A CLUSTER ANALYSIS COMPARISON OF GARDEN ACTIVITIES IN CLASSICAL CHINESE GARDENS AND AMERICAN GARDENS

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ABSTRACT

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Activities that occurred in Chinese classical gardens and American gardens are an important part of their traditional culture. The purpose of this study is to explore the similarities and differences between Chinese classical gardens and American gardens. Six classical Chinese gardens in China and five American gardens in the United States were selected to test. Eighty-five possible activities were selected based on site visits and from historical documents. A method named principal component analysis with plots was applied to this research. After applying the variables into the software SAS, a number of eigenvalues were generated, and the first three eigenvalues representing almost 75% of the variance were used for further analysis. The result shows a distinctive difference between Chinese garden and American garden. The first principal component indicates the major element that differ the Chinese garden and American garden, with activities occurred only in Chinese gardens such as literati gathering, writing calligraphy, and examine antiques; and activities occurred only in American gardens such as barbecuing, making bonfires, and playing ball games. The second and third principal components explained the difference between Chinese gardens, which varies primarily because of the garden owner's lifestyle.

Keywords: Landscape Architecture, Environmental Design, Historical Gardens, Traditional Culture, Historical Preservation, Cross-Culture Study

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1.1 Introduction

The landscape garden is an important part of the development of human civilization, which has many functions. It is not only a place for people to rest and play but also a cultural and social symbol. According to age, ethnic, geographical location, and environmental factors, gardens around the world shows its unique style (Burley & Machemer, 2016).

After thousands of years of accumulation and development, the development of classical gardens has formed three major garden systems: Oriental (east Asian) gardens, European gardens, and western Asian gardens (Stuart, 2010). Eastern Asian gardens are characterized by its natural style, and it originated in China. The Chinese garden and Japanese garden are important representatives of the eastern Asian garden system (Burley & Machemer, 2016). Western Asian garden is also known as the Islamic garden, is a garden system with its characteristics, originating from ancient gardens along the Tigris and Euphrates rivers and in Persia, eventually including Islamic religious features (Burley & Machemer, 2016). The European garden approach can be represented by the Italian terraced garden, French classical symmetrical garden, and English natural landscape garden. American garden evolved from European gardens but has its unique design style due to the cultural and social background, blending the styles of formal approaches out to the natural wilderness and beyond (Stuart, 2010).

While there is a large volume of scholarship focusing upon the design elements, architecture style, and design technique of these gardens, few studies addressed people's daily life or recreational activities in the space. Thus, this investigation seeks to discover different

activities that occurred in both Chinese gardens and American gardens, to help people gain a deeper appreciation and understanding of eastern and western culture in garden design.

1.2 Literature Review of Classical Chinese Gardens

1.2.1 History of Chinese Garden

China is the only country within the four ancient civilizations that has been continuous to be followed until today (Li, 2008). Thousands of years of civilization recorded the changes in this country and recorded the wisdom, inventions and outstanding contributions to the world. Chinese traditional culture is an essential part of Chinese culture, which represents the features and meanings of this country, and is the crystallization of the wisdom of all people in past dynasties (Li, 2008). Chinese classical gardens are a pearl in the cultural heritage of the Chinese.

The construction of Chinese gardens has a history of more than 3,000 years since the Shang and Zhou dynasties (1600 BC). According to the consensus of the academic circle, Chinese classical garden generally refers to the garden construction activities and representative works during the period from Shang and Zhou dynasty to the end of Qing dynasty (Li, 2009). After a long day work, human beings need recreation activities to restore their spirit and physical strength. Therefore, people build gardens based on their practical needs to live in a comfortable living environment that can be fully coordinated and integrated with nature (Lou, 2011). For thousands of years, human beings have been using the natural environment such as water, soil, stone, plants, animals, buildings and other materials to create a livable recreation environment (Figure 1). In ancient Chinese mythology, Yao chi, where the queen mother of the west lived, and Xuanpu, where the Yellow Emperor lived, were depicted as beautiful gardens, which are the

ideal living environment people dream about. In people's perception, a garden is a paradise build on earth, is the most ideal place to live, to work and to play (Li, 2009).

Figure 1: View of the pond with a pavilion in the Master of Nets Garden; people can rest here by leaning upon the balustrade and watching fish, which are typical garden activities in Chinese gardens. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

There were very few publications about Chinese garden in the western countries until William Chambers (1757) wrote the first book about Chinese landscaping in 1757; this was the first book that descripting Chinese gardens. After Chambers, others started to focus on Chinese gardens. Mangin (1888) had drawings of Asian gardens in his book; as well as the book *History of Garden Art* written by Gothein (1928). Later in 1978, Maggie Keswick (2003) wrote the book *the Chinese garden: History, art, and architecture*. This is the first comprehensive westerner description of Chinese gardens, and it helps people around the world understand more about the

Chinese garden. Then, Peter Valder (2002) published the book *Gardens in China*, which is the first truly scholarly discussion of Chinese gardens in the west. He depicts over two hundred gardens he has visited in China; the gardens are illustrated with over five hundred color photos, many of which depict gardens not earlier illustrated in any Western publications.

1.2.2 Classification of Chinese garden

As a carrier of history and culture, Chinese classical gardens not only objectively reflect the different historical background, rise, and fall of social economy, architectural technology and horticulture level of dynasties, but also reflect the evolution of Chinese people's view of nature, outlook on life and worldview (Chen, 1984). It contains the influence of philosophies and religious thoughts such as Confucianism, Buddhism, and Taoism, and traditional arts such as landscape painting and poetry. Chinese classical gardens mainly include four basic types: royal gardens, private gardens, temple gardens and scenic spots (Li, 2009).

The royal garden is generally referred to as gardens that are build, led by the emperor usually, a place for the imperial family to live and play. Because the emperor can use supreme governing power, the concentration of the world's wealth and human resources are used to construct the garden. Therefore the creation of the royal garden has a long history, with grand scale and exquisite skill, which can be ranked first among Chinese gardens. Existing famous examples include the Old Summer Palace, Summer Palace and Chengde Summer Resort (Li, 2009).

Private gardens, which accompanied the magnificent imperial gardens in ancient times, began to sprout and developed in the Han dynasty (206 BC). According to historical records, many scholars and officials in the western Han dynasty had their gardens. After Wei and Jin

dynasties, it gradually became a social fashion to appreciate mountain and water in nature. The scholars and officials were not satisfied with the existing environment and started to build gardens; puissant plantation owners also followed this trend. Private gardens began to flourish since then. After the Song dynasty (AD 960), private gardens in the south of the Yangtze River had significant development (Figure 2). Among them, Suzhou classical gardens gathered the artistic essence of the gardens in the Jiangnan area and became a typical representative of the literati landscape gardens in the Ming and Qing dynasties (Li, 2009). In ancient China, The term "literati" refers to intellectuals who are well educated, and interested in literature, many of them are painters, poets, calligraphers, etc.

Figure 2: View of the pond and the stone bridge in the Humble Administrator's Garden. The bridge provides opportunities to get close to the water and appreciate reflections.

Temple garden generally refers to the attached garden of the religious place (Buddhism, Taoism, Christianity, Islam, etc.) including the gardens of memorial ancestral halls of special historical celebrities with mythological features (such as Yellow Emperor, Da Yu, Confucius). In China, Ancestral temple is part of this group and is also known as "family temple". It is specially designed for the elders of high prestige, intending to continue the families and carry forward the traditional culture (Figure 3). Most ancestral halls have since become the place of interest for the public to worship and remember the ancestors (Li, 2009).

Figure 3: An ancestral temple in the Lion Grove; usually used for family activities such as sacrificing or Buddha blessing. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

Scenic spots are a special type of Chinese garden. It is generally located in the suburbs of the city, with beautiful scenery, and relatively broad in area; it often has a close relationship with

important historical figures or stories. Scenic spots are public recreation places accessible to the common people. Some traditional folk customs spread since ancient times such as "Dragon Boat Race", "Mid-Autumn Festival night tour" and other activities, are mostly in the suburban scenic spots. Great examples of scenic spots include the Qujiang pond in Chang'an city from the Tang dynasty (AD 618) and the Emei Mountain in Sichuan. Today, many scenic spots have evolved into city parks (Li, 2009).

1.2.3 The Concept of "Tian Ren He Yi" and Design Theories

The phrase "Tian Ren He Yi", meaning the harmony between man and nature, was advocated from Confucianism (Chen, 1984). Human beings should obey and protect nature, to form a good relationship of mutual dependence and coordination between man and nature (Chen & Wu, 2009). This idea was largely used when building a Chinese garden.

Among the numerous ancient Chinese gardeners and gardening literature, the book entitled *Yuan Ye* written by Ji Cheng in the late Ming Dynasty (17 Century) is one of the prominent representatives (Zhang, 2004). The author Ji Cheng, from Suzhou, was good at painting, proficient in poetry and had unique knowledge about gardening. He puts forward the standards for styles as "though it is artificial, the garden is comparable to a natural wonder". Regarding the creation of gardening, the book *YuanYe* emphasizes the natural path to organize and build landscapes by the features and morphological characteristics of natural landscapes including mountains, rivers, and other landscapes, and thus achieving the embodiment with nature and reaching the effect of "natural elegance" in the overall style (Ji, 1988) (Figure 4). In

order to achieve a sympathetic touch and resonance, one must have an understanding of spiritual meaning affiliated to the landscape beyond the object (Liu, Burley, and Partin, 2014).

Figure 4: Stylized balustrade for people to sit down and enjoying the view in the Master of Nets Garden. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

1.2.4 Essential Design Elements in Chinese Garden

In Yiwen Xu's study, the design elements in the Chinese garden can be divided as following part: architectural elements include Halls (Ting tang), viewing towers (Lou ge), pavilions (Ting), walls, and covered walkways (Lang) (Figure 5); rockery and water; vegetation include bamboo, magnolias, pine, plum, camellia, crepe myrtle, sweet osmanthus, peony, willow, and lotus; garden paths and pavements (Figure 6); and weather and four seasons; and borrowed scenery (Xu, 2015).

Figure 5: The Little Flying Rainbow in the Humble Administrator's Garden, showing people watching beautiful inverted reflection in the water while resting under the shade. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

Figure 6: Patterned stone paving featuring the red-crowned crane in the Master of Nets Garden. The owners enjoy interacting with the red-crowned crane in their daily life. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

As one of the traditional techniques of Chinese classical gardening, borrowed scenery means that the builder consciously "borrows" the scenery outside the garden into the vision of the garden, and thus forming new landscapes that are different in patterns but complement each other as a whole. Landscapes constructed by this method in the garden occupy a relatively unique and fundamental position. Ji Cheng held the opinion that even though there is no regulation about gardening, borrowing scenery calls for a particular basis. There are many kinds of borrowed scenery, for example, looking at the scenery outside the garden from a specific point; the distant scenery such as islands and water can be seen in the open-ended garden; Two gardens or two landscapes can also borrow scenery from each other. Even more abundant, the contents of borrowed scenery can be roughly divided into natural landscape such as mountains, rivers, animals, plants, buildings and so forth. Artificial landscape including the sound of bells in ancient temples and the sound of instruments in the bamboo forest, and astronomical scenery involving sunrise, sunset, full moon, crescent moon, azure sky, star, cloud, mist, rainbow, rain, snow and so on (Ji, 1988) (Figure 7).

Figure 7: An example of the interior display with removable windows in the Humble Administrator's Garden, the windows were off during summertime so people can feel the cool wind. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

The Chinese classical garden is never separate from Chinese painting and poetry (Chen, 1984). The wonderful artistic conception in ancient poems and landscape paintings became the theme of the garden; in reverse, the artistic elements of the garden are deeply embedded in the poems and paintings (Figure 8). In ancient China, many famous poets and painters, such as Bai Juyi, Liu Zongyuan, Wen Zhengming, and Li Yu, were also outstanding landscape gardeners (Hu, 1992). It could be saying that Chinese poetry and painting are the poet's empathy with the natural landscape, while the garden turned the poet's perception of the natural into reality.

A great example Whom-to-Sit-With pavilion in The Humble Administrators Garden, its name "Whom-to-Sit-With" comes from the famous poet Su Dongpo's phrase "Whom to sit with, the moon, the wind, and I". In this way people can immediately feel the atmosphere, to enjoy the moon and cool wind (Li, 2009).

Another example that reflects the theme of a garden is the inscribed couplets. The inscribed couplets on Suzhou classical gardens are related to literature, philosophy, aesthetics, painting, calligraphy, sculpture and other artistic fields, which fully show the romantic artistic imagination and elegant cultural accomplishment of poets (Figure 9). The content could be sentences or a short phrase from a poem, a name of a plant, or a poetic phrase created by owner. It can be observed anywhere in the garden, with different themes and atmospheres that are connected to a specific area (Li & Hu, 1994).

