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The perspective of children and youth: How different stakeholders identify architectural barriers for inclusion in schools

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ABSTRACT

Recent inclusive policies are promoting the involvement of individuals with disabilities in identifying barriers that limit their full participation and inclusion in public spaces. The present two studies explored the contributions provided by different stakeholder groups in the identification of architectural barriers in elementary and secondary schools. In each school, the principal, special education resource teacher and a student independently identified architectural barriers using an observational walkthrough method. The first study consisted of 29 schools where the student evaluator had a physical disability and the second study consisted of 22 schools where the student evaluator did not have a disability. The results of both studies showed that students identified the greatest number of barriers and principals the least. The type and location of identified barriers are explored and the conclusions are examined in relation to person-environment congruence. The results highlight the efficacy of youth involvement and provide support for collaborative assessments that equitably involve all stakeholders in inclusive environmental assessments.

1. Introduction

Inaccessible schools are a particularly salient issue for children with disabilities, considering the amount of time spent in these environments. Even after decades of equity reform (e.g., The Individuals with Disabilities Education Act in the US and the Canadian Charter of Rights and Freedoms), schools that have students with disabilities are still riddled with accessibility barriers and stigmatizing attitudes by others (Pivik, 2005; Pivik, McComas, & Laflamme, 2002; Valentine, 2001). Inaccessible schools contravene international agreements that most nations have adopted. Most notably, The United Nations Convention on the Rights of the Child (UNCRC; United Nations, 1989) where children with disabilities have the right to enjoy life and participate actively in society (Article 23); the right to a standard of living adequate for their physical, mental, spiritual, moral and social development (Article 27); and the right to express views freely and to be listened to (Articles 12 and 13). Another international agreement that supports inclusion is The Salamanca Statement (World Conference On Special Needs Education: Access And Quality (1994) where: " Schools should accommodate all children regardless of their physical, intellectual, emotional, social, linguistic or other conditions"; and where "regular schools with this inclusive orientation are the most effective means of combating discriminatory attitudes, creating welcoming communities, building an inclusive society and achieving education for all".

1.1. Person–environment congruence

Ensuring inclusion requires compatibility between the person or group's functional capacity and their environment (Iwarsson & Stahl, 2003), in other words, person-environment congruence. Person–environment congruence is generally defined as the degree of fit between an individual's needs, capabilities and aspirations and the resources, demands and opportunities provided by the environment (Coulton, 1979; Kaplan, 1983; Lewin, 1951; Stokols, 1977). Relevant to the discussion of inclusion has been the exploration of environmental fit for vulnerable populations. For example, Lawton and colleagues (Lawton & Nahemow, 1973; Lawton & Simon, 1968) explored the relationship between levels of functional capacity in the elderly (i.e., biological health, sensory and motor skills, and cognitive function) and environmental press (the physical environment, the personal environment, the small-group environment, the suprapersonal environment, and the social or megasocial environment). Recently, models and frameworks have been developed to explore person-environment congruence for individuals with disabilities. The *Model of Competence* developed by Rousseau (1997)

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describes the interaction between the person and the environment (built and social) in relation to one's activities and roles, resulting in degrees of competence or a handicapped situation. This model has been applied to adults with motor disabilities (Rousseau, Potvin, Dutil, & Falta, 2002) and visual impairments (Carignan, Rousseau, Gresset, & Couturier, 2008); providing rehabilitation professionals with an assessment method for identifying barriers in homes. Specific to children, The World Health Organization released the first internationally agreed upon classification code for assessing the health of children and youth in the context of their stages of development and the environments in which they live. The *International Classification of Functioning, Disability and Health for Children and Youth* (ICF-CY; World Health Assembly, 2001), reflects a biopsychosocial conceptualization of health that highlights the role of the environment as a crucial determinant in functioning and development; where access restrictions can have a negative impact. The value of this classification system is multifold: 1) a focus on children and youth, using a developmental lens; 2) a focus on functioning (vs. diagnosis) that includes body function and structure, the performance of personal activities and participation in communal life; 3) the association between functioning/disability and environmental barriers or facilitators; and, 4) the provision of a standardized tool that can be used for surveillance, screening and evaluation. In relation to person-environment congruence, Simeonsson et al. (2003) developed the *Child-Environment Interaction Model* associated with the ICF-CY; which incorporates the developing child's health status, their level of participation and activity and changing environments which provide or don't provide stimulation or feedback necessary for development. Essentially, as these models and frameworks suggest, environments can either help or hinder child development, activity or participation.

