2006

Universal Design: An Educational Presentation for Occupational Therapy Students

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UNIVERSAL DESIGN: AN EDUCATIONAL PRESENTATION FOR OCCUPATIONAL THERAPY STUDENTS

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A Scholarly Project

Submitted to the Occupational Therapy Department

of the

University of North Dakota

In partial fulfillment of the requirements

for the degree of

Master's of Occupational Therapy

Grand Forks, North Dakota
May, 2006

This Scholarly Project Paper, submitted by Steve Fugere and Heather Grasser in partial fulfillment of the requirement for the Degree of Master's of Occupational Therapy from the University of North Dakota, has been read by the Faculty Advisor under whom the work has been done and is hereby approved.

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12-16-05
Date

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Title	Universal design: An educational presentation for occupational therapy students
Department	Occupational Therapy
Degree	Master's of Occupational Therapy

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ABSTRACT

Purpose: Universal design is an emerging practice area within the profession of occupational therapy. Because universal design is an emerging area, educational resources on the topic are limited. If practitioners wish to work in this emerging area, more knowledge and skills need to be developed. The purpose of this scholarly project was to create a resource that could be used to educate occupational therapy students on universal design concepts. Information included in the presentation will help students understand the role of the occupational therapist in the design process. Method: A literature review was conducted to examine the impact of the environment on occupational performance, analyze terminology, and examine the benefits and drawbacks of universal design. In addition, textbooks and websites addressing universal design were reviewed. The information gathered in the literature review was organized into a Microsoft® PowerPoint® presentation. Results: From the literature, it was found that the physical environment plays a strong role in impacting the occupational performance of individuals with and without disabilities. Both barriers and facilitators exist within the physical environment, and universal design concepts can be applied to eliminate the number of barriers that negatively affect occupational performance. In this scholarly project presentation, universal design principles and guidelines are discussed along with their application to the physical environment. In addition, the relationship between occupational therapy and the universal design process are explored. The specific knowledge and skills that occupational therapists have are discussed as well as how they

correlate with implementing universal design concepts. Conclusion: Through viewing the educational presentation, occupational therapy students will have a better understanding of the impact of the physical environment on occupational performance as well as the application of universal design concepts. In addition, students will have a better understanding of the role of the practitioner in the design process. It is hoped that this presentation will educate students and encourage them to consider furthering their knowledge and practicing in this emerging area.

CHAPTER I

INTRODUCTION

Universal design is a concept that has inspired an emerging practice area within the profession of occupational therapy. The idea behind universal design is that products and environments should be equally usable by individuals of all ages and ability levels (Story, 1998). Universal design makes performing tasks easier for everyone without stigmatizing a certain population of individuals (Mueller, 1998). It is a relatively new concept that has gradually been gaining interest among health care professionals as well as the general public.

Occupational therapists have many skills that make them the ideal professionals to serve as consultants in the universal design process. According to Ringaert (2003), occupational therapists have a unique knowledge base on several topics including human functioning, disability, occupational performance, and assistive technologies. However, while occupational therapists have a wide knowledge base, there are still areas of practitioner knowledge areas that need to be developed. Ringaert (2003) advocated that educational programs as well as continuing education courses can serve a valuable role in educating both current and future occupational therapists on this growing area.

In a 2000 article, Johansson described universal design and accessibility consulting as one of the top ten emerging practice areas for occupational therapists. Johansson (2000) described the "aging in place" movement as being the primary impetus fueling the demand for more accessible environments. The number of elderly persons in

the United States continues to increase steadily. It is estimated that by 2020, there will be over 54 million American citizens over the age of 65 (Johansson, 2000). Occupational therapists will have the important role of helping elderly individuals remain as independent as possible.

Universal design, as an emerging practice area, can create numerous opportunities for occupational therapy practitioners. In a 1999 article, Christenson advocated that the current paradigm shift from a medical model of care to a community-based model will provide occupational therapists with the opportunity to embrace new practice areas. With the proper educational background, occupational therapy students can gain the skills needed to work as consultants with other professionals such as contractors, architects, and interior designers (Christenson, 1999). This scholarly project will provide the educational content that is necessary for occupational therapy students to gain the skills that can ensure that environmental accessibility and usability are enhanced and quality of life is improved for many individuals.

The Accreditation Council for Occupational Therapy Education (ACOTE) identified the importance of educating occupational therapy students on the vital role that the environment plays in supporting occupational performance (ACOTE, 1998). Standard B.5.6 identifies that occupational therapy students should be able to "develop and promote the use of appropriate home and community programming to support performance in the client's natural environment" (ACOTE, 1998).

Universal design concepts are closely related to ACOTE standard B.5.6 (1998). Universal design focuses on creating the optimal environments to support occupational performance for individuals of all ages and ability levels. Universal design concepts can

be incorporated throughout all the environments in which individuals complete daily tasks including home, work, community, and school.

In order to implement universal design principles, Ringaert (2003) identified knowledge areas in which occupational therapists may need further education. These areas include knowledge of universal design theory, skills to interact with other professionals such as architects, and knowledge of environments other than housing. Ringaert (2003) advocated that occupational therapy programs should include courses in universal design in order to help students understand this concept as well as the role that the environment plays in affecting occupational performance.

Individuals perform occupations within numerous environments each day. The demands of these environments may facilitate or inhibit the performance of occupations. Individuals must adapt to the demands of their environments in order to perform daily activities.

The occupational therapy theoretical model we find most appropriate to describe the interaction between the environment and individuals in relation to universal design is the Ecological Model of Occupation. This model examines the relationships between the constructs of *person*, *context*, *tasks*, and *performance*. *Context* is heavily emphasized with this model because many current models focus primarily on the characteristics of the individual rather than the *context* itself (Dunn, Brown, & Youngstrom, 2003).

The Ecological Model of Occupation does, however, recognize the unique features of the *person*. In this model, individuals are recognized as having many different qualities. Individuals bring past experiences, values, interests and skills to their occupational experiences. These variables all influence occupational performance;

therefore, they need to be carefully considered. For example, unique individual considerations create a certain amount of unpredictability in task performance and goal obtainment (Dunn et al., 2003). Therefore, no two individuals will have the same occupational experiences.

Goals are fulfilled through the accomplishment of *tasks*. *Tasks* are the observable behaviors individuals perform to achieve goals. The term "*task*" is used in place of "occupation" due to its familiarity among other professional disciplines (Dunn et al., 2003). This common language facilitates communication within an inter-disciplinary team, such as a universal design team.

Individuals perform *tasks* within their *contexts*. The Ecological Model of Occupation describes *context* "as a set of interrelated conditions that surrounds a person" (Dunn et al., 2003, p. 226). In this model two main types of *contexts* are considered. The temporal *context* includes chronological qualities such as age and developmental stage. The second *context*, which is the environment, encompasses physical, social, and cultural aspects. Although external to the person, these aspects shape the performance of *tasks* by providing both barriers and facilitators.

The final construct of the model addresses *performance*. *Performance* is defined as "both the process and the result of the person interacting with context to engage in tasks" (Dunn et al., 2003, p. 226). Individuals use their abilities and previous experiences to analyze the *context* and determine the tasks they want or need to do.

In addition, this model has four underlying assumptions. The first assumption is that "persons and their contexts are unique and dynamic" (Dunn et al., 2003, p. 233). Characteristics of the person and the *contexts* are variable and constantly acting upon one

another. The second assumption states that "contrived *contexts* are different from natural *contexts*" (Dunn et al., 2003, p. 235). To understand a *person* the natural environment in which they function must be understood. The third assumption is that "independence means meeting your wants and needs" (Dunn et al., 2003, p. 237). Under this assumption, occupational therapists assess and modify environments to support an individual's independence. The final assumption asserts that "occupational therapy practice involves promoting self determination and inclusion of persons with disabilities in all aspects of society" (Dunn et al., 2003, p. 236). Occupational therapists serve as valuable advocates for patients and clients. Therapists have a vital role in supporting all individuals to be full and active members of society.

We feel that the Ecological Model of Occupation and universal design are congruent in several ways. Both encompass the environment and how it supports or hinders occupational performance. For example, the Ecological Model of Occupation highlights the influence of *context* on human functioning. Similarly, universal design concepts were developed with the understanding that environmental factors impact the occupational performance of individuals with as well as without disabilities. An underlying assumption of the Ecological Model of Occupation is that *persons* with disabilities should be integrated in all aspects of society. Universal design concepts were developed with the notion that individuals with disabilities can be accommodated without being stigmatized.

There are several terms that appear within the universal design literature. These terms are essential in providing the foundation necessary to understand the concept of universal design, and they are described here.

Built environment is defined as the man-made features of the environment that provide the means for human activity. It encompasses the largest cities to the smallest personal dwellings (Wikipedia, retrieved October 10, 2005).

Accessibility is the interaction between a person's abilities and the features of the physical environment. It consists of both a personal as well as an environmental component. Since accessibility is based on compliance with architectural standards, it can be described as an objective term (Iwarsson & Stahl, 2003).

Usability refers to the idea that all individuals should be able to use an environment equally. In order for usability to occur, accessibility must be present. This term consists of a personal, environmental, and activity component. It is more subjective due to the fact that the degree of usability preferred by an individual is considered (Iwarsson & Stahl, 2003).

Universal design is the design of products and environments to be equally usable and accessible for individuals of all ages and ability levels without adaptation (Danford, 2003). Universal design concepts are based on seven guiding principles which will be explained in Chapter II (Story, 1998).

Inclusive design refers to reasonable adjustments that are made to the environment in order to make it more accessible for everyone. Unlike universal design, inclusive design does not address whether or not the environment is equally usable for all individuals (Doke, 2005)

The following chapters are organized in a sequential order. In Chapter II we review the pertinent literature findings and examine the impact of the built environment on occupational performance. In Chapter III, we describe the methodology employed in

creating the product. The product is presented in its entirety in Chapter IV along with an explanation of how it could be implemented. The conclusion and our recommendations for further development of the product are covered in Chapter V.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

Each day, individuals perform daily occupations within numerous contexts. Contexts consist of the conditions that surround individuals and influence their occupational performance (AOTA, 2002). Contexts can be cultural, social, personal, spiritual, temporal, virtual, and physical (AOTA, 2002).

The physical context encompasses aspects of the environment that do not have human qualities. Examples of the built environment include objects, terrain, and fabricated features such as sidewalks and buildings (AOTA, 2002). The physical context presents barriers as well as facilitators that affect occupational performance. In this review of the literature, we will summarize research that explores the physical built environment and other aspects of context that affect individuals in their daily occupations.

Impact of the Built Environment

In a 2004 study, Whiteneck et al. investigated the impact of environmental barriers on individuals with a spinal cord injury. In this cross-sectional study, researchers interviewed 2,726 adults who had sustained a traumatic spinal cord injury. The main data collection instrument used in the study was the Craig Hospital Inventory of Environmental Factors Short Form (CHIEF-SF). The CHIEF-SF is an instrument designed to measure the frequency, magnitude, and overall impact of

barriers reported by participants (Whiteneck et al., 2004). The Craig Handicap Assessment and Reporting Technique Short Form (CHART-SF) was also administered. The CHART measures levels of participation in six domains. In addition to the CHIEF-SF and CHART-SF, the Functional Independence Measure (FIM) was also administered. The FIM measures the extent of activity limitations by assessing six functional areas. The final instrument used in the study was the Satisfaction with Life Scale (SWLS). The SWLS measures participants' overall life satisfaction (Whiteneck et al., 2004).

The researchers found that barriers in the built environment were rated by the individuals with spinal cord injuries as most problematic based on CHIEF-SF scores. Physical and structural barriers in the built environment were rated as more problematic for participants than barriers in transportation, help in the home, health care, availability of information, policies, attitudes, and discrimination (Whiteneck et al., 2004).

In a similar 2004 study, Whiteneck, Gerhart, and Cusick investigated the impact of environmental factors on individuals with a traumatic brain injury (TBI). Seventy-three individuals between the ages of 16 and 65 who had sustained a TBI were chosen as participants (Whiteneck et al., 2004). Participants were interviewed one year following their injury. Data collection instruments used included the FIM, CHART, CHIEF, and SWLS (Whiteneck et al., 2004).

Transportation barriers were rated as the most problematic area for participants; the mean score for this item was 1.44 on a scale of 0-8 (Whiteneck et al., 2004). The researchers found that physical and structural barriers in the participants' surroundings were rated as the second most problematic area (Whiteneck et al., 2004). The mean product score for this barrier was 1.22, also on a scale of 0-8 (Whiteneck et al., 2004).

Environmental Barriers

While barriers that exist within the built environment may be problematic for individuals with disabilities, it is important to understand specifically what those barriers are. In a 2004 study, Thapar et al. tested the accessibility of various public buildings for individuals with and without disabilities. Three participants with a single impairment were selected. One participant was mobility impaired and used a wheelchair, 1 participant was mobility impaired and did not use a wheelchair, and 1 participant had visual impairments. A participant with no known impairments was chosen to serve as a control (Thapar et al., 2004).

A total of 30 public buildings were tested in this pilot study. All 4 participants traveled though each building and completed six functional tasks. The selected tasks included: entering the building, using the restrooms, using a public phone, using a drinking fountain, accessing seating, and completing one task specific to the building. Examples of building-specific tasks included purchasing a ticket at the movie theater or obtaining voting information at a civic building (Thapar et al., 2004).

A data collection instrument developed by the researchers was used to determine the accessibility rating of each building. The instrument focused on four areas including: accessibility of entrances, access to building services, restroom usability, and additional access to drinking fountains and telephones. In addition, participants were asked open-ended questions regarding both the barriers and facilitators they encountered during each task they experienced (Thapar et al., 2004).

The researchers found that the problematic barriers for the participants with mobility impairments were primarily structural. The participant who used a wheelchair

reported the most structural barriers and these accounted for 48% of the total (Thapar et al., 2004). Similarly, the participant who had mobility impairments but did not use a wheelchair reported structural barriers that accounted for 40% of the total (Thapar et al., 2004). Finally, the participant with a visual impairment as well as the control participant found fewer structural barriers that accounted for 8% and 6% respectively (Thapar et al., 2004). In addition, the participant who used a wheelchair had the lowest percentage of functional task completion within the building. Task completion for this participant ranged from 62% to 78% (Thapar et al., 2004).

The participant who used a wheelchair encountered structural barriers such as narrow doors and walkway and high telephones and drinking fountains (Thapar et al., 2004). The participant with mobility impairments who did not use a wheelchair revealed barriers such as lack of or non-functioning escalators, lack of handrails, uneven terrain, and heavy doors. For the participant with a visual impairment, lack of handrails was the primary barrier reported (Thapar et al., 2004).

Similar environmental barriers were encountered by participants in a study by Meyers, Anderson, Miller, Shipp, and Hoenig (2002). In this longitudinal survey study, 28 participants who had been using a wheelchair for four or more months were interviewed over the telephone.

Participants were interviewed to gather personal demographic data. Interview questions focused on the participants' experiences with disability, health, illness, use of personal assistance, assistive technology, and wheelchair use (Meyers et al., 2002). Further, participants were asked to respond to questions regarding their experiences with environmental barriers and facilitators.

Due to environmental barriers within their communities, 24-32% of the participants reported instances of not being able to reach a specific destination such as the drug store or a friend's house (Meyers et al., 2002). Specific barriers cited by participants included: narrow aisles, no ramps or steep ramps, awkward door handles, heavy door pressure, no curb cuts, inaccessible restrooms, lack of accessible parking, uneven travel surfaces, and obstructed pathways (Meyers et al., 2002).

