IDENTIFYING THE NEEDS OF TACTILE MAP MAKERS

Amy K. Lobben
University of Oregon

ABSTRACT

The following paper reports on the results of one-on-one interviews conducted with directors and teachers working with state blind and visually impaired schools as well as directors and teachers with blind and visually impaired special education programs associated with urban school districts. The results from the interviews identify both the state of tactile map production in the schools as well as what is needed to improve the state of this production. In addition, the paper argues the need for tactile navigational maps in general and potential means to improve accessibility.

INTRODUCTION

Tactile maps and images are created in 3-d relief and are scanned with fingertips (Eriksson 1999); this is one of the most common forms of information input utilized by the blind and visually impaired. In any blind and visually impaired education program, orientation and mobility is a primary focus, ideally conducted with the use of a tactile navigation map. Unfortunately, adequate access to tactile maps has long been hampered by cost and lack of availability.

But, everyone travels and tactile navigation maps are needed if the blind and visually impaired are to have the same mobility opportunities as the sighted. Because tactile maps are mostly unavailable, the blind and visually impaired do not use maps as much as they need. The lack of available tactile maps is due to a combination of factors, including, too few producers, small market with small buying power, production difficulty, production expense, and too few teachers who are skilled at producing them (Dahlberg 1997, Perkins and Gardiner 1997, Sierkierska et al. 2003). Currently there are two means to obtain tactile maps: 1) an individual may choose to take on the laborious task of producing a tactile map by hand e.g. collage tactile map, an etched map, or a hand drawn microcapsule map; or 2) the map can be contracted and purchased from a tactile mapping company. Purchased maps may be long in delivery and are often expensive (more than a comparable sighted-user map) due to the time-intensive and unique production methods as well as the lack of tactile map production firms (low supply).

The American Foundation for the Blind (AFB) is an organization that provides information as well as community and political activism in support of the blind and visually impaired. Much of their support resources and dissemination of results of their activities are maintained on their website (www.afb.org). The AFB formed a Textbooks and Instructional Materials Solutions Forum to address the lack of availability and support for all blind and visually impaired educational materials, including maps. The Forum specifically strives to ensure that children who are blind and visually impaired be given equal opportunity to textbooks and instructional materials. According to the AFB, even though the Individuals with Disabilities Education Law guarantees that children with special needs have equal right to the same quality of education as other children, the materials these children need often arrive long after classes begin, if at all (from www.afb.org).

In an effort to determine specific needs and then develop action steps to meet those needs, AFB conducted a national survey in the spring of 2000. The results were announced in October 2000 at a Textbooks and Instructional Materials Solutions Forum meeting in Louisville Kentucky. Following, on March 15, 2001 at a Forum meeting in Washington D.C. action steps were identified and prioritized. Each participant ranked their top three action steps that needed to be addressed immediately in response to the identified needs of the survey. Below are the top 10 action steps identified, with the number of people who ranked that step at the highest priority. (from www.afb.org)

1. Work with hardware/software developers for automated production of tactile graphics. 31
2. Advocate for the development of a new career as a Braille transcriber and document existing programs in development. 19
4. Facilitate the creation of centralized ordering and distribution centers for each state. 11
5. Advocate for the development of a universal Braille embossing utility for Windows for printing ready-to-Braille files. 10
6. Explore/document alternatives for the production of daily work when no Braille transcriber is available.
7. Develop a training package for teachers in regular education for Braille and assistive technology.
8. Explore a better system of Braille production (states are duplicating efforts).
9. Support a study that investigates the extent to which teachers are requesting materials in alternative media that reflect the learning media and assessed needs of their students (including assistive technology).
10. Advocate for the creation of small production facility in each state for creation of short run/use materials.

**TYPES OF MAPS NEEDED BY THE BLIND AND VISUALLY IMPAIRED**

The mapping needs of the blind and visually impaired community are great and differ from those of the sighted community. Differences in map design and production methods, alone, vary substantially. Due to the inability for the human fingertips to perceive as much detail as the human eye, tactile maps are considerably more generalized than printed maps for the sighted. Also, tactile maps are three-dimensional with their raised relief and require special production processes unlike those processes used to produce two-dimensional printed maps for the sighted. But, while design and production methods differ, both communities need the same types of maps, both navigation (reference) and socio-economic (thematic) maps.

