

EVALUATING UNIVERSAL DESIGN: LOW- AND HIGH-TECH METHODS FOR MAPPING ACCESSIBLE SPACE

By *Nicholas Rattray*

To those unfamiliar with issues of accessibility for people with disabilities, the Arizona State Museum and the Administration Building on the University of Arizona (UA) campus may seem rather similar in outward appearance. Both have entrances that meet the specifications of the American with Disabilities Act, and have been redesigned in recent years. However, for participants in our research project on "Universal Design and Accessibility," they represent vastly different approaches to access.

For members of the disability community, the two buildings have come to symbolize progressive and regressive public design at the university. The Arizona State Museum (Figure 1) has recently been redesigned with a universally accessible entrance. Its gradually sloped entrance enables everyone to enter together. On the other hand, the entrance to the Administration Building (Figure 2) has an inelegant ramp positioned to the west of the main steps—too steep for many people with mobility impairments—that creates a segregated entry. To make matters worse, a small plaque indicating that the construction company donated the ramp symbolizes for disabled people a set of negative attitudes about disability. As one person said, it "feels



Figure 1. The Arizona State Museum

like a slap in the face." Project participants suggested that it implies that the ramp was an afterthought, a charitable contribution from the developer rather than a legally required, integral aspect of the building.

The contrasting views about these two campus buildings emerged during a participatory research project conducted on the UA campus in the spring of 2007. A group of disabled students and staff (including the author) affiliated with the UA Disability Resource Center (DRC) set out to study the patterns and meaning of mobility for campus users. In this project, we found that the built environment reflects and impacts attitudes about disability while campus buildings remain a site of contestation over meeting legal requirements and creating truly inclusive space.

This article discusses the findings from our pilot project, focusing on how low- and high-tech spatial techniques—"map interviews" and Geographic Information Systems (GIS)—can be used to investigate the effectiveness of universal design and accessible space. I argue that such mapping techniques can be an excellent method for engaging people in disability research through pinpointing patterns and location of both positive and negative areas of a built environment. Furthermore, the visualization that maps offer stimulates productive discussions between groups of people who may not otherwise interact with each other.

Spatial Analysis and Universal Design in Disability Research

The framework of universal design (UD) has emerged in the last decade as a method for encouraging social inclusion for the broadest range of users (Story 1998).¹ UD has been applied to disability as a way to shift away from



Nicholas Rattray

a reactive focus on results to a philosophy for "design for all" (Iwarsson and Stahl 2003: 61); it serves as a strategy to move beyond the discourse of individual accommodation for people with disabilities toward the promotion of wider structural change. Key aspects of universal design encourage the transformation of multiple campus "environments"—built, social, instructional, information—in a manner that benefits all students, faculty and staff (Scott et al 2003). The approach of universal design aims at moving the locus of change from individuals to institutions.

Human geographers have also approached issues of accessibility for disabled people from a structural perspective. Many of these scholars emphasize the spatial aspects of accessibility, including the heightened importance of the human-environment interface (Golledge 1993) and the inherently disabling aspects of the built environment (Imrie 2000). Although few studies specifically address universal design, these geographers focus on the critical relationship between the built environment, accessibility, and quality of life for people with disabilities.



Figure 2. The Administration Building

More recent research has begun to explicitly use mapping techniques to investigate accessibility. Mirroring the trend toward increased utilization of GIS in the social sciences (Couclelis 2004: 17), “spatially aware” researchers are using maps in novel ways. Applications of spatial analysis range from “low-tech” approaches that encourage sketching of cognitive maps to more technologically intensive research [e.g. personal navigation devices (Golledge et al. 1998) or computer modeling of access (Matthews et al. 2003)].

This project combines the participatory research approach (Park 1993) with community mapping, responding to Kitchen’s (2001) proposal that participatory GIS (PGIS) projects should work *with* people with disabilities, not simply be about or for them. Geographic research on accessibility has critiqued the neutrality of spatial representations: “[t]he map provides a sanitized conception of space and acts to maintain the *status quo* by intimating that the town is an accessible environment” (Vujakovic and Matthews 1994: 363). By creating an alternative version of the campus map through our “map interview” approach, our project integrates the notion of “personal geography” (Vujakovic and Matthews 1994) with GIS technology and ethnographic field research (Hora 2004) to investigate accessibility issues.