Barriers can be more than an inconvenience; they can also pose a safety hazard. Barriers in the physical environment can contribute to the incidence of older adults falling in public places (Clemson, Manor, & Fitzgerald, 2003). In this qualitative study, interviews and event reconstruction were utilized to gain an understanding of the factors leading up to falls. Event reconstruction consisted of the researchers and the participant going to the scene of the fall and performing a reenactment. Fifteen individuals who were 65 years of age or older and had previously fallen were invited to participate in the study. In addition to the fall reenactment, the participants were interviewed.

The interviews probed for the participants' feelings regarding their experiences with falling. Participants were asked to reflect on the events leading up to the fall and open-ended questions were asked to encourage recall of the event (Clemson et al., 2004). Notes and photographs were taken during the fall reenactment to assist in data analysis.

Themes were identified in order to understand the nature of the falls. Several barriers within the environment were found to contribute to falling. The barriers included: change in surface level, cracked pavement, obstructions in the path, and miscellaneous items such as a metal grate (Clemson et al., 2004).

Environmental Facilitators

While numerous barriers exist in the structural environment, there are also facilitators that may enhance occupational performance. As reported earlier, Thapar et al. (2004) found that both of the mobility impaired participants in the study reported a high percentage of facilitators within the environment. The participant who used a wheelchair and the one that did not accounted for 36% and 52% of the reported facilitators respectively. The participant who used the wheelchair reported facilitators such as automatic doors, no stairs at entrances, accessible restrooms, ramps, and lowered telephones and drinking fountains. The participant who did not use a wheelchair reported such facilitators as elevators, escalators, and handrails (Thapar et al., 2004).

Participants also experienced several environmental facilitators in a study by Meyers et al. (2002). Participants encountered such facilitators as accessible transportation, accessible parking, and level terrain. In addition, participants commented that civic sites were most frequently accessible (Meyers et al., 2002).

Impact of the Environment on Social Participation

The design of the built environment can facilitate not only occupational performance, but social participation as well. In a 2003 study, Leyden compared mixed-use neighborhoods with traditional suburban neighborhoods. A mixed-use neighborhood is designed to enable residents to walk or bike to destinations such as school, work, and grocery stores, rather than relying principally on automobiles or public transportation. Traditional suburban neighborhoods often do not have sidewalks and parks. Additionally, most shopping is done at malls with large parking lots which encourage automobile use (Leyden et al., 2003).

A city in Ireland was studied based on its rapid growth rate and variety of neighborhoods of mixed-use and traditional suburban style. A total of 750 surveys were sent to residents. The surveys consisted of questions regarding social participation. Questions pertained to how well participants knew their neighbors, the extent of their political participation, their trust in other people, and their overall social participation (Leyden, 2003).

The researcher found that participants who lived in mixed-use neighborhoods had a mean score of 7.35 on the questions pertaining to neighborhood walkability while the participants who lived in suburban neighborhoods had a mean score of 4.72 (Leyden, 2003). Higher scores on the survey indicated higher social participation levels. In addition, those participants who lived in mixed-use neighborhoods were more likely to feel connected to their neighborhood. In contrast, participants who lived in suburban neighborhoods were less likely to feel connected to their neighborhood (Leyden, 2003).

Cevero and Duncan (2003) found similar results regarding the built environment and social participation. The researchers investigated the urban environment and its influence on walking and biking within the San Francisco area. The researchers utilized an existing database called the 2000 Bay Area Travel Survey (BATS). The BATS contains information on the daily activities of 15,066 randomly-selected residents in the San Francisco bay area during the year 2000. Activities occured both in the home as well as outside the home. Information obtained from the BATS was analyzed to determine the purpose of each trip including the mode, time of day, day of week, origin, destination, and other information (Cevero & Duncan, 2003).

From analyzing the BATS data, the researchers found that mixed-use environments that contained retail stores in communities rather than malls encouraged walking (Cevero & Duncan, 2003). The researchers found that residents were more likely to walk when the distance was shorter between the origin and destination. In addition to distance between destinations, other factors were found to deter residents from walking or biking. These factors included steep terrain, inclement weather, and nightfall. The researchers concluded that neighborhood characteristics do play a role in encouraging or discouraging physical activity (Cevero & Duncan, 2003).

Impact of the Environment on Health and Satisfaction

Neighborhood characteristics can also play a role in influencing physical and emotional health. In a cross-sectional survey, Wilson et al. (2004) accessed determinants of health at the community level. Participants consisted of 1504 adults who were randomly selected from four contrasting neighborhoods in the city of Hamilton, Canada (Wilson et al., 2004). Neighborhoods included high income and high diversity, low income and high diversity, low income and low diversity, and high income and low diversity.

A telephone survey was conducted with approximately 300 participants from each neighborhood. In addition, 300 adults who were randomly chosen city-wide were selected to serve as a control (Wilson et al., 2004). The telephone survey consisted of questions designed to provide insight on participants' perceptions of their neighborhoods and social networks. Participants were asked questions regarding their income levels, their likes and dislikes with their neighborhood, their health status, their access to health care, and other demographic data (Wilson et al., 2004).

The researchers found that the participants from the low income neighborhoods were more likely to experience poor health status and more emotional distress than those participants from the other neighborhoods (Wilson et al., 2004). The dominant concern for participants in all the neighborhoods was the physical environment. Participants who reported a dislike of the physical environment of their neighborhood were 1.5 times more likely to experience a chronic health condition. Those participants who were satisfied with their neighborhood's physical environment were less likely to divulge a poor health condition. The researchers concluded that individuals' perceptions of their physical environment are closely tied with health (Wilson et al., 2004).

While environmental characteristics can affect health and wellness, they may also impact occupational performance and satisfaction. In a 2004 study, Stark investigated the effectiveness of a home modification program. Twenty-nine low-income older adults were the chosen sample for this study. In order to be included in the study, participants needed to have reported a problem in at least one area of the Functional Independence Measure (FIM) and identified a need for modifications within their home.

Participants were first interviewed to gather baseline demographic data. The FIM and Canadian Occupational Performance Measure (COPM) were administered by interview. Next, the Enviro-FIM was conducted in participant's homes to identify the environmental barriers that affected occupational performance (Stark, 2004).

Two occupational therapists determined a plan for what environmental modifications needed to be made for each home. The recommended modifications were then performed. Modifications varied in complexity for each home. Examples of modifications included adding ramps, stair rails, and widening door frames (Stark, 2004).

The occupational therapists then conducted a follow-up interview 3-6 months after the completion of the home modifications. The COPM was repeated, and the results were analyzed using paired t-tests. The results indicated that the mean score for both performance and satisfaction increased. The performance score mean increased from 3.19 to 7.87. The mean satisfaction score also increased from 2.25 to 7.69 (Stark, 2004).

From the preceding studies, it is evident that the environment plays a strong role in supporting health, occupational performance, and satisfaction. Barriers within the environment may discourage individuals from fully participating in daily occupations within their community. Removing barriers and implementing modifications to improve accessibility and usability within the built environment leads to increased occupational participation. One method of creating more accessible and usable built environments is by implementing universal design concepts.

Universal Design and Terminology

In order for professionals to understand universal design and work collaboratively, it is important to understand some key definitions. Often, confusion exists among professionals between basic concepts of accessibility, usability, and universal design. Professionals differ in their definitions of these concepts (Iwarsson & Stahl, 2003). These differences can lead to decreased communication efficiency.

Iwarsson and Stahl (2003) sought to define the terms accessibility, usability, and universal design in order to improve communication amongst professionals. Iwarsson and Stahl advocated that the term, *accessibility*, consists of two elements, the person and the environment. They described *accessibility* is "the encounter between the persons' or

groups' functional capacity and the design and demands of the physical environment" (Iwarsson & Stahl, 2003, p. 61).

Usability does not have the same meaning as accessibility. It refers to the performance of functional activities within the environment. *Usability* means that "a person should be able to use, i.e. move around, be in and use the environment on equal terms with other citizens" (Iwarsson & Stahl, 2003, p. 62). *Usability* further encompasses psychosocial factors such as motivation and self-esteem. Iwarsson and Stahl (2003) suggested that *accessibility* must exist in order for *usability* to occur.

Accessibility is centered on the concept that there exist two populations: those who have disabilities and those that do not. A distinction is made between the two groups, and as a result, one group may be stigmatized. However, with universal design, no distinction is made between the two populations. Iwarsson and Stahl (2003) described *universal design* as being about inclusion and meeting the needs of as many people as possible.

Universal design is defined as the development of products and environments that can be easily used by people of all ages and ability levels (Story, 1998). The idea behind *universal design* is to incorporate the needs of all individuals without stigmatizing a certain population. *Universal design* is centered on seven guiding principles that establish the characteristics of a universally-designed product or environment. These characteristics include: equitable use, flexible use, simple use, ease in perception, tolerance for error, low physical effort, and appropriate size and shape for use (Story, 1998). These principles can be applied across various settings including homes, places of work, and public buildings.

Universally-designed buildings have been found to be easy to use and beneficial to individuals of all ability levels. In a study similar to the Thapar et al. (2004) research, Danford (2003) investigated the attitudes and perceptions of individuals regarding a model building that was built to incorporate the principles of universal design. Twenty-four adults with a single physical impairment participated in this study. Eight participants had a mobility impairment, 8 participants had a hearing impairment, and 8 participants had a visual impairment. In addition, 8 participants with no known impairments were chosen to serve as controls (Danford, 2003).

Participants were guided through a universally-designed model building. While inside the building, participants were asked to participate in 14 functional activities. Following each activity, the participants were asked questions regarding the usability and acceptability of the building compared to other buildings that were not universally designed. Participants were also asked to reflect on their perceptions of the model building (Danford, 2003).

The researcher found that all four of the groups varied somewhat in their performance within the model building (Danford, 2003). The participants with hearing impairments rated all 14 functional activities as being both easier and more acceptable in the model building. The participants with visual impairments displayed increased effort during some of the tasks. The researcher speculated that this was probably due to over-sized and oddly-shaped items such as elevator buttons. Both the participants with mobility impairments as well as the participants without impairments cited frustration with using devices such as talking signs. The researcher attributed this finding to the fact

that such individuals are relatively inexperienced with the use of alternative senses (Danford, 2003).

While some features of the building were singled out by participants as being more difficult to use, the overall support for the model building was strong (Danford, 2003). All four groups of participants perceived the model building to be more usable than other buildings. Since no single group of participants had an undue amount of difficulty performing tasks in the building, it was concluded that universal design features were equally usable by everyone (Danford, 2003).

While universally-designed buildings may be beneficial to individuals of all ability levels, it is also important to analyze if these benefits can be realized in other environments such as the work place. Mueller described the benefits of using universally-designed products in the work environment (1998). He explored case examples of accommodations that were made to assist employees with impairments or disabilities in completing their work tasks. In all of the cases, the devices and methods implemented for the employees with a disability also benefited the non-disabled employees. Mueller (1998) suggested that this improvement occurred because the modifications addressed some barriers in the work environment that non-disabled employees had encountered, but adapted to. It was speculated that these barriers may have increased an employee's likelihood of developing work-related injuries (Mueller, 1998).

Many of the modifications that were made to the work environment incorporated the principles of universal design (Mueller, 1998). Examples of the modifications discussed were: putting dimmers on light switches to reduce glare, providing adjustable stools, and designing tools with larger grip surfaces. Some of the modifications that were

made streamlined the tasks required of the employees often making the work environment more productive, comfortable, and safer for everyone. In addition, employers recognized the cost benefits of these modifications and discovered that their benefits far outweighed their cost (Mueller, 1998).

Universally-designed homes can also be an economical choice as they reduce the need for individuals to modify their homes as they age. Pynoos and Nishita (2003) explored the factors that inhibited older adults from making home modifications to improve accessibility. The home modification process was described by Pynoos and Nishita as being both costly and difficult (2003). As a result of these factors, many low-income older adults do not modify their homes to promote their performance in daily occupations. Older adults found it difficult to coordinate the team of professionals and contractors as providers of home modifications. They became confused or frustrated with the process (Pynoos & Nishita, 2003).

In addition to the complexity of the process, many older persons were unable to pay for needed modifications to their homes. There was a lack of funding sources for home modifications. It was estimated that more than 75% of those with home modifications paid for them out-of-pocket (Pynoos & Nishita, 2003).

As a solution to the problem of the complexity and cost of home modifications, Pynoos and Nishita (2003) suggested that the housing supply should contain a large number of universally-designed homes. Universally-designed homes can create more options for older persons who cannot afford to modify their current homes. Many cities are beginning to recognize the value of building accessible homes. Many cities have

already passed "visitability" ordinances. These ordinances require certain homes to be built with no steps leading to the entrance (Pynoos & Nishita, 2003).

Universal Design is Client-Centered

Although universal design is a method of creating environments that can be used by all individuals, it is still important that the unique needs of individuals are recognized. In order to make the process client-centered, several professionals are involved from the initial stages of the process through completion. In particular, health care professionals, such as occupational therapists, can assist in helping individuals identify their needs for independence and participation.

Dewsberry et al. (2003) described the process of designing "smart" home technology. "Smart" homes incorporate technological features in order to enable individuals to remain as independent as possible. However, this technology may not be beneficial if it is installed without first considering the needs of the individual as well as the existing structure (Dewsberry et al., 2003).

Designers of the technology need to have a thorough understanding of the individuals who will be using it. When technological features are implemented within a home, the entire family should be considered in the design. A thorough understanding of the needs of the family can be assessed through an in-depth interview (Dewsberry et al., 2003).

The professionals involved in planning universally-designed environments should recognize the consumers as having authority over the process. Ringaert (2003) described individuals who use structures and have developed strategies for coping with everyday

barriers as being "user-experts." The "user-expert" can contribute valuable opinions and suggestions to the design process, thus making it client-centered (Ringaert, 2003).

Problems with Universal Design

While universal design may be client-centered, incorporating the client's choices within a building plan can be expensive according to certain developers (Imrie & Hall, 2001). In this exploratory study, developers were interviewed regarding their opinions about building structures to meet the needs of individuals with disabilities. Several developers expressed concerns about building structures that were accessible in order to meet the needs of a small minority of the population. In some developers' opinions, this practice is discriminatory against those that are not disabled. In addition, Imrie and Hall (2001) found that some developers don't consider the wide range of disabilities that exist among the population. For instance, some developers only considered mobility impairments as a disability. They didn't consider the needs of those with other impairments such as vision or hearing deficits.

Developers were concerned about keeping costs down and maximizing the use of space in order to turn a larger profit (Imrie & Hall, 2001). For example, in this study, developers cited concerns about using space for accessibility features as this may limit space available for other features, thus decreasing revenue. Developers were primarily concerned with maximizing the financial value of each building (Imrie & Hall, 2001).

While some developers felt that accessible buildings were unprofitable, others felt that these buildings were in strong demand. One developer felt that by making a building accessible more customers can be accommodated and, as a result, there would be more potential buyers. While accessible buildings may cost more to construct, these costs

translate to increased income as the building can be used by more people (Imrie & Hall, 2001).

Universal Design, ADA, and Occupational Therapy

While many researchers and professionals have advocated the use of universal design concepts, it is still an emerging area of practice within the health care professions. Occupational therapists are particularly suited to be involved in the universal design process. According to Ringaert (2003), occupational therapists have a myriad of knowledge that makes them ideal candidates to work in this area. Occupational therapists have knowledge of occupational performance, disability, person-environment interaction, psychosocial factors, assistive devices, and many other competencies that other professionals, such as architects and builders, may not have.

