

Crossing the boundaries: spatial sciences as the catalyst to increase equity within geography and across disciplines

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Introduction

Questions and approaches aimed at increasing diversity and participation by underrepresented populations in the discipline of geography (or spatial sciences) are once again being posed. Additionally, concerns pertaining to the further development of interdisciplinary (or trans-disciplinary) approaches to spatial reasoning and spatial analysis are also making their way into academic as well as professional dialogue.

The former question is much the same as it has been since the mid 1960's, "How do we, in the academic discipline, increase participation of underrepresented populations in all phases and sub-disciplines of the "spatial sciences"? More specifically, and I submit, more to the point, how can spatial science, (i.e. geography) as a field of study and as a tool avail itself of the myriad resources represented by African American, Hispanic, Native American, female, and other generally marginalized or at-risk groups? It is incumbent upon the discipline to define and minimize impediments to enhancing diversity within the field. To accomplish these proposed objectives it is equally important to spread spatial concepts and reasoning across disciplinary boundaries.

There is confusion as to the defined targets and expected outcomes. The idea of the Geography of Broadening Participation (GBP) has been expressed in the simplest form as a trifurcated approach. The foci have been identified as three associated but disparate tracts. First; specific target populations have been significantly

underrepresented in the geo-sciences and technology. It has been reported that only about 3% of the total of professional geographers are of minority status (Shrestha and Davis 2005). This number is consistent throughout the literature at least as far back as the 1960's. Current statistics also indicate that efforts to increase minority participation in academia in general, and geography more specifically, have only been marginally successful. Secondly; GBP is tasked with increasing participation in the study of geography by these same groups. While this intimates women and minority groups particularly, I would suggest that this incorporate socially or socio-economically marginalized (at-risk) populations as well. In my simplified analysis the third but equally important focus of GBP is that of incorporating geography and geospatial technologies along with spatial reasoning and applications into the realms of science, technology, engineering, and mathematics – or the STEM disciplines. Studies have shown that spatial thinking and reasoning are important, "...probably as important as verbal and mathematical thinking, for success..." in the STEM fields, (Newcombe 2010, p.35).

All Is Not Lost

Through historical studies we know that spatial cognition is malleable, and that spatial thinking can be improved by effective technology and education (Newcombe 2006). But as a National Research Council (NRC 2006) publication noted, we still do not know exactly how to directly incorporate spatial thinking across the curriculum. This also suggests that we have not been particularly effective in introducing the newer spatial technologies in an already full and challenging academic environment. Though I would

classify these as three distinct objectives I suggest that addressing them singularly will not solve or even comprehensively address the issue.

I submit that the introduction or re-introduction of spatial sciences at the grassroots level is the only plausible and comprehensive approach. Isolated and localized fixes can and sometimes do achieve positive outcomes, but tend to be short lived and often unsustainable. To use a tired metaphor, to keep the “pipeline” flowing, the infrastructure or foundation must be laid – and must be maintained, lest our “pipeline” slow to a trickle. The very foundations of geographic and spatial knowledge and reasoning must be developed at the source. They must be introduced early, very early, in the educational process and must be consistently applied throughout. To be efficacious these constructs must be applicable and sustainable. They must be relevant, first to the foundations of knowledge and learning and secondly to contemporary methods and applications.

Common sense tells us that we would never send a freshly logged tree to a construction site. It has to be cut into lumber and dried before it can be repurposed. We do not build houses on foundations that are improperly seasoned. Geography and spatial sciences must be part of the long term academic “curing process”, part of the foundation of education. They must cross the boundaries to other disciplines and become available to the widest possible audience. To emphasize with a question, How can we expect to effectively widen interest in a course of study after the die is cast or the mold is set?

Education is a multi-step, iterative, and progressive undertaking. For the trans-disciplinary and trans-cultural applications of geography and spatial reasoning to be

effective, they must be introduced early and applied consistently as a discipline of import in the early (K-12) curricula. No one would suggest that we do not need to learn mathematics until after we learn engineering. Nor should we continue to relegate geography and spatial science and thinking to the back row of the early education environment. Studies have shown spatial reasoning and geo-spatial technologies to be relevant, important, and applicable to all disciplines. Geography is so much more than memorizing the states, or countries, and capitals. It is about why! It is about what! And it is about indeed about where! More precisely stated it is about answering the question, “Why is what where?” and maybe the follow-up question, “So what?”. What are the relationships of things in a spatial context? For these tools to reach their potential, individually or in tandem with other disciplines, they must be part of the educational foundations, primary and secondary. Saint Augustine in the City of God wrote, “How excellent inventions are geography, arithmetic, astrology and the rest!”