Why use maps in the first place? I suggest three reasons, each highlighted in our project. For one, it makes an excellent teaching tool that involves building new skills. Second, the tangible nature of using colored markers to draw

on paper maps helps expose underlying cognitive maps from interviewees. Thus it serves as a methodological tool for ethnographic interviewing. Third, GIS and spatial analysis lend methods for visualization and pattern identification. Visualizing data in digital and low-tech maps helps communicate findings to different audiences.

Assessing Universal Design through Participatory Mapping

The University of Arizona is an excellent site for research on universal design and accessibility. With a proven program for recruiting and serving students with disabilities, Arizona offers services that exist at only one fifth of US universities (Lewis and Farris 1999: 21). In recent strategic planning efforts, the campus leadership has remained committed to encouraging accessibility, striving “to promote universal design to increase access to services and facilities for people with disabilities” (SPBAC 2005). People with disabilities at the University of Arizona make up about 3,000 students at the UA, about half of which are served by the DRC. According to enrollment statistics, this is about three times the percentage of African-Americans students on campus, and half the number of Hispanics. The majority of disabled students have hidden disabilities, such as Attention-Deficit Disorder.

Our project grew out a partnership with the DRC and the NASA Space Grant program. As a pilot project, it is geared toward investigating how people with disabilities experience accessibility on campus by using geospatial and qualitative data techniques. Building on the emancipatory framework suggested by disability studies theorists, in the first phase of the project students examined what accessibility means on the UA campus from the perspective of disabled students. In the universal design paradigm, accessibility indicates not only the degree to which a location or facility is reachable by someone with some type of impairment, but other factors including the usability of instructional materials, transportation services, and



Figure 3. Participants Meeting in the Classroom

the attitudes of the social environment. The second, related objective is to teach research skills to course participants so that they become more proficient in conducting research with spatial and qualitative data. One of the intended longer-term impacts is to increase the number of disabled students in the fields of Science, Technology, and Engineering (STE).

In the spring of 2007, the project participants ranged from lower division undergraduates students to staff members at the DRC, creating a relatively heterogeneous learning environment. Six of the participants self-identified as disabled, four were staff members, one was a graduate student, and three were involved in wheelchair athletics. The course met several times during the semester in a seminar format (Figure 3), and spent the remainder of the time conducting research. Training workshops on qualitative data collection were complemented by presentations from guest speakers.

“Map interviews” were the central method for collecting data. Each participant conducted three map interviews each where they spoke to people on campus about their experience with accessibility. During the sessions, interviewees use different colored markers to indicate how they move through campus. A blue marker was used to indicate typical routes traveled through campus, while red and green markers were used to highlight areas considered to be positive or negative in terms of barriers,