While occupational therapists may possess the necessary skills and educational background to be involved in the universal design process, research shows that many occupational therapists lack knowledge regarding the Americans with Disabilities Act (ADA) title III (Redick, McClain, & Brown, 2000). In a 2000 study, Redick et al. found that many therapists lacked knowledge of ADA title III and therefore they may not be empowering their clients to be independent within their environments. This could potentially lead to a lack of fully inclusive communities (Redick et al., 2000).

A random sample of 152 participants was chosen from membership in the American Occupational Therapy Association (Redick et al., 2000). Participants were sent a 36 question survey which examined attitudes towards the ADA, knowledge of the ADA, amount of education provided to clients about the ADA, and questions to determine the ADA resources utilized by therapists.

Ninety percent of therapists surveyed acknowledged that they should have knowledge of the ADA as well as have a role in educating clients (Redick et al., 2000). On the knowledge portion of the survey, the mean score for therapists was 1.85 out of a possible 10 points. In addition, a mere 1% to 5% of therapists reported using ADA activities with clients more than five times during their career. The researchers also found that the therapists who perceived the ADA as positive were more likely to educate their clients on title III (Redick et al., 2000).

While occupational therapists believe they have a role in educating clients on the ADA, some lack the knowledge needed to empower clients (Redick et al., 2000). With the proper knowledge, therapists could serve as advocates for their clients in order to fully integrate them within their communities. Redick et al. (2000) clearly point to the need for therapists to expand their knowledge regarding the ADA and other accessibility issues. With this knowledge, therapists will be more effective in encouraging inclusive environments and enabling clients to advocate for their own needs.

Conclusion

From the preceding literature, it is clear that the physical environment plays an integral role in either supporting or hindering occupational performance and health. Individuals' perceptions of their environment are closely tied to their physical health and levels of social participation. Barriers as well as facilitators can influence individuals as they perform daily occupations.

Barriers within the physical environment can be reduced by implementing principles of universal design. Universal design is the development of environments that

can be used easily and equally by everyone. By incorporating principles of universal design, functional tasks become easier for everyone.

Occupational therapists possess a unique knowledge base that makes them the ideal health care professionals to analyze environments and contexts. With the proper education, occupational therapists can work with other professionals and bring their knowledge of human functioning to the universal design process and advocate for individuals' participation at the home and community levels.

Because universal design is an emerging area of practice for occupational therapy, many practitioners and students need more knowledge on the topic. The following chapters will serve to further describe the importance of universal design as well as provide an educational module on the subject to foster the role development of occupational therapists.

CHAPTER III

METHODOLOGY

The product described in the following chapter is an educational presentation on universal design concepts. This presentation is intended to give occupational therapy students an introduction to universal design concepts and how they can be applied to the built environment. It is formatted as a Microsoft® PowerPoint® lecture with notes provided for the presenter. In addition, a resource sheet is included for students interested in learning more about universal design. Prior to the presentation, students will receive a handout of the slides and resource sheet.

The process of developing the educational presentation began with a review of the literature. Several databases were utilized in the search including PubMed, CINAHL, and OT Search. Initially, scholarly articles were selected that specifically addressed an aspect of universal design. However, the literature search was later expanded to include articles describing the impact of the environment and context on physical health and social participation in order to fully understand the role of the environment in occupational performance.

The selected articles were then analyzed in order to interpret similarities and differences among findings. These similarities and differences were organized into an outline, which served as the foundation for writing the literature review. During the process of analyzing the data and writing the literature review, several important similarities emerged. Several authors mentioned the importance of universal

design as an emerging practice area for occupational therapists. Some of the authors described the need for practitioners to have knowledge of universal design, and advocated that this topic should be included in academic curricula. Since the literature suggested a need for occupational therapists to have more knowledge of universal design concepts, it was decided that the product developed would be an educational presentation for the occupational therapy curricula at the University of North Dakota.

Following the completion of the literature review, a theoretical model was chosen to help guide the development of the product. The Ecological Model of Occupation was selected to guide the process. Other theoretical models were considered; however, the Ecological Model was chosen due to the four constructs that it considers in describing occupational performance. The model's four constructs of *person*, *context*, *task*, and *performance* unite the principles of universal design with the occupational therapy process. Also, the Ecological Model facilitates communication between professionals by creating a common language.

The Ecological Model examines the relationships between the constructs of *person*, *context*, *tasks*, and *performance*. The model asserts that characteristics of the *person* interact with characteristics of the *context.* The *person* completes *tasks* by interacting within the *context*. The result of this interaction results in *performance*.

Similarly, universal design concepts also consider the characteristics of *person, context, tasks,* and *performance*. In particular, universal design concepts address the *context* of the built environment. Universal design concepts focus on creating *contexts* that are equally usable for all *persons* in order to perform *tasks* as easily as possible. The ultimate goal of universal design is to facilitate occupational *performance* for all *persons.*

After selecting the theoretical model, an outline for the educational presentation was organized. Since universal design is a broad subject; topics were carefully selected to include those relevant to an entry-level occupational therapist. In addition, foundational information that described the impact of the environment on occupational performance was included.

In the organization of the educational presentation, introductory topics such as the environmental impact on occupational performance and key definitions were addressed first. This information was followed by the history of universal design and an explanation of how the seven principles were formed. The seven principles and guidelines were then explained in detail. Following explanation of the principles, the role of the occupational therapist was discussed, including practitioner competencies.

Following approval of the outline, the information was organized onto Microsoft® PowerPoint® slides. Pertinent information was included on each slide with supplemental information included in the lecture notes. Several studies found in the literature were described in detail in the lecture notes.

The seven principles of universal design along with the corresponding guidelines were presented on the slides. Examples of each principle were provided in the lecture notes. In addition, pictures representing each principle were included on the slides. The photographs featured examples of universal design found throughout the community. These photographs were taken by the authors using a digital camera.

Following completion of the PowerPoint® slides, a resource sheet was compiled using the references cited throughout the product. This resource sheet was organized

using the American Psychological Association (APA) format. The resource sheet and a copy of the slides will be provided to the occupational therapy students in a handout.

The product is presented in its entirety in Chapter IV. Also included in Chapter IV is an explanation detailing the purpose, intended audience, and theoretical model chosen to guide the development of the product.

CHAPTER IV

PRODUCT

The product presented in this chapter is a two-hour educational presentation for occupational therapy students and resource sheet on universal design. The educational presentation is formatted as Microsoft® PowerPoint® slides with lecture notes. The resource sheet includes information on sources that further explain universal design concepts. Prior to the presentation, students will receive a copy of the slides and resource sheet as a handout.

The presentation begins with an explanation of literature which examines the environmental impact on social participation and health. In addition, literature which describes common environmental barriers and facilitators is discussed. Key definitions are defined in order for learners to understand terminology used throughout the presentation. Universal design history and theory are discussed, and both benefits and drawbacks of the universal design process are explored. The seven principles of universal design as well as the guidelines are then explained in detail. Examples of each principle are also given pictorially as well as verbally. The presentation ends with an explanation of how universal design relates to occupational therapy, and how therapists can become involved in the process.

This presentation is intended for occupational therapy students who are in their second year in the program. Students should either be in or have completed their

physical disabilities courses in order to fully understand the information presented. Learners will receive a handout of the slides and the resource sheet. The presenter will have a copy of the slides as well as the lecture notes.

The presenter should include interactive learning activities to assist the students in understanding the material. The following ideas for activities are suggested:

- Students could give examples of locations within the community that incorporate universal design features into the built environment. They could describe the location and the features that it has which facilitate occupational performance. Students could be asked to write a brief reflection describing what features they saw and how they relate to universal design principles.
- Students could be asked to reflect on instances where they had problems accessing a building or locations within it. Students could be asked what features they felt inhibited accessibility. Students could also be asked to recommend modifications that would make the building more accessible.
- The presenter could ask the students to find a partner. Each partner group could be assigned a disability, such as a visual impairment or mobility impairment. Students could simulate that impairment while completing tasks around campus. Following the activity, students could be asked to describe to the class what obstacles they encountered during the tasks they performed. The students could then discuss ways that universal design concepts could be incorporated to make the environment more conducive to the occupational performance of individuals with disabilities.

- The presenter could separate students into seven groups and assign each group one of the universal design principles. The groups would be responsible for finding more information or examples on the principle assigned and then sharing what was learned with the class. For example, students could use the Internet to find more information and could then share what they found as well as the websites they utilized.
- The instructor could invite individuals from the community with various disabilities to come and discuss their experiences with interacting within the physical environment with the class. The individuals could be asked to reflect on both barriers and facilitators that they have experienced. Students could have the opportunity to ask questions and learn about the perspectives of those with disabilities.

In order to help students understand the concept of universal design, a theoretical model was chosen to guide the development of the product. The model selected was the Ecological Model of Occupation. This model examines the relationships between the constructs of *context, person*, *tasks*, and *performance*. It emphasizes the dynamic and interactive nature of these four constructs. A description of the Ecological Model of Occupation is included in the PowerPoint® presentation in order to assist the students with understanding how the model relates to the universal design process. A rationale for why the model was chosen is also included in the lecture notes.

The four constructs of *context, person, tasks,* and *performance* are a good fit for describing the concepts of universal design as well as the practice of occupational therapy. The model describes how characteristics of the *person* interact with

characteristics of the *context*. The *person* completes *tasks* by interacting within the *context*. The result of this interaction is *performance*.

Universal design concepts also consider the characteristics of *person, context, tasks,* and *performance*. In particular, universal design concepts address the *context* of the built environment. Universal design concepts focus on creating *contexts* that are equally usable for all *persons* in order to perform *tasks* as easily as possible. The ultimate goal of universal design is to facilitate occupational *performance* for all *persons.*

Individual characteristics are also carefully considered in the universal design process and our product. For instance, principle four discusses the importance of effectively conveying information to users of a product or environment. Whenever possible, information should be presented using a variety of modes in order to accommodate individual abilities. For instance, a bathroom sign can convey information to individuals with varying sensory abilities. In addition to placing words on the sign, other modes can be employed. A picture may be provided for those unable to read as well as Braille for those who cannot see. These different modes all accommodate the largest number of people as possible, regardless of individual characteristics such as native language or reading ability.

Individuals' goals are fulfilled through the accomplishment of *tasks*. *Tasks* are the observable behaviors individuals perform to achieve goals. Examples of *tasks* include life activities that individuals perform each day such as activities of daily living and instrumental activities of daily living (AOTA, 2002).

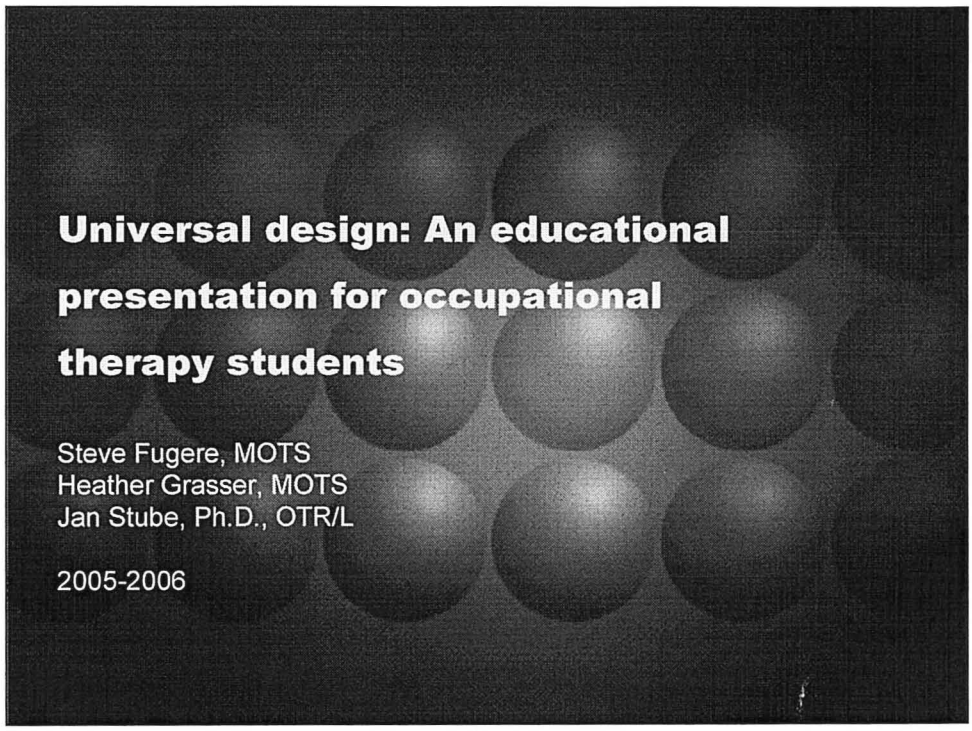
Universal design concepts are intended to make the accomplishment of *tasks* easier for everybody. For example, in our product, we discuss the importance of

minimizing the chances of error; therefore, safety within the *context* is enhanced. By providing fail-safe features and eliminating hazards, the accomplishment of *tasks* becomes easier.

The final construct of the model is *performance*. *Performance* is defined as "both the process and the result of the person interacting with contexts to engage in tasks" (Dunn et al., 2003, p. 226). Performance patterns such as habits, routines, and roles enable individuals to perform daily *tasks* in an effective way by serving as a basis for automatic behavior (AOTA, 2002).

In our product, we discuss the importance of enhancing *performance* for all *persons*. For example, universal design principle three emphasizes the importance of consistency in facilitating occupational performance. By using consistency within the *context*, individuals are better able to develop effective habits or routines to meet the demands of the environment.

The product described in this chapter is presented in its entirety in the following pages. The pages contain both the PowerPoint® slides and the lecture notes for the presenter. The resource sheet is provided as a separate document following the PowerPoint® slides within this chapter.