Figure 8: The Cloud Capped Peak in Lingering Garden. Scholars in the past love to examine stones because they take it as a treasure. (Copyright ©2015 Yiwen Xu all right reserved used by permission).

Figure 9: A gate with carven poetic name of the courtyard in the Humble Administrator's Garden. Many garden owners curved the their horizontal Inscribed Board by themselves. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

1.2.5 The Development of Private Gardens in Suzhou

Among all the classical Chinese gardens, Suzhou gardens are the most distinguished examples that reflect the cultural, political, and economic development in China. The history of Suzhou classical gardens dates back to the Spring and Autumn Period during the 6th century BC (Liu & Wood, 1982). Most of the existing Suzhou gardens were built in the Ming and Qing Dynasties, including hundreds of classical gardens of various sizes. Suzhou was one of the most flourishing places that have a diverse set of gardens at that time. There were over two hundred gardens built, and many of them survived to the present (Liu & Wood, 1982). Among them, the Canglang Pavilion, the Lion Grove Garden, the Humble Administrator's Garden, and the Lingering Garden, which are collectively referred to as the "Four Great Gardens of Suzhou", were built during the golden age in the development of Suzhou's private gardens (Liu & Wood, 1982) (Figure 10). With far-reaching and exquisite artistic conceptions, elegant architecture and rich traditional culture, they have become the models and representatives for numerous Suzhou classical gardens.

Figure 10: Lotus pond with bridge and pavilion during the summer time in the Lion Grove. A place for taking boat rides and picking lotus. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

1.2.6 Garden Activities in Chinese Classical Garden

Garden activities are reflected mostly and fully by ancient poetry and paintings. Ancient poetry is a primary component of traditional Chinese culture and it is inseparable from the landscape garden design. The motivation of this study was inspired by a famous story in China: "drinking wine from a winding canal with one wine cup floating on it" (Swartz, 2012). This is a game belonging to the scholars; the famous calligrapher Wang Xizhi invited his friends for a gathering to his residence, Lanting, which is a famous garden at that time. These people sat on the ground on both sides of the river, and they put the cup full of the wine on the river, floating slowly from the upstream through the winding river when the cup turned round or stopped in front of someone, the person should write a poem extemporaneously and drink. If someone could not write a poem, he would drink three cups of wine. Therefore, such activities like wine drinking are closely associated with the gardens (Swartz, 2012) (Figure 11).

Figure 11: An ancient-style boat made by jade, with people drinking wine on the deck; displayed in Suzhou Museum. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

After a series of upheavals and social changes, the economy and culture of Suzhou reached its peak in the Song dynasty, and the area around Suzhou gradually recovered its lively and prosperous scene of the past period. The development of the economy has promoted the progress of literature, art and science, and technology, which have created excellent conditions for the development of garden art. Many wealthy businessmen spent a lot of money on these recreational things: buying paintings and calligraphy, collecting antiques, listening to music, and watching operas becoming part of their daily lives (Figure 12). These artistic categories have developed and flourished again along with the promotion of those wealthy businessmen. Many retired literati and wealthy young people gathered in Suzhou and formed a social circle of "hermits". They spend most of their time and energy on the pursuit of necessities of life, which directly promotes the development of the garden construction.

Figure 12: A pavilion hiding in the woods in order to create a private shelter to enjoy the site in the Humble Administrator's Garden. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

Just the same as the Chinese poetry, the traditional landscape painting art in China was tightly tied with the classical gardens, and paintings are a substantial factor that impacts the creation of landscape arts (Zhen, 2016). Chinese landscape painting and the Chinese garden are expressing the art of natural landscape, both of which are very similar in theory (Hua & Jin, 1997).

Literati and painters participate in the construction of gardens that were more common and extensive than ever before. They injected their own aesthetic requirements into the process of garden creations, making the gardens at that time present features that had not been shown before. In order to meet the requirements of literati's elegant life quality, the garden functions are more comprehensive (Figure 13).

Figure 13: An example of study room in Chinese garden where people do painting or writing calligraphy, with a frame to look outside; displayed in Suzhou Museum. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

Although different contents will be added due to the needs of life during each historical period of the garden formation, in the middle and later period of the Ming dynasty, the set of active functions were fully explored, such as meditating, Buddha worshiping, having banquets, fishing, appreciating antique, reading, gaming, drinking tea, and planting flowers (Figure 14). The artistic level of the garden was highly advanced. The layout of scenery, style of design, an arrangement of architecture and the borrowing scene all had reached a very mature stage (Figure 15).

Figure 14: An ancient plate showing people's daily life in Chinese garden; displayed in Suzhou Museum. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

Figure 15: Artificial hill with artistic style in Lingering Garden, reminding people of the beauty of natural mountains. (Copyright ©2015 Yiwen Xu all right reserved used by permission).

1.2.7 Existing Studies about Garden Activities

Currently, the research accomplishments of Chinese garden history are fairly abundant in the academic domain, but most of them focus on general studies. These include the history of gardens, the ideas of garden design, and the aesthetics of gardens. Nonetheless, the studies primarily concentrating on leisure activities in Chinese classical gardens are extremely rare.

Taking the Ming and Qing Dynasties as the period for studying, Dong (2012) explores the relationship between opera and garden culture in the Ming and Qing dynasties when opera and gardens were deemed as artistic forms embedded with the aesthetic appeals and spiritual pursuits of the scholars. The author used a qualitative study; he collected a large number of historical materials about opera and then analyzed them. The result shows that Chinese opera has remained popular in ancient China and influenced the garden space in many aspects. Dong (2010) also investigates the development of traditional opera in Chinese private gardens in late Ming dynasty.

There are some investigations that examined researchers studied different activities that occurred in ancient China. For example, Han (2012) studied all kinds of activities that occurred in Dongjing city such as dancing, singing, painting, and Chinese drama. It is worth mentioning that this author not only studied specific sites in detail such as teahouses, riverbanks, monasteries, and streets, but also discusses important events in diverse festivals. However, as he involves many different places, the garden does not serve as the main part elaborated in his article. Another qualitative study used Chinese painting as a tool to study different activities in Suzhou gardens (Mao, Liang & Zhang, 2017). These authors classified four types of garden activities that occurred in garden space: meetings of scholars, ordinary life in the garden, tour in garden and activities in different festivals. They also classified groups of participants: royalties, scholars, children, and normal citizens. The authors then analyzed these paintings and gave their interpretations of how these activities and garden space are influenced by each other. Zhen (2016) also studied Chinese traditional paintings that related to gardens in Suzhou city by using a qualitative approach. Through the interpretation of the paintings in the Suzhou area, the author classifies the following garden activities: banquet, making poems, playing music, appreciating

the scenery and so on. Also, he classified different groups of participants include scholars, women, and farmers. However, Han (2012) and Mao, Liang, and Zhang (2017) both focused on the general space in cities while only Zhen (2016) focused on gardens. Zhang and Fan (2012) classified the different kinds of banquets, as well as drinking games and drinking vessels, and they studied the impact those drinking activities had in landscape gardens by using a qualitative approach. Pan (1963) explored the relationship between the garden owner's lifestyle and the garden layout by using qualitative interpretations. The result shows that the layout of a garden depends on the owner's daily activities to a large extent.

Furthermore, there were also scholars focused on activities occurring in public gardens. Mao & Qu (2017) collected large-scale activities that were led by the imperial family during Song dynasty. Such activities like dragon-boat racing, celebrating the emperor's birthday, and temple fair are mentioned in their research. Also, Wang (2010) used a case study in Jinming Chi, a royal garden in Northern Song dynasty, to illustrate different public activities. The garden was open to public during holidays, and the duration lasts for a month; the activities were mainly occurring on the water, such as putting festive lanterns, water shows, and dragon-boat racing.

1.3 Literature Review of American Gardens

1.3.1 History of American Garden

The history of landscape design can be divided into two streams, the formal European and Western Asia Tradition and the nature symbolism of Eastern Asia (Eckbo, 2009). The development of the western stream was irregular at best, with different eras and cultural periods at different locations in time and place (Bouvier, Bouvier, & Burley, 2012). The highest periods

of this development were in the renaissance period in Italy, in the baroque era France and in the Moslem world, stretching from North Africa and Spain to central Asia and India (Burley & Machemer, 2015). The western tradition was one of planned organization of open space in a simple and direct manner (Treib & Imbert, 1997). The eastern stream was mainly dominant in China and Japan, focused on an oriental and pictorial symbolism that grew at much the same time (Eckbo, 2009). The tradition here was that man and nature were considered companions, and landscape architecture was therefore a way of maintaining the harmony between man and nature (Eckbo, 2009). These systems only came to converge later in/after the 18th century, which was the period of the industrial revolution. It is this convergence that now forms the major motivation for modern residential design (Boults, 2010).

The history of landscape architecture in America can be traced all the way back to the colonies, where the wealthy landowners would normally turn back to England for inspiration (Karson, 2007). The biggest inspirations during these earliest years were always the gardens belonging to William and Mary from the late 17th century. These gardens were famous for their symmetrical layouts, with inspirations from French, Dutch and Italian traditions (Karson, 2007). The best illustrations of these were the governors' palaces, the palaces in Williamson Virginia, Milton, and Middleton, for instance, all showed similar characteristics. According to historians, these locations had similar combinations of such features as cross-axial plains, closely clipped ornamentals and sharp delineated beds, all forming strictly structured layouts (Karson, 2007; Meason, 1828). For many landscapers of the time, the authoritative source and design guide used was Philip Miller's The Gardener's Dictionary, written in 1731. This design philosophy seems to have guided the American landscape architecture way into the 19th century, despite the later evolution to much softer, picturesque lines during this period (Karson, 2007).

1.3.2 Development and Changes of Landscape Architecture in America

According to Karson (2007), changes in American landscape architecture were mostly motivated by individual designers. He described the ideal garden as the colonial design, with symmetrical layouts walled beds or orchards that were bisected by a garden. These models were the inspiration for many gardens in America, even with gardens back in England evolving. The words "Landscape Architecture" was originally from French, later in 1828, in Gilbert Meason's book *On the landscape architecture of the great painters of Italy* the term was first time mentioned in English. The American style changed and developed eventually. There are accounts of designers giving their clients options ranging from the bilateral symmetry of the traditional garden to having something akin to the wilderness outside (Karson, 2007). The tendency towards nature and the naturalistic design grew strong in the 19th century (Eckbo, 2009). This perspective was a derivative of the belief in moral edification through nature. Americans at the time admired nature, giving it a spiritual meaning (Shahli et al., 2014). Nature during this period was described as the pathway through which the universal spirit spoke to the individual, the place where the universal and individual spirits converged (Karson, 2007).

The inspiration by nature was also partly motivated by lifestyle changes at the time (Boults, 2010). New ways of life like industrialization, and transportation methods like the steam train finally made it possible for people to separate home life from work. Karson (2007) describes the 19th century as a time when many people were abandoning the countryside for the 'attractive' life of the city, some landscape designers felt that this tendency towards change was in opposition to the kind of social and domestic happiness that had always been enjoyed (Bouvier, Bouvier, & Burley, 2012). There existed a school of thought that believed in a return to the country life and the need to actively foster it. This was to be done through attractive

landscapes (Karson, 2007). Thus the new era of landscape design was born, one that was the middle ground between the city life and the still-world wilderness. This design was in direct opposition to the old mechanical and symmetrical designs, and incorporated aspects of the picturesque design that was already popular even in Europe and England (Karson, 2007). This design grew in the 1800s, buoyed by perspectives such as those held by Ralph Waldo Emerson, who distrusted the previous symmetrical and geometric designs as an expression of power and wealth (Treib & Imbert, 1997).

The next era was inspired by what many regard as the father of American Landscape Design, Fredrick Law Olmsted (Burley & Machemer, 2015). He was a widely travelled man, one whose designs were inspired by various architectural philosophies from England to China (Tobey, 1973). Again, this new generation was inspired by the social changes of the time. Olmsted belonged to a middle-class reform movement that was focused on cultural and national identity (Karson, 2007). Olmsted believed in the landscape being representative of the local circumstances in each case (Bouvier, Bouvier, & Burley, 2012). This design philosophy was however pushed to the side in the second half of the 19th century, with the new landscape architecture focusing on the possibilities of the botanical garden (Karson, 2007). This was the era dominated by such designers as Henry Shaw, who encouraged the idea of bringing in various different species of exotic plants and flowers to populate gardens and develop landscapes (Karson, 2007).