1.2. Inclusive environmental assessments

Accessible environments are a particularly important element influencing functioning and participation of children with disabilities (Law, 1993; Law & Dunn, 1993, Law, King, King, Kertoy, Hurley, Rosenbaum et al., 2006; Pivik, 2005; Pivik, McComas, & Laflamme, 2002). As Iwarsson and Stahl (2003) note in their review of the literature, the definition of accessibility is ambiguous and differs across disciplines (e.g., disability rights, architects and planners, legal, and rehabilitation sciences). The United Nations (1993) defines accessibility is an "equalization of opportunities in all spheres of society" (5th Standard Rule on the Equalization of Opportunities for Persons with Disabilities). The Canadian Standards Association (1995) defines accessibility as "a program, activity, meeting, hearing, or other event or process that is readily usable by an individual, regardless of his or her abilities. When used in reference to a building or facility, it means that a facility can be approached, entered and used by any individual, regardless of his or her abilities". For the purposes of the present studies, accessibility is defined as "the absence of barriers or anything that prevents a person with a disability from fully participating in all aspects of society because of his or her disability, including a physical barrier, an architectural barrier, an information or communications barrier, an attitudinal barrier, a technological barrier, a policy or a practice" (Ontarians with Disabilities Act, Ministry of Citizenship, 2001). Relatedly, environmental barriers refer to obstacles impacting participation and activity by individuals with disabilities in physical or natural spaces.

Inclusive environmental assessments use a variety of methods to identify barriers to accessibility and participation, including: objective checklists, subjective assessments such as questionnaires, surveys, focus groups or interviews of stakeholders or a process called post-occupancy evaluation. *The Housing Enabler* (Iwarsson, 1999) is an example of an objective assessment tool which evaluates an individual's functional limitations in relation to physical environmental barriers in the housing environment. An example of a subjective assessment tool is *The Facilitators and Barriers Survey* (Gray, Hollingsworth, Stark, & Morgan, 2008), which assesses environmental influences on participation from the perspective of individuals with mobility limitations. Post-occupancy evaluation is the systematic study of a building and typically involves determining whether the building meets the requirements of its users in relation to health, safety, security, functioning, psychological comfort, efficiency, aesthetic quality and satisfaction (National Academy of Sciences, 2002). Typically conducted by architects or planners, post-occupancy evaluations use a variety of methods such as questionnaires, interviews, site visits and direct observation (Cooper, Ahrentzen, & Hasselkus, 1991; Zimring & Reizenstein, 1980). One popular method for direct observation is the "walkthrough method" which involves walking through the environment and noting those elements which contravene building codes, association standards or users' needs. Each of these methods for identifying environmental barriers has both advantages and disadvantages. Objective assessments can provide a level of standardization across difference spaces, however, the evaluation is static and may miss unique elements specific to that space (that are not included on the checklist). Subjective assessments typically include feedback from relevant stakeholders; however, the information is often retrospective and dependent on recall. Post-occupancy evaluations, while extensive, can be costly and time-consuming, with the conclusions usually based on the perspective of the architect or planning professional.

Within schools, inclusive environmental assessments are normally conducted by planners, architects, health professionals and/or school personnel using the walkthrough method. However, planners are realizing that "accessibility standards are often based on limited research and seldom address the physical and emotional needs of disabled children" (Zimring & Barnes, 1987, p. 316). Further, Wachs (1991) contends that the child's perception of the environment and its impact is particularly salient in environmental assessment and evaluation. He suggests that by asking the child to identify their experiences and perceptions of child-orientated environments (e.g., schools, day-care, playgrounds), better environments could be designed to facilitate child developmental outcomes.

Children and youth have shown to be capable of environmental assessments; successfully evaluating preschools (Clark & Moss, 2001), schoolyards and playgrounds (Francis, 1988; Horelli, 1998) and neighbourhoods (Horelli, 1998; Meucci & Redmon, 1997; Schwab, 1997). Including the voices of children is particularly important as their perspective has been shown to differ from adults (Berg & Medrich, 1980; Lightfoot, Wright, & Sloper, 1999; Pivik, 2005; Wachs, 1991; Ward Thompson, 1995). In fact, Eriksson (2005) found that students with disabilities provided better information about person-school congruence and participation than their teachers or special education counselors.

