Examining the Methods for Investigating Behavioral Clues of Special-schooled Children

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Abstract
This article discusses the authors' use of a combination of methods to understand the engagement of special needs children with design features in sensory gardens at two schools in Britain. In addition to observation and behavior mapping, we interviewed landscape architects, teachers, and therapists to anticipate the children's behavior when experiencing sensory gardens. We report how these groups' anticipations differed from what we observed. While the groups anticipated that aesthetic value relates significantly to users' behavior in the garden, we observed that sensory value has a stronger bearing on the behavior. The potential of this finding is important for design studies.

Keywords
observation, behavior mapping, sensory garden, special children

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Introduction

This article presents the methods used in a study of how special-schooled children interacted with a sensory garden. The therapeutic role of a garden environment has long been recognized, although there is little empirical study of the methods for evaluating how gardens support the users’ well-being (Cooper Marcus 2002; Hussein 2002). Investigations of hospital gardens (Whitehouse et al. 2001) and inclusive parks (Moore and Cosco 2007) offer insights into the impact of a garden on the users’ well-being and behavior. A comparison between these two works and the study presented here is shown in Table 1.

Review of Research Methods on Children with Special Educational Needs

Booth and Booth (1996) and Gilbert (2004) noted that although interviewing has been widely thought of as the best method in qualitative research, their own research showed that there are a number of challenges in conducting interviews on children with learning difficulties. Not the least of these is the issue of validity. To be valid, an interview must fulfill three elements (Lewis 2002). First is authenticity, which requires that opinions expressed are fair. Second, validity/credibility requires that opinions expressed are correct. Third, reliability/trustworthiness requires that opinions expressed are typical of what the person believes. In this respect, no amount of visual structure will make an interview possible for some whose learning difficulties are extremely profound (see also Nind 2008).

A formal survey is not a good alternative to interviews. There is no guarantee that a survey will perform effectively in eliciting information from special-needs children with whom more interaction may be needed (Hussein 2002). Indeed, surveys are rarely employed in research of this nature. In McConkey and Mezza’s (2001) survey of employment aspirations of people with learning difficulties, for example, questionnaires were completed by support workers—who acted as intermediaries in conveying disabled persons’ views and preferences—rather than directly by the subjects themselves. This calls the reliability of the data into question.

Focus groups provide an environment that helps self-confidence, peer support, and validation, enabling people with learning difficulties to contribute to research discussions (Cambridge and McCarthy 2001; Nind 2008). There are numerous challenges in using this approach on groups characterized by constrained verbal communication, sensory impairments,
or behavioral difficulties. These challenges can be mitigated, however, by using familiar places as meeting venues and working with human resource officers in organizing and recruiting participants (Barr et al. 2003).

Professionals, such as speech therapists, can assist researchers in gathering and interpreting information from people with profound learning difficulties (Whitehurst 2006). Some researchers, however, question the authorship of data elicited this way (Grove et al. 1999; Rodgers 1999). Researchers also have argued the importance of establishing a relationship as a first step toward eliciting the views of children with learning difficulties (Aitken and Millar 2002; Rodgers 1999). Therefore, researchers have to establish the best medium through which communication takes place and conceptualize the message in a way that is meaningful to the recipient (Lewis and Porter 2004). Limited or poor communication skills lead to difficulty with clarifying the meaning conveyed and thus to ambiguity in the interpretation of the response.

Table 1. Objectives and Methods: A Comparison of Whitehouse et al. (2001), Moore and Cosco (2007), and Hussein (2009).

<table>
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<th>Earlier Works</th>
<th>This Study</th>
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<tr>
<td>The work</td>
<td></td>
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<tr>
<td>Research objective</td>
<td>Investigated the effects of garden on patients, visitors, and hospital staff</td>
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<tr>
<td>Methods employed</td>
<td>Observation and behavioral mapping Interviews Post-occupancy evaluation</td>
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<td>Survey</td>
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A growing body of evidence suggests that question and answer formats may be more constraining than narratives or use of statements (Lewis 2002, 2004). A variety of augmentative and alternative communication supports have been suggested as visual methods, including electronic aids (power point), sign language, symbols systems (cue cards), photographs (Lewis 2002), photovoice (Booth and Booth 2003), photo elicitation (Banks 2001; Mathers 2004), and participatory photography (Aldridge 2007). These methods involve using photographs to invoke remarks, bring back memory, and generate discussion in the course of a semistructured interview, and thus could assist in solving the verbal and communication problem between the researcher and people with learning difficulties. A low-tech and inexpensive visual communication resource that seems to be reliable is the “Talking Mats” method (Cameron et al. 2004; Germain 2004; Murphy 1997; Murphy and Cameron 2001; Murphy et al. 2005; Whitehurst 2006). This was designed to be used as a source of communication in conjunction with sign language jointly with facial expression and gesture (Cameron et al. 2004; Whitehurst 2006) and is particularly useful for students with autism and the visually impaired, who rely on visual clues and textured clues, respectively.