Universal design: An educational presentation for occupational therapy students
Steve Fugere, MOTS
Heather Grasser, MOTS
Jan Stube, Ph.D., OTR/L
2005-2006

Purpose of presentation

- To help students understand the impact of the physical environment on occupational performance
- To inform and educate occupational therapy students on the concepts of universal design and how they pertain to occupational therapy
- To help students understand the role of the occupational therapy practitioner in the universal design process

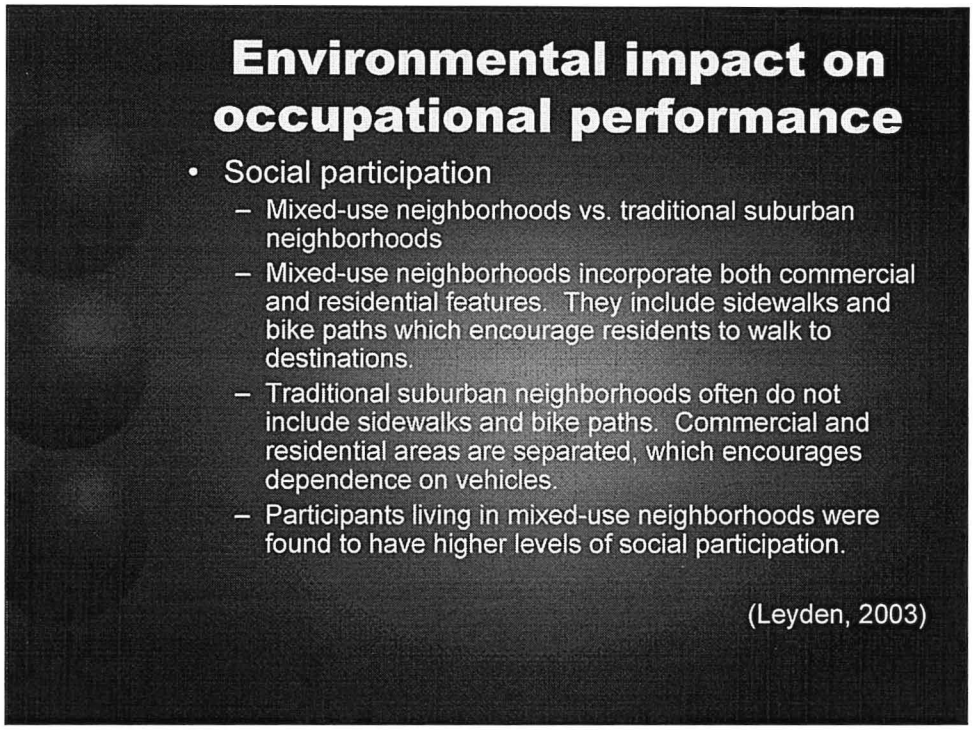
Learning objectives

- Following the presentation, students will be able to:
  - Define universal design and other key terminology
  - Describe how the environment affects occupational performance
  - Give examples of barriers and facilitators found in the physical environment
  - Explain the benefits of universal design
  - Describe the history behind universal design
  - Explain the seven principles of universal design and how they can be applied to the physical environment
  - Describe a theoretical model useful in guiding the universal design process
  - Explain the competencies that occupational therapists possess that make them suitable to influence universal design development
  - Describe possible O.T. roles within universal design

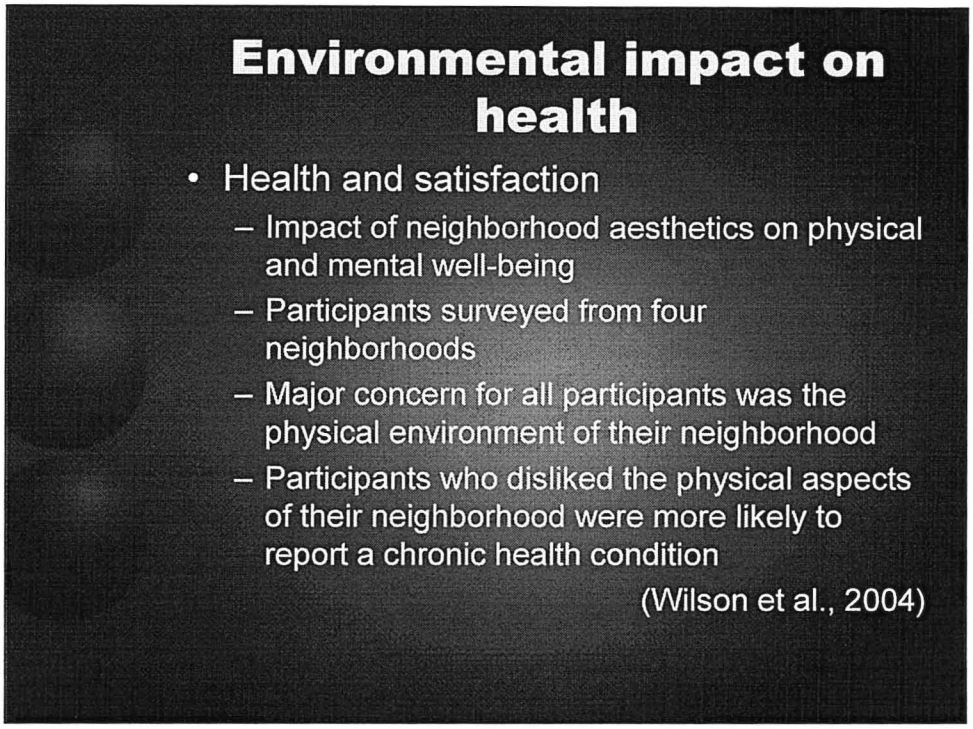
Key definition

- *Universal design*
  - The design of products and environments to be equally usable and accessible for individuals of all ages and ability levels without adaptation. Universal design concepts are based on seven guiding principles.

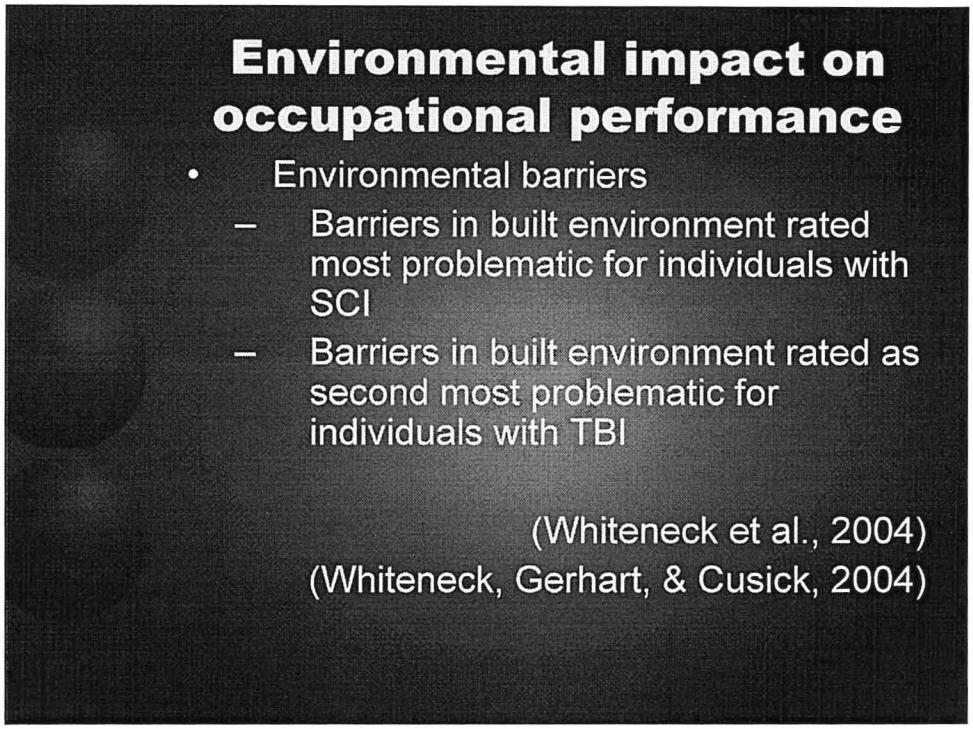
(Danford, 2003)



In a 2003 study, Leyden compared mixed-use neighborhoods with traditional suburban neighborhoods. A mixed-use neighborhood is designed to enable residents to walk or bike to destinations such as school, work, and grocery stores, rather than relying principally on automobiles or public transportation. Traditional suburban neighborhoods often do not have sidewalks and parks. A city in Ireland was studied based on its rapid growth rate and variety of neighborhoods of mixed-use and traditional suburban style. A total of 750 surveys were sent to residents. The surveys consisted of questions regarding social participation. The researcher found that participants who lived in mixed-use neighborhoods had higher levels of social participation. In addition, those participants who lived in mixed-use neighborhoods were more likely to feel connected to their neighborhood.



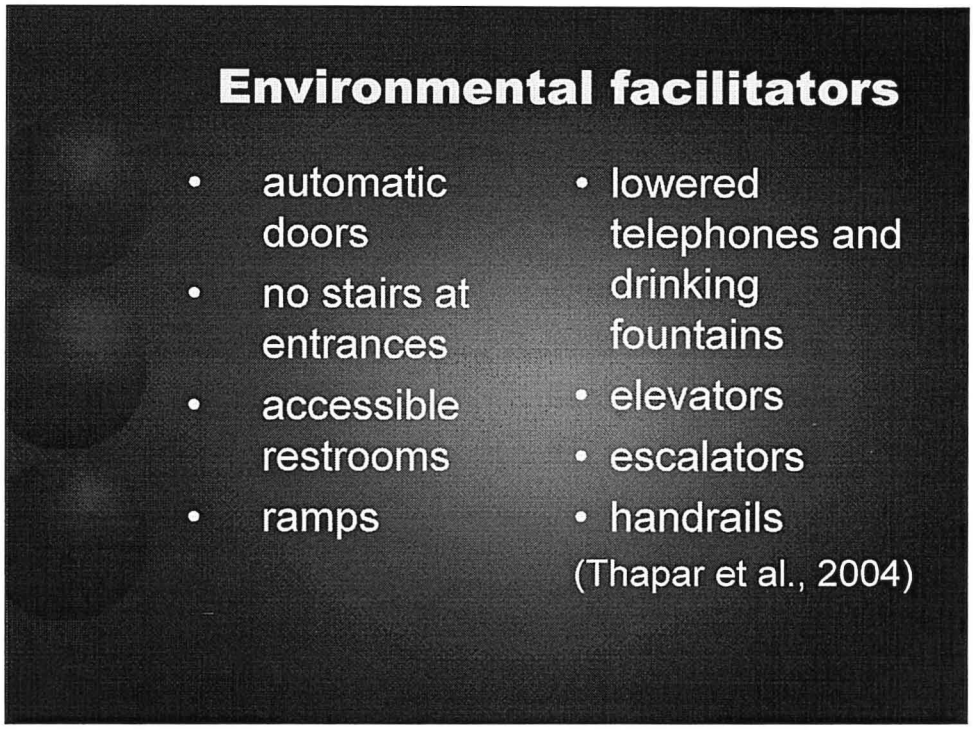
Wilson et al. (2004) accessed determinants of health at the community level. Participants consisted of 1504 adults who were randomly selected from four contrasting neighborhoods in the city of Hamilton, Canada. Neighborhoods included high income and high diversity, low income and high diversity, low income and low diversity, and high income and low diversity. A telephone survey was conducted with approximately 300 participants from each neighborhood. The telephone survey consisted of questions designed to provide insight on participants' perceptions of their neighborhoods and social networks as well as their current health status. The researchers found that the participants from the low income neighborhoods were more likely to experience poor health status and more emotional distress than those participants from the other neighborhoods. The dominant concern for participants in all the neighborhoods was the physical environment. Participants who reported a dislike of the physical environment of their neighborhood were 1.5 times more likely to experience a chronic health condition. Those participants who were satisfied with their neighborhood's physical environment were less likely to divulge a poor health condition.



Whiteneck et al. (2004) found that individuals with spinal cord injury (SCI) rated barriers in the physical surroundings as the most problematic area. A total of 2,726 participants were surveyed regarding their perceptions of environmental barriers. The top five barriers were, in order of frequency, physical environment, transportation, need for help in the home, availability of health care, and government policies.

In a similar 2004 study by Whiteneck,Gerhart, and Cusick, 73 individuals with traumatic brain injury (TBI) were interviewed regarding the environmental barriers that they experienced in their daily lives. Participants rated barriers in transportation availability as the most problematic area. Barriers within the physical surroundings were rated as the second most problematic area by participants.

In a 2004 study, Thapar et al. tested the accessibility of various public buildings for individuals with and without disabilities. Three participants with a single impairment were selected, as well as one individual without any known impairments. One participant was mobility impaired and used a wheelchair, 1 participant was mobility impaired and did not use a wheelchair, and 1 participant had visual impairments. A total of 30 public buildings were tested. All participants traveled though each building and completed six functional tasks. The selected tasks included: entering the building, using the restrooms, using a public phone, using a drinking fountain, accessing seating, and completing one task specific to the building. Examples of building-specific tasks included purchasing a ticket at the movie theater or obtaining voting information at a civic building. The researchers found that the most problematic barriers for the mobility impaired participants were structural. The participants with mobility impairments cited the highest percentage of structural barriers. The wheelchair user reported 48% of the structural barriers, and the mobility impaired individual who did not use a wheelchair reported 40% of the structural barriers. However, the control participant, without any known impairments, accounted for 58% of the wayfinding barriers. This participant cited barriers such as poor signage, lighting, and confusing layouts.



The participants from the Thapar et al. (2004) study also reported the facilitators that they encountered during their visits to public buildings. The majority of the environmental facilitators were reported by the two participants with mobility impairments. The visually-impaired participant cited the most wayfinding facilitators, such as handrails. The control participant, without any known impairments, cited facilitators such as interpersonal communication in order to find locations within a building. The other participants relied less on interpersonal communication to find their way around the buildings.

Key definitions

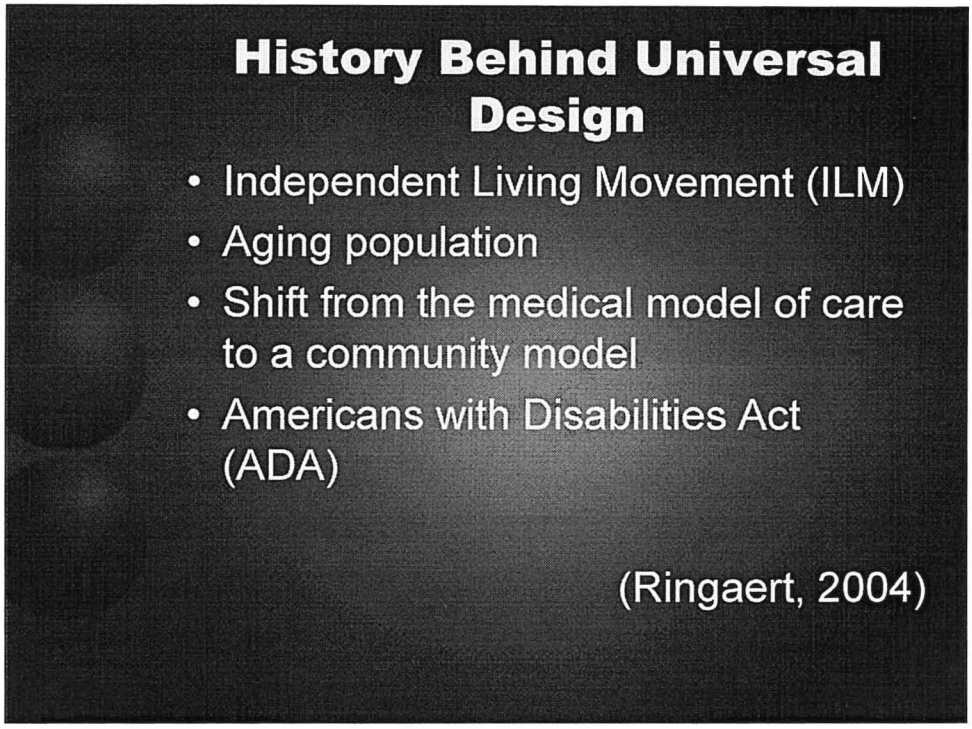
- *Built environment*
  - The man-made features of the environment that provide the means for human activity. It encompasses the largest cities to the smallest personal dwellings (Wikipedia, October 10, 2005).
- *Accessibility*
  - The interaction between a person's abilities and the features of the physical environment. It consists of both a personal as well as an environmental component. Since accessibility is based on compliance with architectural standards, it can be described as being an objective term (Iwarsson & Stahl, 2003).