Going into the 20th century, designs were mostly inspired by the philosophies of Olmsted and the use of nature as a guide in the first few decades until 1920 (Tobey, 1973). The influence of Shaw was not dead, though, and this introduced a new era after the 1920s of experimentation with nature and innovation (Karson, 2007). The next period, though, was a modernization of

landscape architecture, inspired not only by nature but also by three-dimensional space and pictorial composition. Landscape architects found inspiration from modern paintings and sculpture (Burley & Machemer, 2015). American landscape architecture evolved from there, focusing increasingly on innovation and pushing boundaries, experimentation and characterized by strong willed clients and brave landscape architects (Eckbo, 1956).

1.3.3 The Formation of Modern Design

While the historical design was relatively rigid and can effectively be divided into various eras, the modern landscape design is more flexible (Eckbo, 2009). This is especially true considering the fact that the social, technological and physical elements have changed. The modern design is based on finding solutions for all practical functions and problems and creating pleasant surroundings for work and play (Eckbo, 2009). This is done with an inspiration from great architectural practice and natural beauty, as well as the quest to broaden the limits of practice through research. Modern design is focused hugely on solving the general problems of the physical environment (Bouvier, Bouvier, & Burley, 2012). It moves from the simplistic design outside space that was the focus of historical design, to a focus on the establishment of relationships between man and land (Eckbo, 2009).

There were not many publications about landscape garden design before Ossian Cole Simonds's book *Landscape Gardening*, published in 1923. The book talks about different garden elements such as plants, water, roads, parks, cemetery, and golf. Simonds preferred to use the term "Landscape Gardener" instead of "Landscape Architecture" because he thought "Architecture" refers to building, construction, and engineering, which takes away the graceful

of landscape, where “Landscape Gardener” recognize as truly living things. Then, Jere Stuart French, who graduated from Michigan State University in Landscape Architecture major, wrote the book *The California garden: and the landscape architects who shaped it.* This book is much more in-depth regarding the development of a modern garden. He started by introducing the European style design along with its influences and then focused on those important landscape architects that contribute to modern gardens. For example, Thomas Church was literally the one who invented the modern garden. One noticeable garden he did is the Kirkham garden, with a transformation from an Italian square to an interesting outdoor space. Through the redesign, an open deck with a shaded sitting area was added. With the little change, the design accomplished the visual movement and created a strong sense of space. This is one of the earliest modern gardens in 1948, where things began to change. However, Lawrence Halprin, a designer born in Brooklyn, did the first great modern garden, which was completed in 1948. Although there were already some modern gardens showed up gradually, the Dewey Donnell garden is considered an essential step in the transformation of the modern garden.

Other notable publications such as *The History of Landscape Design in 100 Gardens* written by Chisholm and Garber (2018), illustrate large amount of garden designs all over the world, with exquisite photos of each site. Jellicoe (1975) in his book *The landscape of man* keeps an idea that an environment must be intentionally formed at a particular moment to qualify as ' landscape of a man.' The writers, taking twenty-eight cultures such as Rome, Greece, the medieval Europe, Moslem world, China, India, Japan, pre-Colombian America, first summarize the cultural and intellectual context, then describe how this expressed itself in terms of landscape, and lastly show their case in a sequence by illustrating pictures what actually occurred. Girot (2016)’s book *The course of landscape architecture* also provide a wide range of

cultural references that relates to mankind and landscape. Another book *Design on the land: the development of landscape architecture* written by Newton in 1974 conduct a comprehensive historic works of landscape design. The first third of the book focus on the Western world's landscape design, primarily Europe, from ancient period to the nineteenth century, then the book concentrating mainly on cases in the United States, including the formation of ASLA (the American Society of Landscape Architects).

1.3.4 Residential Landscape Design

Residential landscape design, at least in the modern context, is based on the belief in landscape architecture being more than just a tool for horticultural display or visual pleasure, or the context of a stylistic battle between formal elements and informal elements (Shahli et al., 2014). Instead, it focuses on landscaping as the site for interaction between nature and man, basically exterior spatial design (Treib & Imbert, 1997).

1.3.5 Design Elements and Techniques of Residential Garden

Modern landscape design cannot be reduced to one single element. However, the techniques of design are inspired by the following factors (Bouvier, Bouvier, & Burley, 2012). Modern advanced design processes are geared towards the greater concentration of space and its relations to human interactions, material properties, social relevance to the people and the specific local conditions. According to Eckbo (2009), modern design elements and techniques reject the pre-conceived academic systems and label them stale and irrelevant. Instead, it is a

reanalysis of the basic elements and problems, intending to find the right design approach that would be truly relevant without being shallow or superficial (Eckbo, 2009).

There are some important factors when designing residential gardens. When designing residential gardens, one must think about the general evolved function of landscape design. It no longer is about the simple design of outdoor spaces and arrangements (Eckbo, 2009). Designing residential gardens, in particular, must take into account the relations between man and the land, with the aim of designing the landscape such that the individual gets the maximum experience from the relationship (Eckbo, 2009). Designing the landscape for residential gardens must focus on the overall outlook of the space and not necessarily just the isolated design of individual spaces and structural elements (Shahli et al., 2014). It must focus on spatial continuity and the wholeness of view (Eckbo, 2009). Furthermore, residential gardens must incorporate the natural, artificial, cultural and environmental aspects (Shahli et. al., 2014).

1.4 Conclusions

To summarize, garden activities present its features in social and political life, literature, art, and also attitude towards life. While the existing literatures emphasize the significant role traditional culture plays in Chinese garden and historic destinations, none of this research focuses on cross culture comparisons. Most study simply focus upon the objects and contents of the space. Thus, more study is needed to explore specific activities and its impact on garden spaces. To achieve that, the author seeks to investigate the comparison by discussing the relationship between garden activities in both Chinese classical gardens and American gardens. It is worth mentioning that, the methodology used in many of studies are more or less similar: case studies

and analyzing historical documents (Han, 2012; Chen, 2013; Zhen, 2016; Chang, 2007; Dong, 2012; Mao, Liang & Zhang, 2017; Mao & Qu, 2017; Wang, 2010), which largely influences the choice of method in this research.

Based on above information, the author believes that studying activities that occurred in the space is crucial and meaningful. First, behavioral activities play an important role in promoting the formation of a garden space. Through the study of this activity that occurred in classical gardens and American gardens, not only can we understand the living conditions throughout the history, but also learn how garden space is formed. Moreover, this study enriches the research content that helps people to deepen the understanding of the interactions between traditional culture, garden space, and ancient literature.

CHAPTER 2: METHODOLOGY

2.1 Purpose of Study

The enjoyment of a garden is not just the object but the activities that occur in the space. This research aims to determine the similarities and differences of garden activities between selected classical Chinese gardens and a few selected American gardens, by using both a statistical method and qualitative interpretations; but, also to explore how cluster analysis methods can be put into use to compare cross-culture garden elements. Thus, there are three research questions that this study tends to address, which are listed below:

1. What are the similar activities between Chinese garden and American garden?

2. What are the different activities between Chinese garden and American garden?

3. What are the distinguishable activities that reflect the cultural context?

2.2 Study Sites

In this research, there are total of eleven case studies used for comparison, which are six Chinese classical gardens (the Canglang Pavilion, the Lion Grove Garden, the Humble Administrator's Garden, the Lingering Garden, and the Couple's Retreat Garden) in Suzhou, China; five American gardens (Burley Residence, Songbird Garden, Front Yard Garden, Erickson Residence, Leno Residence) in United States.

2.2.1 Classical Chinese Gardens

2.2.1.1 The Humble Administrator's Garden

Humble administrator's garden is the representative of all Jiangnan gardens, also the largest classical garden in Suzhou. The garden located in Northeast Street, Suzhou city, China; it was built during the Ming dynasty (1368-1644). Today, the area of the garden under jurisdiction is about 12.85 acres (Feng & Fan, 2007). It is also one of the four famous gardens in China and one of the key cultural relics under national protection. It is known as the "mother of Chinese gardens" and was listed as a world cultural heritage by UNESCO in 1997. At the beginning of the 16th century, Wang Xianchen, a royal officer who had returned to his hometown because of his official frustration, built the garden. The whole garden takes water as the center and has exquisite architecture and luxuriant plants surrounding the area (Feng & Fan, 2007).

The garden is divided into the east, middle and west parts, each with its characteristics (Figure 16). The middle part is the main scenic area of the Humble Administrator's Garden; the area is about 18.5 mu (3 acres). The general layout takes the pool as the center and has pavilions built near the water or extend to the water. Among them, Drifting Fragrance Hall, Fragrant Snow and Cloud Pavilion, The Boat-like Structure, and The Small Flying Rainbow are the main attractions in the middle garden (Feng & Fan, 2007). The west garden is beautifully built, with an area of about 12.5 mu (2 acres?). It has a circuitous water surface and a compact building layout. The main building in the west is The 36 Pairs of Mandarin Duck Hall close to the main residential area, which was the place for the host to entertain guests and watching Chinese opera. The other main structure in the west, Whom-to-Sit-With Pavilion, is a small pavilion with two fan-shaped empty windows on both sides of solid walls, one facing The Inverted Reflection Building and the other facing The 36 Pairs of Mandarin Duck Hall.

Figure 16: Master plan of the Humble Administrator's Garden. (Copyright ©2010 Suzhou Institute of Landscape Architecture Design Company all right reserved used by permission).

The architecture of the humble administrator's garden was mostly single buildings in the early period, which changed a lot in the late Qing dynasty. First, things like hall, pavilion, zigzag corridor, and boat-like structure increased significantly (Figure 16). The building density in the middle reaches 16.3 percent of the total space. Secondly, the building tends to group; the courtyard space gets to have many twists and turns. The Humble administrator's garden is also famous for "the victory of the plants"; eighty percent of the 23 landscapes in the central area features primarily plants. Lotus, camellia, azalea are the most famous three characteristics among all the vegetation (Feng & Fan, 2007) (Figure 17).

Figure 17: Lotus pond separate by zigzag tone bridge in the Humble Administrator's Garden. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission)

2.2.1.2 The Master of the Nets Garden

The Master of Nets Garden is an eight-hundred-year-old private garden located in Suzhou, China. All the owners of the garden from each dynasty were literates; therefore, the gardens they designed and constructed were naturally elegant and making people feel they are in a graceful environment (Li, 2009). As early as in the 1970s, when China and the United States established friendly relationships, the Metropolitan Museum of Art in the United States had sent scholars to visit the Master of Nets Garden. Influenced by the art of Suzhou gardens, these scholars decided to build a replica of the Master of Nets Garden on the second floor of the museum (Li, 2009).

Different from the famous gardens like the Lingering Garden and the Humble Administrator's Garden, the Master of Nets Garden is characterized by its small size, elegant architecture and brightness atmosphere, which is quite different from other spacious and magnificent gardens in Suzhou (Figure 18). Later in the Qing dynasty, a retired local officer changed its name to the “garden of nets”; “nets” has the meaning of fishing and fisherman, but also contains the meaning of hidden from the society and stay in seclusion (Bedingfeld, 1997).

Figure 18: Master plan of the Master of the Nets Garden. (Copyright ©2010 Suzhou Institute of Landscape Architecture Design Company all right reserved used by permission).

The garden is divided into three areas according to its functions. The east is a residential area, the central area is the main garden, and the west area is an old study (Figure 19). Although it looks like there are a lot of buildings, it does not feel crowded at all; instead, it is the model of small to medium-sized gardens with beautiful and exquisite structures. The Master of Nets Garden in the east has the typical architectural style of the official family in the feudal age. The house's orientation is determined based on theories of feng shui; the gate is adjacent to the lane, inside the gate door is a delicate screen wall. The small courtyard is enclosed but the layout is ingenious. The sedan hall, the flower hall, and the main hall are all exquisitely carved with wood and stone; even the fine wood and stone on the threshold are precious antiques from the early Qing dynasty. The western part of the Master of Nets Garden is the "library" during the period, named, with three small rooms for saving books and historic documents. The Peony Study takes peony as the main scenery, has unforgettable purple flowers filling the yard during the spring (Li, 2009).

Figure 19: The Cool Spring Pavilion in the Master of Nets Garden. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

The pool's construction in this garden is also very unique, the pool in the central part built with yellow stone, and pools in the east and west parts were used other types of stone, which never repeat. The unique pavilion structure surrounding the pool allows people to enjoy not only the changing of the day but also the changing of four seasons year-round. When winter comes, the beautiful snow will cover the garden and turned the place into a white wonderland (Li, 2009).

