

Connecting to Nature in Interior Dementia Care Environments

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ABSTRACT

The purpose of this thesis is to examine the opportunities and benefits of connecting to nature within dementia care facilities. The increased need for dementia care and the rising level of acuity creates a unique opportunity for designers to create environments that support health and wellness for a vulnerable population. An increasingly recognized science known as biophilia can play a central role in facilitating wellness for both people and planet.

Biophilia is defined as the innate human need to connect to nature and sets the basis for an understanding of the many benefits natural elements can provide. Experiencing nature through a variety of stimuli and engaging in nature related activities offers a number of physical, mental, and emotional health improvements that would be especially helpful for people with dementia. Maintaining a high quality of life for the residents and providing human-centered care are the primary goals for dementia care facilities, and the benefits provided by biophilic design support these goals. Relevant research in hospitals and work environments are examined, as a number of studies have shown how biophilia can improve healing in hospitals and increase productivity in the work place.

As a result of this research, several design concepts were developed in a sample dementia care environment. They demonstrate how a connection to nature can be considered and implemented through design. The primary elements identified as providing positive effects on human health are views of nature, natural daylight and ventilation, access to water, plants, and access to wildlife. Other strategies include interior décor and furniture placement, nature related activities, and the creative use of conservatories and edge spaces. Many of these elements can be implemented in a design through thoughtful space planning, selection of materials and with special features such as indoor gardens and aquariums.

With numerous benefits that can be gained from biophilic design, it is evident that this strategy is a compelling element with dementia care facilities. The need for a greater connection to nature is universal to all generations and cultures, so while there is more research to be done to continue maximizing the value of design within interior environments, these strategies should be implemented in all dementia care facilities to improve the health and wellness of the residents.

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1 INTRODUCTION

Senior living has been a growing market segment in recent years and many interior designers are finding themselves creating interior environments for populations they are not familiar with. The need for dementia care facilities in particular has been increasing as residents are coming in older, frailer, and with a higher level of acuity. The needs within dementia care facilities are different than those of a conventional hospital, as dementia care residents are encouraged to move throughout the space while the facility operators and care givers are encouraged to utilize more personalized care methodologies. This delicate combination of residential, hospitality and healthcare design can leave interior designers struggling to create home-like environments that support the resident's physical and mental health needs.

One strategy that is gaining consideration in other areas of design, is biophilia, a hypothesis that suggests humans have an innate need to connect with natural systems. Biophilic design supports this connection to nature through an approach that emphasizes the necessity of maintaining, enhancing, and restoring the beneficial experience of nature in the built environment (Kellert and Heerwagen vii). A person with dementia could connect with nature through the interior environment, the outdoors, gardens, and nature related activities for a number of health and wellness benefits. A typical solution may focus on how to get residents outdoors more often, but in cold climates and during inclement weather, this opportunity is greatly diminished. Some strategies specific to the outdoors could be adapted for indoor uses to capitalize on the benefits year round.

Dementia care residents are constantly coping with the effects of cognitive and sensory decline. Common symptoms include a reduced sense of smell, vision, and hearing, along with memory loss, frequent confusion and disorientation. Helping residents connect to nature both indoors and out can reduce these effects significantly. To achieve this goal, interior environments must build stronger connections between people with dementia and nature by including features that offer access to natural elements such as wildlife, plants, and

water. Current dementia care design may offer some opportunities to interact with nature in an outdoor environment, but it typically falls short in offering similar opportunities indoors. Designers need specialized knowledge of biophilic design and how residents can benefit from natural stimuli through adapting outdoor gardening and landscape design strategies to be implemented indoors. Dementia care residents are an especially vulnerable population without the ability to be advocates for themselves, therefore, interior designers need to act on their behalf to create a supportive environment for them to live in. The mental, physical, and emotional benefits of biophilic design and the ability to reduce the negative impact of dementia on the residents' quality of life cannot be ignored and it is the responsibility of interior designers to realize these benefits through better design.

2 METHODOLOGY

The process for this thesis project was a combination of research, analysis, synthesis of ideas, and design conceptualization. To begin the process, a variety of topics were researched. The first step was to gain a more thorough understanding of the need for connecting to nature at a dementia care facility through an interior environment. I researched case studies, scholarly journals and books regarding interior design, dementia, biophilia, and other related topics, to understand the healing and therapeutic benefits of human connections to nature. I also strengthened my understanding of dementia by researching how the brain is affected, and how changes in the interior environment can impact the effects of dementia, and the quality of life for those living with cognitive impairment.

I also researched the different types of care opportunities for seniors, and have focused my research on memory care facilities, as they would be the most relevant living option for someone with the symptoms of dementia. Also, the role of the interior designer may be most important in a memory care facility as the residents are unlikely able to leave on their own and will spend the majority of their time indoors. I also discovered that many

of the design features and benefits of dementia care facilities may be relevant in the other types of settings as well.

Built upon this research, I then explored how each idea can come together and be conceptualized and implemented in the setting of an actual dementia care facility. Furthermore, I examined existing efforts by interior designers and architects to incorporate biophilic elements into hospitals and senior living communities to understand what has worked, what hasn't, and what could be done differently to achieve more beneficial outcomes. This context will help shape my own proposed design solutions that can be integrated within dementia care environments. I used a combination of computer aided design and hand rendering to show how these ideas can be implemented in resident bedrooms and common spaces, with consideration for operational needs of the facility to still be able to provide, a clean, safe and functional space for the residents and staff.

3 DEMENTIA AND CARE ENVIRONMENTS

3.1 Defining dementia

Dementia is defined by the Alzheimer's Association as a "general term for a decline in mental ability severe enough to interfere with daily life." It is most often associated with Alzheimer's disease, although dementia itself is not a disease. Memory loss is one of the most well-known symptoms of dementia, but others include impaired mental functions relating to communication and language, the ability to focus and pay attention, and the reduction of reasoning, judgment, and visual perception (Alzheimer's Association). It is also important to note that dementia and its symptoms are not just a result of normal aging. Some forgetfulness and sensory loss is common with the aging process, but the serious, progressive mental decline that a person with dementia will experience is not typical aging. Dementia is caused by permanent damage to the brain cells and may not be cured, but can be treated to improve the symptoms and should not be ignored (Alzheimer's Association).

When designing a place to live for a person with dementia, one of the most important considerations is the behavioral and emotional changes that occur with their cognitive decline. Impaired cognition can lead to

confusion, anxiety and stress as the person tries to understand the world around them and the changes happening to their brain. Wandering, aggressive behavior, depression and a decline of sensory abilities can also occur and will impact how a person interacts with and reacts to their environment.

Interior designers must understand these symptoms and changes in behavior in order to create a care environment that supports the resident's physical and psychological health and well-being. All humans want to live in comfortable and safe places, but to achieve this for someone living with dementia, there are a few special concerns to address. Primarily, interior designers and care facilities need to support the residents' ability to maintain a high quality of life. What does this mean for someone with dementia? This will vary for each individual, but all people have a universal need to age with dignity, maintain a sense of identity and personhood, maintain physical health, communicate with others and have a sense of control over and connection to their environment.

3.2 Dementia care environments

There are currently a number of different types of residential options for seniors and people with dementia. Each type of facility offers a different level of care to meet the various needs of the aging population. A few of the most common types are independent living, assisted living, nursing homes or skilled care, memory care, and continuing care retirement communities. Some seniors will choose to live at home or with family members for as long as possible, but with people living longer and with a higher level of need, moving into a dementia care facility will be a likely possibility for many aging adults.

Typical memory care facilities are designed to emulate a small scale, residential, and domestic-style setting. Each facility may be an independent building, housing eight to twelve residents, or it may be part of a larger building, with residents grouped into separate, small "neighborhoods." Residents may have a private bedroom and bathroom or they may share a unit with one other resident, depending on cost and privacy preferences. All residents in the building or "neighborhood" will share common spaces that mimic a typical single-family home.

Spaces that are commonly included in the building design are a kitchen, living room or lounge area, dining room, library or den, and various activity spaces. Other spaces that support grooming, bathing and fitness activities may also be included.

3.3 The growing need for care facilities

As we recognize that the aging population is quickly increasing, we are faced with the challenge of creating care facilities for those who develop dementia that meet their special needs. There is no doubt that there will be an increased need for housing, as the number of people aged 80 or older will almost *quadruple* between 2000 and 2050 (WHO, “Interesting Facts about Aging”). We also understand that the risk of dementia sharply rises with increased age. More than 5 million Americans are already living with Alzheimer’s, which is the most common disease associated with dementia (Alzheimer’s Association). There has been a lot of research in recent years demonstrating that facility design can impact care. An increased number of new dementia care buildings has been instrumental in testing out new approaches to design and the way care is administered. However, even as the number of these facilities has been rising, the inventory of housing available has not been keeping up with the demographics. There is still a lot of room for improvement in design to create a more supportive environment for this vulnerable population (Kaysen).