In relation to identifying accessibility barriers within school settings, youth with mobility impairments have shown to be capable of retrospectively identifying both barriers and solutions to those barriers (Asbjørnslett & Hemmingsson, 2008; Hemmingsson & Borell, 2000, 2002; Pivik et al., 2002; Prellwitz & Tamm, 2000). For example, Pivik, McComas et al., 2002 conducted a series of focus group sessions with 15 students with mobility impairments, asking them to identify the barriers at their schools. The students identified accessibility barriers associated with doors, ramps, hallways, elevators, classrooms, washrooms, playgrounds and fixtures such as lockers and water fountains. They also described attitudinal barriers, ethos considerations and policy and procedure issues that impeded their full participation as well as providing a list of solutions to address these barriers. One of the main recommendations from this study was that both students with disabilities and their parents be involved in planning and designing their school environments to ensure accessibility and equitable participation. This study, although informative from the perspective of students with disabilities, used recall as a method for evaluating barriers within schools. An inclusive environmental assessment using direct observation would provide more current information on the state of architectural barriers within schools.

The aim of the following studies was to explore whether there are differences between stakeholders in their evaluation of architectural barriers in schools using the typical method employed, the observational walkthrough. This goal was instigated by *The Ontarian's with Disability Act* (2001) which required that relevant stakeholders, including individuals with disabilities, be involved in identifying barriers and recommending solutions for accessibility in public buildings (Ministry of Citizenship, Ontario, 2001). The stakeholders in the first study consisted of students with disabilities, special education resource teachers (SERTS) and principals. The second study explored inclusive assessments in schools by students without disabilities, SERTS and principals. It was hypothesized that students with disabilities would identify the greatest number of barriers due to their experiential knowledge. The studies also explored the different areas and types of barriers that were identified by stakeholder groups.

2. Methods

2.1. Study schools and participants

The schools that participated in this study were drawn from a large school board in Ontario, Canada, encompassing 12,000 km ($N = 93$ schools). Of the 73 elementary schools and 20 middle/high schools represented; 29 schools had students with physical disabilities that participated in Study 1 and 22 schools that did not have students with physical disabilities participated in Study 2. According to school board policy at that time (Upper Canada District School Board, Annual Accessibility Plan: 2003–2004) schools are grouped as “families” based on geographical location, with at least one school in a family identified as “accessible”. Seven schools across the entire board were built after 1991, when Canadian Standards required barrier-free design (Canadian Standards Association, 1990), with the other 40 schools identified as “accessible” being retro-fitted as needed. For example, in the year prior to these studies, the board addressed accessibility in nine schools: building two new “barrier-free schools”, re-fitting three school washrooms, installing three automatic doors and replacing one damaged access ramp. Table 1 describes the characteristics of the schools and participants for both studies. The majority of schools in both studies were elementary schools built in the late 1950s (range = 1806–1998). About half of the schools in either study had an accessible washroom and 20% had an elevator or lift. Of the schools deemed “accessible”, 69% had a ramped entranceway and 31% had an automatic door. In 2003, the school board, in compliance with the *Ontarian's with Disability Act* (ODA), contacted the author to determine accessibility in all of its schools, working with students with disabilities in those schools when possible. Along with this subjective assessment, an objective assessment was conducted on 41 schools (11 with student participants with disabilities; manuscript in preparation). Schools were randomly assigned to either the subjective or objective assessment based on their “accessibility” status according to the school board.

Pilot testing of the process and measures (Pivik & McComas, 2002) indicated that students in grade 4 and above were capable of completing the assessment. Principals of all of the schools were asked to identify a student participant, aged 9 or older with the cognitive and verbal ability to participate in the study. Of the schools that had students with disabilities, the principals were asked to identify a student with a *physical* disability that met the same inclusion criteria. The types of disabilities of students in Study 1 consisted of biophysical impairments (cerebral palsy, spina bifida, cystic fibrosis, muscular dystrophy, paralysis, arthritis or rheumatism), with one student identified as “legally blind”. The majority used assistive devices (manual wheelchair, electric wheelchair or crutches/walker). As Table 1 indicates, students in both studies had an average age of 13 years.