**Navigation Maps**

Navigation maps serve as aids to a person who needs to travel through a real-world environment. Such maps are vital because nearly everyone needs to travel to some extent and “the most significant handicap produced by visual impairment is the limits imposed on the ability to travel independently” (Golledge 1986 p. 297). For those who live “without the gift of vision, mobility has to be gained through training, patience, courage, and hard-earned personal experience [but] the visually impaired person who wants to live an active life… has no choice” (Passini and Proulx 1988 p. 228). Blind and visually impaired people who choose (or must) navigate through the environment face hurdles that the sighted obviously do not. Sensory inputs represent the most significant difference; exploring with touch and hearing precludes the ability to fully preview and preprocess the environment (ibid). For environmental information input, vision is very efficient and significantly more so than touch; but, that doesn’t mean “that touch cannot be used, if not just as efficiently then at least more consciously” (Eriksson 1999 p. 2). For visually impaired map readers, forming a cognitive map of an area is significantly more time consuming, if not more complicated as well (Spencer et al. 1992, Ungar et al. 1996, 1997). The tactile map may provide an essential layout or reference point to which they may register landmarks (which are recognized through kinesthetic, auditory, tactile, or olfactory cues) as encountered during environmental exploration. Researchers have discovered that the task of traveling through and learning an environment may be completed much more efficiently and easily if the blind or visually impaired traveler has the aid of a map before and during the task (Golledge 1986, Passini and Proulx 1988, Spencer et al. 1992, Ungar et al. 1993, 1994, 1996, 1997, Espinosa and Ochaita 1998, Blades et al. 2000).

Not only do visual and tactile navigation maps differ from one another in materials used, production methods, and specific information presented, they also differ in availability and numbers needed. To navigate within a medium size city (say 150,000 people), a single traditional road map available at any bookstore or gas station serves a sighted person. However, for a blind or visually impaired person, that same city may require dozens of tactile maps, due to the limited number of symbols and limited geographic area that may be represented on a single map. Researchers are also suggesting that strip maps, which highlight only a single travel route, may be considerably more effective for some map readers (Golledge 1991). Some maps may be so cluttered with unnecessary information that the visually impaired map reader cannot distinguish between the necessary and unnecessary map elements. A map that singles out only the needed route may provide some tactile map readers with a more usable map. By design, a single strip map only includes a specific travel route and many strip maps, each highlighting individual travel routes, would be necessary for a geographic area, such as a school or campus map. When geographic area increases to the size of a town or even a small city, the number of strip maps needed may increase to a point where, by current methods, production is too taxing (both in time and money). Due to the expense of ordering such a mammoth set of maps from a tactile map production company, map sets of this type are rarely used.

**Thematic Socio-Economic Maps**

Thematic maps are those that represent subject themes (such as population or income). Such maps provide an important tool in the education about and understanding of geographically distributed phenomena. In addition to the need for tactile navigation maps, teachers have also acknowledged a need to be able to create socio-economic maps with tactile symbols (as opposed to the graphic symbols used for visual maps) highlighting US population and other socio-economic data recorded by the US Census (Aldrich et al. 2003, Firos 2003; Langendonk 2003). The teaching materials used in science and social science classes for sighted students nearly always include a variety of maps. However, the
same educational materials simply are not available to the blind and visually impaired population. A limited number of maps at very general geographic levels may be obtained, but these limited materials preclude an adequate representation and therefore an adequate teaching of socio-economics. Maps representing country-level and individual state-level patterns in a variety of socio-economic areas (population, age, gender, economics, education…) are central to understanding any country’s culture and society.

THE PROJECT

The project presented below, focused on tactile navigation maps. We know these maps are needed. To some extent, we know how to design the maps. To a lesser extent, we know how the maps are used. We know how to produce the maps, currently. But we have not made available to the people who need it, any meaningful, automated way to produce the needed maps.

Rowell and Ungar (2003) conducted an international survey in order to ascertain the state of tactile mapping. Their respondents represented a variety of organizations, including: blind practitioner (25%), commercial (21%), university (16%), independent producers (11%), education (11%), civic and local authority (9%), and library (8%). They constructed a questionnaire that asked: how long respondents have worked with maps, the number they have produced, production methods, design preferences and reasons for such preferences, types of maps, environments mapped, and specific production (format, display) used. Their results revealed several important facets of tactile map production. The preferred method of tactile map production is microcapsule paper, primarily because of speed, cost and convenience (fast, cheap, and easy). They also found that the most common reason for the creation of tactile maps is for mobility, orientation, and general reference. Moreover, most respondents (over 80%) identified that they produce tactile maps for educational purposes.