Key definitions continued

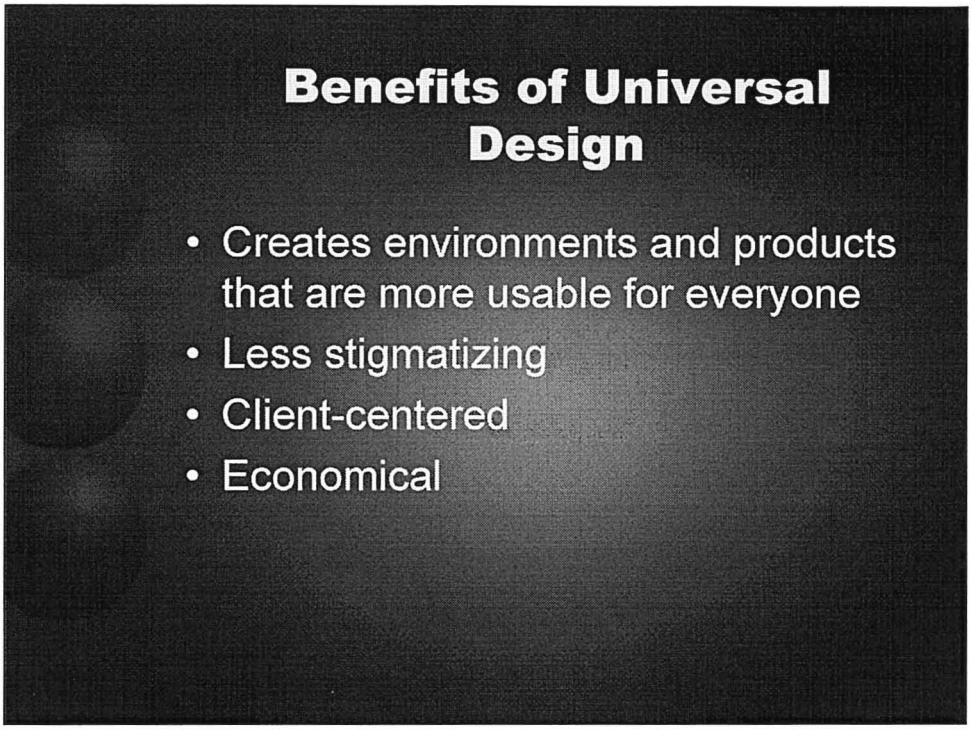
- *Usability*
  - The idea that individuals should be able to use an environment as equally as other citizens. In order for usability to occur, accessibility must be present. This term consists of a personal, environmental, and activity component. It is more subjective due to the fact that the degree of usability by an individual is considered (Iwarsson & Stahl, 2003).

Key definitions continued

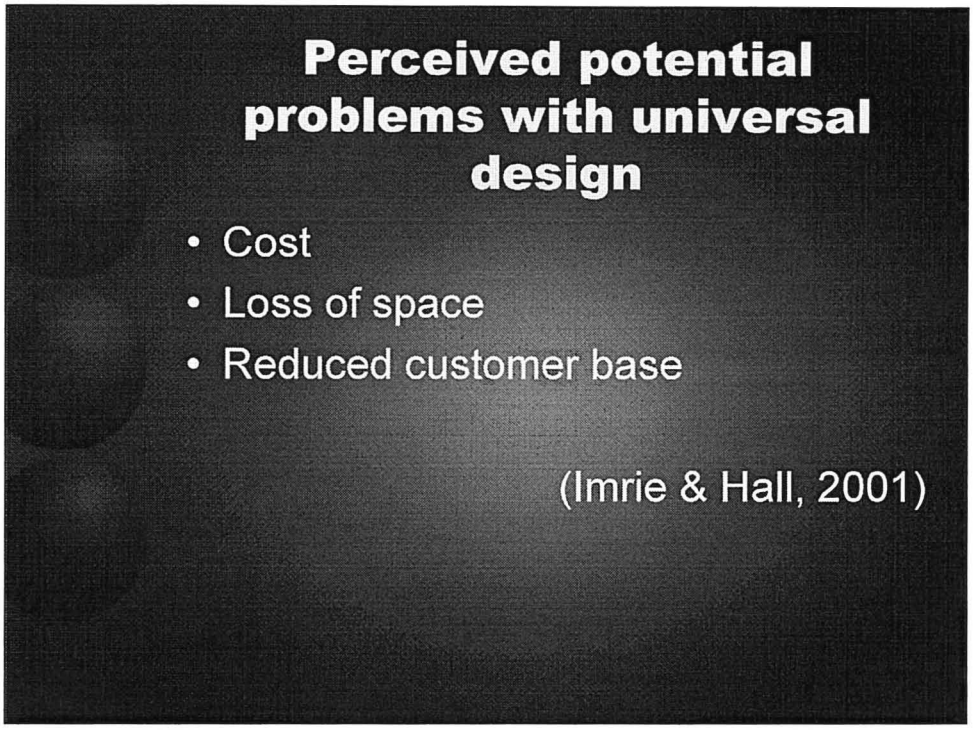
- *Inclusive design*
  - Reasonable adjustments that are made to the environment in order to make it more accessible for everyone. Unlike universal design, inclusive design does not address whether or not the environment is equally usable for all individuals (Doke, 2005)



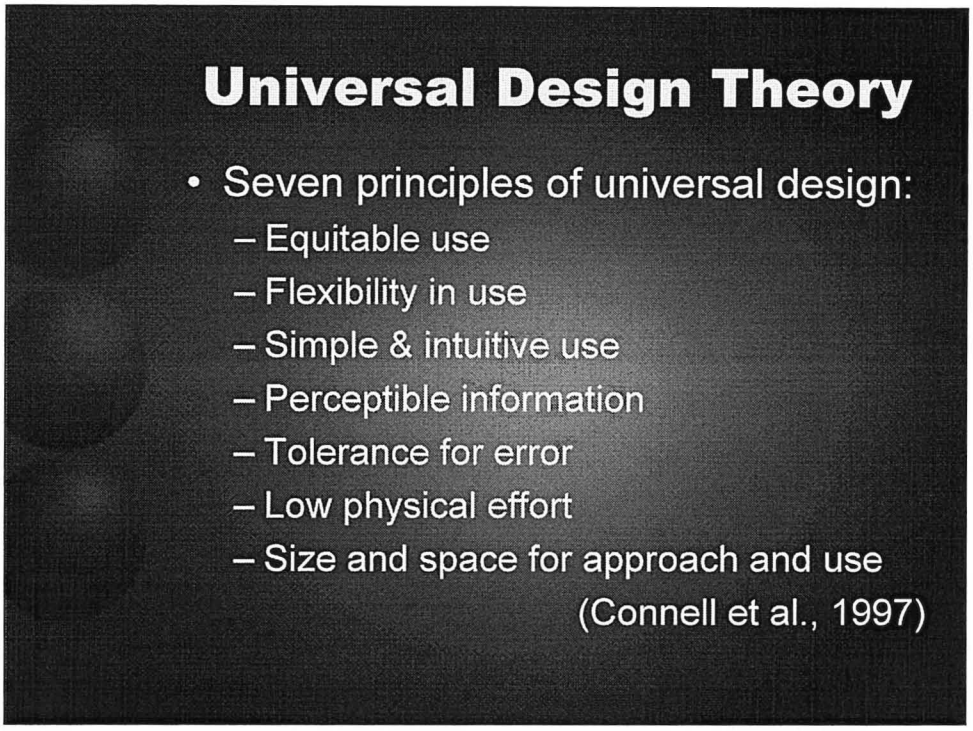
•Independent Living Movement-Emphasizes the importance of architectural, economic, or social barriers in supporting the occupational performance of individuals with disabilities. The ILM stresses the importance of having control over one's life and community experiences. Individuals with disabilities gain control by constantly adapting to barriers within their environments. Because of this constant adaptation, they become user-experts and are recognized as unique individuals rather than "patients."
•Aging population-The "aging in place" movement is fueling the demand for more accessible environments. This movement emphasizes the importance of the elderly remaining in their own homes for as long as possible. The elderly population continues to grow. Johansson (2000) estimates that by 2020 there will be over 54 million American citizens over the age of 65.
•Shift from the medical model-Many changes are occurring in this paradigm shift. In the community model, the community and clients are seen as having the power to change their circumstances rather than the health care provider. Unique cultural aspects are appreciated and respected rather than ignored. Community members, not the professional, are regarded as the "experts."
•ADA-Addresses discrimination against people with disabilities. Title III mandates the accessibility of public buildings. Title III involves the removal of architectural barriers when the removal is achievable and reasonable. It also entails providing aids and services for people with disabilities to use in order for them to benefit from the products and services of an establishment. (Ringaert, 2004)



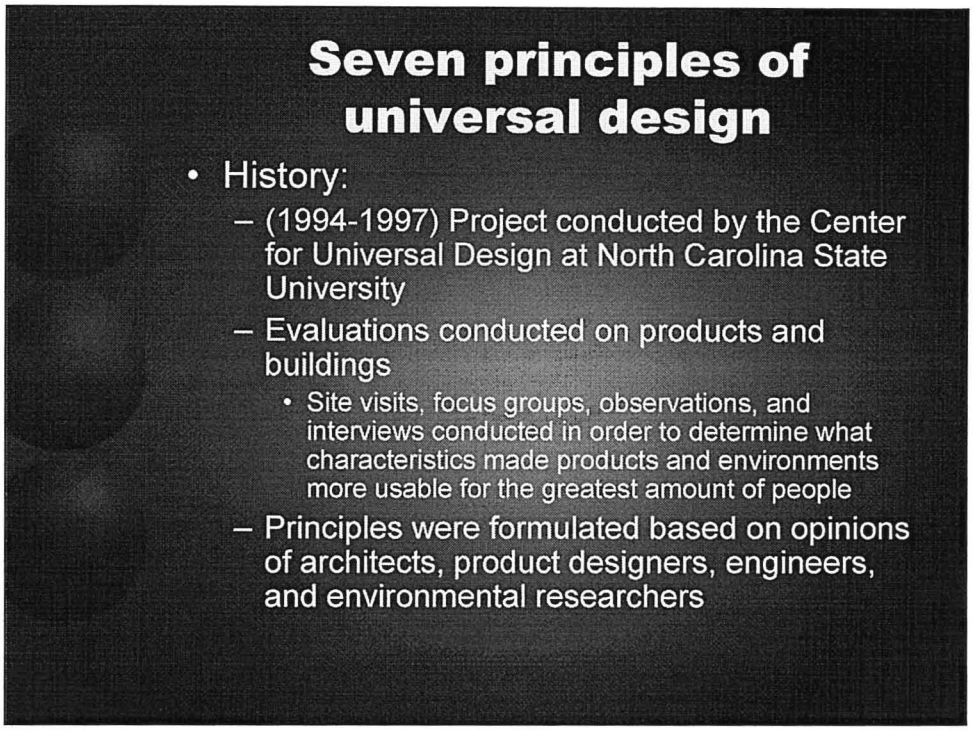
•Environment and products-Universal design principles attempt to make a product or environment more usable for the broadest range of people as possible. Example: leveled entrances not only accommodate individuals who use wheelchairs and other mobility aids, but also people pushing a baby stroller, shopping cart, or somebody moving furniture or other items into the building.
•Less stigmatizing-Because universal design features simplify tasks for everyone, they do not pose an inconvenience for those who are not disabled. Therefore, they are likely to be seen by individuals as innovative design rather than features to accommodate the disabled.
•Client-centered-Within the universal design process, community members are viewed as the "user experts." Community members are recognized as the authority figures due to their continuous, everyday interactions within their community.
•Economical-Building universally-designed homes may save consumers money as it could eliminate the need to make costly home modifications as age or functional status changes.



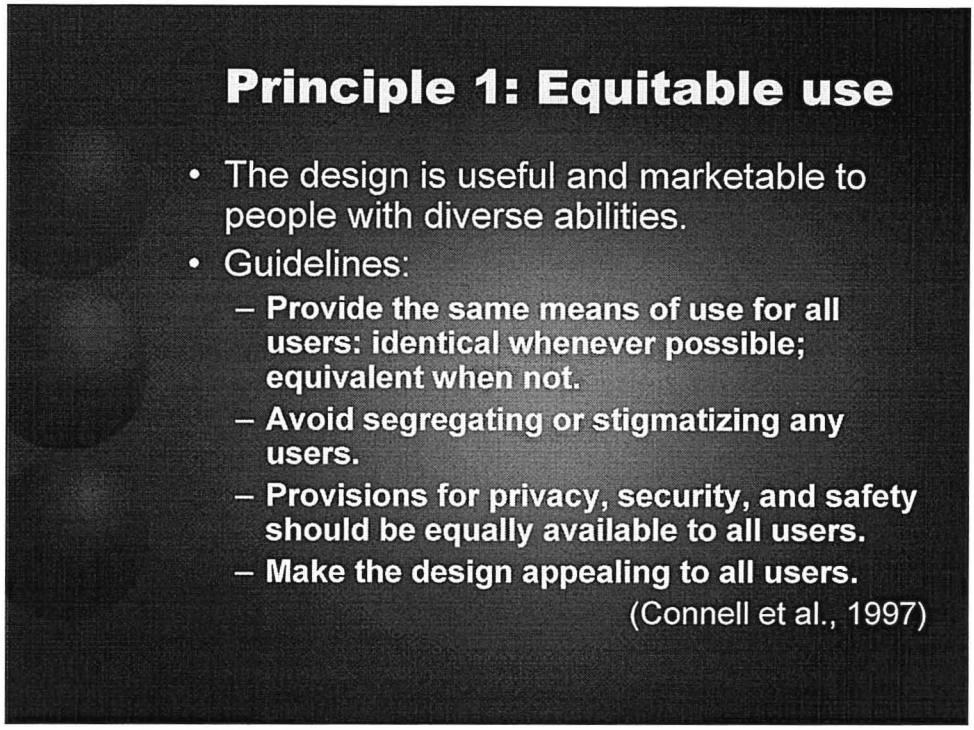
In a 2001 study by Imrie and Hall, developers were interviewed regarding their opinions about building structures to meet the needs of individuals with disabilities. Several developers expressed concerns about building structures that were accessible in order to meet the needs of individuals with disabilities, which they perceived to be a small percentage of the population. Developers were concerned about keeping costs down and maximizing the use of space in order to turn a larger profit. For example, in this study, developers cited concerns about using space for accessibility features as this may limit space available for other features, thus decreasing revenue. Developers were primarily concerned with maximizing the financial value of each building. While some developers felt that accessible buildings were unprofitable, others felt that these buildings were in strong demand. One developer felt that by making a building accessible more customers can be accommodated and, as a result, there would be more potential buyers. While accessible buildings may cost more to construct, these costs translate to increased income as the building can be used by more people (Imrie & Hall, 2001).