Table 1
Frequency of school and participant characteristics.

	Study 1 Student participants with disabilities ($n = 29$ schools)	Study 2 Student participants without disabilities ($n = 22$ schools)
School type		
Elementary	18	20
Middle/high school	11	2
Age of buildings (years)		
>14 (1991–2005)	3	2
15–25 (1990–1980)	1	1
26–36 (1979–1969)	4	2
37–47 (1968–1958)	12	10
48+ (1957–older)	9	7
Building characteristics (%)		
Ramped entranceway	69	64
Automatic doors	31	18
Accessible washroom	53	49
Elevator/lift	23	21
Mean # students	289.5	240.4
Gender (Female–%)		
Principal	52	59
SERT	59	n/a
Student	45	68
Student age (mean/SD) years	13 (2.9)	13 (.48)
Student: assistive devices		
Electric wheelchair	5	Not applicable
Manual wheelchair	13	Not applicable
Walker/crutches	2	Not applicable
None	8	Not applicable
Missing data	1	Not applicable

2.2. Procedure

The author worked with the school board to develop a systematic method of barrier identification in all its schools. For both studies, the typical walkthrough method of barrier identification was employed with three relevant stakeholders from each school: the principal, the SERT and a student. For those schools without students with a physical disability, a student without a disability who met the same inclusion criteria participated. Following pilot testing of the measures and process, the school board convened a meeting of all school principals. The author presented the requirements of the ODA and clarified the method for data collection; with the school board emphasizing compliance of the project and process. Even though the project was a program evaluation for the school board, it was submitted and received ethics approval from *The University of Ottawa Behavioral Research Ethics Board*. Each principal was given an instruction sheet asking him/her to identify a potential student and ascertain interest in participating.

Interested student participants were provided an information letter and consent form to be completed by their parent or guardian. The principal was also responsible for explaining the process to the student (and his/her educational assistant, when necessary) and the SERT. Three assessment packages were sent to each school, containing the instruction information, a consent form and a form for writing down identified barriers. All evaluations took place on the same day across the school board and results were required to be sent to the school board office the next day. Within each school, the principal, SERT, and student were asked to independently evaluate their school at the same time. Students with disabilities were provided an educational assistant to assist if needed or wanted; with strict instructions to only record the students' feedback. Breaks were to be provided to students as required.

2.3. Measure and scoring of barriers

2.3.1. Subjective barrier assessment instrument. The subjective barrier assessment instrument simulated the typical method used for assessing barriers within schools. Namely, participants were instructed to walk through their school and list all accessibility barriers noticed. The given definition of an accessibility barrier was "things which stop or make it difficult for a person with a disability from doing what everybody else can or cause a person to be treated differently because of a disability. For example, smooth elevator buttons for people who are visually impaired". This example and definition were used in a previous study (Pivik, McComas, Macfarlane, & Laflamme, 2002) and was easily understood by 60 students in grades 4–6. Identifying information on the form included the name of the school, whether it was an elementary or high school, whether the participant was a student, teacher, or principal, and the type of assistive device employed, if applicable. Space was provided on the form for participants to make comments.

2.3.2. Scoring

Scoring consisted of recording the number of barriers identified in the following categories: entranceway, ramps, doors, passageways, washrooms, signage and safety, water fountains, elevators, classrooms, stairs, libraries, recreational facilities, and other, as well as the total number of barriers found per school. An objective checklist was used as a template to determine if an item was a barrier. This template was Part 1 of the *Inclusive Schools Checklist* (Pivik, 2005, see www.apriorіresearch.com) which consists of 76 potential architectural school barriers. The items are based on standardized child and adult dimensions and anthropometrics identified in building codes that apply to both elementary and high school students. As well, an extensive literature review of accessibility barriers, environmental design, universal design, and inclusive education, along with feedback from students with disabilities, their parents, key experts and pilot testing, ensured both content and face validity of the *Inclusive Schools Checklist* (Pivik & McComas, 2002). Its inter-rater reliability ranged from .87 to .94 for 111 school personnel, including students (Pivik, 2005). For the present two studies, two raters independently scored all of the subjective barrier assessment forms, with an inter-rater reliability rating of 92%. Discrepancies were resolved through discussion. The data for both studies was compared across the stakeholder groups (principal, SERT or student).