2.2.1.3 The Lingering Garden

The Lingering Garden was built 420 years ago during the Ming dynasty. The first owner of the Lingering Garden was Xu Tai; after several twists and turns, a successful candidate in the imperial examinations named Liu Shu bought this garden. Liu Shu is fond of calligraphy, strange stone, and is professional at seal cutting; he is also a calligrapher and painter. The Lingering Garden, the Humble Administrator's Garden, the Summer Palace in Beijing, and the Chengde Summer Resort are known as four famous gardens in China. It was listed as a UNESCO world heritage site in 1997 (Li, 2009).

Now the whole garden covers an area of about 5.76 acres, which can be divided into four scenic areas, namely, middle, east, west, and north (Figure 20). The east is dominated by architecture, the central part focus on landscapes, the west contains stylized big rock and fake mountains, and the north has beautiful pastoral scenery (Figure 21). The garden has a beautiful pool as the center point; to the north of the pool are rockeries and pavilions, with trees intermingling. On the west of the pool, the Osmanthus Fragrance Pavilion is the best place for overlooking the whole garden, and there is a long corridor connecting with places. The building

divides the garden into several parts; each building is equipped with a variety of doors and windows, where various views can be seen from different angles. When a person watches outdoor scenery from indoors, there is a picture that one can take of a frame with a carved window; in this way, the field of visual space is widened greatly (Tian & Fang, 2016).

Figure 20: Master plan of the Lingering Garden. (Copyright ©2010 Suzhou Institute of Landscape Architecture Design Company all right reserved used by permission).

Figure 21: The ornamental plants in front of architecture in the Lingering Garden. (Copyright ©2015 Yiwen Xu all right reserved used by permission).

The rockery in the Lingering Garden is very famous, one of the most famous is called the Cloud Capped Peak, which is the highest stone of Taihu Lake in Suzhou gardens. It is 6.5 meters high and has a tall and unique shape. The Cloud Capped Peak is so special because it has a long history; it was retrieved during the Song dynasty. The emperor Songhuizong was a person who has a strong passion for Taihu stones; hence he established an organization that mainly focused upon selecting Taihu stones. In the northeast corner of the viewing area, there is a hexagonal pavilion called the Cloud Capped Pavilion, people who stay here receive the best view of Cloud Capped Peak (Li, 2009).

Another major feature of the garden is precious calligraphy and paintings. At that time, the owner Liu Shu collected a large number of famous calligraphic posts that from famous literati, then copied the content by carving it on the stone and embedded in the wall. In this way,

the walls on the corridor were decorated with these special stone artworks, which left valuable information to posterity; the artwork includes but not limited to Wang Xizhi's, Wang Xianzhi's, Su Dongpo's poems (Li, 2009).

2.2.1.4 The Lion Grove Garden

As one of the four famous gardens in Suzhou, the Lion Grove Garden has a history of more than 650 years and is representative of gardens in the Yuan dynasty. It covers an area of 1.1 hectares and an open area of 0.88 hectares (Tian & Fang, 2016). In 1982, it was designated as a cultural relic protection unit in Jiangsu province (Figure 22).

Figure 22: Master plan of the Lion Grove Garden. (Copyright ©2010 Suzhou Institute of Landscape Architecture Design Company all right reserved used by permission).

The garden is full of various rockeries, and has a corridor all around, which gives people a feeling of entering a maze (Figure 23). There are a lot of fake mountains in the southeast and ponds in the northwest. Surrounding the central pool, build architectures, abundant vegetation and trees, and bridges and corridors are nicely built, which make the whole garden appear compacted and full of "forest and mountains all around" atmosphere. The garden not only has traditional design elements of Suzhou's classical gardens such as a pavilion, building, hall, corridor, etc., but also more well known for its mountain and stone, and received a reputation of "rockery kingdom" (Tian & Fang, 2016).

Figure 23: View of the fake mountain with interconnected passageways in the Lion Grove, so people can play under the stone, and imagine they are in natural landscapes. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

The Lion Grove Garden used to be the back garden of the Bodhi Orthodox Temple. The name Lion Grove was given because there are many rocks look like a lion. In 1341, a famous monk, also a Chan master, Tianru, came to Suzhou to give a lecture and was praised by his disciples. In the following years, his disciples bought the land and build houses for him to teach. After the completion of the temple, many poets and painters came here to practice meditation. After master Tianru died, his disciples were dispersed and the temple gradually became barren. Since 1589, the place was bought by individuals and became a private garden, many of the structures were reconstructed and gradually recovered to its former glory (Tian & Fang, 2016) (Figure 24).

Figure 24: View of the fish pond along with zigzag corridors in the Lion Grove. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

2.2.1.5 The Canglang Pavilion

The Canglang Pavilion is a world cultural heritage site, located near the south of Suzhou city with an area of 2.6 acres, and has the longest history in Suzhou's existing gardens (Figure 25). Su Shunqin, a famous poet in the Song dynasty (960-1127), bought the abandoned garden with 40,000 yuan and built a pavilion by the water. He had a phrase saying, " If the Canglang water was clear I could wash my tassel; if the Canglang water was muddy, I could wash my feet under it." Therefore he gave the place a name called Canglang Pavilion. Because of its long history, the Canglang pavilion experienced several times of abandonment and reconstruction, the owners of the garden have also changed many times (Xu, 1999).

Figure 25: Master plan of the Canglang pavilion. (Copyright ©2010 Suzhou Institute of Landscape Architecture Design Company all right reserved used by permission).

The Canglang pavilion's main scenic area is the forested mountains in the center and surrounded by architectures. Through the curved windows on the corridor, the mountain, the water, the pavilion, the plants in this garden are all visually connected. One of the most famous features in this garden is its ornamental perforated window. Canglang pavilion has various carved windows are embedded with the wall of the corridor, with a total of 108 styles. The window has a variety of appearance, with hollow patterns and gorgeous shapes; as far as the shape of the frame, there are square, polygon, round, fan-shaped, begonia-shaped, vase-shaped, pomegranate-shaped, leaves-shaped, palace-shaped, peach-shaped and so on, with no repetition with one another (Li, 2009).

2.2.1.6 Couple's Retreat Garden

If people ever come to Suzhou, they would not want to miss the place, where to feel the passing of thousands of years and the growing beauty of the garden and its love story, it is the Couple's Retreat Garden. Compared with the four famous gardens in Suzhou, Couple's Retreat Garden is a small but delicate one, with romance as its theme. The garden located in Suzhou city, and was built during the reign of Emperor Shunzhi of the Qing dynasty (1638-1661). In 2000, it was listed as a UNESCO world heritage site (Henderson, 2013).

The garden has a long history and has been destroyed and rebuilt several times (Figure 26). Among the many owners, the one who can best form the historical and humanistic connotation of the garden is probably Shen Bingcheng, a governor of Anhui province in the late Qing dynasty. This man was very righteous and respected by the local people. But his career was not very smooth, with the loss of his wife and children. With this despair, he bought this garden

that was abandoned at that time and lived in there. Later years, he met Yan Yonghua, a talented girl in the Jiangnan area who was 15 years younger than him and married her. The owner loved reading books and making poems, and so did his wife. They would always sit together, making poems, drinking wine, playing an instrument, and painting. Because of this marriage, the Couple's Retreat Garden showed a very apparent change, from a desolate garden to sweet home, every design of this place reveals the fondness of this couple (Henderson, 2013).

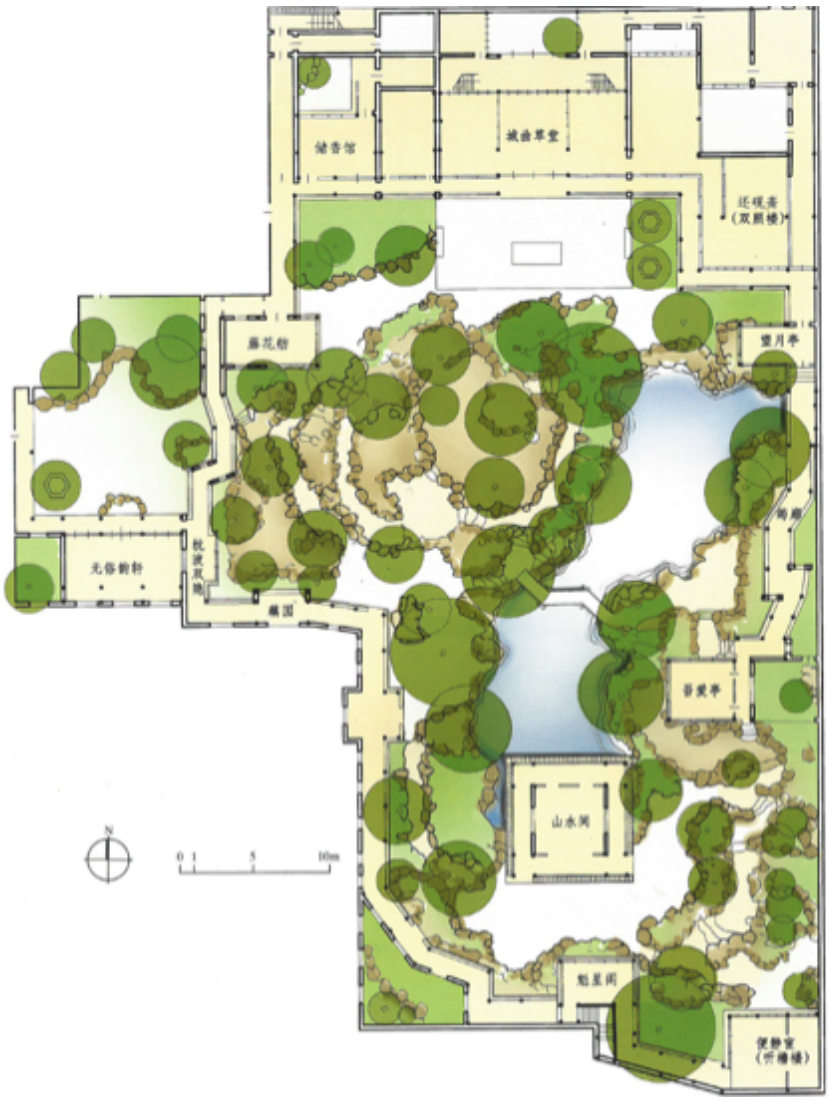

Figure 26: Master plan of Couple's Retreat Garden. (Copyright ©2010 Suzhou Institute of Landscape Architecture Design Company all right reserved used by permission).

2.2.2 American Gardens

When searching for desired gardens in United State, there are some difficulties the investigator has faced during the process. In the beginning, the investigator tended to choose gardens on those well-known landscape design firms in Michigan, however, all the designers the investigator tried to contact declined to participate. The search lasted a couple of weeks, but no ideal designers/gardens came forward. Therefore, as an alternative, the investigator decided to choose someone that is less well known, but willing to help the research.

The designer of the five selected American gardens is Dr. Jon B. Burley. Dr. Burley is an associated professor at Michigan State University, also a Fellow of American Society of Landscape Architects, and a registered landscape architect. Dr. Burley lived in Canada, and he found himself enthusiastic in garden design when he was in teenage ages. He wanted to be a professor since he was a child, and he got a Ph.D. in landscape architecture in 1995. Since 2002, Dr. Burley started working with many international landscape architects from China, France, Turkey, Portugal, and Russia and gave impressive speeches in these counties. Since then, many scholars came to MSU to visit and giving lectures.

Dr. Burley also has traveled over much of the world and had over 1100 sketches and 200 oil paintings (Figure 27). He has designed 50 gardens when he was only 27 years old, but then he thought making landscape is easy and not challenging enough. Now the most interesting things for him are writing, researching, and teaching students. He preferred writing little articles in the field of landscape architecture more than designing the garden. In 1978, Dr. Burley wrote his first paper about home landscaping when he was still an undergraduate student (Burley, 1978). Since then, he has published close to 400 articles and abstracts, and two books (one is about reclamation of planning and design, and another is about landscape history). His articles cover a

wide range of environmental content. For example, he talked about evergreens gardens (Burley, 1986); creating landscape by using prairie plants (Burley, 1990); visual quality study of flowering plants and green vegetation (Burley, 2006); planting non-native plants such as Minnesota azaleas in Michigan gardens (Burley, 2007); European gardens like a French Garden in Versailles (Burley, 2010); Chinese garden design such as the Master of Nets Garden (Burley, 2014). He also received a large amount of domestic and international rewards within the area of research, design, and teaching.

Figure 27: Dr. Burley's oil painting of the Acropolis in Athens, Greece. (Copyright ©2019 Jon Burley all right reserved used by permission).