The need for care facilities is compounded by the fact that families are often not able to bring a family member with dementia into their home to live with them because they do not have the skills or understanding needed to provide the proper care. Families may be able to provide some care or support for a family member while they are still living in their own home or if they are not experiencing the symptoms of dementia. However, as the symptoms progress and the need for care is too great for family members to provide, other alternatives will need to be considered. Furthermore, family residences may no longer be safe or accessible for someone with the physical and cognitive impairments of dementia, especially when combined with the typical decline of hearing and eyesight that are part of the regular aging process. In addition, family members are often busy with

obligations such as work and raising children and cannot provide the necessary amount of care. This often culminates in a more stressful environment for both the family and person with dementia, which can further reduce the quality of care the family can provide and may prompt the move to a dementia care facility.

3.4 Sustainable design for better dementia care environments

As our understanding of how to better care for people with dementia continues to evolve, so do the implications and trends for the design of care facilities. An article in *Building Design + Construction* magazine identified some current trends in dementia care to be optimizing resident privacy and dignity, creating a home-like setting, introducing hospitality design concepts, expanding individual choice, and seeking more sustainable environments (Perkins). The discussion about sustainability has been parallel to the discussion on the need for better dementia care. While they often happen as two separate conversations, they are, in fact, strongly connected. Sustainability does not just mean good design for the health of the planet, but also for the health and wellness of people.

In the past, the model for dementia care was designed based on the idea of providing an institutional type of care similar to that of a hospital. Recently, the focus has shifted to a more human-centered care. Human-centered design is needed for sustainability just as it is for a good care environment. When the human is ignored in the design of a building, we are left with sterile environments that are hard for people to relate to. In dementia care, people can lose their sense of self and begin to feel trapped or enclosed in a space. They do not see where they live as “home,” but instead they see themselves as a visitor in an unfamiliar place. Buildings and interior environments need to reflect a home-like environment and support opportunities for each person to express their identity and personal preferences through activities, customization of their environment, and the ability to reminisce about past events in their life.

The physical health of a building’s occupants is also an important consideration for both dementia care and sustainable design. Many of the building materials and furniture we use today are full of toxic chemicals that can

be harmful to human health. The off-gassing, or release of these chemicals into the environment, can lead to poor indoor air quality. While the use of materials with these chemicals is often avoidable, they are still widely used and of most concern in newly built or renovated buildings, since most off-gassing occurs when materials are first installed. However, materials may still give off toxins for weeks, months or even years after they are installed depending on a number of factors, including how long ago the product was made, where it is being used in the building, and the temperature and humidity of the indoor air (Vermont Department of Health).

4 BENEFITS OF CONNECTING TO NATURE

One issue that is central for human well-being and sustainability is the recognition that people have lost much of their connection to nature. The term for this condition, known as nature-deficit disorder, was coined by Richard Louv in his book *Last Child in the Woods: Saving our Children from Nature-Deficit Disorder*, in which he proposes that direct exposure to nature is essential for the physical and emotional health of children and adults (“Last Child in the Woods”). Stephen Kellert makes the argument that sustainability goes hand-in-hand with a new respect for nature (Kellert, “Dimensions, Elements, and Attributes” 63). By making nature part of our identity, we feel a sense of ownership over it and a desire to protect and care for it. Using design to foster a connection to and appreciation for nature should lead to greater efforts to address some of the other major environmental issues. A cleaner, healthier environment can lead to healthier people, so it is no surprise that fulfilling our innate desire to be connected to nature through architecture and interior design is said to be the missing link (Wilson 326). In some ways, it is also the missing piece of the puzzle in creating a dementia care environment to help the residents feel whole again and enjoy a higher quality of life.

4.1 Defining nature

In the context of this paper nature is defined as plants, animals, weather, climate, water, air, earth, sun and light. Nature can be inside or outdoors, and includes ranges of ecosystems such as domestic house-plants and well-manicured lawns to tropical rainforests. The focus of this paper will be on connecting to nature through an

interior environment, but will first look at all types of connections and the benefits that can result. A connection to nature means that nature is experienced physically by being accessible to the person's senses (Chalfont, "Wholistic Design" 158). Most often, our interactions with nature occur without much thought or intention. On a daily basis we may hear the rain fall against the window and then feel it wet on our face when we go outside. When we think about nature, we think about trees, dirt, rocks, sunshine and the way leaves become brightly colored and crunch under our feet in the fall. Some people may think about less pleasant experiences with thunder and lightning, snowstorms and the cold wind whipping across our skin. Without an ability to go outside, these experiences, good and bad, would be missed.

4.2 Biophilia: How & why we need to connect to nature

The love of life or living systems is the definition of biophilia (Gonchar 1) and describes the innate human need for humans to be connected to natural systems and processes. The term was popularized by E.O. Wilson through his book *Biophilia*, where he describes our desire to connect with nature as having roots in our evolution as an adaptive mechanism to protect people from hazards and to help them access life sustaining resources such as food, water, and shelter (Wilson 326). Interior design and architecture can be used to intentionally build a connection to nature to fulfill our desire to be closer the surroundings we inherently understand and that helped us survive throughout history. Access to nature is a basic human need, and is not specific to culture or age. The natural environment is universally understood as being a critical foundation for our health and well-being. In everyday life, people have fewer opportunities to connect with nature as more time is spent on long commutes to work, stuck in traffic, and in front of televisions (Chen, Tu and Ho 302). However, human health and well-being is dependent on the interactions with nature that so many people are now missing.

Fortunately, we can connect to nature in a myriad of ways. Active engagement in nature happens through some or all of our senses (Chalfont, "Wholistic Design" 158). Our sense of smell, taste, touch, sight and hearing can all offer ways for us to experience the natural world. Although we are surrounded by nature every day, we have become disconnected from it physically and emotionally, spending most of our time indoors. We are focused on

trying to protect ourselves from it instead of letting ourselves be immersed in all the benefits it has to offer. While there are some natural elements that people commonly fear such as severe storms and dangerous animals, we can design the built environment to allow us to have positive interactions that avoid what is unsettling about the wilderness and still allow us to make engaging with nature part of who we are as humans again.

4.3 Biophilic design



Figure 4.2: Typical Atrium (DesignShare)



Figure 4.1: Biophilic Atrium (Cooper)

Biophilic design is the deliberate attempt to incorporate the inherent human desire to connect with natural systems and processes into the built environment (Kellert, “Dimensions, Elements and Attributes” 3). It

can be as simple as having windows and the correct building orientation for views to landscapes and foliage, or it can be realized in the complex shapes and forms borrowed from nature to shape the building structure itself. Figure 4.1 shows an atrium space that incorporates few or no biophilic design features. In contrast, Figure 4.2 shows an atrium that implements biophilic design through the use of large windows to let in as much natural daylight as possible, interior plants, building shape and décor. The feeling of each of the spaces shown in these images is entirely different and helps demonstrate the difference that biophilic elements can make in a space. Although only a few specific features were highlighted by these images, there are endless ways biophilic design can be implemented in an environment, and numerous possible benefits that could be critically important for a person with greater health needs.

There are two basic dimensions of biophilic design. The first is an organic or natural dimension which would include features such as daylight, plants, animals, and habitats. The second, is a place-based or vernacular dimension which includes buildings, landscapes, and what is referred to as a “sense of place” (Kellert, “Dimensions, Elements and Attributes” 5-6). Within these two dimensions are six biophilic design elements that are observed through more than 70 biophilic design attributes. The six design elements are: environmental features, natural shapes and forms, natural patterns and processes, light and space, place-based relationships, and evolved human-nature relationships, which are realized through features such as water, color, natural motifs and natural light among many others (Kellert, “Dimensions, Elements and Attributes” 5-6). These attributes can be used to merge artificial structures with natural elements to implement nature in a building design that supports the connection to nature that humans require.

4.4 Human health benefits of biophilic design

The World Health Organization defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO, “Official Records” 100). Biophilic design can contribute to the improved health of humans. Connecting to nature offers positive benefits to our physical, mental, emotional and social well-being.

4.4.1 Physical benefits

Interacting with nature can serve as therapy for the body and brain. Gardening and walking outdoors can improve dexterity and mobility. Exposure to natural daylight is beneficial in vitamin D production in our bodies to strengthen our bones and prevent some diseases (Brawley 73). Daylight can also help people maintain better circadian rhythms by orienting them to the time of day and make it easier for the body to rest at night. Biophilic design use in facilitating views of nature has been shown to alleviate pain by focusing attention elsewhere (Ulrich, “Biophilic Theory” 93). Reduced pain can lead to reduced stress and increased positive emotions, which may help a person heal faster, or require less medication. Less stress can also lead to additional

physiological benefits such as reduced blood pressure and muscle tension (Ulrich, “Effects of Interior Design” 103) and creates an overall improvement in a person’s quality of life.

Finally, biophilic design can improve physical health through better indoor air quality. A study by NASA researching the ability of house plants to remove three specific indoor air toxins, found that some plants were able to remove up to 70 percent of the toxins from the air within a 24 hour time period (Wolverton, Johnson and Bounds 17).

