

A Systems Approach to Community-Based Space Education

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A case is made for identifying the systemic problem of education as an inadequate system of educational subsystems. Realization of an “elegant” system of subsystems however will require overcoming three major challenges. As a start to learning how these challenges might be overcome, a proposal is being made to the Huntsville Association of Technical Societies. HATS is a regional umbrella organization of many technical societies and associated organizations in north Alabama and south central Tennessee. The proposal would have HATS co-ordinate and facilitate co-operation and collaboration (CCCing) among those programs and projects of its Members that would be relevant to the design of two port cities, one on the earth and the other on the moon. Many advantages of such a systems approach are foreseen for STEM (science, technology, engineering and math) education at all grade levels, for innovative thinking, and possibly even for new economic growth.

I. Introduction

The first point needing to be made is that children learn every waking moment. They learn different things, in different places, in different ways, at different time and at different speeds. In addition the world and the nature of work are changing rapidly and so too are the educational needs not only of children but also those of adults. Any one school system thus is not equipped to define and to meet all the varied en masse educational needs of the population.

Many community groups, companies and government agencies seek to help schools, but their efforts are mostly uncoordinated and often competitive with each other. As a result large amounts of time and money are devoted to fund-raising rather than service directly to the mission. Further, administrative costs and inefficiencies abound and the public left bewildered and besieged. Still further, all of this uncoordinated activity results in little or no collective learning that could provide a solid basis for logical future expansion or development. Clearly, what is needed is a better system of community organizations, one calling for higher levels of coordination, cooperation and collaboration (CCC).

But what kind of system might this be? Modern system studies teach that in a system every part is related to every other part. You just cannot change one part without affecting all the other parts. So any changes have to be compatible with every other part of the system. A system where such compatibility is realized is called elegant and its design is one that meets the following criteria.

“--- an elegant design is one which produces the intended result, is both robust and efficient, and generates a minimum of unintended consequences.”

ex NASA Head and current Director of the Center for System Studies, Michael D. Griffin

Nature provides many examples of elegant systems. The phenomenon of a flock of birds flying in a V formation provides one that holds lessons for design of community-based systems. The lead bird in these V formations do the hardest work but followers in their wakes have to expend less energy. Lead birds are relieved as they tire by follower birds making the total V formation a process in which leaders and followers are continually changing places. The total formation thus is quite energy efficient. Also the maneuverings of various flocks – some of which

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are quite spectacular – are made possible by communications systems in which each bird provides both information and reaction, i.e., information such as warning of an approaching enemy bird and anticipatory action such as reacting to warning signals much as humans do in “waves” at sport events.

An elegant community-based educational system thus is projected to be one in which the leadership and followership roles would be shared by its various member groups on some sort of rotating basis and in which each group would be part of a bird-like communication system. As it happens there are a number of umbrella organizations of one sort or another already in existence that do provide some of this bird-like organizing principle to their member organizations. However, all face to varying extents three major challenges.

The first, and probably the most important, is the lack of a clear and compelling vision. Defining a clear and compelling vision is hard work, especially in non-crisis times. When the Russians launched Sputnik the vision of a man on the moon was compelling for Americans. With the crisis over, the vision was no longer compelling, leaving NASA to have to continually struggle with program and budget designs.

Volunteer organizations generally either fail to recognize the need for a compelling vision or lack the management resources to seriously address defining one. Thus many organizations are readily formed because a few individuals think it is a good idea only soon to be disbanded because their visions were insufficiently compelling to attract substantial support.

The second challenge is the notion that leadership and followership are two separate, distinct capabilities. As previously mentioned, the leaders in a flock of birds flying in V formation have the hardest job but only for a time. Thus, if we take this lesson from nature, every organization in an umbrella organization, like a bird, has to be a leader or a follower at times. But how can this imperative be realized in a system of organizations?

As our birds in V formation demonstrate, each person or group possesses both capabilities to some degree. However the degree to which a person or group chooses to exercise either capability depends on their degree of commitment and on economic practicalities. For example, most parents feel varying degrees of very commitment to education. Some, whose economic circumstances allow, are committed to the degree that they become leaders in PTAs. Another example, a person having limited free time for volunteer work accepts a rather routine but very crucial followership task. His or her employment demands, however, escalate to a level where reliable performance of the volunteer task is no longer possible. Rather than just resigning, he or she becomes a leader by helping to recruit and train a replacement.

With regard to the third challenge, bird or human communication systems are still little understood. It is thus hard to prescribe a most effective one for any given mission. However, much can be learned by observation of umbrella groups in action and some experimentation. For example, we can ask if there is something unique about the communications systems of successful umbrella groups. Also we can experiment with things like cutting down on information overloads and jargon, enhancing presenting and listening skills, planning publicity strategically, increasing sensitivity to communication tones and body language, and anticipating how any communication is likely to be misunderstood.