The finding by Rowell and Ungar (2003) that, according to their report, most maps were produced for educational purposes, prompted the interviews presented here. Because they that educational applications were overwhelmingly the most common reason for tactile map production, I initiated a series of interviews with school and special education programs that service blind and visually impaired students. The goal was to identify the needs of these schools/programs and how the needs may be most effectively met. Therefore, twelve face-to-face interviews were conducted. Five of the interviewees are directors of blind and visually impaired schools/programs; seven are orientation and mobility specialists.

The Director Interviews

I interviewed five directors, two from state (public) schools for the blind and three from urban special (public) education programs. The two state schools are public schools that serve blind and visually impaired students; one of the schools is a residential school in which students live in dormitories on campus while the other provides outreach service and summer programs. The three special education programs are associated with urban school districts and are part of general special education programs, where the special education program also includes services for other special needs, i.e. deaf education and cognitively impaired education. The same questions were directed to all interviewees (according to their category, directors or teachers), though some questions were selected or not selected depending on answers to previous questions (see Figure 1).

| 1. | Is Orientation and Mobility instruction part of the educational curriculum of the blind and visually impaired students you serve? |
| 2. | Does (organization name) employ OM specialists? |
| 3. | If yes to 2, how many are employed? |
| 4. | If yes to 2, how much of their job is devoted to OM (estimate as a percentage of time/duties)? |
| 5. | Do these OM specialists use tactile maps as part of their instruction? |
| 6. | Where do they get their maps? |
| 7. | (if they indicate in question 6 that teachers make their maps) Does the school/district ever purchase existing or special order tactile maps? |
| 8. | If yes to 7, what is the source for these maps? |
| 9. | Does the school/district employ a tactile graphics/map making specialist? |
| 10. | What technology is available for tactile map production? |
| 11. | Does the school/district offer or send teachers to workshops designed to give them instruction in graphic design or tactile map production? |
| 12. | Do OM teachers have their own, or have on-demand access to a computer? |

Figure 1. Directors Interview Questions
All interviewees indicated that specialized OM instruction was offered at their school or through their program.

2. Does (organization name) employ OM specialists?
3. If yes to 2, how many are employed?
Again, all organizations not only include OM instruction, but have employed OM specialists. But, the number varies by school/program, from one faculty to seven OM specialists with additional support staff. The differences in OM numbers corresponds with mission and student population. For example, the residential school for the blind does not employ the same number of OM specialists as one of the urban school districts. Because all students are present on the school campus, the OM teacher at the residential school is able to maintain a higher caseload than the OM teachers in the urban program who have to travel to the students.

4. If yes to 2, how much of their job is devoted to OM (estimate as a percentage of time/duties)?
Most of the OM teachers spent 100% of their time in OM instruction. In two cases, the OM teachers also maintained administrative duties.

5. Do these OM specialists use tactile maps as part of their instruction?
All directors indicated that they thought all of the OM teachers use tactile maps, but not necessarily with all students.

6. Where do they get their maps?
All of the directors said that in most cases, the OM teachers make their own maps.

7. (If they indicate in question 6 that teachers make their maps) Does the school/district ever purchase existing or special order tactile maps?
Again, all directors were in agreement. They indicated that every year they purchase or special order at least one or one set of tactile maps.

8. If yes to 7, what is the source for these maps?
All five directors said that they have contracted for special order maps either from individuals or through companies that produce tactile maps. Three of the directors said they have purchased pre-made tactile map sets.

9. Does the school/district employ a tactile graphics/map making specialist?
Only one director said that their program employed a tactile graphics specialist (and in fact they have two such specialists on staff).

10. What technology is available for tactile map production?
All five schools/programs own a tactile image enhancer and one program owns a TIGER embosser, both of these printers are used for tactile map and graphic production.

11. Does the school/district offer or send teachers to workshops designed to give them instruction in graphic design or tactile map production?
None of the schools/programs have sent teachers to a workshop for the specific purpose of tactile map design. In addition, all indicated that teachers have attended presentations and/or short, informal workshops addressing tactile graphic production.