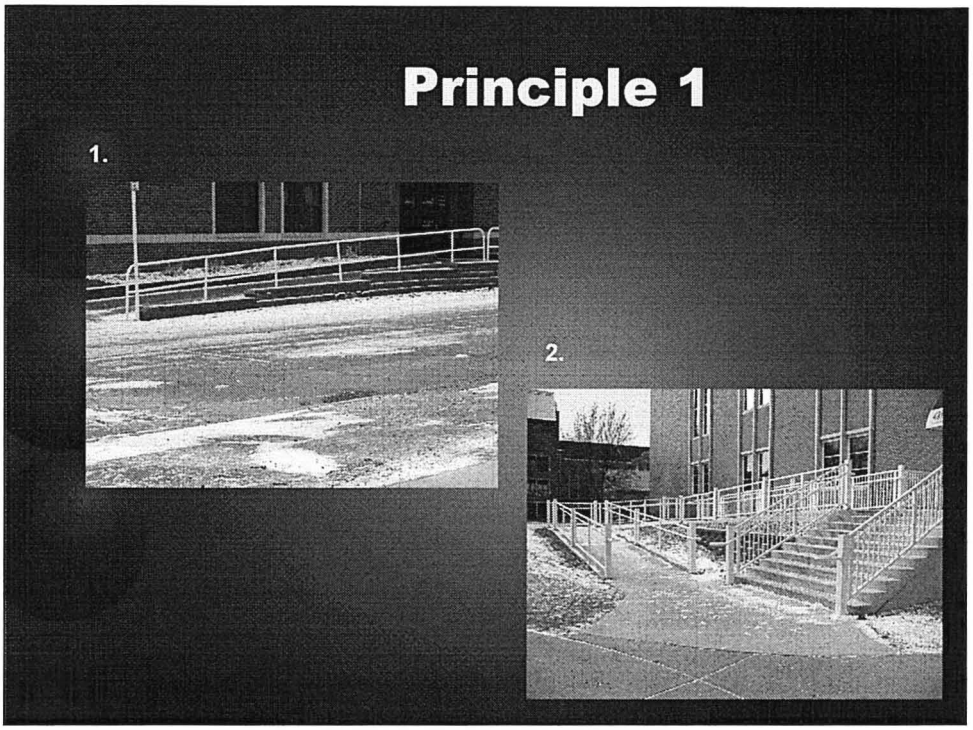
These principles define precisely what universal design is. They are intended to clarify universal design criteria and standards in order to make the concept as uniform as possible. They will be described in more depth in the following slides.



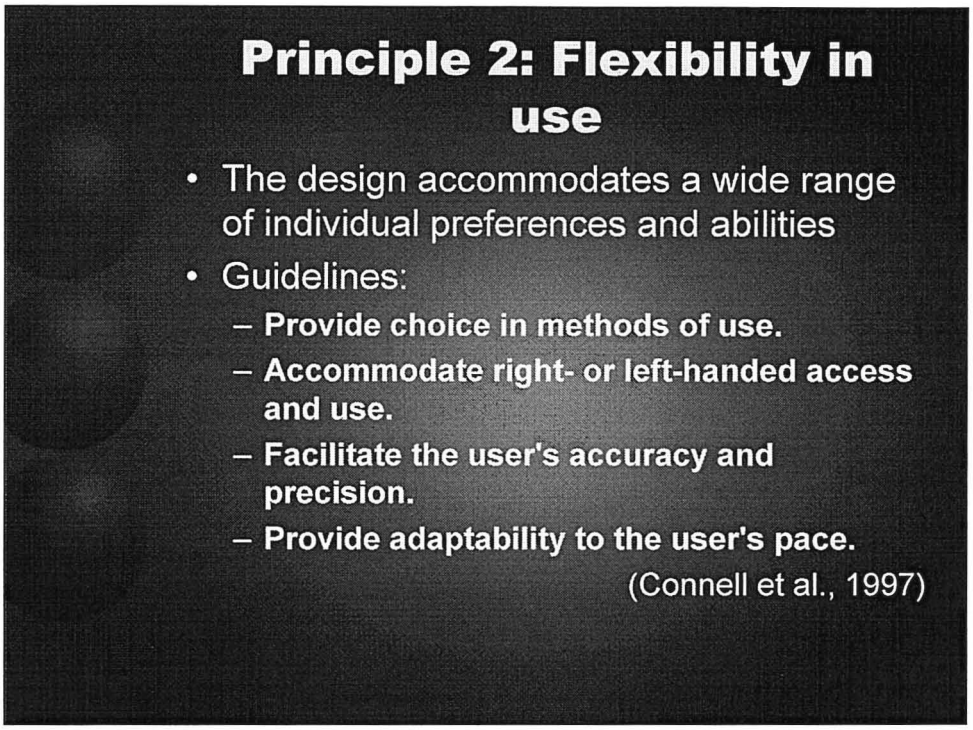
•The Center for Universal Design is located at North Carolina State University. The center is well-known for its skill in designing accessible housing. However, the center intended these principles to encompass all design disciplines including landscaping, architecture, and interior design.
•Between 1994-1997 a study was conducted by the center entitled: "Studies to Further the Development of Universal Design." Evaluations were conducted on numerous products and buildings in order to determine the characteristics that promoted optimal performance in the greatest number of people possible. The project was funded by the U.S. Department of Education's National Institute of Disability and Rehabilitation Research.
•The result of the study was the development of the seven principles. Each principle also contains four to five guidelines to further assist in defining the concept.



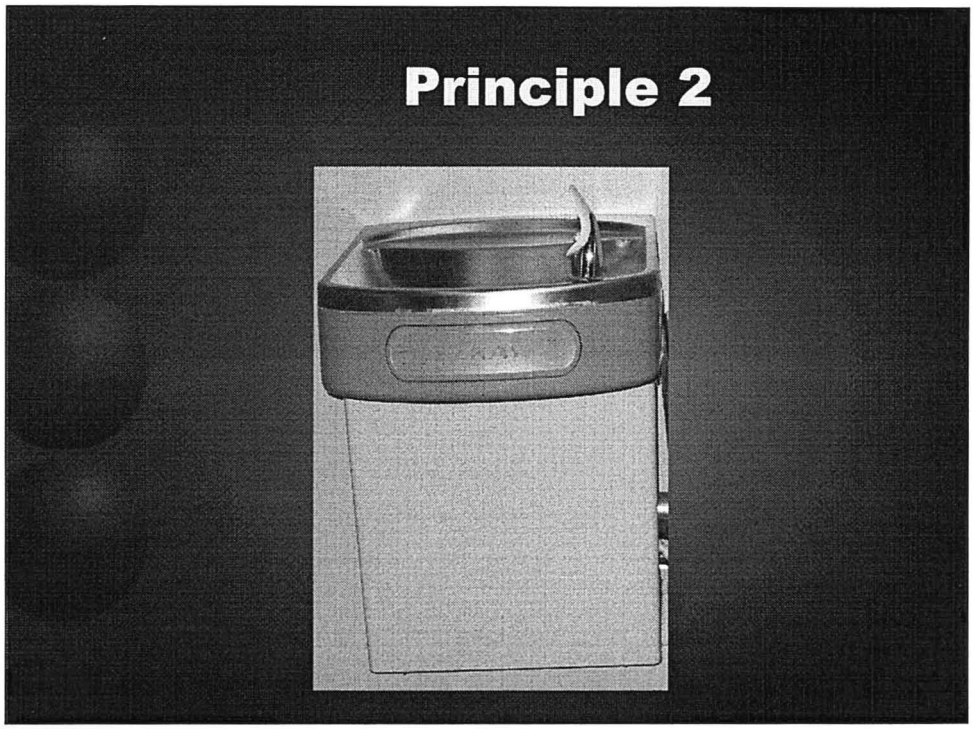
Example:
Some designs could potentially stigmatize a certain population of users. For instance, if a public building has both a ramp and stairs leading to the entrance, than those with mobility impairments will use the ramp while the majority of the users will use the steps. Since those needing to use the ramp require a different means to access the building, they are being segregated from those without mobility impairments. In contrast, providing the same means of use (a ramp) for everyone does not stigmatize certain individuals. In addition, those without mobility impairments may benefit. For example, a parent pushing a stroller or a delivery man transporting goods on a cart will be able to access the building easier.



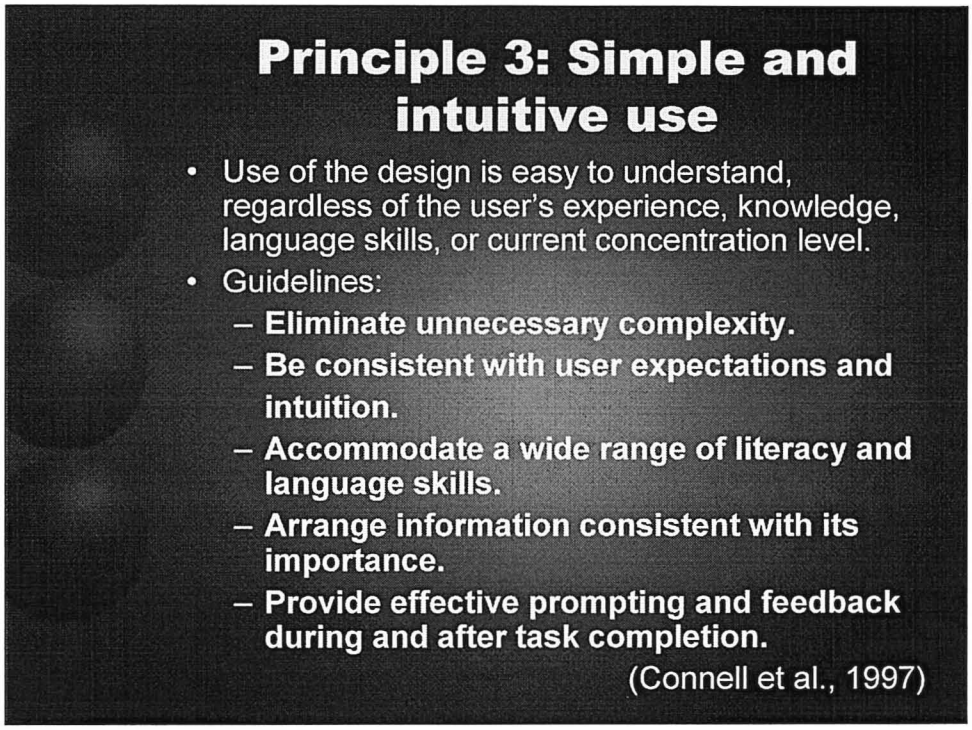
1. This entrance is an example of a universal design principle number one. The ramp to the entrance provides the same means of accessing the building for all users. Due to a single method of accessing the building, this design does not segregate a certain population of users.
2. This entrance is an example of accessible design. While it provides access for those with mobility impairments, it requires those individuals to use a separate means to access the building, thus segregating them.



Examples:
Many computer programs facilitate user accuracy by allowing the font size and color to be adjusted. All individuals, not just those with visual impairments, can benefit from being able to adjust fonts as this allows for more precision in typing and reading text.
Buildings that contain elevators, escalators, and stairs provide users with a choice that accommodates the user's pace and preferences. For example, a person may not have adequate balance to ride an escalator, but may feel comfortable using the stairs.

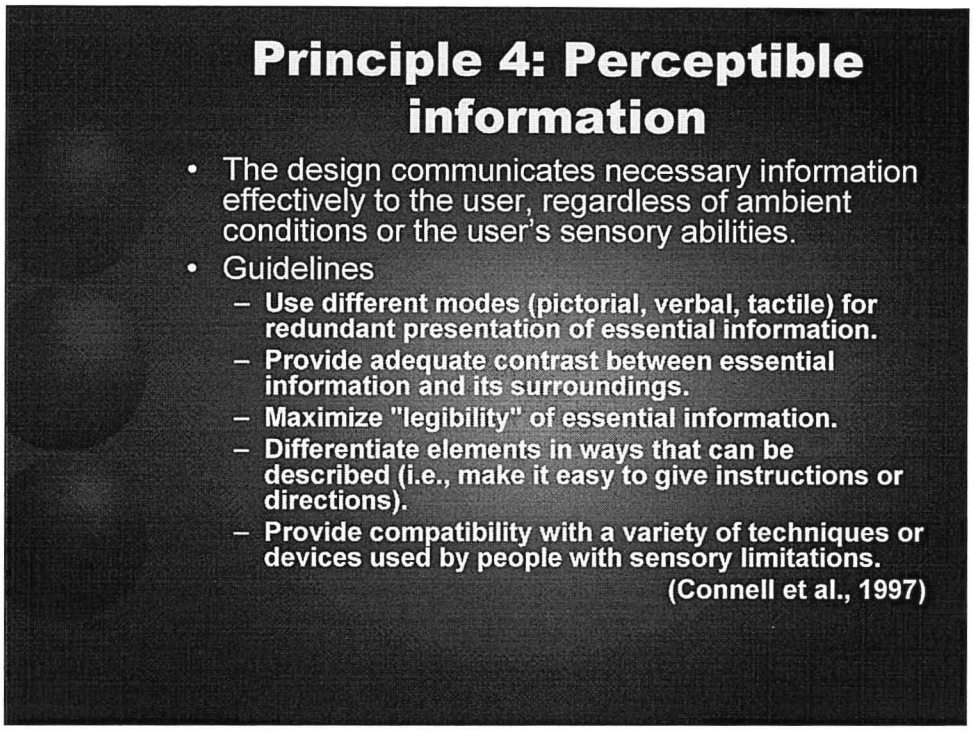


This drinking fountain accommodates individuals who are right and left handed by placing the activation switch directly in front of the user. It also accommodates a wide range of abilities as individuals do not need to have much fine motor skills or manual dexterity to operate the fountain.

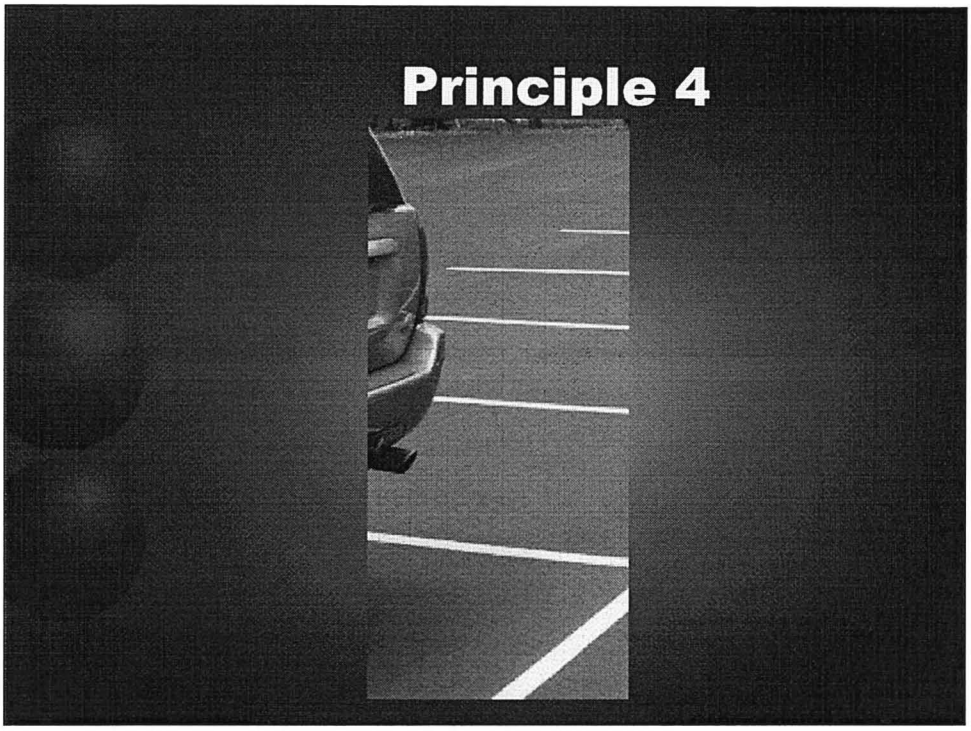


Example:
The use of symbols accommodates users who may have problems reading or interpreting words. An example of this is using both words and symbols on road signs. Symbols can eliminate complexity, but need to be chosen carefully as the goal is to decrease confusion.

