloaked underneath the fog of school boards, teacher unions, textbook companies, drugs and alcohol in school, and the dominance of vertically organized hierarchical management structures. Obscuring of education purposes by the realities of traditional schooling is now a common problem here at home — one we will need to avoid if and when some of us move off the planet.

What Does History on Earth Tell Us?

In some ways, we have already lived the issues of colonization in a “new world.” The establishment of the North American colonies by European seafarers provides a clear example in terrestrial history of the relationship between colonization and education. There are stark variations in how this occurred and what resulted. One historical analysis shows how education purposes and methods from England, Holland and Germany informed life in the North American Northern European colonies. Another examines the Central and South American colonies of Southern Europe. Yet another divides education activity in North America between pre-Revolutionary War America and the rise of the United States.

Three to five centuries later, the dynamics arising from progress in North America continue to contrast strongly with development in Central and South America. If we asked the relative historical importance of education in the North versus the South, perhaps the reason is clear. Education was a mainstay of both colonial America and Canada and it was assumed, though not legislated, to be a right after the United States became a nation. On the other hand, the Spaniards disallowed formal education in their colonies for centuries and even punished those who tried to establish schools. The results are reflected in the contemporary GDPs of the countries of the North and those in Central and South America.

At first, education in the American colonies had a religious or moral purpose, to better serve God. But it soon developed a secondary mercantile and commercial purpose. Learning to read and write, required of all the members of the Massachusetts Bay Colony, turned the Puritans into the most literate society on Earth in pre-revolutionary America. The founders of the Colony were from Cambridge University and they built the first university in North America, Harvard College. As life in the colonies gave way to a new young nation, well-developed skills and capability among its people were necessary to rapidly build a new republic capable of being a nation among nations. Soon the religious purpose of education fell away and was replaced by the academic and moral education that would be needed for the emergent civic culture of the early United States. The models that resulted were the roots of the aspiration of universal education that swept across the world.

In Revolutionary America, there were three founders who advocated education, each promoting a variation. Thomas Jefferson, who founded the University of Virginia, believed in an academic education, exposing the young to the wonders of science, writing, and politics. Benjamin Franklin believed in the trades with their systems of apprenticeships. Benjamin Rush believed in a moral education. Each of these important figures outlined a type of education necessary for a colony to turn into a country. Today, we know each is important. These gentlemen did not believe in control above all else; they envisaged processes for encouraging knowledge, skills and beliefs to flow from one set of humans to another. Today, the world of education is highly structured; and much is lost because rigid systems of control overrule flexible processes for learning.



PART TWO: Planning for Education in an Extra-Planetary Colony

If we contemplate a hierarchy of processes as opposed to a hierarchy of control, we can begin our extra-planetary planning. By hierarchy of processes, I mean what we are trying to accomplish in new education systems for an extra-planetary colony and how we will accomplish it. By hierarchy of control, I mean an education structure driven by top-down management that is dedicated to delivering a traditional program and that is disinclined to alter that structure based on logic, pressure from the outside or from learners on the inside. The U.S. space program and other national space programs had to alter their processes and controls in order to accomplish things that had never been accomplished before. Similar things will have to happen in education off (and on) our planet.

To design and engineer education on a distant colony, a hierarchy of processes could be imagined and one might be organized this way.

1. **Purpose:** Why are we educating, and to what end?
2. **Methods:** How are we educating, and by what means?
3. **Content:** What are we educating with, and how does it fulfill the purpose?
4. **Stakeholders:** Who is being educated, and who benefits from the education?
5. **Stewards:** Who manages the education process, and what qualifies them?
6. **Measurement:** How do we know the education has been absorbed, and who else knows this?

These six areas and the questions that enliven them are not asked on a routine basis in education discussions here on Earth because the traditional system, based on an established and largely unchangeable set of patterns, is considered to be fixed and, in many ways, is above question. Our extra-planetary system, as we discussed before, can take no such chances.