4.4.2 Mental benefits

Exposure to natural light not only has the physiological benefits mentioned previously, but is also effective in reducing depression and improving mood (Ulrich, “Biophilic Theory” 89-99). Gardens and the scent of flowers are said to also reduce depression by having a calming effect on a person. Exposure to natural elements elicits positive feelings, reduces negative emotions such as fear, anger, and sadness, and instead, promotes wellness (Ulrich, “Effects of Interior Design” 103). The presence of vegetation has also been correlated with enhanced coping and adaptive behavior and in general, a connection to nature has been linked to cognitive function on tasks requiring concentration and memory (Kellert, “Dimensions, Elements and Attributes” 4).

4.4.3 Emotional/Social benefits

Viewing or actively engaging in nature can also have many emotional and social benefits. Being with or viewing the natural environment helps people perceive the leisure rewards of escaping from their daily routine and gain the benefits of a psychologically pleasant experience. Engaging in nature and horticultural activity provides people with the opportunity to forget about the worries and stresses of life, and instead focus their attention on their experience with nature (Chen, Tu and Ho 302-305). Research has also shown that specific natural elements such as water, large trees, flowers and rich vegetation can contribute to a sense of pleasure, well-being and engagement with place (Heerwagen and Gregory 227). Flowering plants, especially, seem to have a stronger positive effect on human emotions (Chalfont, “Connection to Nature” 45). One research study found that

presenting flowers to an individual had a positive impact on mood, measured by a significant increase in the Duchenne or 'true' smile and change in social behaviors (Haviland et al. 122). Community gardening also has the social benefit of bringing diverse groups of people together and helps develop a sense of community and belonging (Chen, Tu and Ho 304).

4.5 Biophilic Design - Case studies

Design research and case studies have already demonstrated the proven impacts that biophilic design can have on the human mind and body. Hospitals and office environments have often been studied as both can be high stress environments where occupants are trying to manage health, wellness, and in some cases, productivity.

4.5.1 Biophilic design in hospitals

There have been many different studies exploring the use of nature in hospitals and the impact it has on healing. One study by Roger Ulrich looked at the duration of the hospital stay and pain medication requested for patients in two different types of rooms after having abdominal surgery. One type of room had a window facing a brick building, and the other had a window with a view of trees. Patients whose windows overlooked trees needed fewer doses of strong pain medications, had fewer minor complications, such as nausea and headache, and had a shorter post-surgery stay compared to those with the view of a wall (Ulrich, "View Through a Window" 421). Another study found having an aquarium in a dental office waiting area reduced stress before an appointment. In a study at a blood donation clinic, blood pressure was lower when a nature videotape was shown in the waiting room as compared to an urban videotape or a daytime television program (Ulrich, Simons and Miles 42). In all cases, the health benefits of incorporating natural elements into the environment were clearly observed.

4.5.2 Biophilic design in work environments

Office spaces are another environment that have been studied to understand the possible benefits of access to nature. In buildings where office workers had views of nature from their work stations, the employees were more productive, more patient, and reported more overall life satisfaction than workers with no visual access to

the outdoors (Heerwagen 4). In a study of spaces where workers did not have views to the outside, they put up more pictures of nature scenes or plants around their workspace for a more calm and relaxing environment, compared to people who had window views (Heerwagen and Orians 635-636).

5 WELLNESS BENEFITS OF BIOPHILIC DESIGN IN DEMENTIA CARE FACILITIES

Much of what we have learned about how connecting with nature impacts our ability to work and heal can be directly applied to how it could also be a benefit to a person in a dementia care environment. Similar to patients in a hospital, dementia care residents often deal with physical health issues. When at work, high cognitive functioning is required and can be stressful. Although the cognitive functioning required in a dementia care facility is just to support basic tasks and activities, the resident's reduced cognitive ability can quickly make simple tasks a stressful experience. Incorporating natural elements into the environment can contribute to improved physical, mental, and emotional health to make day to day life more enjoyable.

5.1 Improved physical health

Using nature as therapy for the body and brain can significantly improve physical health in care environments. These benefits are especially important for the already frail dementia care population. Working in and viewing gardens are among the many ways residents can realize these benefits. Gardening can improve dexterity and stimulate the memory of a dementia resident, giving them an opportunity to reminisce about past events. Since many residents may have once had gardens of their own, recalling names of flowers and plants can help them maintain memory (Hernandez 141). Improved memory and cognitive functioning is extremely important, as memory loss a primary concern for people with dementia.

Connecting to nature through exposure and access to natural daylight can be beneficial in helping a resident sleep better by influencing their circadian rhythms (Chalfont, "Connection to Nature" 44). Most people with dementia in long-term care environments experience some trouble sleeping and will typically not sleep through

the night. It is hard to develop healthy sleep patterns when only exposed to artificial light, and for people with dementia, this can lead to additional health issues and higher levels of agitation. The circadian rhythm plays an important role in physical health because helps regulate many biological processes including body temperature, heart rate, and blood pressure (Brawley 73). Natural elements such as plants and wildlife can also provide signals to help orient to the time of day and year which can additionally help regulate the internal body clock and improve overall health (Zeisel, "Creating a Therapeutic Garden" 17).

Exposure to sunlight can also provide a variety of physical benefits. Sunlight helps the body produce vitamin D and when elderly people generate enough, it can greatly reduce the risk of falls. It works by maximizing calcium and phosphorus absorption which helps prevent decreasing bone density and weakened muscles (Gillard 23-24). Maintaining bone density and strength is important for all elderly people, including those with dementia, to maintain mobility, prevent osteoporosis and certain chronic diseases. Most of the short UVB rays from the sun that synthesize vitamin D in the body are blocked by the glass in windows, so going outside with some exposed skin is most effective. However, in northern climates and during the winter months when people have limited exposure to the sun's UVB rays, artificial UVB lights can be used indoors as light therapy.

Reduced pain is another important benefit of biophilic design. Many elderly people suffer from aches and pains due to illness and injuries, so any opportunity to reduce pain is welcomed. Residents in a dementia care facility typically have a slow-paced daily routine without much to distract them from any physical pain. Views of nature and engaging activities can be useful in taking the resident's mind off of what might be bothering them physically.

Finally, the benefit of improved indoor air quality is essential to a dementia care environment. Too many toxic chemicals in the air can result in what is known as "sick building syndrome," causing building occupants to experience symptoms such as headaches, eye, nose or throat irritation, or dizziness and nausea (United States, "Indoor Air Facts" 1). Many dementia care residents may already have COPD (chronic obstructive pulmonary

disease) which causes them to cough and have trouble breathing, and is made worse by indoor air pollutants (United States, “What is COPD”). Dementia care residents may also be experiencing other respiratory issues or require additional oxygen to support their breathing, making them even more vulnerable to indoor air pollution.

5.2 Improved mental health: Reduced stress, anxiety, and decreased depression

Equally important to the physical benefits of connecting to nature, are the many mental health benefits. Some of the most challenging symptoms to deal with are the confusion and disorientation caused by dementia. This often leads to distressed behavior, anxiety, and depression. Stress is a major health concern because it can suppress immune system functioning, and have behavioral effects including social withdrawal, verbal outburst and resistance to taking medications. In a study of patients with dementia, adding large color nature pictures and nature sounds to a shower room lessened stress and reduced incidents of aggressive behavior (Whall et al. 218-219). The positive emotions that flowers generate can also be utilized in a dementia care environment, as there does not need to be an established memory of a flower for there to be a positive effect, but rather the symmetrical patterns and multi-sensory stimuli is enough to positively impact mood (Haviland-Jones et al. 124). Furthermore, a study that measured positive emotion and memory in residents in senior living retirement homes found that participants who received flowers had higher scores on episodic memory tasks than those that did not (Haviland-Jones et al. 122). Flowers and other natural elements can also be used to re-direct behavior, having a significant impact in as little as five minutes, which may make it an effective way to quickly resolve behavioral issues in a positive way (Ulrich, “Effects of Interior Design” 103).

5.3 Better quality of life for seniors: Emotional and social benefits

Connecting to nature through biophilic design also may support a higher quality of life for people with dementia from the emotional and social benefits it provides. People with dementia face many difficult emotions while dealing with the continued decline of physical and cognitive ability. A care facility can create an opportunity to better the lives of the residents by creating experiences that have a strong positive effect on human emotions

through the use of natural elements. In a survey by Neil Mapes, 82.2% of experts agreed with the statement that “Human well-being depends on contact with nature” (Mapes 19).

For someone with dementia, a few good measures of well-being are the ability to feel a sense of identity, purpose, ownership and control. All of these measures can increase happiness and create a better life for the resident. Residents in a care facility are vulnerable to a loss of sense of self, in part due limited access to the outside world. These concerns, in coordination with memory loss and cognitive impairment, make dementia care residents especially vulnerable to start to lose touch with their individual history and experiences (Chalfont, “Connecting with nature” 228). However, that does not change the fact that they will always have likes, dislikes and have the same range of emotions as someone without dementia. Working in a can provide opportunities for conversation about past events (Hernandez 141), which can help residents build their sense of identity and prevent feelings of isolation or loneliness. The beauty of nature is not something that can be forgotten or misunderstood, but rather, can be appreciated by every person, regardless of cognitive ability or impairment. In that respect, interacting with nature plays to the strengths of people with dementia and their dementia takes a back seat to their human nature and universal appreciation for our natural world (Gillard 37).