2.4. Design and analyses

SPSSX Version 10.0 was used for all analyses. To ensure systematic differences were not present due to level of school (elementary, middle/high school), or student gender (female, male), preliminary independent samples *t*-tests were conducted on the total number of barriers identified by the three groups in each study (principal, SERT, student). No differences were found. A repeated measures analysis of variance was then used to examine group differences for the planned comparisons, since each person (principal, SERT, student) examined the same environment at the same time. For the main analysis, the independent variable was the total number of barriers identified in the school and the dependent variable was the stakeholder group. To maximize power, a univariate approach was taken for the repeated measures ANOVAs. When sphericity was violated, the Greenhouse–Geisser correction was applied to the degrees of freedom to adjust for a potential increased Type 1 error. When the results of the ANOVAs were significant, protected *t*-tests were performed for the post-hoc analyses, due to SPSS's inability to conduct post-hoc analyses for within-subjects factors. Although more powerful post-hoc analyses are available for between-subjects factors, the use of protected *t*-tests analyses for repeated measures ANOVAs is considered the best solution (Cronk, 2004). Data were screened to ensure that the assumptions of analyses of variance were fulfilled. The three cases that indicated outliers were re-coded to the highest or lowest acceptable score within the normal distribution.

3. Results

3.1. Study 1

In the 29 schools that had students with physical disabilities participating in the evaluation, it was expected that there would be significant differences between stakeholder groups on the total number of barriers identified; with students with disabilities reporting the greatest number of barriers due to their experiential knowledge. The within-subjects repeated measures analyses revealed a significant effect for group, $F\,(2, 52) = 3.81$, $p < .05$. To further examine which groups were impacting the results, protected t- tests were performed for principal-SERT, principal-student, and SERT-student. The results indicated that the averaged student scores ($M = 10.6$, $SD = 8.0$) were significantly higher than either the averaged principal scores ($M = 8.0$, $SD = 4.7$), $t\,(27) = -2.42$, $p < .05$ or the SERT scores ($M = 8.5$, $SD = 5.7$), $t\,(27) = -2.08$, $p < .05$. No significant differences were identified between principal and SERT scores for the total number of barriers identified. Thus, as hypothesized, students with disabilities reported more barriers in their schools than either their principal or the SERT.

To explore whether different stakeholders identified more barriers in certain areas of the school, the total number of barriers per school area was examined by stakeholder group using a one-way ANOVA, with the category as the grouping factor and the multiple observations (principal, SERT, student) within each category as the "within-subject" factor. This type of analysis is used when there are multiple observers for each subject but no observers common to more than one subject (Streiner, 1986). The results of the ANOVAs indicated that two areas showed significant differences between stakeholders: doors ($F\,(2, 52) = 3.6$, $p < .05$) and elevators ($F\,(2, 52) = 3.2$, $p < .05$.). *T*-tests indicated significant differences between the principals ($M = .64$, $SD = .82$) and students ($M = 1.1$, $SD = 1.3$), $t\,(47) = -2.1$, $p < .05$. The responses from a middle school provide an example to illustrate this result. The principal indicated that the "fire doors at the entrance were extremely heavy" whereas the student reported that "the doors to the cafeteria, the music room, the upstairs entranceway and resource center were all too heavy to enter unaided". Principals also rarely identified barriers associated with elevators ($M = .10$, $SD = .31$) compared to SERTS ($M = .37$, $SD = .82$), $t\,(27) = -2.2$, $p < .05$. The only responses regarding elevators by principals were to indicate that the school needed one whereas the SERTS (and students) reported difficulty with size, button location, lighting, slow speed or the need for a key to activate the elevator.

As Table 2 shows, overall, principals reported the least number of barriers in the fewest areas and the students the greatest. Principals reported the highest number of barriers for the entranceway, signage/safety and water fountains. The SERTS reported more barriers than the other two groups for ramps, washrooms, elevators and stairs. Students reported the highest number of barriers for doors, classrooms, library and recreational facilities.

3.2. Study 2

The same analyses were conducted for the 22 schools that did not have a student evaluator with a physical disability. Similar to the first study, there were significant differences between groups, $F(2, 42) = 6.7$, $p < .01$. Protected t- tests also found that the averaged student scores ($M = 13.1$, SD = 8.7) were significantly higher than the averaged principal scores ($M = 8.0$, SD = 5.7), $t(21) = -3.92$, $p < .001$, and the averaged SERT scores ($M = 9.5$, SD = 5.9), $t(22) = -2.1$, $p < .05$.