Exercise

As planner for education in a new space colony, prepare answers to the following.

Instructions

Only consider taking from your home planet Earth what you think will work well or better in the new colony. Do not automatically think about the culture of practice on Earth. Terms like *school*, *teacher*, *principal*, *textbook*, *classroom*, and *grades* are all cultural and traditional Earth-bound terms. They do not describe fundamental processes and functions of education, but are descriptors or labels for the structure of education as practiced on Earth during the industrial era. The processes for the information era have not yet been designed. The planning you do for a new colony could easily apply to this planet as well as the next.

Purpose: Why are we educating, and to what end?

A clear purpose has to be established. Are you educating for general knowledge, for learning skills, for moral and ethics, or for some mix of these? Can you state the purpose of education in this colony? Survival, replication, evolution or other type of purpose is fine to explore. We educate in the world today using a mix of academic knowledge that is generally felt, but rarely stated, to be needed as a default to be active globally. Most public systems on Earth teach versions of civic understanding and engagement and reinforce proper behavior between people. What purposes do you see for education on your new colony? Is it about knowledge transfer, moral uniformity, or understanding?

Methods: How are we educating, and by what means?

On Earth, despite having an abundance of new and socially acceptable methods in the technology, science and business spheres, formal education is still largely carried out by a single methodology in a single structure. Alternatives to this system are rarely discussed. How would you use the following methods to carry out education on your new colony? Can you think of others?

- Peer teaching
- Technology networks
- Smart technologies
- Access to experts
- Apprenticeship
- Project Based Learning

Content: What are we educating with, and how does it fulfill the purpose?

Where does education content come from? Who is responsible for it? Does it look backward or forward? These are critical questions that surround the issue of what do you want to put into and help to evolve in young developing human minds on the new colony. Are all learners also creators and active participants in their learning? Or can learners opt to be passive, as many are here on Earth? On Earth, we have cultures and nations devoted completely to education as the highest value of a society. We have others that argue for its importance, but do not make it the top priority. In every case the content is key. Do you have math instruction, or must students master technical devices to acquire learning in this crucial area? The questions of content are myriad. How will you constrain them?

Stakeholders: Who is being educated, and who benefits from the education?

Employers, government, students and families are the beneficiaries of education. They are the ones who consume the end product. On Earth, they often have little say about what education is. Instead, they are reliant on separate structures to produce graduates, some of whom are useful in society and some of whom are not. On your new colony, how can you have education serve the stakeholders directly? How can you make sure general principles that might not be immediately important to the stakeholders are nonetheless part of the new system? How can you include the learners in the process and make them the critical stakeholders, not just passive players in a pre-ordained, scripted delivery?

Stewards: Who manages the education process, and what qualifies them?

The people, or machines, running the education process only consume a small percentage of their product. They are not the primary stakeholders of education, but they are its stewards. How do we create a class of stewards, or program the processes, that will make sure that education does not become stagnant and disconnected either from the needs of the colony or from the ways young people learn and interact? This requires thinking about how an education system is constructed, who runs it, where does it get its funding, and how it remains vital over time?

Measurement: How do we know the education has been absorbed, and who else knows this?

Today on Earth most measurement of learning in education systems is held at the systems level, but not at the learner or instruction level. How can the measurement of learning become more of a central component in education, opened directly to the learner, the learner's immediate social network (family/team), and the instructor — directly feeding back into any technology used for these purposes? In the future, there may be other ways to peer into human brains and know what has been acquired. In other societies, making learners immediately and over time teach what they have learned is another method that is very direct. Come up with ways to measure educational efficacy on your new colony.

***End Note**

International Space University (ISU) Space Science Program 2012 at Florida Institute of Technology

Each summer, ISU offers an intense nine-week course at rotating locations for post-graduate university students and professionals in all disciplines. Courses cover technical and nontechnical space-related topics, including technologies, physical science, satellite applications, life sciences, policy management and social sciences.