However, according to Brewster (2004), these visual methods may shift control to the participant, with the potential to make the range of responses limitless. This, in turn, makes the task of analyzing the views of people with learning difficulties challenging and increases the pressure on the researchers involved to validate their interpretation (Silverman 2006). This is often best achieved by combining methods, which may confirm or elucidate an analysis. For example, Goodman (1998) combined focus groups and workshops with collage, drawings, role-plays, videos, posters, photographs, and pictures. Mark Boothroyd, a landscape architect who designed the sensory garden of Lyndale School in Liverpool, mentioned in a personal interview that the collage work, which the students produced, is more useful than all the consultation data, questionnaires, and reports because it shows exactly the kind of environment the users wanted.

Narrative is another method that enables people with learning difficulties to share stories of their life experiences with others (Gilbert 2004). The life history approach (Goodley 1996), including narrative and photography and pictorial representation, was developed to bring together insight and empathy of the individual, allowing others to make connections and to draw strength from them. The narrative method requires genuine commitment by the researcher to listening and facilitating the relating of experiences (e.g., through group discussions).
Choice of Research Methods

The preceding discussion underscores the complexity of data collection when it involves children with special educational needs as respondents—particularly those with speech, language, and communication difficulties. Although there is great need to foster effective communications between researcher and the children, not many methods cater to this need. As an experiment, we attempted using a focus group with the visually impaired at the Royal School of Blind in Edinburgh during the preliminary site study. The purpose was to gain an understanding of how students behave in the garden—an understanding that observation alone could not reveal. We thought that a focus group might provide a fuller picture of the use of the garden, as the information would come first-hand from the students. Teachers were not allowed to answer on behalf of the students in the focus group or to prompt the students with specific answers. Teachers could encourage the students by helping them understand a question or by assisting them in grasping the answer. However, the method failed to deliver data on the features the students preferred for their sensory garden, on their experience in the garden, on their use of design features, or on the problems they encountered in the garden.

We found that when we interviewed the children, particularly those with speech difficulty, about how they used the area in their garden, it was difficult to get first-hand information from them. Following Nind (2008), we chose neither of the visual methods because the process of getting permission from the parents of children with special educational needs to participate in a study was time consuming and would not have allowed us to conduct behavioral observation during May and July, the time of year with the best outdoor conditions. This led to the construction of a methodology for studying the behavior of users with special needs in service to the design of sensory gardens.

Face-to-face Interviews and Walk-through Interviews

A walk-through interview is an unstructured interview (Bechtel and Srivastana 1978) that uses the detailed specification of environmental qualities as a prompt to help respondents articulate their reactions to a setting (Zeisel 1981; Zimring 1987). We used this method to elicit information from the landscape architects, teachers, and therapists. To benefit fully from the walk-through interview, the interviewer should gather up points, in terms of the environmental qualities, to a more detailed specification (Zeisel
This will allow the interviewer to use the respondent’s personal definition of the setting to define important features.

**Observation and Behavior Mapping**

Behavior mapping is a recording technique that supports observation for studying environmental influences on behavior. It was developed by Ittelson et al. in 1970 (Bechtel and Zeisel 1987:22) and is a method of understanding the engagement between users and the particular spatial setting. Bechtel et al. (1987) noted that the aim of behavioral methods in environment behavior research is mainly to gain insight into research questions and problems. They described observation as a method with five dimensions: behavior, environment, time, observer, and record of observation in relation to the mapping of an individuals’ use of the setting. An empirical study of a children–environment relationship is best conducted by observing the children’s situation and their actions in a particular context (Graue and Walsh 1995).