Table 3 describes the means and standard deviation scores of the principals, SERTS and students for each school area for Study 2. Like Study 1, the students reported the greatest number of barriers in the most locations and the principals the least. The only school area which significantly differentiated the three groups was the category "other" which consisted of laboratories, cafeterias, and resource rooms, $F(2, 42) = 15.5$, $p < .001$. Paired t-tests indicated significant differences between principal and student reports, $t(21) = -4.1$, $p < .001$; with students reporting more barriers. Significant differences were also found between SERT and student reports, $t(21) = -4.0$, $p < .01$; with students again reporting more barriers than the SERTS. Although not significantly different, principals reported more barriers for the stairs; SERTS had the highest number of reported barriers for ramps, washrooms and elevators; and students reported the greatest number of barriers in the entranceway, doors, passageways, signage and safety, classrooms and recreational facilities.

3.3. Type of barriers identified

Due to the unexpected result of students without disabilities reporting more barriers than either their principal or SERT, the data was further explored to determine the *type* of barrier (mobility, visual, hearing) identified by stakeholder group for both studies. Table 4 displays the frequency of barrier type for each group for the two studies. Unfortunately, the study design does not allow a comparison of identified barrier type between schools with and without students with disabilities. However, as Table 4 shows, some trends are apparent. The majority of barriers identified for all groups in both studies were related to mobility. The students who had disabilities (where most had a mobility disability) reported the greatest number of mobility barriers; providing detailed descriptions of different types of mobility barriers. For example, many described items not identified by any other group, such as locker hooks which are too high, inaccessible counters or the fear of being trapped during a fire. Often the visual barriers that were identified by the students in Study 1 related to the need for visual strips on stairs for those with balance problems. Interestingly, no students in Study 1 identified barriers associated with a hearing impairment. The principals and SERTS in the "accessible schools" also reported a higher number of mobility barriers than those in Study 2 but also reported barriers associated with hearing disorders (e.g., flashing lights for fire alarms) or visual impairments (e.g., the need for Braille to identify location). However, no significant differences were identified between stakeholder groups for the type of barrier for Study 1.

For the schools which did not have students with physical disabilities, a wider range of barrier type was reported. Particularly noteworthy were the student responses, where they significantly identified the greatest number of mobility barriers, $F(2, 40) = 4.22$, $p < .05$. T-tests indicated significant differences between principal and student reports, $t(21) = -3.12$, $p < .01$; with students reporting more mobility barriers. Students also reported such barriers as obstacles that might impede access for those visually impaired (e.g., doors that opened into hallways), lights needed for period changes or fire drills or the lack of recreational programming for students

Table 2
M (SD) of barriers identified for group by area – schools with student participants with disabilities ($n = 29$).

	Principal	SERT	Student
Entrance way	1.3 (1.5)	1.1 (1.3)	1.1 (.84)
Ramps	.35 (.67)	.44 (.94)	.42 (.69)
Doors	.64 (.82)*	.72 (1.03)	1.21 (1.37)*
Passageways	.62 (.77)	.68 (1.25)	.71 (1.04)
Washrooms	.93 (1.57)	1.1 (1.67)	1.0 (1.46)
Signage/safety	.89 (1.79)	.82 (1.69)	.57 (1.28)
Water fountains	.39 (.68)	.20 (.49)	.32 (.57)
Elevators	.10 (.31)*	.37 (.82)*	.35 (.86)
Classrooms	.82 (1.0)	1.0 (1.7)	1.14 (1.4)
Stairs	.14 (.44)	.17 (.46)	.14 (.44)
Library	.42 (.57)	.34 (.89)	.67 (1.0)
Recreational facilities	1.2 (1.6)	1.03 (1.32)	1.5 (1.9)
Other	1.3 (2.9)	1.7 (3.5)	1.3 (2.9)
Grand mean	7.8 (4.7)	8.5 (5.7)	10.6 (7.9)

*Significantly different $p < .05$.

Table 3
M (SD) of barriers identified for group by area- schools without student participants with disabilities ($n = 22$).