2.2.2.1 Burley Residence

Burley Residence is located beside a beautiful lake in Gratiot County, Michigan. The whole front yard was originally an empty space with just grass (Figure 28), but Dr. Burley turned it to a functional garden with interesting features after years of construction. He removed most of the turf area and started growing woody plants and flowers. He likes to collect statues from

around the world and put them in his garden. All the elements in this garden (hardscape and plant material) were designed by him and constructed by him and his friends.

Figure 28: The original look of Burley Residence; with nearly empty space around the house. (Copyright ©2019 Xiaoyi Wang all right reserved used by permission).

The garden was connected with the house and has multiple entrances. The layout of the garden divides because of functional use. The entryway connected with the house and the garden through a wooden walkway, with ornamental flowers and sculptures along the side (Figure 29). A statue of husband and wife from China located in front of the house, which implies the romance that Dr. Burley and his wife have in this garden in their daily lives. A small deck located nearby with some toys and a basin for children to play with. There is another deck with barbecue equipment and a decorated sitting area that is surrounded by ornamental plants. Over a small bridge, a relatively larger space with children's slide and swings is located, on the side, there is another small deck with table and chairs that is shaded by evergreen trees. Because the house is beside the lake, Dr. Burley is now constructing a walking deck around the house and extends to the lake, so the garden experience can be further expanded. On the back of the house, there is an extended deck for feeding the birds, with lighting on both sides, which provide the

chance to interact with animals and nature. On the roadside, a vegetable garden started to form, and Dr. Burley is planning to have a sandy space for sports and ball games next to it. The garden covers a wide range of plant species, but the most distinctive one is the magnolias.

Figure 29: Entryway of Burley Residence with ornamental plants and Chinese Foo Dogs (a mythical creature guarding the garden) sculpture. (Copyright ©2016 Yu Wang all right reserved used by permission).

2.2.2.2 Songbird Garden

The Songbirds Garden is located at Purgatory Creek watershed basin, Minnetonka, Minnesota. The area was designed in 1980, and completed with a townhome in 1981. The site takes advantage of being close to a natural island and creek basin, where lots of birds reside (Figure 30). The main purpose of building this garden is to attract varieties of savanna-seeking songbirds. By using his experience and knowledge in landscape architecture, Burley communicated 15 design principles that were useful for creating a livable environment for songbirds (Burley, 1987).

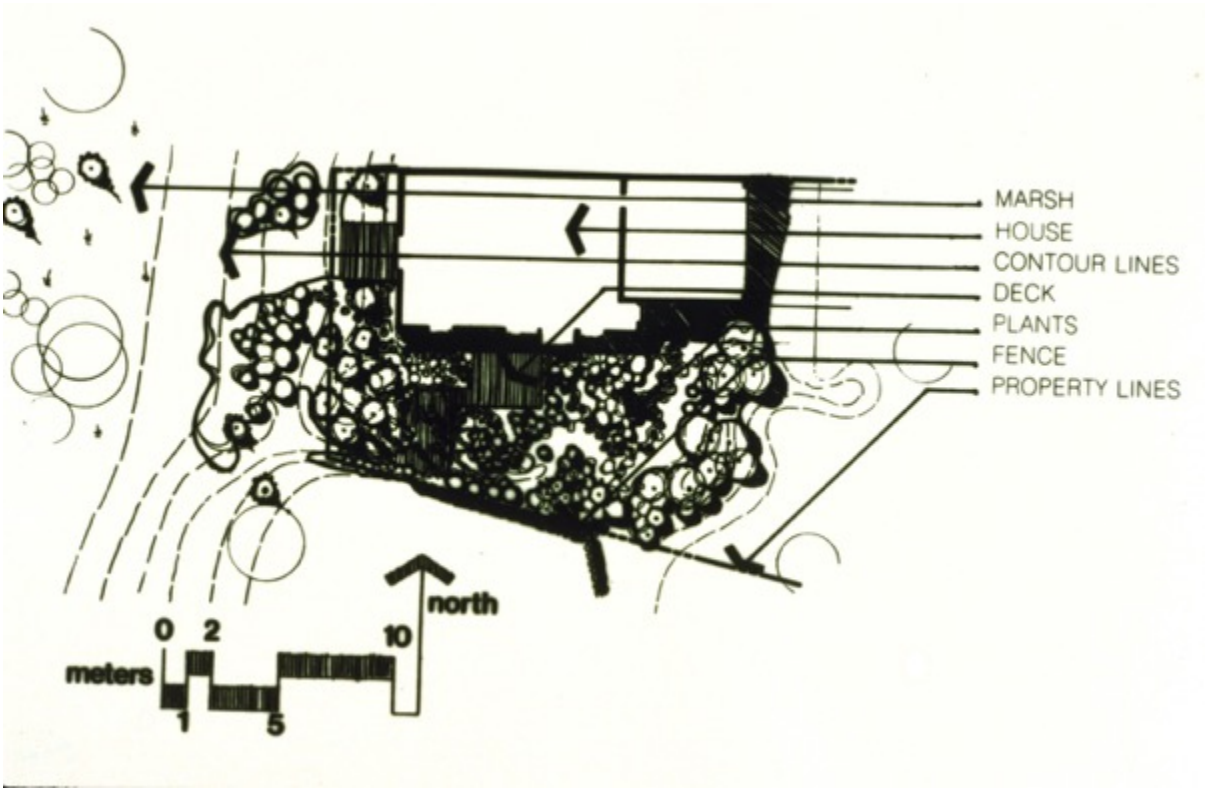

Figure 30: A Master plan of the Songbird Garden. (Copyright ©1981 Jon Burley all right reserved used by permission).

The garden was protected from the street by plant materials so it cannot be seen from the street. What makes this garden so special is that the landscapes for songbirds do not look like the traditional landscape as we commonly have seen (Figure 31). The important design elements that differ from the landscape for humans include cover, hiding area (Figure 32), feeding area, perching site (Figure 33), special composition, and climate control. Multifunctional feeders were placed throughout the site. The garden is mainly serving the songbirds, but there are also other animal species lived in this garden. For example, there is a cat stay in there every day, she will not attack birds but just mice. Also, frogs, snacks are found; turtles let their eggs there. In 1987, Dr. Burley published a paper talking about the design elements for such landscape like this, and listed 15 principles that could make it successful (Burley, 1987). In 1990, another paper was published about this garden talking about creating wildlife landscapes (Burley. C & Burley. J, 1990).

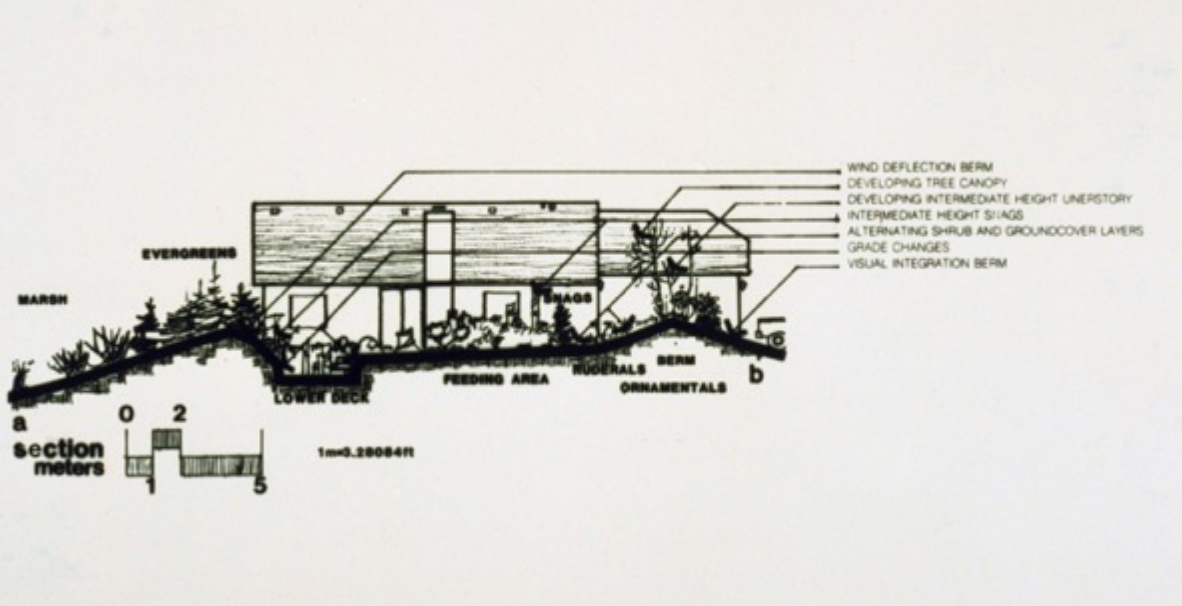

Figure 31: Section-elevation of the Songbird Garden. (Copyright ©1981 Jon Burley all right reserved used by permission).

Figure 32: A view of a shrub thicket for birds to hide in Songbird Garden. (Copyright ©1981 Jon Burley all right reserved used by permission).

Figure 33: The perching site made by a wooden buried snag for birds to perch upon in the Songbird Garden. (Copyright ©1981 Jon Burley all right reserved used by permission).

2.2.2.3 Front Yard Garden

The Front Yard Garden is located in south Minneapolis. Dr. Burley moved to this big house after he just published his first paper. The site originally had a lot of elm trees but were all removed before Dr. Burley moved in. He found that the site looked terrible because of the loss of street trees; there was garbage and sundries spread everywhere. There was one day in that August 1978 when Dr. Burley siting on the porch by the front yard, he realized that he could do something nice, so he started to design the front yard for fun. After that, his landlord found his design and talk to him, so Dr. Burley explained to him the design and wondering what could be done in real life. His landlord was please. Dr. Burley started the construction and the yard was all stalled in October. This front yard does not have many human activities, but there is a boy next door likes to bring his trunk and playing in the garden. The garden also provided a very good sidewalk experience, due to the full of ornamental plants (Figure 34). Dr. Burley thought this design is meaningful so he published a paper about it (Burley, 1984). With his influence, his neighbor did the same front yard the next year.

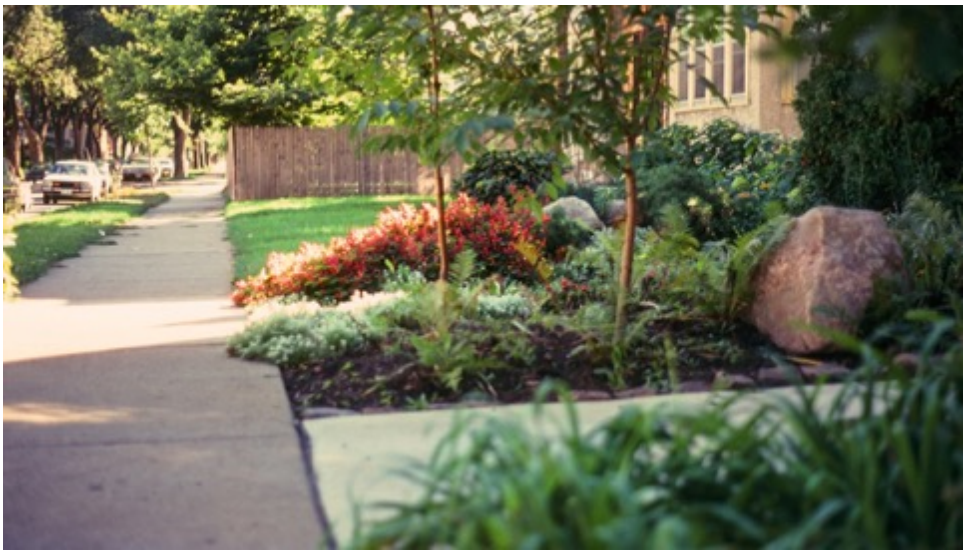

Figure 34: A view from street of the Front Yard Garden, providing enjoyable sidewalk experience. (Copyright ©1981 Jon Burley all right reserved used by permission).

2.2.2.4 Erickson Residence

The site is located at Edina, Minnesota. The owner of the house is a wealthy family, and they wanted to have a tennis court next to their house. Therefore the owner contacted Dr. Burley and wanted him to design the area. They want to have design ideas for the tennis court, the pool and the privacy of the space. Then Dr. Burley has worked on some designs. The whole design process and construction lasted 2 months with three contractors working together to build walls, stairs, grading, tennis court; Beautiful fences made by timber were created around the site to provide privacy; and some interesting pattern such as hexagon edge outside the pool. After the area was enhanced, there were a lot of fun activities happening in the space, such as swimming, partying, drinking tea, planting in vegetable gardens, and friends gathering (Figure 35). The site has a deep slope where the tennis court is 15 feet lower than the pool. The project won the Minnesota Chapter Merit Award in 1984.