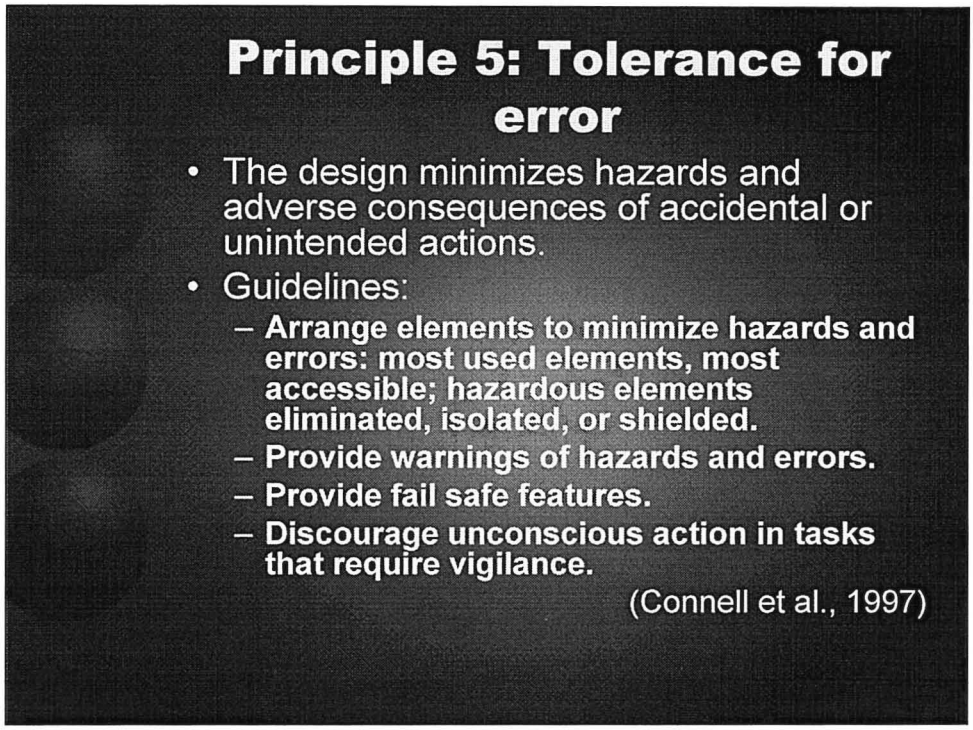
This bathroom sign incorporates both words and symbols in order to accommodate individuals with varying language and literacy skills. These signs are also used to identify most public restrooms, which makes it consistent across environments.



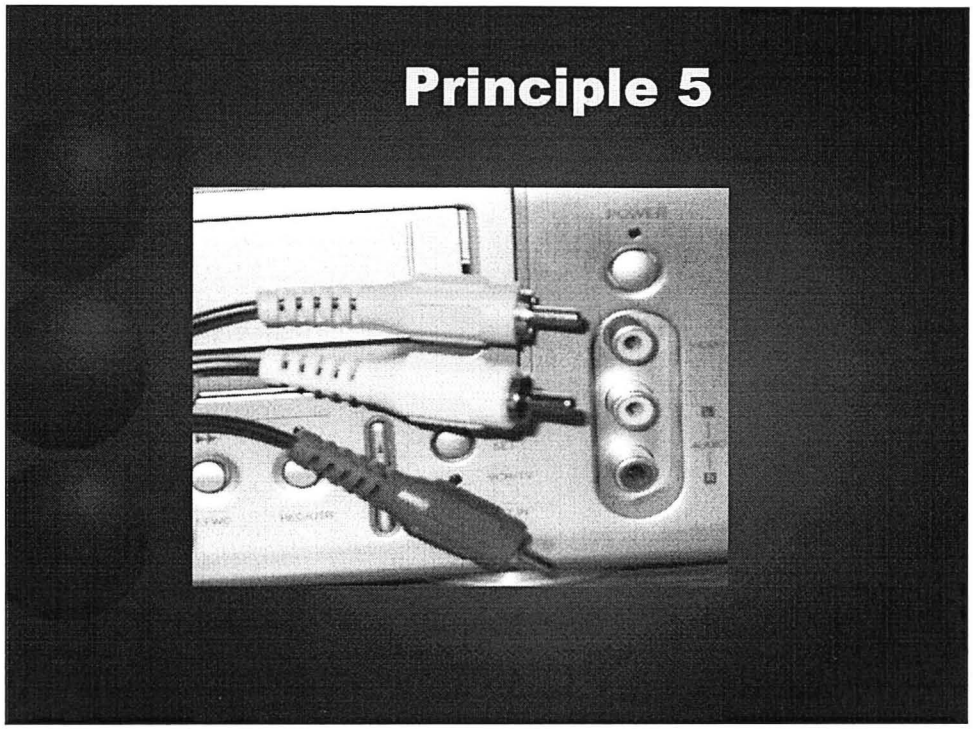
Example:
Elevator controls that light up when selected, give audible information, and contain Braille feature three different ways to provide sensory input. These different modes of information accommodate individuals who may have an impairment such as reduced vision. However, they also assist individuals without impairments by providing several means in which information can be relayed.



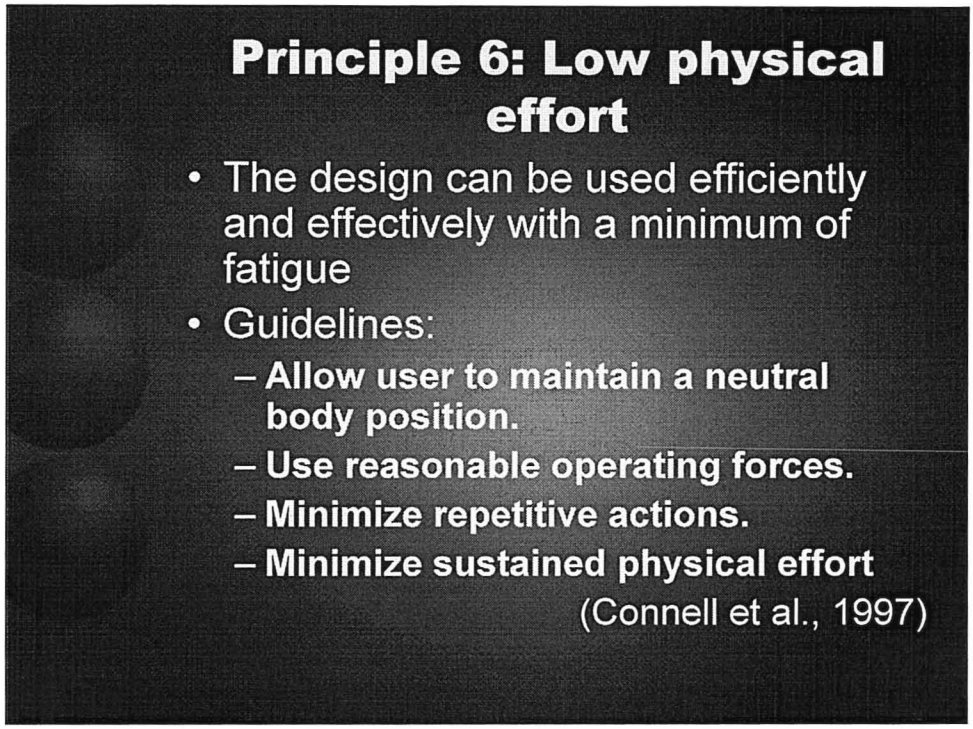
This picture of parking lot striping demonstrates the guideline of maximizing the contrast between essential information and the surroundings. Yellow on black provides the most contrast than any other color combination. Drivers are able to easily discern the markings on the pavement, even if lighting conditions are not optimal.



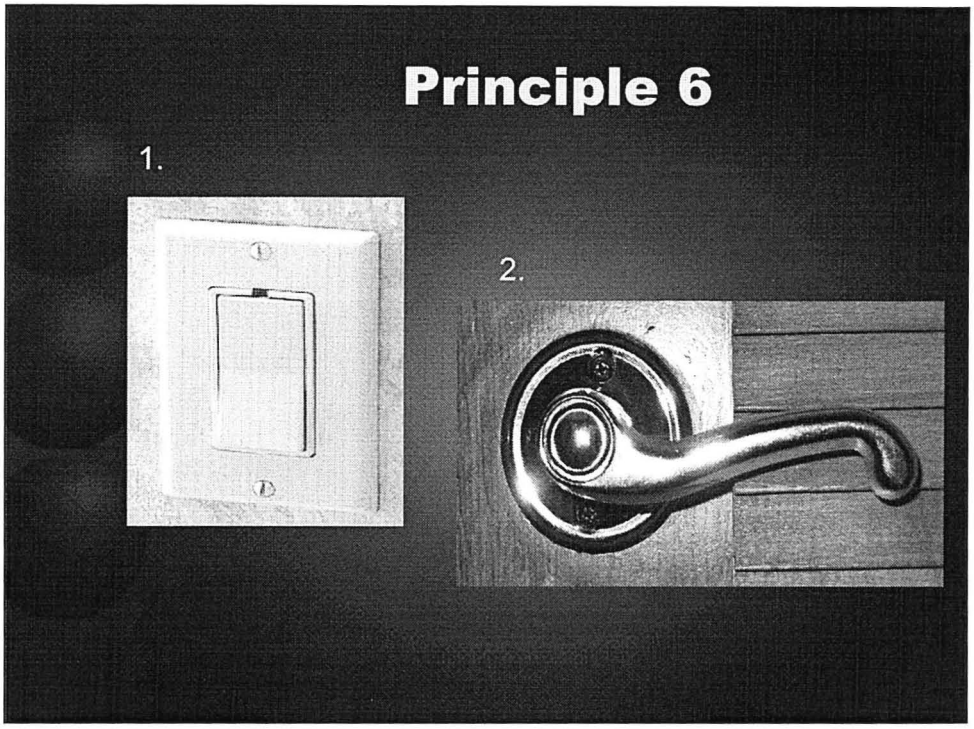
Example:
Some buildings contain railings in the entryways which separate the traffic of people entering and leaving, thus providing a fail safe feature to ensure that people to not collide with one another. Some neighborhoods and roads contain speed bumps or speed tables which force drivers to slow down and pay attention which discourages unconscious actions in tasks that require vigilance.



Cables which are color coded to match their connections provide a fail safe way for individuals to operate the product by eliminating complexity.

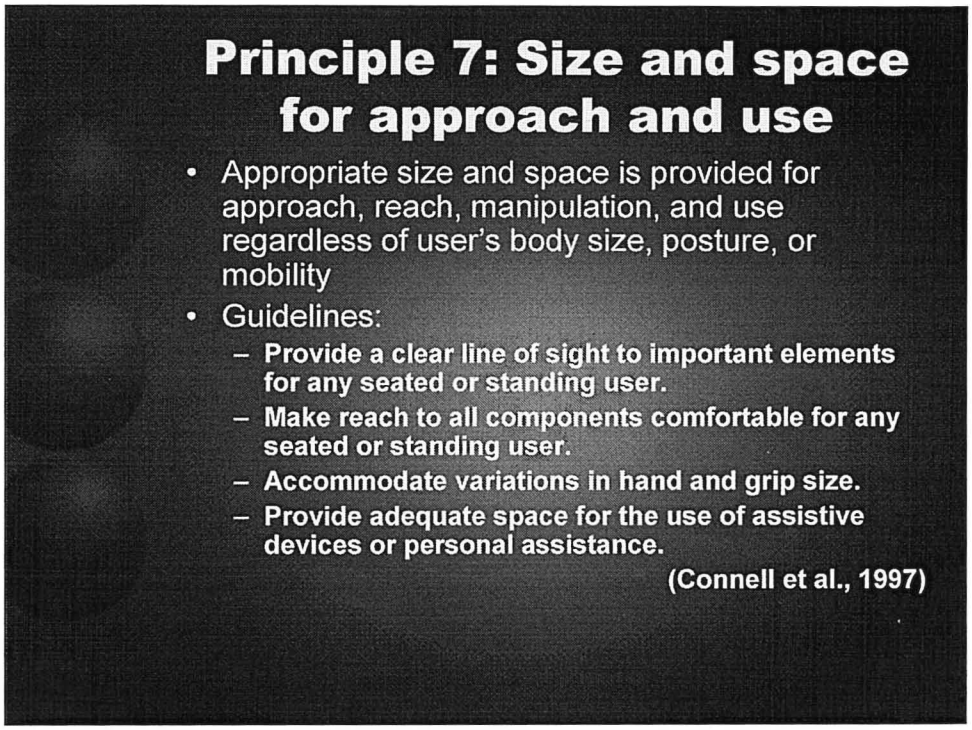


Example:
Light weight doors not only accommodate individuals with reduced strength, but also enable other users to exert less force, thus conserving energy. Conveyor belts used at store checkouts minimize repetitive actions and sustained physical effort by reducing the amount of reaching and twisting required.

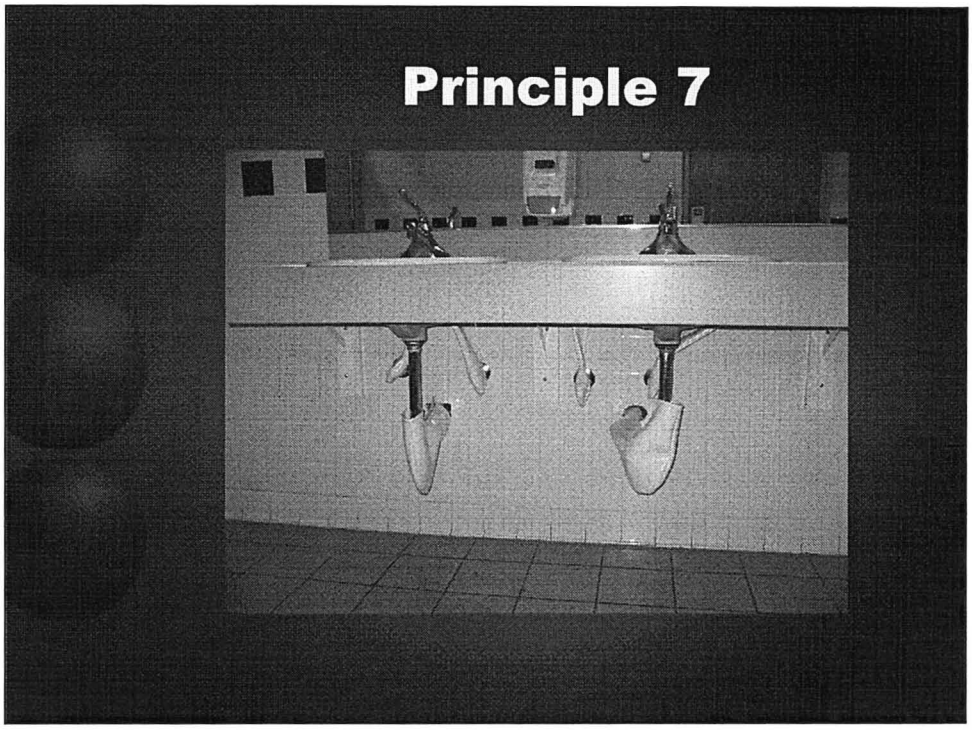


1 This rocker switch allows users to operate lights and other appliances with minimal motion. Users can easily activate and deactivate the switch numerous times without exerting an undue amount of physical effort.