Meaningful activities and interactions are also important in helping reaffirm a resident’s identity as a person and a sense of self-worth (Brawley 30). Maintaining a garden and caring for animals are ideal activities to achieve this goal. Not only do they keep the resident active and help give them a sense of purpose, but they might be activities that they enjoyed throughout their life before coming to the care facility and they give the residents a chance to reconnect to those past hobbies.

As residents engage in purposeful activities and start to build a new daily routine in the care facility, it helps them feel a sense of ownership and control over their environment again. Residents often feel displaced and confused when in a care facility. They may frequently talk about wanting to go home or think that they are just a short term visitor. Caregivers typically prepare all the meals, do the cleaning, and restrict access to the kitchen

and utility areas which can make the residents feel a lost sense of control and ownership of their environment. Gardening and other nature related activities can help create a sense of home-making and ownership in providing for oneself (Hernandez 139-140). Many of the residents have also probably cared for children and other family members for most of their lives, so caring for a garden is one way for them to feel like “care givers” again instead of always being a “care receiver” (Stimson). Natural elements can also be used as “landmarks” and assist with way finding so residents can feel a sense of control and confident about navigating to their room or around common spaces.

Memory recall and reminiscing is important not only for the cognitive benefits, but also for communication skills and abilities. Engagement in nature creates an opportunity for communication and a way for residents to express themselves (Chalfont, “Connection to Nature” 261). Communication is often challenging and can be frustrating for someone with dementia as they may struggle to find the right word or speak clearly, but talking about nature gives them a chance to talk about what is meaningful to them instead, of just having a care-related conversation. Being able to communicate more effectively creates more opportunities for social interaction and a sense of belonging in a place a resident might feel is otherwise unfamiliar.

5.4 Benefits for staff

The care staff is also under a lot of stress and has a very difficult job caring for the residents. Without a supportive environment, their stress levels will rise, and the level of care they provide will be reduced. Stressful jobs can create a high level of burnout, turnover, and absenteeism, which is expensive for owners of care facilities (Ulrich, “Effects of Interior Design” 98). High turnover means additional money and time spent on hiring and training instead of those resources being used for better care for the residents. These issues can be reduced by 10 percent with good, biophilic interior design (Laminart 4). Many of the same benefits the residents experience from connecting to nature, also apply to the staff as they, too, get to interact with nature through

their environment. They will also benefit from working with residents who are less stressed, have fewer behavioral incidents, and are in better physical and mental health.

5.5 Biophilia in existing dementia care environments

Much of the research regarding the benefits of nature for humans is not new, and designers and facility operators have already started to incorporate some biophilic design elements, but there is still a lot of room for improvement. Many senior living facilities now have gardens, courtyards and large vegetated atriums, but they are often under-utilized and under-designed. Gardens and courtyards may not be designed with an understanding of how these will be perceived by someone with dementia, and many of the potential benefits are lost. Figure 5.1 shows an image of a typical courtyard for a small dementia care facility. This courtyard has a few successful design features such as a walking path, benches to sit on, and large windows; however, the courtyard shown in figure 5.2 is much more successful in implementing biophilic design features. Large trees, brightly colored flowering bushes and a winding path with raised beds on the far left side provide much more interest and opportunity for residents to feel connected to nature.



Figure 5.1: Typical Dementia Care Courtyard (Golden Healthcare Group)



Figure 5.2: Courtyard with biophilic design (Stantec and Perkins Eastman)

Senior living communities that have a range of care options, including dementia care, often have large common areas or atriums that may be used incorporate biophilic elements, but these are typically not accessible by the dementia care population in the building. Therefore, designers need to be intentional with their design to

include natural elements in the dementia care area since the residents will not be able access these otherwise beneficial features of the building.

Another issue with dementia care design is that the primary focus is typically on getting residents outside to interact with nature. While it is a laudable goal to get all residents outside and it should still be part of their daily routine whenever possible, it is not always a reality when you consider weather, staff availability, and resident mobility limitations. When residents do get to go outside, their experience may only include sitting on a chair in a walled-in courtyard and may not include any beneficial multi-sensory experiences. In some climates, such as Minnesota, residents are limited by the rain, snow, and extreme hot and cold temperatures. If we look at the average yearly temperatures of Minneapolis as reported on Climate-Zone.com, May through September are the only months when the average temperature is 55 degrees Fahrenheit or higher. Additionally, with an average of about ten days of rain per month and an average of two weeks per year when the temperature is over 90 degrees, that leaves just over 100 days per year that would have fair enough conditions to go outdoors.

The health of the residents can also be a very limiting factor. The resident or care taker may be fearful of letting the resident go outside without supervision because of the risk of injury. Residents who use a wheel chair or walking aid might also need assistance outdoors and if a staff member is assisting with other, more urgent needs of the residents, they will not be able to provide the needed support. These limits on mobility reinforce the need for a variety of different ways to interact with nature that can be both active and engaging or more passive and comforting when necessary.

6 BIOPHILIC DESIGN STRATEGIES FOR DEMENTIA CARE ENVIRONMENTS

The benefits of connecting to nature are clear. With the opportunity for a happier, healthier life for people with dementia, designers must learn how to take advantage of as many of these benefits as possible. When aligning the ways we can connect to nature through interior design, there are eight main strategies I have identified to achieve the most benefits: views of nature, natural daylight and ventilation, use of water, plants, access to

wildlife, nature related activities, interior décor and furniture placement, and the use of conservatories and edge spaces. Each one can be implemented to specifically benefit people in a dementia care environment.

These eight strategies fall into three main categories. The first, is nature in the space, which includes plants, water, landscape paintings and other nature related décor. Second, is nature analogs, which is identified by the use of natural materials and forms such as leaves, flowers, stone and wood textures. Last, is the nature of space, which is defined by ceiling heights and special features that create a place of refuge with the ability to look out to a prospect space and is fostered by the building layout and furniture placement (Seal Cramer and Browning 340-341).

6.1 Views of nature

Views of nature may provide beneficial effects on the physical and mental health of people with dementia and should be considered as early as possible in the design process to be most effective. Large, accessible windows and doors are the first design feature to consider. Windows should have a low sill height so that residents can look through them whether they are seated or standing. Doors to the exterior accessible for residents should have windows in them and should be clearly visible. Drawing attention to the doors and windows through the use of color, placement, and materials can cue to the residents that there is a door or window there and they are invited to look out. Once the windows and doors are in place, it is also necessary to make sure residents



Figure 6.1: Typical Residential Landscaping (Achenbach)



Figure 6.2: Landscaping with Biophilic Design Elements (Eastman)

have views of nature to look at. Views should include items that are close by and also that are a focal point in the distance. Figures 6.1 and 6.2 illustrate two examples of typical residential style landscaping that offer two very different views. The two images clearly demonstrate a yard that offers many biophilic features with interesting views, and one that does not. It can be easy to get confused thinking that grass and a few shrubs results in biophilic design, but that is not necessarily true. The yard in figure 6.1 doesn't offer many opportunities to observe nature from the inside or outdoors. In contrast, the yard in Figure 6.2 offers many points of interest with a variety of plants, varying textures in the rocks and stone path, and a water feature near the small patio. These elements contribute to a much more successful biophilic design. Trees, a body of water, a garden, or other foliage can also make for great viewing opportunities. Brightly colored flowers and plants should also be utilized, as they are more noticed by the residents (Hernandez 143). Successful implementation of this strategy can result in reduced stress and anxiety for the residents, as discussed in the previous section.

6.2 Natural daylight & ventilation

Windows and doors can also be essential in providing natural daylight and ventilation while simultaneously reducing energy needs. Building orientation is important to make sure that windows can be placed on the southern side of the building for maximum access to sunlight. The use of clerestory windows and skylights can also be effective to let light deeper into interior spaces. A narrow building footprint can help improve interior spaces that do not have access to natural light. Every resident room should have a window, and common spaces should have windows on at least two walls. Glare and overheating in the summer can be a concern, so windows must have the proper shading for visual and thermal comfort. Awnings and mesh screens are good options, but window treatments must not be too heavy or cumbersome for a frail person to be able to operate on their own. Care facilities should also be sure to include operable windows to allow fresh air indoors. Window controls must be properly functioning and operable by the resident, with the appropriate safeguards so that windows cannot open far enough for someone to get out. Windows are ideal to allow people to feel the sunlight on their skin and

the fresh air on their face. When actual skylights and windows cannot be used, luminous “sky ceilings” that simulate skylights can be installed and dimmed or brightened to simulate daily cycles (Wilson 327).