Figure 35: Section of the Woodland Terrace Garden in Erickson Residence. (Copyright ©1984 Jon Burley all right reserved used by permission).

2.2.2.5 Leno Residence

The Leno Residence is located at Moorhead, Minnesota. The site was built along the Red River and covers over 1 hectare of the area. The owner invited Dr. Burley to design the space because they want to have a swimming pool next to the house, and have the area well designed (Figure 36). The owner envisioned a tight security fence around the pool so children would not drown, but it gives people a feeling like they are sitting in a prison. Therefore Dr. Burley started transforming the site by designed a swimming pool, adding a gate and lighting, and extending making the fence into the yard. Before the design, the area was just a space with grass near the river, but after about two months of construction, the site finally became an inviting, livable, and enjoyable place. People could enjoy the sun, relaxing, socializing. This project has won Minnesota Nurseryman's Association Honor Award in 1985.

Figure 36: The back yard of Leno Residence, showing the well-designed fence and lighting. (Copyright ©1984 Jon Burley all right reserved used by permission).

2.3 Data Collection

This investigation will compare the activities in the six Chinese gardens and the five American gardens. According to previous studies, there were no specific activities studied largely and systematically; instead they examined landscape contents and features.

To have a deep understanding of the garden activity, a cluster analysis could reveal the relationships between the gardens based upon activities. Thus, there is a total number of eighty-five variables selected based on the historical documents, literature review, and site visits. In terms of Chinese garden activity, there are two main document types selected for this study: ancient paintings and poems, because these are the medium that used to recorded people's daily life in the space. The author has examined a large number of paintings and poems, to determine the evidence of the ephemeral activities recorded by ancient people. For American gardens, the data were mainly selected from the site visit and literature review. A list of eighty-five variables in total was generated, as shown below (Table 1).

Table 1: List of all 85 garden activities included in the eleven study sites.

1. Painting
2. Making Poem
3. Appreciating the Moon
4. Book Reading
5. Playing Instrument
6. Playing Chess
7. Tea Drinking
8. Wine Drinking
9. Feeding Birds
10. Angling
11. Spinning

Table 1 (cont'd)

12. Literati Gathering
13. Gaming
14. Writing Calligraphy
15. Appreciating Flowers
16. Embroidering
17. Constructing
18. Swinging
19. Lotus Picking
20. Cuju (Soccer)
21. Grass Stem Fights
22. Examining Antique
23. Eating
24. Playing Traditional Opera
25. Watching Lantern
26. Examining Stone
27. Playing on the Fake Mountain
28. Feeding the Fish
29. Receiving Visitors
30. Wedding
31. Sacrificing
32. Making Fragrance
33. Buddha Blessing
34. Cultivating (Farming)
35. Carving the Horizontal Inscribed Board
36. Romance
37. People Watching
38. Enjoying the Sun
39. Sleeping
40. Overlooking
41. Resting
42. Chatting
43. Listening to the Rain
44. Watching Snow

Table 1 (cont'd)

45. Watching Frost
46. Feeling the Wind
47. Watching Cloud
48. Watching Mist
49. Watching Star
50. Sitting
51. Appreciating Plum Blossom
52. Listening Chirping of Cicada
53. Listening Bird Sound
54. Watching Sunrise
55. Watching Sunset
56. Associating (Connect in the Mind)
57. Appreciating Bamboo
58. Sitting Under the Shade
59. Boating
60. Leaning Upon a Balustrade
61. Planting Medicinal Herbs
62. Observing Mountains
63. Interacting with Red-Crowned Crane
64. Private Teaching
65. Smelling Osmanthus Fragrant
66. Interacting with Parrot
67. Practicing Meditation
68. Setting off Firecrackers
69. Petting Tiger
70. Swimming
71. Receiving Emperor
72. Drawing Well Water
73. Barbecue
74. Family Talking
75. Walking Dog
76. Planting Trees
77. Fruit Picking

Table 1 (cont'd)

78. Observing Insects
79. Watching Waterfall
80. Making Bosai
81. Exercising
82. Making Bonfire
83. Playing Ball Game
84. Playing Toys
85. Socializing

2.4 Analysis Techniques

Cluster analysis is a useful and effective tool to determine the similarities and differences of objects (Romesburg, 1984). In this investigation, a cluster analysis is used to define the similarities and differences of each garden activity by classifying similar elements into groups. By using this method, the results will be observed more clearly and to be understood easily for the audience.

To start the process, statistical software called SAS (version: 9.4 TS Level 1M2, X64_8PRO platform, English, Copyright© 2002-2012 by SAS Institute Inc., Cary, NC, USA.) was used to build the principal components analysis (PCA) of the eighty-five variables. The software has been used to examine a varied range of environmental issues.

In previous studies, people have applied this method to different researches about Asian landscapes. Yiwen Xu et al. (2015) used this to compare similarities and differences of design elements between classical Chinese gardens and modern Chinese gardens. Haoxuan Xu et al. (2017) used this to compare the elements in western and Chinese burial sites. Dexin Chen (2018) also used this method to determine similarities and dissimilarities of classical Chinese gardens,

modern Chinese gardens, and traditional Japanese Gardens. The method was also used to analyzing environmental issues. Burley. J, Singhal, Burley. D, Fasser, Churchward, Hellekson, and Raharizafy (2009) studied multi-dimensional map of the roadside; Wang (2012) examined native tree distributions in Michigan; Burley and Gray (2001) studied soil ordination and its the implications on land use; Burley and Brown (1995) investigate interpretable environments from GIS and principal component analysis; Burley and Bauer (1993) explored the reclamation of disturbed landscapes in central Florida; Burley (1991) examined recovering surface mines in Clay County, Minnesota.

After operationalizing all the variables in SAS, the result table is then shown composing the list of principal components with four categories: eigenvalue, difference, proportion, and cumulative. After the eigenvalues of the covariance matrix are generated, there are two steps for calculating the final score of each site. The first equation that is used in this research is adopted from Yiwen Xu's study of the comparison between classical Chinese gardens and modern Chinese gardens, which is shown below.

Equation 1:

Standard score of a variable = $\frac{X - \bar{X}}{SD}$

Where:

X = Each Value of Variable

$\bar{X}$ = Mean of the Variable

SD = Standard Deviation of the Variable

The second step is to calculate each site score by using the equation below.

Equation 2:

$$\text{Site Score} = [(\frac{X1 - \bar{X}1}{SD1}) k_1] + [(\frac{X2 - \bar{X}2}{SD2}) k_2] + \cdots + [(\frac{X85 - \bar{X}85}{SD85}) k_{85}]$$

Where:

X_n= Value of Each Variable

$\bar{X}_n$ = Mean of the Variable

SD_n = Standard Deviation of the Variable

k_n = Each Principal Component Coefficient

After each site score was calculated, a scatter graph can be created by using Excel (Microsoft® Excel for Mac, version: 15.32). In this two-dimensional scatter graph, the horizontal axis should be site score of one principal component set, where the vertical axis should be another principal component set; therefore, a garden score of the two principal components can be observed visually in the scatter graph. When the select sites are close to each other, it means these sites share similar characteristics than others. Finally, from each principal component, the elements of the highest coefficients and elements of lowest coefficients will be listed according to the site scores, to further illustrate the distinguish variables and its impact of the comparison.

CHAPTER 3: RESULTS

As shown in Table 1, there are a total of eighty-five possible garden activities listed in the eleven garden sites. Numbers will be recorded to determine whether the garden includes these activities or not (see Appendix A). In this study, if the activity is present in the garden, it will be shown as "1"; if the activity is absent in the garden, it will be shown as "0". Among all the eighty-five garden activities, thirty-three variables are defined as unconsidered variables because they all receive "1" in all eleven garden sites. This means these variables will not be used for the major discussion of variance.

The next step is to standardize the variables by operating the data in SAS, and then get the means and standard deviations (see Appendix B).

After the calculation of all the standardized scores of variables, principal components analysis (PCA) is ready for developing in SAS. Table 2 illustrates the eigenvalues of the covariance matrix. The first three principal components contain 74.78 percent of the variance in the datasheet, whereas the first and second principal components covered 52.32 percent and 14.36 percent of the variance respectively. According to Yiwen Xu's study, the eigenvalues that is greater than 1.0 can be seen as the most useful numbers to discuss the variance (Xu et al., 2015). In this case, the first nine principal components have the eigenvalue that is larger than 1.0; however, only the first three principal components have the most representative numbers, which will be used for further calculation of principal component coefficient in this research.

Table 2: Principal component analysis eigenvalues of the covariance matrix from SAS software.

Eigenvalues of the Covariance Matrix				
	Eigenvalue	**Difference**	**Proportion**	**Cumulative**
PRIN 1	27.2074323	19.7424411	0.5232	0.5232
PRIN 2	7.4649911	3.2510849	0.1436	0.6668
PRIN 3	4.2139063	0.4895379	0.081	0.7478
PRIN 4	3.7243684	0.8473787	0.0716	0.8194
PRIN 5	2.8769897	0.9968299	0.0553	0.8748
PRIN 6	1.8801598	0.2596458	0.0362	0.9109
PRIN 7	1.620514	0.2259088	0.0312	0.9421
PRIN 8	1.3946052	0.1781463	0.0268	0.9689
PRIN 9	1.2164588	0.8158844	0.0234	0.9923
PRIN 10	0.4005744	0.4005744	0.0077	1

The principal component analysis coefficient of each variable from SAS software then illustrated (see Appendix C), and it will be used later to calculate the site scores of all eleven garden sites. The variables that are greater than 0.18 and smaller than -0.15 in principal component 1 and variables that are greater than 0.2 and smaller than -0.2 in principal component 2 and 3 are investigated as the most distinguishable elements, which will be discussed in detail in the next chapter.

The subsequent step is to calculate the site scores of all eleven gardens by using the Equation 2 that was mentioned earlier, inputting the variable values, means, standard deviations, and principal component coefficients into the equation. The example shown below is the calculation process of the Lingering Garden in principal component 1. The result of the eleven study sites in the first three principal components is listed in Table 3.

$$\text{Site Score} = [(\frac{X1 - \bar{X}1}{SD1})\, k_1\,] + [(\frac{X2 - \bar{X}2}{SD2})\, k_2\,] + \cdots + [(\frac{X85 - \bar{X}85}{SD85})\, k_{85}\,]$$

$$= [(\frac{1 - 0.5454545}{0.522233}) \times 0.18887\,] + [(\frac{1 - 0.5454545}{0.522233}) \times 0\,] + \cdots + [(\frac{1 - 0.5454545}{0.522233}) \times -0.18887\,]$$

$$= 4.133995177$$

Table 3: Site scores of eleven gardens in first three principal components.

Study Sites	**Prin1**	**Prin2**	**Prin3**
The Humble Administrator's Garden	6.125384093	5.350579623	0.09454717
The Master of the Nets Garden	3.454400456	-5.118831137	2.668320226
The Lingering Garden	4.133995177	-2.425309228	-1.380461206
The Lion Grove Garden	3.94821225	-2.203154044	-0.068599746
The Canglang Pavilion	5.521976667	2.710656958	2.973672071
Couple's Retreat Garden	3.651864964	-0.190965183	-4.674955728
Burley Residence	-4.523734648	0.640283773	-0.442349856
Songbird Garden	-4.690565186	-0.265086895	0.201423529
Front Yard Garden	-5.90814796	0.110845531	0.164840982
Erickson Residence	-5.591563054	0.35005667	-0.775956798
Leno Residence	-6.121820384	1.04092209	1.239518162

CHAPTER 4: DISCUSSION

4.1 Scatter Graph

After all the data was generated in spreadsheet, three scatter graphs were developed to illustrate the relationship of all the eleven study sites, which was shown below. Based on the previous chapter, the first three principal components contain a large number of proportions (74.78 percent) among all the principal components. Therefore the following discussion will primarily focus on the principal component 1, principal component 2, and principal component 3.

In the first scatter graph (Figure 37), the horizontal axis presents the principal component 1, where the vertical axis presents the principal component 2. The location of dots can be seen clearly. All the five American gardens are gathered close on the negative side, where all the six Chinese gardens are located on the positive side more dispersedly. As the pattern shows an obvious distinction, the principal component 1 can be defined as the major difference between American garden and Chinese garden.

Furthermore, when recognizing the vertical axis, almost all five of the American gardens are near zero. Comparatively, the Chinese gardens are divided into two groups, two on the positive side and four on the negative side. The positive side has The Humble Administrator's Garden and The Canglang Pavilion, where the negative group includes Couple's Retreat Garden, the Lion Grove Garden, the Lingering Garden, and the Master of the Nets Garden. By observing the axis of principal component 2, the American gardens are tied close and located in the middle, while Chinese gardens are spread either in larger scores or lower scores.