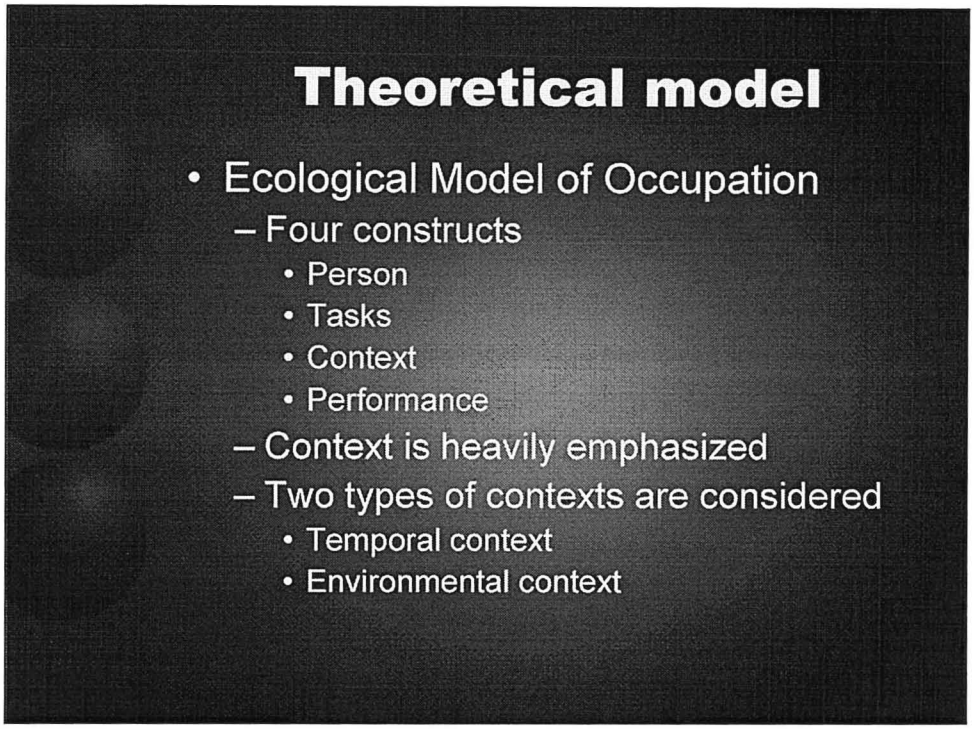
2. A lever door handle is easier to operate than rounded door handles and requires less physical exertion. It also allows the user to maintain a more neutral body position.



Example:
Full length mirrors in bathrooms not only accommodate individuals in wheelchairs, but also accommodate people of different heights.



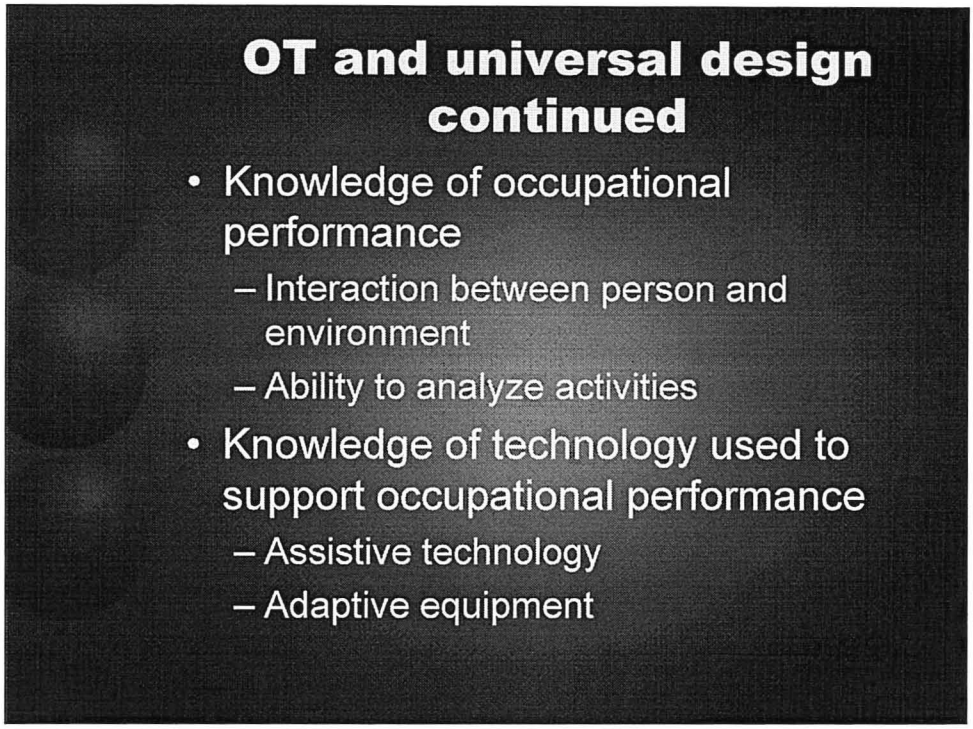
This example of a countertop allows individuals in wheelchairs to access the sinks comfortably from a seated position. While at the same time, the design allows people who are standing to have easy access to the sinks as well.



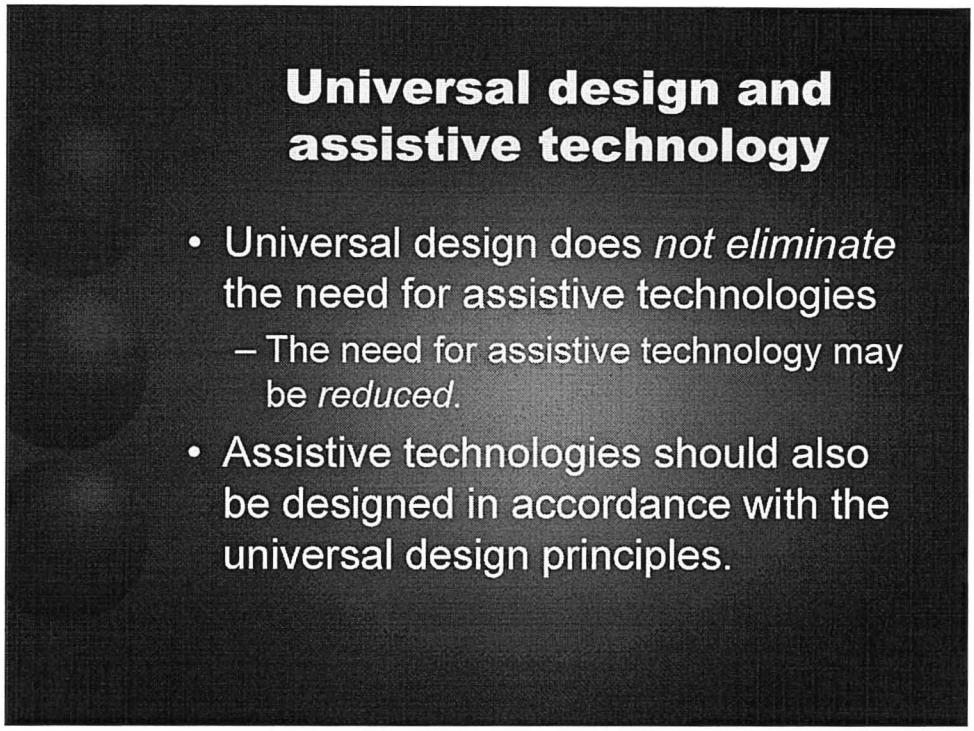
•The Ecological Model of Occupation addresses the constructs of context, person, tasks, and performance. A person is defined as "an individual with a unique configuration of abilities, experiences, and sensorimotor, cognitive, and psychosocial skills" (Dunn, Brown, & Youngstrom, 2003, p. 226). Universal design concepts also consider the features of individuals. For example, the guidelines of principle 3 state that products and environments should accommodate a wide range of literacy and language skills, these traits are part of the *person* construct.
•The person completes tasks which are defined as "an objective set of behaviors necessary to accomplish a goal" (Dunn et al., 2003, p. 226). Universal design concepts also address the completion of tasks. For example, one of the guidelines for principle 5 states that fail-safe features should be provided. Fail-safe features ensure that individuals complete tasks in an accurate manner.
•Individuals perform tasks within contexts which are defined as "a set of interrlated conditions that surounds a person" (Dunn et al., 2003, p.226). Performance is what results from the person interacting with the context (Dunn et al., 2003, p.226).Special attention is paid to context in this model. Two types of context are recognized. The temporal context includes an individual's chronological age, developmental stage, life cycle phase, and health status (Dunn et al., 2003,). The environmental context encompasses the physical, social, and cultural dimensions (Dunn et al., 2003). All of the universal design principles are intended to address some aspect of context. For example, principle 6 specifies that environments should be designed to allow individuals to perform tasks using minimal physical effort. This requires that careful design of building layouts and product design.
•Performance is defined as the "process and result of the person interacting with context to engage in tasks" (Dunn et al., 2003). Universal design principles also address performance. For example, the guidelines for principle 2 state that a variety of means to accomplish a task should be provided. Therefore, individuals can choose the means that work best for them in order to interact with the context.

OT and universal design

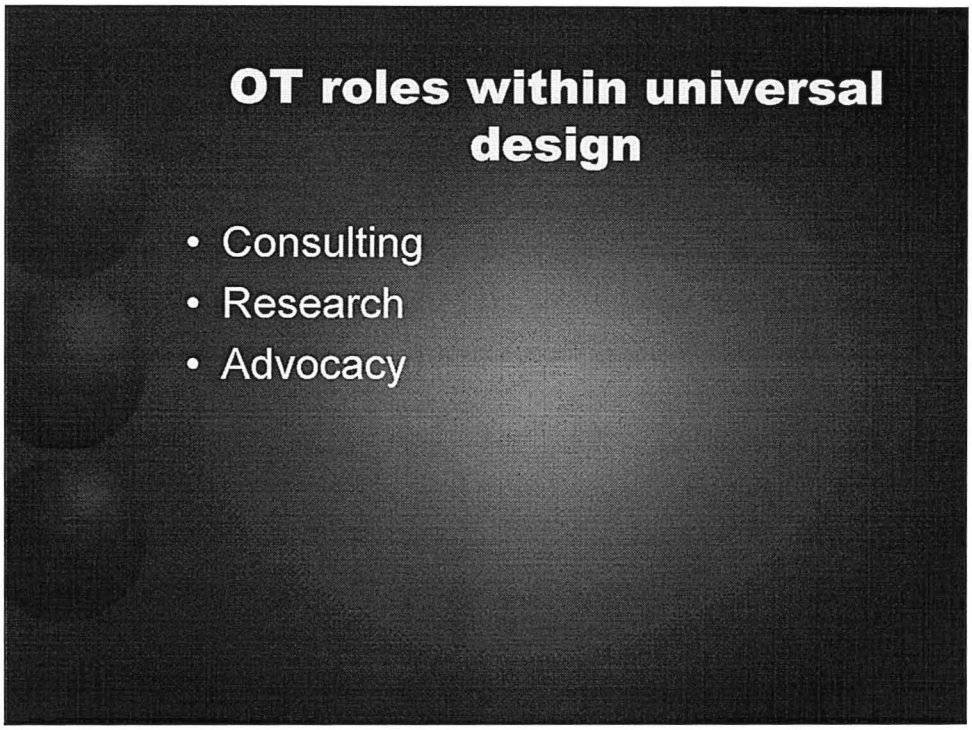
- OTs posses a broad knowledge base
- Knowledge of human development
  - Physiological changes that occur as people age
  - Psychosocial factors
  - Knowledge of disability



Universal design is concerned with making the environment as usable and accessible for as many people as possible it is important to understand functional changes that occur throughout the aging process. OTs study each stage of development and learn to understand the changes, both psychological and physical. OTs also have knowledge on how disability effects occupational performance in the environment. Because OTs understand the challenges that individuals with disabilities have in the environment, they understand the modifications that are necessary to make the environment more usable and accessible.



Assistive technology will always be needed because it is virtually impossible to design something that will be equally usable by everybody due to the unique characteristics and abilities of individuals.
If products and environments are built to comply with universal design principles, then they will be more usable by a wider range of people because complexity and difficulty of use has been reduced. Therefore, the need for assistive technologies may be reduced as well.
If assistive technologies are designed in accordance with universal design principles, then they will be able to be used by a wider range of people with as much ease as possible.



Occupational therapists can serve as consultants to architects, developers, builders, contractors, etc. Many of these professionals do not have knowledge of how disability can effect design. Occupational therapists can bring their knowledge of human development and disability to the universal design process.

Numerous research opportunities exist within universal design. For instance, occupational therapists could research what features of an environment or product make it easier to use by everyone. OTs can also be involved in developing assessment instruments in order to measure the effectiveness of universal design.

Because OTs work with clients with disabilities, they can find out what environmental factors are inhibiting or enhancing occupational performance and they can use this information to advocate changes the make the environment more user friendly.

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CHAPTER V

SUMMARY

The product presented in the preceding chapter is an educational presentation on universal design. It consists of Microsoft® PowerPoint® slides, lecture notes, and resource sheet. It is intended to give occupational therapy students a thorough introduction to universal design concepts and how they can be applied to the built environment. It is also intended to create interest among students and to encourage them to consider practicing in this emerging area of the profession.

The product is designed to be implemented within the occupational therapy curricula. It is recommended that the lecture be presented to students in the second year of the program who have already completed or are currently enrolled in physical disabilities courses. This recommendation is to ensure that students have sufficient background information on the functional impact of disability, human development, activity analysis, and environmental modification.

We recommend that interested students utilize the provided resource sheet in order to further study universal design concepts. The information included in the resource articles will assist students in learning more about the universal design process. In addition, the information will further prepare students who wish to gain practical experience in the universal design field.

It is recommended that students interested in universal design gain some practical experience in the area. Students could complete fieldwork experiences that

will allow them to work in accessibility consulting. This experience will allow students to gain exposure to other professionals who may work with universal design, such as architects. By working as part of the design team, students will learn terminology and practical considerations for implementing universal design principles.

In the future, this product could be expanded upon. For instance, information on understanding architectural schematics and building specifications could be explored. This would help the occupational therapist understand the design process, which is beneficial for communication with architects and other professionals. Understanding building specifications will also help the occupational therapist determine if the parameters of a design are conducive to supporting the occupational performance of individuals with and without disabilities.

This product could also be expanded to include information on designing products that comply with the universal design guidelines. For example, several sources in the literature recommended that assistive technology devices be universally-designed. Information could be included on how products can be modified or designed to support the occupational performance of as many people as possible.

Information on how universal design impacts individuals of different diagnoses could also be explored. For instance, we feel that it would be beneficial to study the impact of environments and universal design on individuals with mental illnesses. Most of the research conducted has been with individuals with physical disabilities. Research could focus on exploring the impact of aesthetic appeal on the occupational performance of those with mental illness.

There is also a need to examine how street furniture such as park benches and tables affect pedestrian use in the built environment. Research could focus on aspects such as identifying how far apart street benches should be placed in order to encourage elderly individuals to use sidewalks. Lighting aspects could also be explored to examine how it if affects safety and night vision among pedestrians.

The product we have created provides a thorough introduction to universal design for occupational therapy students. The information provided in the product is intended to be supplemented with further research by the student as well as practical experience.

While the information provided in the presentation gives a thorough background on universal design terminology, theory, principles, and some application, there exist opportunities for further research and development. These opportunities include exploring the impact of universal design and the built environment on individuals with different diagnoses, such as mental illness. The effects of other aspects of the environment, such as street furniture and lighting, could also be explored. In summary, universal design is an expansive and dynamic area, and the potential for further development is promising.

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