	Principal	SERT	Student
Entrance way	1.5 (1.2)	1.4 (1.4)	1.5 (1.0)
Ramps	.36 (.58)	.40 (.79)	.22 (.42)
Doors	.54 (.67)	.54 (.80)	.90 (.97)
Passageways	.86 (1.45)	1.0 (1.5)	1.4 (1.96)
Washrooms	1.2 (1.6)	1.6 (1.8)	1.5 (1.6)
Signage/safety	.86 (1.3)	1.0 (1.3)	1.5 (2.0)
Water fountains	.18 (.39)	.40 (.50)	.40 (.50)
Elevators	.18 (.39)	.31 (.47)	.27 (.54)
Classrooms	.81 (1.0)	1.0 (1.4)	1.9 (2.6)
Stairs	.13 (.35)	.04 (.21)	.04 (.21)
Library	.27 (.55)	.40 (1.2)	.63 (1.0)
Recreational facilities	1.0 (.89)	1.1 (1.0)	1.5 (1.7)
Other	.22 (.68)*	.13 (1.0)*	1.0 (1.1)*
Grand Mean	8.0 (5.7)	9.5 (5.9)	13.1 (1.8)

*Significantly different $p < .01$ between student and principle/SERT reports.

Table 4
Frequency of reported barrier types identified by group and study.

	Principal	SERT	Student
Study 1: Student participants with disabilities ($n = 29$ schools)			
Mobility barrier	249	252	292
Visual barrier	9	13	17
Hearing barrier	11	8	0
Study 2: Student participants without disabilities ($n = 22$ schools)			
Mobility barrier	162*	178	248*
Visual barrier	11	21	20
Hearing barrier	13	15	11

*Significantly different $p < .05$ between student and principal reports.

who are physically or developmentally challenged. Principals and SERTS at these schools also reported less mobility barriers than those in Study 1, but more barriers associated with vision and hearing impairments.

To further explore stakeholder influences on the type of barriers assessed in these schools, the recent accessibility evaluation by plant supervisors was reviewed. This is relevant since the plant supervisors in this school board were the individuals who typically evaluated the schools for accessibility barriers. A review of the administrative board records indicated that the following categories were examined: 1) whether the main entrance is ramped; 2) # of other ramped areas; 3) whether there is handicapped parking available; 4) whether the entrance has automatic doors; 5) areas served by magnetic hold open devices; 5) availability of handicapped washrooms; 6) availability of an elevator or lift; 7) wheelchair access to stage, gym, wings or science lab; 8) availability of a hearing impaired sound system; and 9) availability of visual alarm system. The results from both studies clearly indicate that the plant supervisors were not evaluating, and thus missing, barriers associated with classrooms, passageways, stairs, water fountains, libraries, science labs, music rooms and recreational facilities.

4. Discussion

In their search for architectural barriers in schools, students, SERTS and principals saw the same environments differently. This finding provides support for the theory that one's role in the environment may be useful in the examination of differential perception (Canter, 1972, 1977; Kaplan, 1984). Although differential perception by role has been reported for preference ratings (Canter, 1972) and projective techniques (Ward Thompson, 1995, 1998), this study provides support for roles influencing perception using direct observation.

Of particular interest is the greater number of barriers identified by the students in both studies compared to the other two stakeholder groups. These studies clearly highlight the capabilities of youth in conducting an inclusive environmental assessment. The ability of the youth to accurately describe their school environment confirms work conducted Axia, Baroni, and Peron (1991) and emphasizes the capabilities of youth as noted by researchers focused on child-environment congruence (Björklid & Nordström, 2007; Chawla & Heft, 2002; Haikkola, Pacilli, Horelli, & Prezza, 2007; Horelli, 1998, 2007). Further, these two studies confirm previous findings that youth provide a unique perspective in evaluating environments compared to adults (Eriksson, 2005; Wachs, 1991; Ward Thompson, 1995).

The results of the two studies do raise the question of why students identified significantly more barriers than the adults. Familiarity, expertise and salience appear to be an obvious explanation for the students with disabilities (Golledge, 1991; Kaplan, 1983; Pedersen, 1978). As mobility barriers were identified most often in these studies, students who deal with physical inaccessibility on a daily basis would most likely be able to identify these types of barriers, as they did in great detail. The barriers identified and where they were noticed also corresponded to school barriers identified in earlier research by students with mobility disabilities (Pivik, McComas et al., 2002), particularly the classrooms, libraries and recreational facilities. The fact that students significantly identified the greatest number of barriers for recreational facilities reinforces the importance of social and recreational inclusion as a valued factor for inclusive assessments.