6.3 Water

Interacting with and viewing water is important to include in interior environments. In some cases, the only water we might interact with on a regular basis is the water in our faucets and toilets. Water is often seen as a life giving element and is essential to our survival. Water is also important because it can offer a variety of different sensory experiences for someone with dementia. It can be calming when looking at the smooth surface of a body of water; moving water can draw our interest and curiosity, the sound of water has a gentle musical quality, and the sparkle of sunlight on water can help us appreciate its beauty. Standing water in a dementia care environment can be troublesome because there are health concerns with the cleanliness of the water, but flowing water can be used in a variety of ways. Water flowing over stone or a sculpture can give residents an opportunity to see, hear, and feel the water. Wall mounted or small table top water features can be also used. Rain is another great opportunity to interact with water. Windows can be opened to allow residents to hear the rain hitting the ground and rain barrels can be used to collect water to be used for indoor plants. Lastly, if water through plumbing fixtures is going to be one of primary ways we interact with it, then we can use more interesting faucets that help us appreciate the biophilic nature of water with a spout that allows the resident to watch the water flow over a smooth surface while pouring gently into the sink.

6.4 Plants

Indoor plantings can offer a number of different ways to connect with nature, both passive and active. Potted plants, indoor gardens, and vertical foliage can all be used to bring nature indoors.

6.4.1 Potted plants

Potted plants are one of the easiest and ways to bring nature into a dementia care environment. However, there are a few important considerations to take into account. Most importantly, all accessible plants must be non-

toxic, because a person with dementia may try to put part of a plant in their mouth. Because plants can remove chemicals from their air, it is also beneficial to select plants that have been shown to be the best for filtering the air. A few plants that have been identified as non-toxic and promote better indoor air quality are the banana plant, bamboo palm, spider plant, American rubber plant, and orchids (Carlet). These plants should be scattered around the interiors in small clusters with a variety of different types of plants, allowing for some randomness with the placement so it feels more natural (Freeman 5). It will also be important to select plants that are suitable for all four seasons so they can be enjoyed year round. A window seat with plantings can be an ideal place for plants to thrive and offer a place for residents to interact with them.

6.4.2 Indoor gardens

There are a wide range of benefits that gardens can provide for someone with dementia as discussed in the previous sections. By bringing them indoors, residents still have the opportunity to touch, smell, eat and care for the plants no matter how cold it might be outside. Raised planter boxes at seated and standing height should be used so that residents do not have to bend over to dig in the dirt. They can be free standing or built as a permanent fixture, but in either case, should be sturdy enough to support enough weight so that residents can use them to lean on or as support when walking next to them. Easy access to the planters via wheelchair or walker will help ensure residents feel they are able to work in them without any assistance. A wide variety of plants can be used, including vegetables such as spinach, lettuce and kale, as well as flowers or other domestic plants that can thrive in an interior environment. An herb garden near the kitchen can also provide residents with fresh herbs to use with their meals, in addition to the fragrant scents that they provide. If the care environment does not have a suitable interior location with access to sunlight for the plants, artificial grow lights can also be used. Having actual dirt on their fingers can give residents a similar experience to going outdoors, and achieve many of the same benefits, but without the concern for the weather or health risks.

6.4.3 Vertical foliage

Vertical foliage can be used as an additional way to incorporate more plants into the interiors. Live walls with vertical plantings can be used as a form of artwork to add visual interest and offer a sensory interaction when residents touch and smell the plants. Again, non-toxic plants should be used along with plants that have a variety of colors and textures. Vegetated facades can also be used, especially in porches or sunroom areas to help connect the interior with the exterior. They are also a good solution when floor space is limited. The dense foliage also creates more opportunities to incorporate air-filtering plants that can contribute to better indoor air quality.

6.5 Access to wildlife

Access to wildlife is another important way to help people with dementia to connect with nature. Viewing wildlife can serve as a positive distraction and have many of the same benefits as viewing trees, water, and other natural elements. A few simple additions to the outdoor landscape such as bird baths and bird feeders can attract all kinds of wildlife that can become a popular topic of conversation in dementia care facilities. Accessible habitats for small animals such as squirrels and rabbits can also add to the residents' enjoyable wildlife viewing experience. Wildlife can also be brought indoors with aviaries and fish tanks; however, staff must make sure they are well maintained and thriving. Some communities may also be able to put in place a pet program where animals are brought in for therapy to interact with the residents. Many of the residents may have grown up with animals either on a farm or in their home, so this can also be a way to reconnect with their past experiences.

6.6 Nature related activities

Taking care of wildlife, plants and other nature-related activities can also be an opportunity for engagement with the residents. Bird feeders can be brought inside so residents can help fill them. Some residents may also be interested in making bird houses or homemade treats that can be placed outside for wildlife. A small role in helping clean the fish tank or aviary can also help give a person with dementia a sense of purpose and

ownership over their environment. Having a gardening center or an area with tools and supplies can help cue the residents to work in the garden on their own. However, it is important that proper operational programming is in place so soil, seeds, and any other supplies for the garden are purchased regularly and are available for the residents to use. If many residents are interested in gardening, an informal garden club could be established to help foster social interaction and a sense of community between the residents.

Having so many natural elements indoors can also become great subject matter for resident artwork. Drawing or painting a still life of flowers is a positive way to incorporate nature into the residents' daily activities. Flower arranging can also be enjoyable and a form of art for many people. Cut flowers from the garden, a greenhouse, or dried flowers can be used and displayed throughout the common areas or in resident rooms. Arranging and caring for the cut flowers can become part of a resident's daily routine. Flowers can also be dried and used to make homemade potpourri that can be enjoyed by the residents. All of these activities allow residents to experience the life cycles of nature, provide them with fun, positive activities to engage in, and offer the many benefits of biophilia.

6.7 Interior décor & furniture placement

Thoughtful design of interior décor and furniture placement can go a long way in facilitating how people connect with nature. Materials and furnishings with designs that are inspired by nature are incorporated in biophilic design and still have many beneficial qualities. Organic patterns and textures can be used on furnishings and wall coverings. Warm, natural colors are calming for residents and can be more easily perceived by the elderly. Many products are available with leaf or floral patterns that can make for a calming and beautiful interior environment. Natural or natural looking materials such as stone, wood and leather are also ideal for use as they are patterns and forms that people with dementia can more easily perceive than an abstract form. Pine-cones, rocks, leaves, and other items taken directly from nature can also be utilized as decorative elements around the care facility. Although residents may not be able to go outside, this gives them an opportunity to touch and

interact with a small part of the natural world. Photography or artwork depicting nature, including water and distant views can also be used throughout the interiors.

When placing furniture and other décor items, designers should consider a variety of seating options that offer different types of interactions with nature. Seating should be available along the edge of the room or near windows so residents can look out. Space should also be left available near some windows for walking up and standing to look out. A window seat or railing for support can also make views from the windows more accessible. Because there are so many limiting factors for people with dementia to go outside, it is also important to arrange the seating so they will receive sunlight at some time during the day. This still gives the residents an opportunity to feel the warm sun on their skin while they relax. Some residents may not want to be in the sun, so seating should be available for them as well. Sturdy, but movable furniture near the windows can be helpful in accommodating many different arrangements and preferences throughout the day. Placing furniture and natural elements along walking paths can also be used to help create “landmarks” so residents can better orient themselves in a space and can encourage purposeful wandering. An activity or object such as a plantings or a seat with a view out a window can give them a variety of different experiences along the way. Some furnishing should also be placed to create a place of refuge. This could be a smaller, cozy space that looks into a large, open space or scenic view to offer a sense of safety and security while they observe or engage with nature.

6.8 Conservatories and edge spaces

Conservatories and effective use of edge spaces can blur the line between indoor and outdoor spaces and build a stronger connection to nature. An indoor greenhouse or conservatory would offer the most benefits and similar experience to going outside, but can be out of budget and unrealistic for some care facilities to achieve. However, covered porches and sunrooms can be the next best alternative. Offering residents a place to get as close to nature as possible while still being protected is the goal. Maximizing the use of edge spaces along

windows as mentioned above is a small step, but should not be the only strategy. Sunrooms with many windows along two or more walls make for a great place for residents to feel surrounded by nature. Covered screened-in porches also offer an opportunity to feel closer to the outdoors and are less limited by weather and the risks of being outdoors alone for dementia care residents. A combination of all or some of these strategies may be used, depending on building type, location and budget, but as many as possible should be implemented to ensure that every person can be engaged with nature throughout the day.

7 BIOPHILIC INTERIOR DESIGN CONCEPTS FOR DEMENTIA CARE FACILITIES

Based on benefits of biophilic design and the eight design strategies that have been outlined above, I have created a number of design concepts to demonstrate how these ideas can be implemented within a dementia care facility. Understanding the benefits and opportunities of connecting to nature is an important step for designers; however, understanding how to implement them is equally important. Research has shown that humans connect to structures embodying organized complexity more strongly than to environments that are too plain (Salingaros and Masden 63), but with most residents experiencing impaired cognition, a delicate balance of complexity and simplicity is required. Designers and dementia care operators may think it is too difficult or costly to successfully incorporate the ideas presented in chapters 5 and 6 into a care environment; however, I will demonstrate that these benefits are attainable. The sample dementia care facility used in these concepts is designed for a maximum of ten residents, with amenities including a sun room, library, common dining and living room, activity room, tub room, and spa. Each design concept will look at one or two spaces, calling out finishes and design details that incorporate biophilic design concepts while meeting the special needs of a person with dementia.