The same method is also appropriate when observing children with multiple and severe disabilities (McLinden and McCall 2002). Hart (1979) used this method when investigating environmental knowledge and when exploring children in their living environment. Laurie (1986) and Natu and Padmavathi (2006) noted the importance of making observations in areas, which could reveal patterns of use. To understand the whole picture of an individual’s involvement with his or her environment, it is not enough to know what behavior occurs but also why it occurs and what its significance and meaning are (Lang et al. 1974). Thus, in terms of an analytical tool to evaluate sensory gardens, observation and behavior mapping comprise a single, complex method.

**Piloting the Method**

A pilot study was conducted to identify difficulties in applying the methods and the modifications needed to address those difficulties.

For the initial approach, we referred to Golicnik’s (2005) work to understand how the method could be carried out in a practical way on the site. The essential instruments needed were an accurate scale map of the area, multicolored pens, a clipboard, a wristwatch, a digital camera, and a tape recorder. The invention of symbols to map the users’ activity on a scaled base plan (a map of the property, drawn to scale, with houses, gardens, and other landmarks properly indicated) with a matrix to record the details of
the setting, the user characteristics, and the type of activities undertaken are also crucial. According to Golicnik, it is important for the researcher to memorize the activity codes so the data will be collected systematically as well as to note any significant behaviors that occurred during the observation period.

During the on-site investigation, we conducted interviews with the teachers, using a preliminary questionnaire to understand the experience in terms of the benefits and problems as perceived by the adult caregivers (staff) in the sensory garden. This initial step also mapped both staff and student behaviors as they occurred within the setting, on a scaled base plan, using symbols. It entailed the recording of discrete behavioral observations as they took place, categorizing them and then compiling a behavioral setting inventory (after Barker 1968). After carrying out this initial step, it was possible to categorize the different types of main activities that were undertaken by the users.

The pilot test pointed to a number of difficulties. One problem was that the questionnaire was not self-explanatory enough for the teachers and had to be refined. Another was uncertainty as to how to systematically record the physical activities that were observed during the observation period. A third problem was uncertainty over whether to conduct interviews with the special educational needs students because of their speech, language, and communication difficulties. There was uncertainty in the timescale of users’ activity and the optimum extent of the duration of observation (anything from 30 to 60 minutes) recorded per base plan. There were also technical problems, such as insufficiency of the scaled base plan and matrix, and more binder clips were needed due to the windy weather. Most importantly, there was confusion in the sequence of methods as to whether to conduct the interviews or the observation and behavior mapping first.

A clear outcome of the pilot study was the need for information about the environment from local specialists before undertaking the observation and behavior mapping. The sequence, then, was (1) interviews and walkthrough interviews with the landscape architects, teachers, and therapists; and (2) a systematic series of observations and behavior mapping (see Table 2).

The questionnaires were simplified into structured interviews and made into four sets (i.e., two sets for the landscape architects and one set each for the teachers and therapists). Following Golicnik’s (2005) work, a decision was made to record the users’ activity in four timescales of less than 1 minute, 1–2 minutes, 2–5 minutes, and more than 5 minutes. To avoid too much data packed into the one, scaled base plan, the observation and behavior mapping was planned to be conducted over 14 separate 30-minute periods,
on different days, and at different times of the day. This is further explained in the next section.

**Execution of the Methods**

The data collection started with a two-session interview of the landscape architect. The first session was undertaken at a place of the architect’s choice and the second involved a walk-through of the sensory garden.

In exploring the benefits of having a sensory garden as part of a school’s special education environment, we interviewed the teachers and therapists on any problems the students had encountered when engaging with the features of the garden. This interview involved a standard questionnaire followed by a systematic series of observations and behavior mapping. We observed the users of the sensory garden to see if they understood what was going on, in terms of how the users, especially some particular children, behaved and how long they spent in the garden.

After the interviews and walk-through interviews with the landscape architects, teachers, and therapists were complete, observation and behavior mapping of on-site activities began. This data gathering was conducted in May and July for seven consecutive working days each month, and the period of observation was chosen to try to ensure that the daily variations

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<th>Method</th>
<th>Objective</th>
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<td>Interview with the landscape architects</td>
<td>To understand the design process and design intentions and to find out challenges the landscape architect had to deal with</td>
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<tr>
<td>Walk-through interview with the landscape architect in the sensory garden</td>
<td>To allow subsequent assessment of whether users utilized areas and features in the way intended by the landscape architect</td>
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<tr>
<td>Interview with the teachers and therapists</td>
<td>To enquire into their experience of and benefits in having the sensory garden; to assess the garden features and any problems identified in the sensory garden</td>
</tr>
<tr>
<td>Observation and behavioral mapping</td>
<td>To understand how users behave; to categorize all the different types of behavior</td>
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in behavior could be observed. The data were then recorded continuously from 8:30 a.m. to 3:30 p.m. on weekdays, during the opening hours of the school during the term. We took photographs but avoided shots of the users in observance of the school policy. The behavior mapping data were the main focus of the study. The results are shown in Figures 1 and 2.