Interestingly, in the third scatter graph (Figure 39), all the dots of American gardens are almost around zero, but the Chinese gardens are located around the American gardens dispersedly. Thus, the principal component 2 and 3 can be defined as the difference between classical Chinese gardens. Once the meaning of each principal component is defined, more detailed elements can be operated to further discuss the cause of formation.

Table 4: Corresponding initials of the selected gardens as shown in scatter graphs.

Name of the Study Sites	**Initials in Scatter Graphs**
The Humble Administrator's Garden	hag
The Master of the Nets Garden	mng
The Lingering Garden	lg
The Lion Grove Garden	lgg
The Canglang Pavilion	cp
Couple's Retreat Garden	crg
Burley Residence	dbg
Songbird Garden	sg
Front Yard Garden	fyg
Erickson Residence	er
Leno Residence	lr

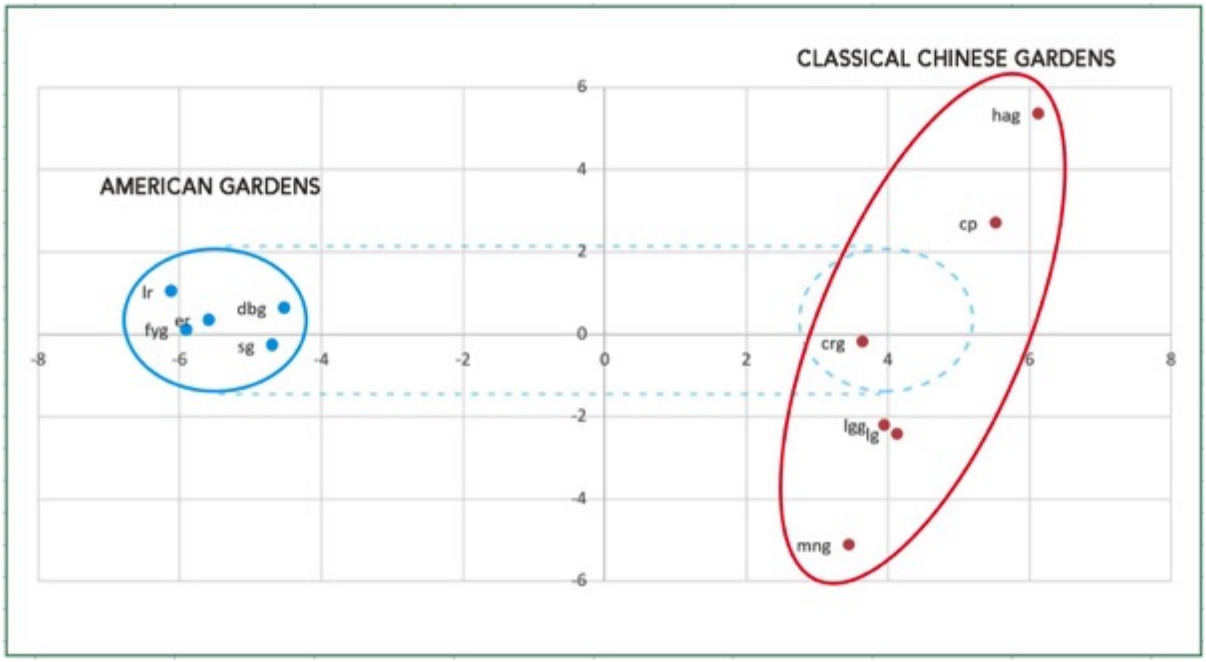

Figure 37: A scatter graph of the correlation between the eleven selected gardens based on Principal Component 1 and Principal Component 2.

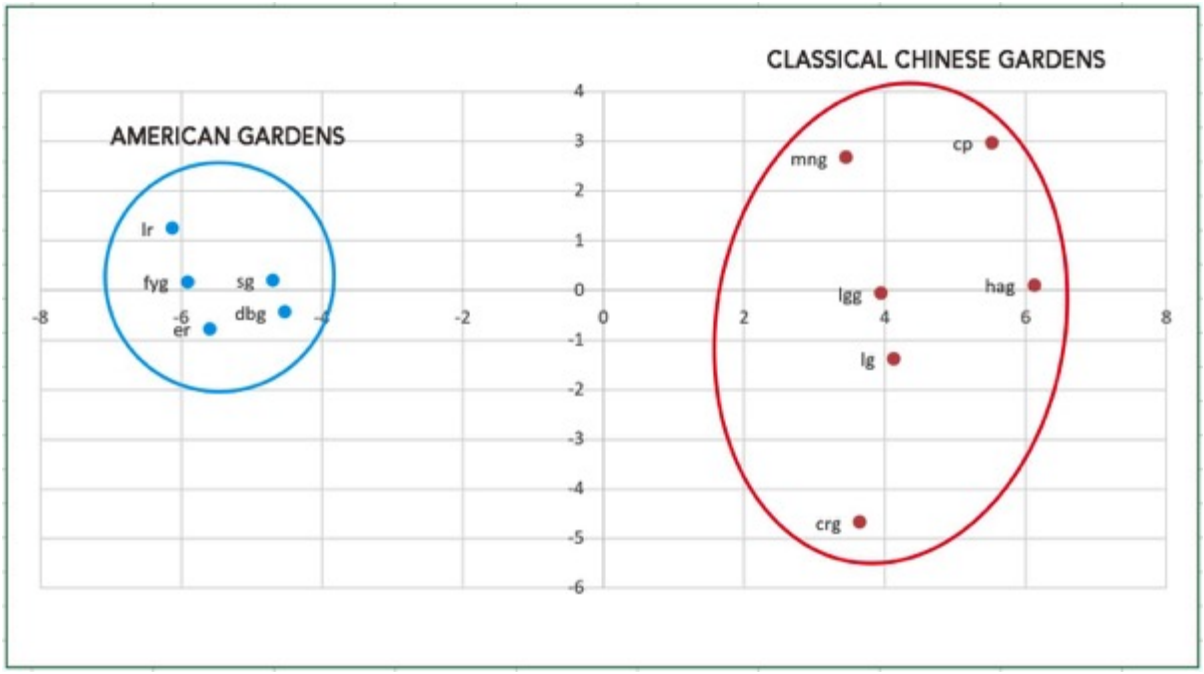

Figure 38: A scatter graph of the correlation between the eleven selected gardens based on Principal Component 1 and Principal Component 3.

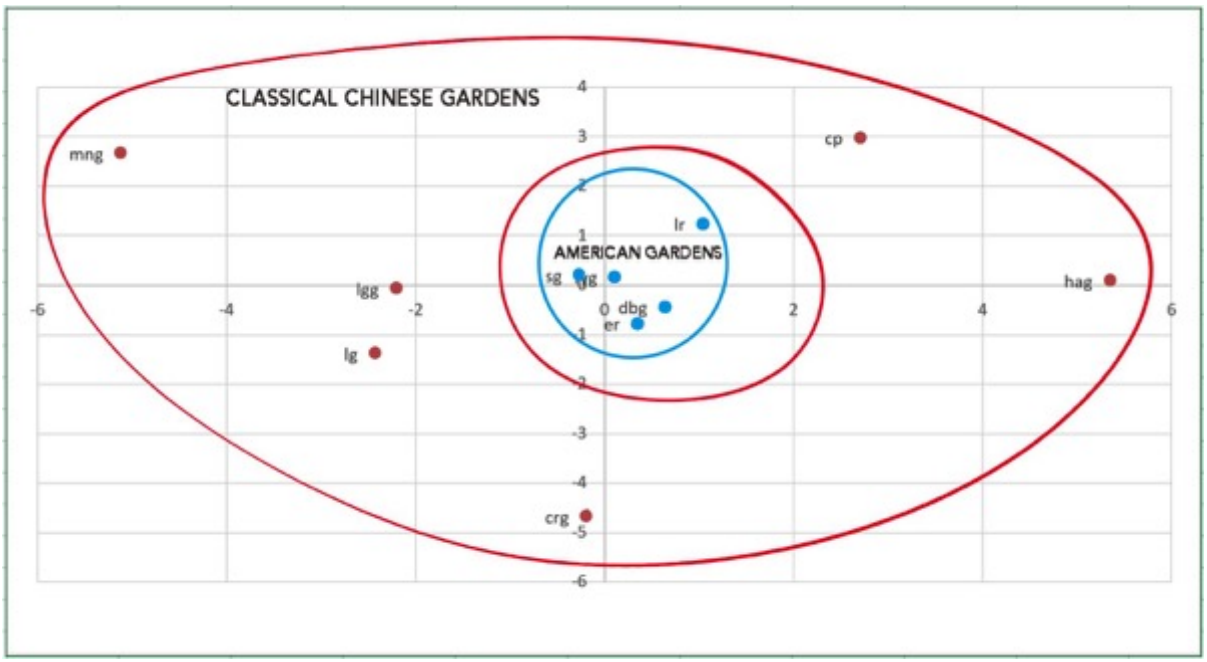

Figure 39: A scatter graph of the correlation between the eleven selected gardens based on Principal Component 2 and Principal Component 3.

4.2 Distinguishable Variables

In order to have a deeper understanding of the reason why the dots spread in certain ways, coefficient of each variable from appendix C is used for classification. Table 5 below listed the coefficients that are greater than 0.18 and Coefficients that are smaller than -0.15 in principal component 1. These distinguishable elements greater than 0.18 are the reasons for the score of all the classical Chinese gardens gets very high, and elements smaller than -0.15 cause the score of all the American gardens goes to very low. Table 6 and Table 7 also showed distinguishable variables in principal component 2 and principal component 3 respectively.

Table 5: List of distinguishable variables in Principal Component 1.

Coefficients greater than 0.18	Coefficients smaller than -0.15
Making Poem	Barbecue
Literati Gathering	Walking Dog
Writing Calligraphy	Making Bonfire
Lotus Picking	Playing Ball Game
Examining Antique	Playing Toys
Playing on the Fake Mountain	
Sacrificing	
Carving the Horizontal Inscribed Board	
Appreciating Plum Blossom	
Appreciating Bamboo	
Leaning Upon a Balustrade	
Smelling Osmanthus Fragrance	
Drawing Well Water	

Table 6: List of distinguishable variables in Principal Component 2.

Coefficients greater than 0.2	Coefficients smaller than -0.2
Angling	Interacting with Red-Crowned Crane
Grass Stem Fights	Set off Firecrackers
Playing Traditional Opera	Petting Tiger
Wedding	
Observing Mountains	
Interacting with Parrot	
Fruit Picking	

Table 7: List of distinguishable variables in Principal Component 3.

Coefficients greater than 0.2	Coefficients smaller than -0.2
Watching Lantern	Spinning
Planting Medicinal Herbs	Embroidering
Set off Firecrackers	Making Fragrance
Observing Insects	Romance
Watching Waterfall	

When examining the data, there are thirty-three variables with a score of 0 (appendix C) because these exist in all eleven sites as a zero, which listed in Table 8 below. By the meaning of that, these variables did not show any significance when calculating the site scores. However, even though some of the elements presents both in Chinese gardens and American gardens, the spiritual meaning may vary due to the culture difference and social background. More details are discussed in later sections.

Table 8: List of variables that have coefficient that is zero.

Painting
Appreciating the Moon
Book Reading
Playing Instrument
Tea Drinking
Wine Drinking
Feeding Birds
Gaming
Appreciating Flowers
Constructing
Eating
Receiving Visitors
People Watching
Enjoying the Sun
Sleeping

Table 8 (cont'd)

Overlooking
Resting
Chatting
Listening to the Rain
Watching Snow
Feeling the Wind
Watching Cloud
Watching Mist
Watching Star
Sitting
Listening Chirping of Cicada
Listening Bird Sound
Watching Sunrise
Watching Sunset
Sitting Under the Shade
Planting Trees
Exercising
Socializing

4.3 Comparison of classical Chinese gardens and American gardens

According to the first scatter graph, principal component 1 indicates the difference between classical Chinese gardens and American gardens. In addition, in table 5, the coefficients that are larger than 0.18 are the activities that happened only in the Chinese garden, where coefficients that are smaller than -0.15 are activities that happened only in American gardens. Therefore, the most distinctive differences between the Chinese garden and American garden can be seen in Table 5. The author thinks the major reason that makes such differences is because of the social background and traditional culture. In terms of traditional culture, for instance, there are many activities were born under special social conditions. For example, "literati gathering"

and “Making poems” The word “literati” in ancient china are those who are landscape painters, poets, or other scholars that focus on literature. In ancient China, especially during Ming and Qing dynasty, lots of garden designers mimicked the concept in Chinese paintings - to create a place of natural beauty with a serene and elegant atmosphere. Due to social instability, many of the scholars were extremely disappointed with the government, which lead them to create a garden. The garden thus became their spiritual wonderland: a peaceful and soothing place provided to help them escape from the turbulent society and discover their true selves by connecting with nature. Under this condition, the scholars gathered together; to make poems, to drink, to paint, thus comfort each other.