II. Umbrella Organization

As mentioned previously there are many umbrella organizations already providing CCCing in various degrees to community groups. Examples include Arts Councils, United Ways, Homeschool Groups, PTAs, and so on. The one in the Huntsville, Alabama area that appears particularly relevant to enhancing STEM (Science, Technology, Engineer, Math) education is the Huntsville Association of Technical Societies or HATS and thus the one that

would be the most appropriate to approach about undertaking an effort to develop a more effective community-based education system.

HATS was formed in 1969 to coordinate the meeting schedules of its Member organizations. The vision eventually evolved however “to do those things done better together than alone”. Its current Membership consists of 23 Members, many being local chapters such as HAL5 and IEEE of national societies, and 10 Associate Members.

Past activities of HATS have included secretarial services, career counseling, conducting for twenty one years the annual Technical and Business Exhibition and Symposium (TABES), later renamed as TEAMS, and various educational programs. Current HATS activities include a Website, a Professional of the Year Recognition Dinner, a Holiday Reception and the STEDTRAIN (Science and Technology, Education and Training) Program.

The HATS STEDTRAIN Program provides grants to K-12 teachers in the north Alabama area for hands-on science projects in the classroom. In the first months of every year the HATS STEDTRAIN Committee issues a Call for Proposals to K-12 schools in the north Alabama area for innovative projects that will "seed" students enthusiasm for science and technology. The grant application is a simple on-line form. Grant amounts requested can range up to \$1000. HATS supplies administration and donors supply funding. Proposals are evaluated and rated by STEDTRAIN volunteers according to strict criteria. STEDTRAIN volunteers also conduct follow-up visits to grantee teachers' classrooms. Grantees report on their projects by means of mid-term reports and by brief overviews of their projects with PowerPoint presentations at an annual STEDTRAIN Conference. The program presently is focused on the five north Alabama counties of Jackson, Madison, Marshall, Morgan, and Limestone and Lincoln County in south central Tennessee. The program has been in existence since 1988. In 2010 the 23-year-old HATS STEDTRAIN Program raised and administered funds totaling over \$330,000 for more than 355 STEDTRAIN Seed Grants and other worthy K-12 programs in the north Alabama area. The seed grants and other activities are currently benefiting an estimated 10,000 students directly and about 20,000 indirectly. The accomplishments of the program have proved numerous and amazing. Further information on HATS and STEDTRAIN can be found at www.hats.org.

The HATS STEDTRAIN Program is a collaborative activity, but many HATS Members also have their own education programs. HATS thus is well positioned to explore strategies for coordinating the various educational programs of its Member organizations and encouraging cooperation and collaboration (CCCing) among them. The HATS Board is now considering a proposal described in the next section to this effect².

III. A Proposed Initial Step

A series of meetings of HATS Members would be held to define an official compelling visionary education project that would coordinate all of the separate educational projects of its Members. One such visionary candidate is the design of two port cities, one on the earth and the other on the moon. The two cities would be considered from the beginning as an earth-moon system. The mission of the moon city would be to provide the infrastructure for humans to conduct R&D and commercial development on the moon. The mission of the earth city would be to provide earth resources needed by the moon city and be a delivery location for resources and products transported from the moon. The concept has the following foreseen advantages.

² The views of the crisis in education problem here presented are the result of my experiences with after school activities for at-risk youth and with a K-12 STEM education in two non-profit organizations as a volunteer. At this time the views and proposal here presented are mine and do not represent any position, program or policy of HATS.

- The cities design concept needs inputs from every discipline. For example, is human habitation on the moon possible or advisable? If not, what sorts of robots would we need? What sort of transportation would be used on the moon? How would we get electricity on the moon? The concept thus will encourage projects from all of the HATS membership.
- A very popular project-based activity for children is the design of future cities. One of the HATS Members, the local Chapter of IEEE, sponsors a Future City local competition every year.
- The concept favors projects in which children work in teams. Such projects have been shown in numerous studies to be very effective in enhancing learning. Project activities furthermore relate to real life work.
- The concept of systems would be early introduced into children's thinking giving them a head start in working on real life systems.
- The children would have input into what they might like to see in the cities of the future. The possibility that their input might become a reality would increase their interest in pursuing technical careers.
- And just possibly the effort might generate ideas and information that will result in real economic development. But even if it didn't at least something will have been learned about why not.

Upon adoption of an official visionary project, various meetings will be held to consider how the various Member projects might relate to it. The information generated in these meetings will provide direction for future developments.

IV. Conclusion

The concept of a visionary project to CCC the educational efforts of organizations appears to offer many benefits. The crucial question however is whether an umbrella organization can overcome three major challenges to defining a visionary project that will elicit strong commitment from all of its Members. Hopefully, the present proposed project of two cities or another more inspiring one yet to be offered will be adopted and successfully implemented allowing us to say:

We put a man on the moon – we ARE helping our children reach the stars!