In the two special schools selected for the case studies, there was no set time for the teachers, therapists, and children to use the sensory garden. Children had their own individual timetables and were free to use the garden as they wished, with the help of their adult caregivers. However, children were not allowed to wander around the garden by themselves. As a result, we decided to record and observe all users who utilized the garden in a specific observation period.

Behavior mapping records the users’ movement (using symbols) from the time they enter the sensory garden until they leave the setting, which includes coding each type of user (gender and users’ role: student or staff). This is done by observing (from a distance) and recording the location of main activities the users undertook, simultaneously with the features engaged by the users, within the four timescales, on the scaled base plan. The authors stayed as invisible as possible from the users, especially from

![Diagram of the sensory garden](image)
some particular children because, according to their adult caregivers, strangers could attract those students’ attention and this would influence the behavioral mapping data. An example of the observation and behavior

**Figure 2.** Behavior mapping symbols used to record the users’ activity, the users characteristics, and the details of the setting.
mapping as recorded in one 30-minute period is shown in Figures 1 and 2 and is described in our notes as follows:

Description: It was a sunny morning. Two female staff and a hearing-impaired male student walked together (main activity) from Green Space Two and stopped at the Water Central Area. The water feature offered the potential for hands to be splashed about in it. A female teaching assistant had a fear of getting wet at the water feature. She was sitting on the seat while another female teacher and a male student were busy playing with the water. Suddenly, the student scooped up the water with his hands and splashed it on his teacher. After being at the Water Central Area for less than two minutes, three of them continued their walk to the classroom, via Asteroid Arts Garden and Parents Waiting Area. On another occasion, students in wheelchairs wanted to feel the water but did not manage to do so because of the shrubs around the feature. This is evidence that an environment or an object can be looked at in relation to the individual’s qualities such as children’s physical skills or bodily proportions, social needs and personal intentions are matched with the environmental features. (Kytta 2002, 2003, 2006)

Conclusion

This study has constructed a methodology based on the methods from Whitehouse et al. (2001) and Moore and Cosco’s (2007) research. We further developed the methodology in the context of a sensory garden and showed how it can be employed in this study. Whitehouse et al. (2001) carried out a post-occupancy evaluation, visual analysis, behavior observations, surveys, and structured interviews, whereas Moore and Cosco employed methods of behavior observations, park visits with people with disabilities, setting observations, and interviews with users, and we applied some of these methods. At the same time, we innovated by introducing the element of interviews and walk-through interviews with the landscape architects of the sensory gardens. This turned out to be very useful. We demonstrated that the methodology is applicable in two special-needs schools in Britain. It remains to be seen whether similar methods can apply seamlessly across different contexts where variations in climate and culture may affect the behavior of special-schooled children.

The divergence between what the landscape architects, teachers, and therapists anticipated (during the interviews) regarding how students would behave and what the authors recorded during the observation periods in case study sensory gardens is important for design studies. While the groups anticipated that users’ behavior in the garden was significantly influenced
by aesthetic values, we observed that the behavior was influenced more by sensory values. This showed in the elements such as water features and raised planters, which produced unanticipated behavior. We learned that the composition of the features and the spatial design of the sensory garden enabled particular users’ engagement and usability of the garden. For example, designers should ensure that all users are offered a variety of activities and engage with features, minimizing barriers to allow users full access to the garden.

The study has shown that the structured combining of individual interviews, walk-through, observation, and behavior mapping provides a new and tested approach for investigating the behaviors of special-schooled children in the context of sensory garden. These methods were appropriate for elucidating the issues that the users had to deal with when using the sensory garden, which areas in the garden were utilized by the users and the frequency of this use, and why users engaged with the features.

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Notes
1. This feature induced feelings of avoidance, danger, escape, and fear (Heft 1999; Kytta 2003).
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