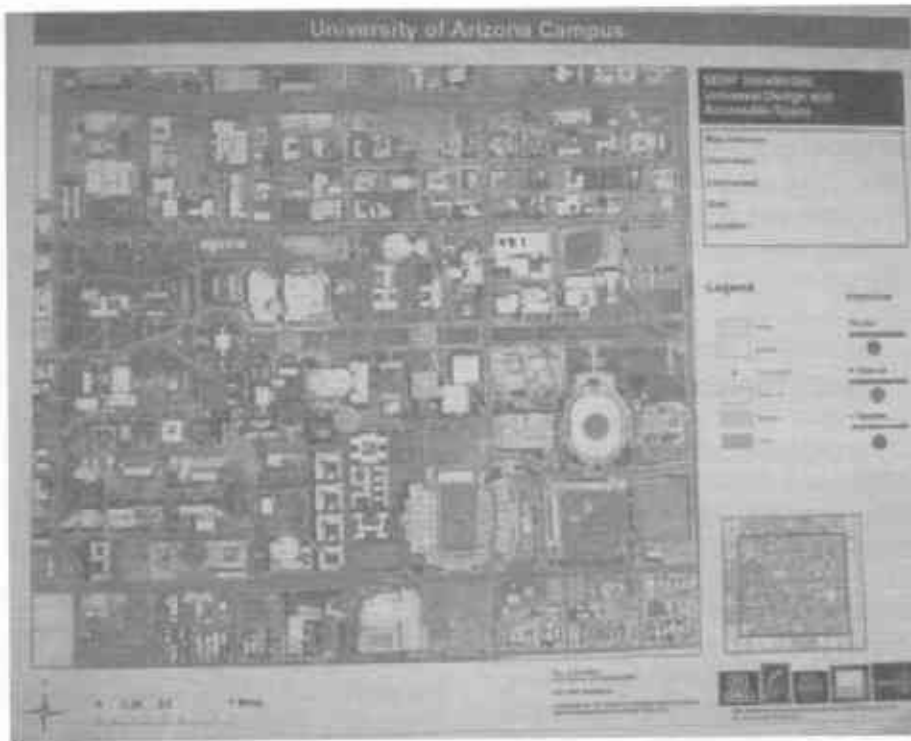


Figure 4. A Composite Map of Interview Findings

attitudes, or other factors that affect accessibility. The goal was to interview two people who self-identify as disabled, and one person who is non-disabled. Transcripts and the completed map documents were analyzed in cooperative review sessions.

Code Enforcement, Diverse Needs, and Identity through Modality

The findings from the first phase of the project were presented to the public and campus officials in April 2007. After analyzing the responses from the map interviews, participants highlighted important locations on campus by pasting different colored dots on a composite map (Figure 4). I will share three of the most interesting findings.

First, a persistent dilemma in creating accessible space arises from the difference between design according to legal requirements (for example, as required by the American for Disabilities Act), and producing environments that are universally designed. In many

cases, simply meeting the building code does not adequately meet the needs of students. This contradiction is most vividly represented in the divergence between the Arizona State Museum and the Administration Building, as previously described.

Implementing universal design necessitates continual involvement, carefully applied to the appropriate stakeholders. As one interviewee put it, persistence is a necessary aspect of moving beyond requirements:

When you really zero in on physical stuff, I am just amazed that if some voice isn't present most of the time, it won't...you'll get code, but the problem is, we know what code is, code in this project would have been a new elevator on the back side."

In the case of the Arizona State Museum, advocates from the DRC persuaded museum staff of the benefits of universal design, which aided in discussions with campus officials.

In the Administration Building situation, the ramp to the west of the main stairs does meet code, but is highly objectionable to many people with mobility impairments. In addition to creating a separate, highly sloped ramp, the small plaque to the east of the ramp indicates that the very existence of the ramp resulted from the generosity of the construction company. In contrast to non-disabled interviewees, disabled students felt that this was an insulting statement, suggesting the entrenchment of the "charity" model of access.

Even more troubling was the fact that this building had been recently renovated making subsequent change highly unlikely. Despite initial indications that universal design would be implemented, the financial backing of the Alumni Association ensured that the building would prioritize the preference of the private donors.

A second important theme that emerged was the diversity of the needs of the disabled campus community. Small teams of students took digital photos of locations on campus that are especially positive or particularly problematic. For instance, students who use wheelchairs often dislike using the clunky, aging chair lifts in some of the older buildings. Often requiring a key, these lifts make students feel like they are a spectacle and if they are broken, prevent them from attending class. Two crucial points about the physical environment that were repeatedly raised by wheelchair users are the effects of slope and weather. These are not only physical barriers, in the sense that they make people walk or push their chair slower, but they also are psychological barriers. For instance, when chair users are pushing uphill or in hot weather, the majority of participants feel that people are more likely to feel sorry for them or even try to help them out—something that should be avoided save in exceptional circumstances.

Other students expressed entirely different needs. For students with cognitive issues or anxiety disorders, bureaucratic barriers such as onerous registration procedures or single-format education materials can be significant

obstacles. One student with a mental impairment discussed the emergence of online instructional methods in instruction, emphasizing how the university has changed considerably in the last two decades in its commitment to universal design in the classroom. From his perspective, online communication resources have significantly improved accessibility for people with "hidden" disabilities.