More surprising was the significant difference in the number of identified barriers between students without disabilities and their principals and SERTS. Possible explanations include: 1) students routinely visit more areas of the school than the principal or SERT and thus have greater familiarity; 2) the students paid more attention to the task; 3) students were less concerned about a negative evaluation; or, 4) the students had greater disability awareness. The fact that the principals mostly identified barriers near their offices (e.g., entranceway and front door) and students from both studies identified more barriers in the classrooms, libraries and recreational facilities, suggests that familiarity as a result of motoric exposure may have played a role. Gibson's (1977) *Theory of Ecological Perception* which links perception to environmental opportunities for action and movement, along with later work by Heft (1988) and Kyttä (2002, 2004) may provide an explanation for the differential perception responses between stakeholder groups. Future research should consider including post evaluation interviews or focus groups to clarify this issue. As well, research which includes students with and without disabilities evaluating the same environment would assist in confirming or clarifying the influence of experiential knowledge and/or familiarity of the environment for barrier identification.

The location and type of barriers identified by the SERTS and principals was also unexpected. Administrative school board records indicated that the principals were responsible for inclusion within the physical setting and SERTS responsible for inclusion in educational content (Special Education Plan, 2005–2007, UCDSB). It was believed that principals would identify more barriers in those areas that related to potential litigation. Although the principals did report more barriers associated with entranceways and stairs (for schools without students with disabilities), they did not have the highest scores for washrooms, ramps or elevators. Interestingly, SERTs appeared to focus on these barriers instead of those associated with learning environments such as classrooms and libraries. This suggests that the role of SERTs focused more on physical inclusion and less on educational support. Since there is only one SERT in each school and regular teachers often teach students with disabilities, this explanation is not improbable. Further research examining specific role identification and environmental perception is needed to explain this finding.

The results of these studies support collaborative environmental assessment methods and inclusive planning efforts. Differences between stakeholders in the same environment were found for the total number of barriers identified and in some cases, where they were located. With principals identifying the least number of barriers in the typical walkthrough format and students identifying barriers not reviewed by plant supervisors, the current system is lacking. A collaborative assessment method would provide a more comprehensive evaluation by incorporating feedback from all relevant stakeholders within the environment. The collaborative planning model developed by Healey (1997) provides concrete strategies for ensuring that all stakeholders are provided equal opportunity to contribute to and participate in the decision-making process. Principles of this model include: getting support from the major stakeholders; meeting informally in places where all stakeholders are comfortable; discussing and clarifying the issues to be discussed from the perspective of all participants; maintaining an inclusionary process; and, using a consensus format for decision-making. As Wandersman (1979) has shown, user involvement in design planning, results in greater satisfaction with the environment by meeting the user's needs and values and providing a sense of mastery and competence.

4.1. Limitations and future research

The most critical limitation of the evaluation was the lack of methodological control due to the study design (independent assessments by study participants). Even though explicit instructions were provided and a presentation given to all of the principals, a few assessment forms were completed incorrectly. Relatedly, student selection was left up to the principal of each school, thus limiting control for age, gender or type of disability. A more stringent age classification would allow the examination of developmental influences on the types of barriers identified. As well, controlling for different type and level of disability would have provided valuable information related to barrier identification. Finally, as mentioned, including students without disabilities in Study 1 would have assisted in determining whether barrier identification was associated with experiential knowledge or greater familiarity with the environment.

These studies were the first stage in exploring accessibility in schools. They investigated whether there are differences between stakeholders in their evaluation of barriers in schools using the typical method employed. Future research is needed to understand why these differences occurred and whether other factors are important considerations in differential perception. For example, along with the influence of familiarity and expertise, how does potential moderators such as goals, expectations and needs influence inclusive environmental assessments? From a practical perspective, another line of inquiry could focus on individual variability within evaluators, such as the differences in barrier identification for students with different types of disabilities and capabilities. Answers to these questions could assist architects and designers in developing barrier-free and universal design environments. Finally, research examining the processes of collaborative planning and decision-making between different stakeholders would facilitate future inclusive environmental assessment efforts.

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