Rebranding

To paraphrase Gandhi, “become the change you want to see.” The concept of what geography is or what geography has become over the last 30 years must be incorporated into the body of thinking. It must become the larger discussion rather than part of the tired dialogue. Quoting from Lubinski (2010, p1),

“Spatial ability is a powerful systematic source of individual differences that has been neglected in complex learning and work settings; it has also been neglected in modeling the development of expertise and creative accomplishments. Nevertheless, over 50 years of longitudinal research documents the important role that spatial ability plays in educational and in occupational settings wherein sophisticated reasoning with figures, patterns, and shapes is essential.”

There is no need to reinvent the wheel. However, to accomplish our appointed tasks, it is necessary to rethink, to reflect, and re-project geography into the 21st century. Geography, spatial sciences, and spatial reasoning are as relevant, if not more relevant than they were in the days of Eratosthenes. Technology has changed. The understanding of spatial relationships has changed. “Geography is to space what history is to time. It is a spatial way of thinking, a science with distinctive methods and tools, a body of knowledge about places, and a set of information technologies...” (Dobson 2007, p. 1). The problem, I submit, is not with the discipline of geography. Geography is well rounded, trans-disciplinary, and decidedly applicable and relevant to most facets of life. The Geo-sciences extend this relevance even further. I suggest that the problem has been the perception of geography.

There is a tired repetition of questions that surface when I speak to non-academic populations about geography or the geosciences. “Hasn’t everything already been discovered?” “Doesn’t everyone already know the names of the states and capitals?” “What can I do with a geography degree besides teach?” Or, perhaps the most pointed, “Can I get a job with this stuff?” In today’s economic climate and with our proposed target population (the underrepresented, minority, female, and other at-risk groups) this is likely the question that is the most relevant.

Turning the battleship

There are no easy answers. What is required is a long term commitment on the part of the primary and secondary education system. With limited resources and ever higher demands this becomes even more problematic. This proposal requires a successful, directed, and multifaceted pilot program in the public school system. It

requires a curriculum that addresses geography and spatial relationships in the primary grades along with geosciences, spatial analysis and spatial technologies in the secondary grades. The program must be dynamic. It must be monitored, evaluated, and adjusted regularly to meet the changing needs of the students and faculty along with the growth and development in technology in general and spatial technology more specifically.

This program must have a dual approach. First it must address the goal of geosciences as a discipline. The discipline of geo-sciences will be all inclusive, serving as the shell for geography, spatial thinking and reasoning, spatial and geographic analysis, and spatial technologies. The program must be progressive, building each year on the previous foundations. The idea of geography cannot be lost to process but must be enhanced and transfigured. Geography is the foundation upon which the rest will be built.

We must also consider inter, multi, or trans-disciplinary applications – what I call “crossing the boundaries”. Everything has a spatial component! Nothing is “nowhere”. There are relationships in space. It matters little if we are studying the correlation and spatial representation of changes in meiofauna habitat from a biological perspective or the proximity of trace metal content in soil samples and environmental impact for the chemist – it is all spatial in nature. Geography and geospatial technologies can effectively cross those boundaries, enhancing understanding, allowing and promoting deeper questions and fuller analysis. The GEO prefix must be indelibly inked. GEO must not be lost; it must imprint early and maintain an identity.

The difficult part...

Funding and adequately trained, motivated and open minded staff will be required for a series of pilot projects across the United States to operate in a minimum of five year increments. An oversight committee will be required to evaluate progress on an annual basis making recommendations and adjustments as needed to realize the full potential of this program.

It is imperative that faculty in the project locations enthusiastically embrace this program. School participation will be incentivized by infusion of human and capital resources, recognition as a pioneering institution, as well as the opportunity for students to discover exciting new possibilities. Once these programs are implemented, tested, modified, and proven successful for enhancing not only geographic and spatial abilities but incorporated across the disciplinary lines, they can easily be modeled and shared in other curricula and multiple venues.

With specific initial target groups, outcomes will be more easily measured. The initial objective is to increase (enhance) geographic participation across boundaries. These boundaries have been previously identified as underrepresented populations as well as the boundaries of the various STEM disciplines.

Spatial thinking is critical to many facets of everyday life. Spatial thinking is utilized in a wide range of occupational pursuits to define problems, discover answers, and express solutions. Spatial thinking is increasingly recognized as essential to success in science, technology, engineering and mathematics (STEM). As identified by NSF (2010) spatial thinking is on par with quantitative and verbal abilities when predicting achievement in STEM, but spatial thinking is not clearly integrated in the K-12 curriculum. Now is the time to bring the mountain to Mohammed.

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