7.1 Overall design goals implemented

Common spaces are where residents spend most of their time during the day, so these spaces were designed to capture the most opportunities to interact with natural elements. Each of the common area rooms are located

so windows are visible on at least two walls in the space. Columns are used throughout the living and dining room areas to emulate the feeling of trees in a forest and the protective canopy they provide. They build a connection to nature on a deeper level by using artificial structures to emulate natural structures. The common areas were also left open to not only allow light to penetrate the space, but so that care takers have an easy view of all the residents. Each common area and biophilic design features are described in more detail in the following design concepts.

7.2 Design concept 1 – Natural elements in the living room & library

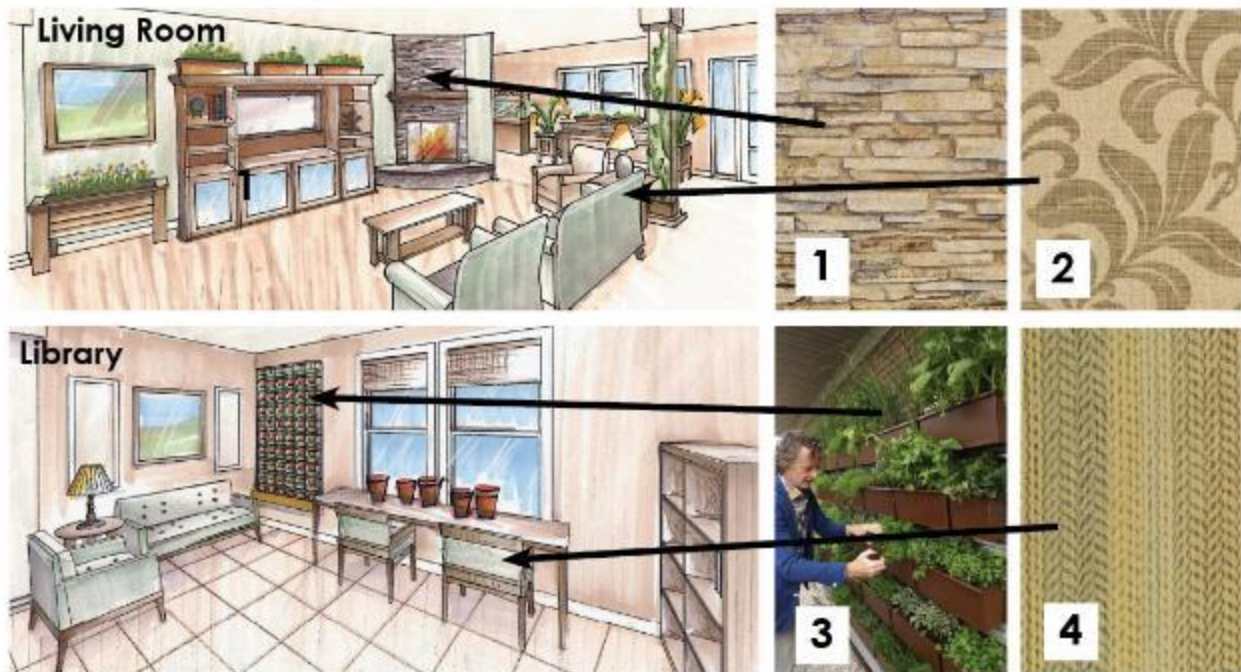


Image 1: Buechel Stone Corp. *Fond Du Lac Rustic Ledge Stone*. Photograph. Buechelstone.com. Web. 19 March 2014. <<http://www.buechelstone.com/shoppingcart/products/Fond-du-Lac-Rustic-LedgeStone.html>>
Image 2: Architex. *Atherton Palm*. Photograph. Architex-ljh.com. Web. 19 March 2014. <<http://www.architex-ljh.com/cgi-bin/cob?CPN=iteminq&SID=2229225517639&SKU=96536>>
Image 3: Live Wall. *Michigan Chef Uses Herb Wall to Liven Up Menu*. Photograph. Livewall.com. Web. 28 March 2014. <<http://livewall.com/chef-uses-herb-wall-to-liven-up-menu/>>
Image 4: Mayer Fabrics. *Herringbone Opal*. Photograph. MayerFabrics.com. Web. 19 March 2014. <<http://www.mayerfabrics.com/Search.aspx?skeyword=herringbone>>

Figure 7.1: Living Room & Library Design Concept

Figure 7.1 shows the design concept for an adjacent living room and library area. The living room offers a place to sit away from the windows, but is still full of natural light. Views to all the surrounding spaces may encourage the residents to get up and interact with their environment. Another biophilic feature to note is the fireplace

surround, shown as image '1.' This material is a stacked stone with a rough, interesting texture to look at and touch. The fabric in the living room, image '2', is an organic leaf pattern that mimics nature. The fabric in the library, image '4', is a coordinating stripe that is simple and easy to perceive for someone with dementia. Other features also include an herb garden along the exterior wall in the living room, a planter next to the television, and an aquarium that is double sided to be enjoyed from the spa as well. The herb garden is on a plant stand that a person can roll up under with a wheelchair to work with the plants. It also has drawers with gardening tools, and a small spade and gloves hanging on the side so they are visible to the residents to cue them to engage in tending to the herbs. This space is also adjacent to the kitchen, where the herbs can be used when preparing meals and they are placed near a window for sunlight and so residents have a view to the courtyard while working.

The library includes a potted garden wall similar to the one shown in image '3' with space for residents to pot plants on their own. Potting supplies can be stored on the nearby shelf which makes better use of the space than decorative accessories or books that are rarely used. Light boxes on either side of the artwork in the library also provide an opportunity to residents to be exposed to bright lights or UVB rays when they are not able to go outside. The seating group has views to the outdoors, but is also set back in a corner for a cozy refuge that offers the residents seating out of the sunlight if they prefer. In this space, they can feel safe and secure while looking out a window or out into the living room and the other large common spaces.

7.3 Design concept 2 – Natural elements in the entry & dining room

The dining room is an important place for residents, as it is where they spend quite a bit of time eating meals and potentially working on activities at the tables. For this reason, there are many opportunities in this design concept to connect with nature. Within the dining room is



Image 1: Terrain. Vertical Gardens at Terrain. Photograph. Remodelista.com. Web. 26 March 2014. <<http://www remodelista.com/posts/accessories-vertical-gardens-at-terrain>>
Image 2: Ali Express. 7 Tier Iron Plant Stand. Photograph. Aliexpress.com. Web. 1 April 2014. <<http://www.aliexpress.com/item/75033H-7-tier-iron-plant-stand-flower-holder-Black-white-can-choose/461652184.html>>
Image 3: Wilsonart. Harvest Maple. Photograph. WilsonartContract.com. Web. 19 March 2014. <<http://www.wilsonartcontract.com/pattern-availability-search-results/?patternNo=7953>>
Image 4: Centiva. European Cherry. Photograph. Centiva.com. Web. 19 March 2014. <<http://centiva.com/centiva-flooring/cherry-wp-3307-european-cherry/>>

Figure 7.2: Entryway design concept

a feature wall at the entry shown in Figure 7.2. All the finishes throughout the dining room and entryway mimic natural materials and have organic patterns. The cabinets and furniture are a light maple wood finish, shown as image '3' to appreciate the natural texture and grain of wood. A similar, but darker contrasting wood-look vinyl plank floor, shown as image '4', is used to make it easier for the residents to identify the edges of lighter colored furniture and countertops against the dark floor. Cut flowers are set out on all the tables as well as on the console table to improve the mood of the residents. These flowers may be cut from the gardens at the facility or brought in from a greenhouse. The residents can help cut and arrange them and place them at the table where they eat their meals every day. The entryway also features framed plant boxes that hold colorful plants as shown in image '1'. The tiered plant stand in image '2' along with a few large potted plants and an outdoor-style bench help give this area the feeling a private garden or space where a resident can quietly sit and enjoy looking into all the other spaces.

