have an academic fantasy. It is of a virtual Global University existing within our current universities. In this Global University, a select group of students from any number of participating brick-and-mortar institutions from around the world would contribute, and these students would spend their four undergraduate years answering one question per semester or per year, depending on its depth. The questions would encompass a number of contemporary global challenges. Here is just a sample of what the students might study:

- How to work toward environmental sustainability on a comprehensive scale, including prevention of global warming and of the extinction of many species
- How to create international jurisdiction and substantive law in order to settle legal disputes
- How to shape a developmental model of a global economy that distributes resources—including education—equitably and fairly around the world
- How to inculcate an understanding of local or national culture, history, and traditions sufficiently to encourage tolerance of each other's religions, manners, and mores
- How to deploy all layers (physical, logical, and applications) of the Internet while also developing international governing bodies and policy principles for information and communications technologies, including search engines and the repositories of information and knowledge
- How to optimize agricultural research on a global scale in order to eliminate starvation and hunger
- How to research, manage, and treat disease—and thus provide reasonable health care, including pharmaceuticals—around the world
- How to understand the human condition through the study of cross-cultural and transhistorical art, literature, languages, and humanities
- How to live the ethics of scientific research, whether it be the exploration of outer space (and its expenses, given other needs), particle and nuclear physics (and the creation of such devastatingly destructive technologies), Internet and data networking technologies (the use of highly flawed proprietary operating systems without consequence to the companies making profit, notwithstanding the consequences that result to users from those flaws), or genomics and the creation of species for which we do not yet know all of the intended, or unintended, consequences

Students would approach these questions through traditional courses and disciplines at their home institutions. Their choices would require them to take everything from math and physical sciences and engineering through the social sciences, arts, and humanities. This project would turn traditional education on its head. Instead of the study of each discipline for its own sake, this approach would place traditional learning in service of the larger questions that frame our lives. Moreover, educators would no longer simply push information out to students, as in the traditional format, but would advance more dynamic learning functions.

Although face-to-face exchange would be built into the program, much of the interaction among participants would be done virtually. The virtual experience would draw on any number of existing and future technologies: course management systems, tele/videoconferencing, online digital archives, and even shared open-software administrative systems could be a part of the process. A student who is working on environmental sustainability might take biology, chemistry, archeology, and history in traditional classes in the home institution, but he or she would also take a remote course that addresses a discrete aspect with a particular professor. For a case study, the student might want to focus on a geographic location different from his or her own. Almost certainly, students would want access to resources housed at the remote locations. Transparent technologies would encourage students from different countries to work together on projects.

Higher education institutions face many educational, financial, and governmental, as well as technological, barriers to achieving such a vision. But the technological barrier is probably the least significant. Essentially, the technology exists to realize this fantasy. The world, according to Thomas Friedman, is flat. Its “flatness” relies significantly on technology: a network of fiber-optic cables that make up the physical layer of the Internet; personal computers, the hypertext and markup languages of the World Wide Web, browsers, interoperable systems and applications; search engines consolidating more and more information
in as many languages as bequeathed to us by the Tower of Babel. Excluded from Friedman’s list is what technologists call middleware—the technical glue that would enable all of the other pieces he credits.

Middleware is the software applications that can bridge network systems between and among institutions. Authentication mechanisms lie at their functional core. Participating institutions can use each other’s resources without having to enroll each student in every institution. This approach avoids multiple accounts and the duplication of electronic identifiers and passwords. Middleware makes the multidimensional exchange of virtual real-time communications or classroom experiences achievable. It provides facilitated and appropriate access to proprietary resources or digital archives housed in remote locations. Middleware allows a U.S. student to take a course in American history from Beijing University and allows students from all over the world to collaborate synchronously on an economicsustainability project. In short, middleware is the technology that makes the fantasy of the Global University possible.

InCommon exists with the purpose of deploying such technologies. InCommon (http://www.incommonfederation.org/) is an organization that provides participating clients with a trusted framework for the use of authenticating technologies. Legally, it is a limited liability company whose single “member” is Internet2, but the company is composed of InCommon participants. The Steering Committee bylaws outline the purpose, membership, and voting requirements of the company. To join, a member must be willing to sign and adhere to a participation agreement, including a fee schedule, and must operate technologically according to certain practices outlined in the Participant Operational Practices. After becoming a member, each participant must work within the federation according to certain group practice and procedural rules.

InCommon currently uses Shibboleth as its technology. This technology connects the identity management systems between—and as a federation, potentially among—individual institutions. For example, if the U.S. student wants resources at Beijing University, she can authenticate to her home institution’s network. Shibboleth will act as the bridge between her institution and the authentication mechanisms at Beijing University. This system preserves both the student’s privacy and the integrity of Beijing University’s resources. Thus, what an institution “buys” when it signs on to InCommon is the middleware software that makes the technical connections between institutional directories and identity management services. These technical connections appear as “assertions” that pass between the two entities. Of course, what the institution really buys is an unprecedented range of opportunities for remote resource and information sharing, collaboration, and communication among peoples.

InCommon is currently open to two- and four-year degree-granting, regionally accredited institutions. Higher Education InCommon participants may sponsor nonacademic partners for participation in InCommon. A sponsored partner is an organization that makes online resources (i.e., information or services) available to individuals or groups. So in a sense, in hatching my virtual Global University fantasy, I am getting a little ahead of myself in terms of the existing administrative structures. But as usual, the technology is ahead of the administrative structures that it can benefit. We must continue the work pioneered by Ken Klingenstein to create global federations.

Numerous complementary efforts are under way to make these structural kinds of connections. Internet2, which sponsors and supports InCommon, is working with a number of other federating agencies, or federations, on both a national and an international scale. For example, the E-Authentication Federation (http://www.fmcsa.dot.gov/eauth/federation/) involves a similar effort within the U.S. government, and to date there are four other national initiatives: the Federated Electronic Identity, or FEIDE (http://www.feide.no), Norway; the Haka Federation (http://www.csc.fi/suomi/funet/middleware/english/), Finnish universities, polytechnics, and research institutions; the Shibboleth Development and Support Services (SDSS) Development Federation (http://sdss.ac.uk/), the United Kingdom; and the Swiss Education and Research Network, or SWITCH (http://www.switch.ch/). The very process of creating these national federations, which will in turn partner with other federations, offers lessons in how to create governance structures for an international community—structures that could give meaningful lessons on how to create international jurisdiction. The process of building federations might contribute to the dynamics as well as the substance of “international law,” at least insofar as it applies to data networking.

I confess my real fantasy is that we, as citizens of the world, can find ways to address challenging global questions. Higher education’s missions pursue and provide knowledge for its own sake. Collaboration among institutions of higher education represents the best means we have to perhaps overcome what otherwise seem to be insurmountable obstacles of poverty, disease, hatred, and war. That the technology exists to enable the communication that could address these problems turns the opportunity into a virtual imperative for people who take such matters to heart. Why not, then, pursue some fantasies?

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