A third key observation is the heterogeneity of the disability community on campus. While there appeared to be general consensus that there was a fairly cohesive community, there were also notable fractures and sub-communities. Some people commented on divisions between athletes and non-athletes, as well as the lack of interaction among people with different types of impairments. In the course of the map interviews, issues around identity and modality arose. One of the staff members reflected on how closely self-image related to the means of transport:

Again, you know, I'm older and, I think I see you know in hindsight, and I see it with the students, is that barrier. It's a big barrier, trying to move into utilizing these different options. I think we get caught up in our identity about I'm a walker, I'm a manual wheelchair user...to go even from walking to a manual wheelchair, or a manual wheelchair to an electric chair, there are pretty big identity hurdles.... That it isn't just about "Oh I gotta be as normal as I can be"...and I think we get it in our head that you know walking is more normal, and a manual wheelchair is a little more normal.

This quotation, from a woman in her 50s, demonstrates how people with mobility impairments are just as impacted by hierarchies of disability when faced with choices about how they move around. While the built environment is important, there are also hierarchies of normality that are constantly being encountered.

Praxis in Participatory Mapping

The best way to encourage students to engage in STE fields is to recruit and support them once they gain access to universities (Malcom et al 1996). Hands-on experience using technology, participating with professionals, and collecting scientific data has the potential to enrich the learning experience of students with disabilities. As a university center dedicated to serving the needs of disabled students, the DRC is committed to research *for* and *by* rather than merely *about* people with disabilities. This project contributes to such efforts by encouraging students to be actively involved in ongoing research and bringing their expert knowledge to important campus issues.

In the policy arena, the project has other objectives. We intend to assist the DRC in utilizing technology and spatial science in their decision-making. To supplement the services offered by campus planners, it has been suggested that an updateable web-GIS system could help disseminate accurate accessibility information to the campus community. Second, the flexible nature of course involvement enables the project to serve as a continuing education opportunity for staff members. In addition, the course strengthens the curricula in the emergent Disability Studies program at UA.

Since creating accessible space involves a range of campus entities, the public presentations offer an important medium for dialogue between key stakeholders. To move beyond mere code compliance, as Gray et al (2003) suggest, an interface for communication between "built environment professionals" and people with mobility impairments needs to be created. In addition to the public presentation given in April, our research findings and course materials were placed on a website.

In the next phase of project (Fall 2007), we will make some methodological and topical adjustments. In terms of methodology, small teams of student will digitize the maps in order to examine patterns of mobil-

ity while simultaneously exposing students to GIS techniques. We are also collecting GPS points and digital images of specific areas. Participants demonstrated significant interest in publishing their results, and we plan to ensure that all participants—not solely the instructors—are certified by Human Subjects.

Other important topics to more specifically address are conceptual issues with universal design and accessibility for people with mental and learning disabilities. Our initial findings indicate that people with these hidden disabilities have more trouble negotiating the informational and attitudinal barriers on campus. We would also like to interrogate the notion of universal design? Should we be thinking instead about "inclusive" design? How can we take the notion of universal design in an even more effective direction? The hope is that we can move beyond mere compliance with building code.

Exploring Accessible Space through Participatory Research

On complex issues such as the accessibility of the built and social environment, the participatory mapping framework offers a flexible yet powerful approach. In our project, participants leveraged their expert knowledge with qualitative and spatial research techniques to better understand how universal design can meet the needs of the disabled community on campus. The initial phase of research revealed how public dialogue between key stakeholders is a critical component of effective design.

The contrasting perspectives on the Administration Building and the Arizona State Museum exemplify contestation over public space on campus. As advocates intimated, areas that simply meet legally required code are insufficient in "designing for all." We are hopeful that the next phase of the project will contribute to a more accessible campus environment for disabled and non-disabled people alike.

Acknowledgments: I would like to express my appreciation the effort of the participants of the Universal Design and Accessible Space project: Kyle Mutz, Jackie Cimino, Aaron Foster, Meghan Sooy, Jean Dill, Zack Fogle, Jean Paul Jorquera, Paul Brooks, and Bryan Barten. In addition, I thank the Sue Kroeger and the Disability Resource Center, the UA NASA Space Grant program, the Bureau of Applied Research in Anthropology, the UA Department of Anthropology and the Center for Applied Spatial Analysis for their support. More information about the project is available at <http://www.cultureplace-health.org/spacegrant/>.