7.4 Design concept 3 – Natural elements in the sunroom & activity room

The sunroom and activity room are spaces that blur the line between indoor and outdoor by offering the feeling of being outside while still being in the safety of an interior environment. The sunroom has many features that contribute to this effect. In Figure 7.3, you immediately notice the space is full of greenery. Planter boxes at varying heights, indoor gardening boxes, hanging plants and a pergola with vines make this space feel more like a courtyard than a sunroom. The focal point of the room is a wall hung water feature shown in image '1' which gives residents the opportunity to touch and feel water. The walking path curves through the space directly in front of the water feature with a small bench directly across from. A window seat and chairs tucked between the planters also give residents the opportunity to sit down and enjoy the scenery. Natural stone materials shown in image '2' are used to simulate outdoor raised flower beds. Plants in a variety of sizes and colors are used in the

planters simulate the wide range of plants shown in the garden in image '3'. Along the wall that connects the sunroom to the library is a live wall full of colorful plants. The concept of the wall is similar to the one in image '4' in that it acts as a feature wall that is both beautiful and functional. The plants can be touched and smelled by the residents, but also help remove

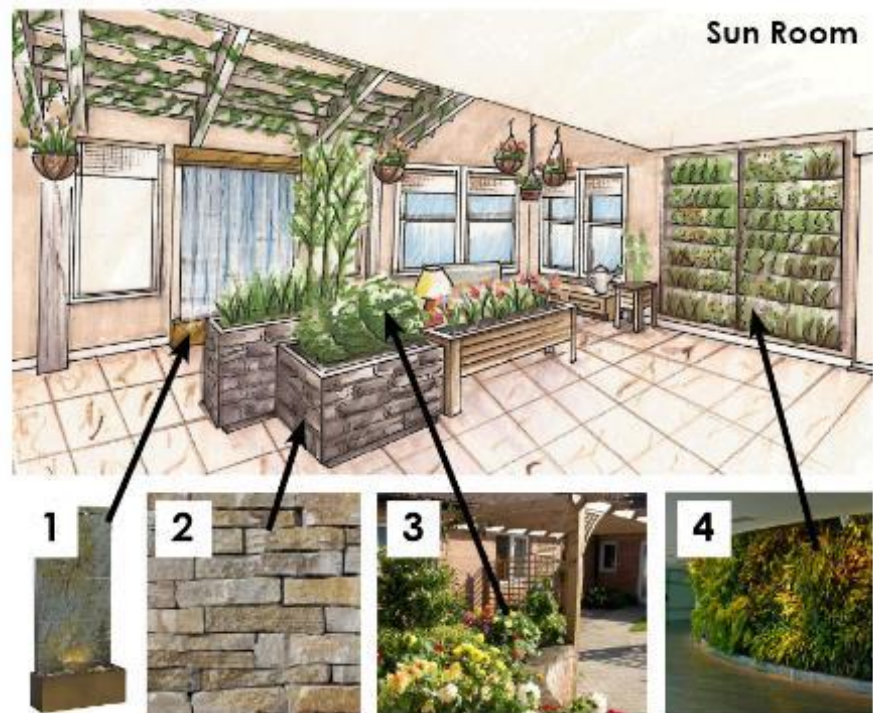


Image 1: Ebay. *Ladon Light Natural Slate Rock New Home Indoor Outdoor Floor Wall Water Fountain*. Photograph. Ebay.com. Web. 28 March 2014. <<http://www.ebay.com/itm/Ladon-Light-Natural-Slate-Rock-New-Home-Indoor-Outdoor-Floor-Wall-Water-Fountain-/360763518140>>
Image 2: Bueschel Stone Corp. *Fond Du Lac Weatheredge Wall Stone*. Photograph. Buechelstone.com. Web. 1 April 2014. <<http://www.buechelstone.com/shoppingcart/products/Fond-du-Lac-Weatheredge-Wall-Stone.html>>
Image 3: Chalfont, Garuth. *Courtyard Dementia Care Garden*. Photograph. Chalfontdesign.com. Web. 28 March 2014. <<http://www.chalfontdesign.com/projects.html#prettyPhoto>>
Image 4: Home Designing. *Office Interior Vertical Garden*. Photograph. Home-designing.com. Web. 28 March 2014. <<http://www.home-designing.com/2013/04/vertical-gardens/>>

Figure 7.3: Sun Room Design Concept

toxins from the air and replace the need for artwork.

In the activity room, the finishes and biophilic features continue with the theme of the rest of the spaces. A leafy print fabric, shown as image '3' is used for the activity chair seats and the upholstery fabric in the sunroom.

Wood stained furniture and doors match image '1' and the floor through the activity room and the sunroom is a vinyl tile that mimics the look of stone, but has a matte finish that will reduce glare from the sun coming through the many windows.



Figure 7.4: Activity Room Design Concept

Image '4' shows mesh roller shade that can further reduce glare and help shade the heat of the sun, while still allowing the natural light to shine through. Similar to the sunroom, this space also has a planter box and hanging flower baskets. All the plants throughout the activity room and sunroom include a variety of different smells, colors, and textures to provide a positive sensory experience for the residents, while also being non-toxic in case they are ingested. The orientation of the planters also brings attention to the courtyard doors, which may help encourage the residents to go outside when the weather permits.

The activity room also includes an art easel and table which the residents can use to draw or paint nature. They could be inspired by the interior gardens, cut flowers on the table, or views out the window. Not only do they get to enjoy the benefits of looking at nature, but can be actively engaged in using therapy using art tools while engaging in social interaction. The activity space is positioned so that residents will have a view to the courtyard

while they work. The double doors lead to a covered porch with seating that can be used as a transition space between indoors and outdoors. These doors, along with the large windows throughout these spaces can also provide an opportunity for fresh air. All the windows in the common spaces are operable so that they can be opened during fair weather. The raised ceilings in these spaces also create a sense of openness that one would feel in nature.

Together, these spaces create the feeling of an interior courtyard. Residents can feel as though they are outside as they meander through the space, allowing their senses to take in all the different stimuli. Even in during the cold winter months, residents can utilize this space to interact with water and plants.

7.5 Design concept 4 – Natural elements in dwelling units & transition spaces



Image 1: GharExpert. *Clerestory Roof*. Digital rendering. GharExpert.com. Web. 28 March 2014. <http://www.gharexpert.com/articles/Start-Construction-2322/Clerestory-roof_0.aspx>
Image 2: Sky Factory. *Korian Les Begonias Eldercare*. Photograph. Skyfactory.com. Web. 1 April 2014. <http://www.skyfactory.com/portfolio/?p=BegoniasEldercare_tn>

Figure 7.5: Floor Plan Design Concept

Not only do each of the individual spaces encourage the resident to interact with nature, but the entire layout facilitates these interactions, as shown in Figure 7.5 (see Appendix A for larger floor plan). There is a clear path around the common spaces that allows that residents to engage in purposeful wandering. The hallway, along with this path in the common areas, uses nature as landmarks to direct the residents around the space. In the hallway, the area in front of the tub room breaks up the walk with a place to sit. If residents move to the end of the hall, they find a place to sit by a window. There is an exterior door for egress, but it is positioned so it is not visible while walking in the hall to prevent residents from attempting to exit.

As residents come into the dining room, they see the garden bench and potted plants. Railings and an aquarium along the shared wall with the salon will guide them to the herb garden. Continuing along the path, they'll interact with the garden planters and then the live plant wall. They can then sit down in the quiet library for a break and relax while looking out the window or potting some plants. A desk positioned on the other side of the bookshelf in the library is a place to read or work quietly while looking out the window at cars or people passing by. Continuing along, they'll reach a few potted plants before they sit down in the corner surrounded by nature themed artwork. Finally, they'll make their way back to the dining room where they can join in an activity or continue down the hall to their unit.

Along the unit hallway, clerestory windows are used, similar to those shown in image '1' to allow more natural light into the space. An angled roof facing the east allows for light to enter the hallway in the morning. They are brightly lit in the evenings with artificial light, but the natural light in the morning can help orient them to the time of day and stabilize their internal body clock.

In spaces off the hall, such as the tub room where there may be limited natural light, a sky ceiling that simulates a skylight as shown in image '2'.

In Figure 7.6, the use of landmarks is illustrated again. The tub room is situated approximately halfway down the hall with a recess that creates a resting place for residents. A small water feature shown in image '3' and an indoor trellis create an opportunity for residents

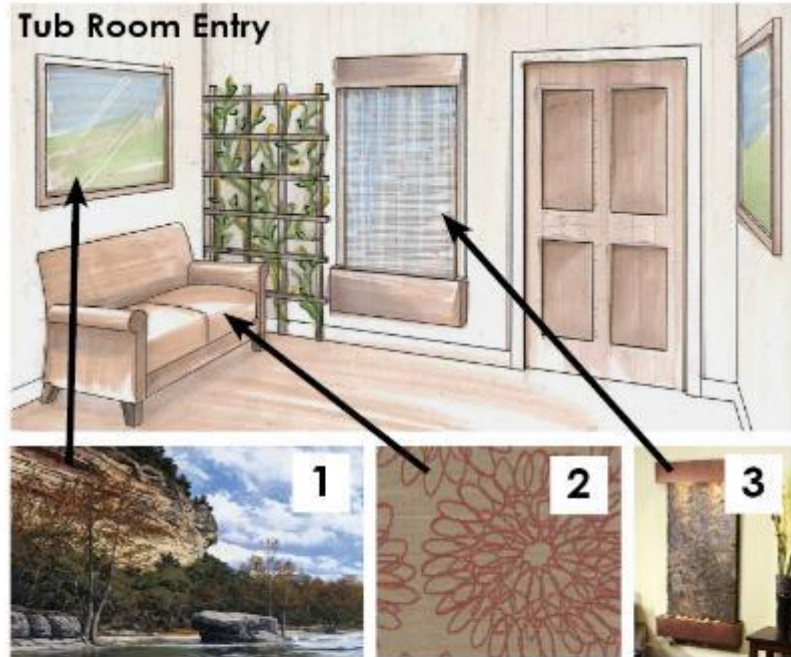


Image 1: Glowka. *Bluff On The Guadalupe*. Print. Artlineinc.com. Web. 28 March 2014. <<http://artlineinc.com/products/posters/traditional/?page=1>>
Image 2: Mayer Fabrics. *Wildflower Sandstone*. Photograph. Mayerfabrics.com. Web. 28 March 2014. <<http://www.mayerfabrics.com/Product.aspx?i=392-019>>
Image 3: Water Feature Supply. *The Whispering Creed Lightweight Slate Wall Fountain*. Photograph. Waterfeaturesupply.com Web. 28 March 2014. <<http://www.waterfeaturesupply.com/waterfalls/lw-slate-wall-mounted-water-features/whispering-creek-lw-slate-wall-water-feature.html>>