12. Do OM teachers have their own, or have on-demand access to a computer?
All directors reported that their OM teachers at least had on-demand access to a computer; four of the directors said that all OM teachers were equipped with their own desktop and/or laptop computers.

The Teacher Interviews

Seven orientation and mobility teachers, representing each of the five schools or special education districts mentioned above were interviewed.
1. **Is Orientation and Mobility instruction part of the educational curriculum of the blind and visually impaired students you serve?**

All interviewees said that orientation and mobility is part of the educational curriculum in their school/district.

2. **Are you an Orientation and Mobility specialist?**

All seven interviewees indicated that their titles did include OM specialist.

3. **What is your training?**

All interviewees held a bachelor’s degree in special education. Four held a master’s degree in special education, specializing in blind and visually impaired education.

4. **How much of your job is devoted to OM (estimate as a percentage of time/duties)?**

Two of the orientation and mobility teachers indicated that their time was split between teaching and administrative duties. For all seven teachers, all of their teaching time is devoted to orientation and mobility instruction.

5. **Do you use maps as part of your instruction?**

All interviewees reported that they use tactile maps in their orientation and mobility instruction. However, they also said that they did not use maps with all of their students. But, all teachers also reported that those students who read Braille all used tactile maps, as well.

6. **Where do you get your maps?**

Five teachers reported that they make their own maps. Two of the teachers said that while they make most of their maps, their district employs two tactile graphics specialists who make some of the maps.

7. **What methods are used to produce the maps you use?**

Results were most varied for this question. One teacher reported that all of the tactile maps they make are collage-style. Five teachers reported that they use a combination of collage maps and microcapsule paper maps. For these five teachers, only one uses a computer to create the graphics that are transferred to the microcapsule paper; the other 4 hand draw and then copy to microcapsule paper or use a carbon pen. One teacher reported using collage, microcapsule, and embossed maps (created with TIGER embosser); though this teacher is the only of the interviewees who is employed in a district that owns the TIGER.

8. **(If they indicate they use computer production) What software do you use to create your maps?**

Only one teacher indicated using computer production; they used Microsoft Paint to create the graphics and then transferred these graphics to microcapsule paper.

9. **(If they do not mention computer production) Do you ever use a computer to design and product tactile maps?**

All responses are summarized per question.
This question was asked to the six teachers who did not initially volunteer that they used computers in the tactile map production. After asking about computers, specifically, these teachers all answered that they do not use the computer for tactile map production.

10. Is there any technology that the school/district does not own or to which you do not have access that would be useful in producing tactile maps?
Six of the teachers indicated that they would possibly use a TIGER embosser if it were available. Though two of them admitted that they currently do not use a computer and said that they realized computers were used to print tactile graphics to the TIGER embosser. The seventh teacher already has access to a TIGER. All eight said they would possibly use a talking tablet, but only two indicated a level of familiarity to say they would definitely use it if it were readily available for OM lessons.

11. If computer production of tactile maps was available in a simpler, more accessible manner, would you consider this beneficial?
All seven teachers answered yes to this question.

12. Would you consider using software designed specifically for the production of tactile maps?
Again, all seven teachers answered yes to this question. Five indicated that the lack of such software was the reason they currently do not use a computer in the production of tactile maps.

SUMMARY AND CONCLUSION

In addition to the information provided in direct answers to the questions, all interviewees expressed a reasonable amount of frustration over the lack of available technology, the lack of accessibility to needed materials, and the lack of attention to tactile maps in general. They specifically bemoaned the fact that tactile map design guidelines are virtually non-existent. Most of these teachers said that all of the maps they produce are designed based on their own experience and assumptions based on this experience. While most seemed reasonably confident that their maps are, indeed, useful to the students, they also suggested that their expertise is not in map design and would appreciate some guidance in this area. The interviewees also expressed enthusiasm for the idea of software designed specifically for tactile map production.

While this paper presents the results of only twelve interviews, one common thread found in all interviews was the frustration over the lack of availability of either pre-made, usable maps or the lack of reasonable methods for tactile map production. If blind and visually impaired travelers are to be given the same opportunities for mobility as available to the sighted, not only do we need the means to make the maps, but we also need the means provided in schools, where the orientation and mobility training begins for most.
REFERENCES