Notes

[The principles of Universal Design are: (1) Equitable Use, (2) Flexibility in Use, (3) Simple and Intuitive, (4) Perceptible Information, (5) Tolerance for Error, (6) Low Physical Effort, and (7) Size and Space for Approach and Use (Story 1998).

References

- Couclelis, Helen.
2004 The Third Domain. *Cartographica* 39(1):17-24.
- Golledge, Reginald G.
1993 Geography and the Disabled: A Survey with Special Reference to Vision Impaired and Blind Populations. *Transactions of the Institute of British Geographers, New Series* 18(1):63-85.
- Golledge, Reginald G., Roberta L. Klatzky, Jack M. Loomis, Jon Speigle, and Jerome Tietz
1998 A geographical information system for a GPS based personal guidance system. *International Journal of Geographical Information Science* 12(7):727-749.
- Gray, D. B., M. Gould, and J. E. Bick-
enbach
2003 Environmental barriers and disability. *Journal of Architectural And Planning Research* 20(1):29-37.
- Hora, Matthew
2004 Identifying Effective Promotional Strategies for Farmers Markets through the Integration of Ethnography and Geographic Information Systems (GIS). *Practicing Anthropology* 28(2):18-22.
- Imrie, Rob
2000 Disabling Environments and the Geography of Access Policies and Practices. *Disability & Society* 15(1):5-24.
- Iwarsson, S., and A. Stahl
2003 Accessibility, usability and universal design--positioning and definition of concepts describing person-environment relationships. *Disability & Rehabilitation* 25(2):57-66.
- Kitchen, Rob
2001 Using Participatory Action Research Approaches in Geographical Studies of Disability: Some Reflections. *Disability Studies Quarterly* 21(4):61-69.
- Lewis, Laurie, and Elizabeth Farris
1999 An Institutional Perspective on Students with Disabilities in Postsecondary Education. NCES 1999-046. Washington, D.C.: National Center for Education Statistics, US Department of Education, 1-36.
- Malcom, Shirley M., Yolanda S. George, and Virginia V Van Horne, eds.
1996 The Effect of the Changing Policy Climate on Science, Mathematics, and Engineering Diversity. Washington, DC: American Association for the Advancement of Science.
- Matthews, Hugh, Linda Beale, Phil Picton, and David Briggs
2003 Modelling Access with GIS in Urban Systems (MAGUS): capturing the experiences of wheelchair users. *Area* 35(1):34-45.
- Park, Peter
1993 What is Participatory Research? A Theoretical and Methodological Perspective. In *Voices of Change: Participatory Research in the United States and Canada*. Peter Park, Mary Brydon, Budd Hall, and Ted Jackson, eds. Westport, Connecticut: Bergin & Garvey. 1-20.
- Scott, Sally S, Joan M McGuire, and Stan F Shaw
2003 Universal Design for Instruction: A New Paradigm for Adult Instruction in Postsecondary Education. *Remedial and Special Education* 24(6):369-79.
- SPBAC
2005 Five-Year Strategic Plan FY 2007-2011. Tucson: University of Arizona Strategic Plan and Budgetary Advisory Committee, 1-27.
- Story, M.F.
1998 Maximizing usability: the principles of universal design. *Assistive Technology* 10(1):4-12.
- Vujakovic, P., and M. H. Matthews
1994 Contorted, Folded, Torn: Environmental Values, Cartographic Representation and the Politics of Disability. *Disability & Society* 9(3):359-374.

Nicholas Rattray is a doctoral student in cultural anthropology at the University of Arizona, Tucson. His prior research includes the Neighborhood Knowledge California project, a web-based community-GIS project aimed at supporting research on affordable housing and fair lending practices. His dissertation will investigate issues of social inclusion for people with disabilities in Ecuador, funded by the International Education Fulbright Fellowship. He can be reached at nrattray@email.arizona.edu. ■