Figure 7.6: Tub Room Entry Design Concept

to see and hear natural elements along what might otherwise be a long, dark hallway. Nature artwork similar to image '1' and the floral upholstery fabric in image '2' help make this space a comfortable and quiet alcove that can be used by residents waiting to use the tub room or that are just passing through.

The units are also positioned to maximize natural daylight. All resident rooms have windows on at least one wall and seating that looks out. The window sills have been made wide enough to place a few small plants and are low enough so the resident can see out while seated in bed.

There are numerous ways for someone with dementia to passively or actively engage in nature. While these design concepts show one way to incorporate these features, there are endless ways they can be implemented. Most important, however, is to make sure that biophilic design features are utilized with thoughtful consideration of the symptoms of dementia so the environment does not become too complex or confusing for the residents to understand. Natural elements that are familiar to the residents combined with spaces that cue the residents to engage in positive activities best help realize the many benefits of biophilic design.

8 DISCUSSION

With an understanding of the various benefits of biophilic design can provide dementia care environments along with strategies for implementation, designers should feel compelled to include these elements in their building design. While a connection to nature is important for all people, it is especially important for people with dementia. The previous sections addressed some of the specific benefits, but it is up to designers to understand the significant responsibility they have to provide the opportunity for a person with dementia to realize these benefits. If designers do not embed opportunities for people to connect with nature in care facilities, minimal contact will likely result. A person with dementia may be living in a care facility that they themselves did not choose to enter. As a vulnerable adult, they cannot contribute to their own environment, have a say in their physical surroundings, or even their meals and day to day activities. A new, confusing, and unfamiliar environment creates a challenge for any person, especially someone that is coping with memory loss and cognitive impairment. The more opportunities people have to connect to nature, the more opportunity we give them to feel comfortable with something familiar. Nature is universally understood; dementia care residents don't need to be taught or reminded how to respond to natural stimuli such as sunshine or flowers (Gillard 33). Due to the limited access to nature and daylight for people in dementia care and long-term care facilities, their only opportunity to experience nature may be through the features we include in the building design.

8.1 Benefits of providing a strong connection to nature through the interiors

There is a great opportunity in the design industry to ensure residents can experience a connection to nature year round. Many facilities may already be incorporating some of these features without fully realizing the benefits they provide, so moderate changes may be all that is needed to maximize their impacts. Design trends are changing and dementia care environments have evolved over time as we better understand the changes that happen in the brain, but no matter the generation or disability, we can be sure humans will have an innate desire to connect to nature.

8.2 Gaps and limitations

One of the most challenging limitations in dementia care research is that the users of the spaces are often not able to effectively communicate their thoughts and needs. While we can measure the physiological changes in the body when interacting with nature, the psychological and emotional responses are much harder to gauge. Residents may be confused if a researcher asks them how a natural element impacts their quality of life, so instead, we have to rely on observations and conversations with family and staff about the resident. This can be especially challenging when trying to understand what may have caused a behavioral or emotional change in a resident. Every environment is full of various stimuli that impact how people behave which can make it difficult to measure the direct impact of design on behavior. To best understand the impacts of specific biophilic design strategies, health and behavior of the residents would need to be observed and measured before and after design strategies are implemented.

Another challenge in implementing biophilic design is that the way each person connects with nature will vary depending on their personal interests, history, and physical health. Some people may have a preference for gardening while others may find enjoyment in bird watching, so it is important for each care giver to get to know the personal interests of the residents. Having a variety of different ways for residents to connect to nature allows for more personal choice based on their preferences.

Physical health and mobility may also be a factor in how the residents can experience nature, so there should be opportunities for people at all levels of health and wellness to be engaged. As dementia progresses, some residents may also forget activities they have completed or think they remember just doing something, when they may actually be remembering an experience from a long time ago. For this reason, it is important that the environment and the staff support frequent engagement so they will connect with nature continuously throughout the day.

With these limitations as potential set-backs to implementing biophilic design, one could argue that more research is needed before these design strategies be utilized. However, even if just some of the benefits discussed could be realized through design, it makes the effort worthwhile. There are few, if any, reasons not to encourage a person with dementia to connect with nature, so it would make sense to include these features as often as possible and as part of the design programming goals from day one.

Other important considerations for design are staff limitations and building code regulations. Many of the interactions with nature for dementia care residents are facilitated by the care giving staff. Since the staff may be busy with the immediate health needs of the residents, they may not have time or see the value in supporting nature-related activities. Designing a safe, low-risk environment where the residents can build a connection to nature on their own, reduces the demand on staff and gives the residence more opportunities for engagement with or without assistance. For activities that do require staff assistance, it is important that the staff be properly trained and feel confident working with the residents to build those connections. By understanding the benefits nature can provide, they will also feel more motivated to engage residents with nature on a regular basis. The building itself is also subject to certain health and fire code limitations, which must followed when incorporating nature into the built environment.

8.3 Feasibility discussion

A concern for designers and operators may be the feasibility of implementing these strategies. How much will it cost and will more staff or training be needed? What can be done in an existing facility? These are good questions and important considerations. In many cases, these design features come at no additional cost. Seating will always need upholstery fabrics, and one with an organic pattern can be selected at no cost difference than a geometric pattern. An aquarium and water feature may be an extra cost, but can be swapped out for a piece of furniture or artwork. A smarter building design and layout that facilitates exterior views may cost nothing, but may just mean a more thoughtful layout is needed.

Many of these items will also require some amount of maintenance, but by using the maintenance as part of the activity programming, it can reduce the amount of time needed by the staff. To offset more costly design items, the overall health of the residents should also be considered. Healthier residents demand fewer medications and less care from the staff, lowering the overall cost of operations. Existing facilities should also be able to easily modify furniture layouts and activity programming to immediately increase the opportunities for the residents to connect with nature. For elements that cannot be experienced in the facility, day trips can be planned to other indoor environments, such as a conservatory, as to supplement their experience.

8.4 Post-occupancy evaluations to verify working strategies

As designers test out their own ideas in their projects, a helpful tool to understand what's working are post-occupancy evaluations. After a building is in use, there will always be lessons learned and things a designer would go back and change once they've had a chance to see how the space functions. While some of this information is clear throughout the construction process and through observation, talking with the people that occupy the space can provide valuable insight. Staff may notice a certain element that is helpful or draws the attention of the resident with positive results. Design elements may not always be used as intended especially in

a dementia care environment where it can be difficult to predict the behavior of the residents. To continually build a stronger connection to nature, understanding how each element is used is a crucial part of the process.

8.5 What's next: Other areas to research and explore

To further understand how design can facilitate a connection to nature in a dementia care environment, some of these design concepts should be implemented and tested in a controlled space to try and measure their impact. Since there are different levels of severity of dementia, more research is also needed to understand how the impacts and benefits of these design strategies might change for someone first showing signs of dementia to someone that has already experienced severe cognitive decline. With an understanding of a resident's level of decline, health status, and personal preferences, activities and spaces can be tailored to best suit them and create beneficial engagement with nature.

9 CONCLUSION

Through this research and design exploration, we can recognize that there are many possible health and wellness benefits to connecting with nature through an interior environment for people with dementia. While currently the primary strategy for connecting to nature has been going outdoors, bringing the interaction indoors offers many of the same benefits, with the added advantage that engagement can happen more frequently and at all times of the year. It is also evident that biophilic design goes hand in hand with good dementia care design and sustainability. For those who argue that sustainable design and incorporating nature is too complicated or expensive for dementia care, it is increasingly evident that this is not the case. While sustainable design is talked about more than ever before, this research illustrates that it is not just about design that is good for the environment, but design that is good for every person, especially someone with sensory and cognitive impairments. As the care needed for people with dementia rises, interior designers can use this knowledge to design beautiful and sustainable spaces that facilitate improved resident health and create an opportunity for a higher quality of life for a vulnerable, and often misunderstood population.

10 RESOURCES

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11 APPENDIX A