Moreover, Table 5 has suggested several plant materials that occurred only in a Chinese garden, “appreciating bamboo”, “appreciating plum blossom”, “lotus picking”, and “smelling osmanthus fragrance”; which were given a spiritual meaning beyond the object itself. In Chinese culture, people using the characteristic of these plants as a metaphor that showing one’s character and morals. For example, bamboo is the most widespread plant with a long history that used in the Chinese garden. Their stems are always straight up and never turned yellow; its leaves never full over. People use bamboo to metaphorize modesty, strong, and incorruptible personalities. Same, Lotus comes from the mud but never gets dirty; it metaphors a person who is pure and elegant. Plum blossom during the cold winter, its flower is small but lasts in the heavy snow; which indicates a personality of brave to fight, and not afraid of danger. Therefore, from the standpoint of appreciating all kinds of plants, the Chinese garden is more focused on its inner resonance, where American people focused on its aesthetic and arrangement of plant species.

Besides plants, “Examining stone” is also an exclusive cultural symbol in the Chinese garden. Stone was of great value in the eyes of ancient Chinese people; people think stone has

implied the meaning of strength, tenacity, and integrity, which also refers to one's personality. From the emperor to normal people, examine stone was an essential garden activity. Designers also use the stone to build the fake mountain to represent natural landscapes, and to achieve the "Naturalness" due to the deep influence of "harmony between man and mature".

American gardens and Chinese Gardens also share some similarities (Table 8). Table 8 indicates the activities that happened in all eleven gardens. In other research, people identified these as "insignificant" variables and did not further discuss them (Y. Xu 2015; H. Xu 2017; Chen, 2018). However in this case, even though some activities happened in both Chinese gardens and American gardens, the spiritual meaning behind them are different, thus they are worth mentioning here to express the culture difference. For instance, "appreciating moon". The moon in Chinese culture has a special meaning; it is elegant, quiet, and poetic. Many poets like to use the moon as an intermediary to express their miss of friends, family, or hometown. The mid-autumn festival also called reunion festival, because the full moon indicates reunion in Chinese culture. In poet Wang Anshi's poem "Spring breeze green the river in Jiangnan, when will the bright moon shine on the way home?" the moon sustenance a deep miss of hometown. Thus, from authors standpoint, appreciating the moon in most of the American garden's are just by observing at the beauty of it, where Chinese people put many of their emotion to it.

Another example is "Wine drinking", as mentioned in the literature review; Chinese people in the garden tend to drink wine while doing some poetical activities, such as making a poem. When people drink~~ing~~ in American gardens, mostly they are partying with friends and families, with some music playing. Again, the reason for this is because of the social and cultural background; people who lived in these gardens are scholars like painters or poets, but people who lived in American gardens are just normal people.

However in America, at least in these study sites, such social background like in ancient China did not exist, therefore the garden in this case simply provides a place to feel the nature, to play and to relax. Activities like barbequing, walking the dog, making a bonfire, playing a ball game, playing toys are the typical American-styles, which rarely happen in the Chinese garden. In the author's opinion, American garden's activities are more busy and active; they usually gather with friends and families. Instead, Chinese garden activities are relatively more quiet and implicit, although there are also scholar's gathering in the space, most of the time they spend is connecting their mind to nature.

One interesting appearance in the first scatter graph shows that Burley Residence was a little bit closer to the Chinese garden side compare to the other American gardens. The author thinks this is because Dr. Burley knows a lot about Chinese culture, and loves to follow the example of ancient literati. Things Dr. Burley will also do in his garden just like Chinese literati include drinking, painting, associating (connect in mind), examining antique, practicing meditation, etc.

To conclude, classical Chinese garden and American garden shared few similarities, but the environment, times, art, culture, technology and other factors have lead Chinese garden and American garden to a completely different direction.

4.4 Comparison of the Six Chinese gardens

As the results showed in the first scatter graph, the American gardens formed a closer group than the group of the Chinese garden, meaning they are very similar in terms of social background, cultural context, environment, and design elements; while the Chinese gardens are

spread far away from each other. As listed in Table 6, the distinguishable elements larger than 0.2 led The Humble Administrator's Garden and The Canglang Pavilion goes to the positive side. Likewise, distinguishable elements smaller than -0.2 causes the score of Couple's Retreat Garden, the Lion Grove Garden, the Lingering Garden, and the Master of the Nets Garden goes to the bottom.

The reason for the dots of the Chinese garden separated from each other is various. The Humble Administrator Garden covers the largest area among all the Chinese gardens. Thus, its spatial layout is relatively more functional and included more activities than the other five gardens. For instance, just in terms of the pool area, The Humble Administrator Garden has the largest pool area, thus covered many activities that around water, such as angling, lotus picking, watching fish, and boating, which many of these were limited in other gardens due to the small area of the pond. Also, activities, like playing traditional opera, making bonsai, need more space and more people involved; the Humble Administrator Garden does have the strength to accomplish during that period.

The reason Canglang pavilion distributed close to the Humble Administrator Garden, the author thinks is because it’s a long history and owners. Canglang Pavilion has the longest history among all these gardens, and experienced many owners, thus the activities that happened here were diverse. Angling, playing traditional opera, boating, private teaching, interacting with parrot, watching waterfall; it is not hard to see how much the owner loved water, the garden was originally built beside Canglang water, and the name Canglang means “Surging wave”, there were also many poets making poems and do painting about Canglang Pavilion and the water. So in the author’s opinion that is the reason why Canglang pavilion had so many activities around water.

Another group gathered Couple's Retreat Garden, the Lion Grove Garden, the Lingering Garden, and the Master of the Nets Garden. In these gardens, the Lion Grove Garden and the Lingering Garden are very close to each other while the Master of the Nets Garden is furthest away. The distinguishable elements in these gardens are interacting with red-crowned crane, set off firecrackers, petting tiger. Master of the Nets Garden was the smallest in the area among all Suzhou Gardens. However, the garden got many interesting and unique activities; setting off firecrackers and petting tiger have only happened in this garden. The main reason that tied the Lion Grove Garden and the Lingering Garden together is because these two gardens were received by the emperor; and people did Buddha worshiping in the places.

Although the investigator could not provide a specific definition for these two groups, the distinguishable activities in each garden were indicated, so people can see the major difference between them.

4.5 Future Implication

By comparing and analyzing different activities occurring in the garden space, this study illustrates that the value of a gardens is not merely reflected in their ornamental attributes, but also numerous activities at the spiritual level that exert crucial impacts on gardens.

Chinese classical gardens are also the main content of the resources of literature tourism today (Chen, 2013). Another research paper (Sofield & Li, 1998) mentioned that Chinese people tended to go to the place associated with the story of ancient poetry when traveling to historic sites because many travelers know some history more or less. These ancient poems add the value

of the historic sites and are helpful for people to understand the site. However, due to the fast development of the economy and the urbanization, Chinese people have ignored many of the traditional cultures when they visit a historical site (Zhou, Zhang & Edelheim, 2013).

This paper mainly provides a reference for the landscape architecture designers. In the process of the creation of scenic areas and the development of the landscape gardens in the future, the designers need to take these traditional cultures as a consideration, making those gardens more meaningful. For example, providing more opportunities for people to do all kinds of activities in the garden according to local culture.

Secondly, some research methods in this study can be used to benefit the historical scholars for their future studies as well as other types of historical research. For the tourism aspect, this study helps to organize the planning and management of the historical destinations like Suzhou Gardens and contributes to social development. For educational purposes, the author hopes that for people today, especially the young generation, could also benefit from this study. For example, when people visit a classical garden, they would not only focus on the visual elements but also think about the cultural background about the site. Today in China, there are an increasing number of contemporary gardens built (Mao, Liang & Zhang, 2017); the investigator believes that it is every Chinese persons duty and responsibility to preserve and promote these important traditional cultures in order to promote the success of society.

4.6 Limitations and Suggestion for Future Research

Owing to some objective limitations, this paper has the following deficiencies. First, the variables collected for this study were based on the author's personal experience and

understanding. Thus there might be some bias on these variables. More, the 85 variables can be further classified to a different type of activities, for example, sports activity, literary activity, children's activity, and festival activity, which can be seen more clearly. Due to the time limit and the amount of research, the author suggests that future studies could focus more on the classification of garden activities.

For classical Chinese gardens, there are two groups divided by principal 2, but the author did not find a clear definition to summarize these two groups. The results may because of the limitation on historical documents or the shortage of knowledge. On account of the historical research method used for Chinese gardens in this study, some documents can only be found in specific places, some of which are hard to get access yet such as the online library of Chinese institutions. Besides, due to the age of these documents, some poems or paintings might be damaged or not open to the public, which affects the authenticity of this research more or less. By saying that, if the author cannot find any document about a certain activity, it does not mean that it does not exist, it only means no evidence could be found.

Furthermore, the geographical scope of this study focuses only on Suzhou city, where the gardens are typical representatives of Chinese classical gardens. However, to some extent, many garden activities and customs in the north are different from those in the south. Consequently, these results cannot be generalized outside of the southern China region. Also, the private garden is just one category of the Chinese garden, there are other types of Chinese garden which also worth studying, such as the emperor garden and scenic spots. In prospective studies, the author will further broaden the scope of the research subject and conduct a more in-depth analysis.

In terms of American gardens, the biggest challenge the author faced was the limitation on garden selection. Many wells know designers the author tried to contact rejected to participate; some did not respond at all. As a result, Dr. Burley offered the opportunities of his own accord; to allow the author to study his five American gardens. It is not Dr. Burley trying to show off his work, but wanting to help the student complete the research. Because all the five gardens come from the same designer, therefore the diversity of garden selection was limited. In the future study, the selection of American gardens can be extended national wide and from different designers, in order to have more comprehensive variables.

Finally, due to the limited time and knowledge, there are still some deficiencies in the depth and breadth of the interpretation. Many of the explanations about the results are subjective and may cause some bias due to the lack of research experience, or not understanding the local culture fully. Besides, the time of the data collection happened in different seasons, the Chinese site visit occurred during summertime where the American gardens are in the wintertime, which may affect the diversity of the variables. As there are no similar studies about the topic found, these deficiencies call for further research and reinforcement in this respect.

APPENDICES

Appendix A: List of garden activities and existence in the eleven garden sites.

Activities	Classical Chinese Gardens						American Gardens				
	The Humble Administrator's Garden	The Master of the Nets Garden	The Lingering Garden	The Lion Grove Garden	The Canglang Pavilion	Couple's Retreat Garden	Dr. Burley's Garden	Songbird Garden	Front Yard Garden	Erickson Residence	Leno Residence
Painting	1	1	1	1	1	1	1	1	1	1	1
Making Poem	1	1	1	1	1	1	0	0	0	0	0
Appreciating the Moon	1	1	1	1	1	1	1	1	1	1	1
Book Reading	1	1	1	1	1	1	1	1	1	1	1
Playing Instrument	1	1	1	1	1	1	1	1	1	1	1
Playing Chess	1	1	1	1	1	1	1	1	0	0	1
Tea Drinking	1	1	1	1	1	1	1	1	1	1	1
Wine Drinking	1	1	1	1	1	1	1	1	1	1	1
Feeding Birds	1	1	1	1	1	1	1	1	1	1	1
Angling	1	0	0	0	1	0	0	0	0	0	0
Spinning	1	0	0	0	0	1	0	0	0	0	0
Literati Gathering	1	1	1	1	1	1	0	0	0	0	0
Gaming	1	1	1	1	1	1	1	1	1	1	1
Writing Calligraphy	1	1	1	1	1	1	0	0	0	0	0
Appreciating Flowers	1	1	1	1	1	1	1	1	1	1	1
Embroidering	1	0	0	0	0	1	0	0	0	0	0
Constructing	1	1	1	1	1	1	1	1	1	1	1
Swinging	0	0	0	0	0	0	1	0	0	0	1
Lotus Picking	1	1	1	1	1	1	0	0	0	0	0
Cuju (Soccer)	1	1	0	0	0	0	0	0	0	0	0
Grass Stem Fights	1	0	0	0	1	0	0	0	0	0	0

Appendix A (cont'd)

Examining Antique	1	1	1	1	1	1	1	0	0	0	0
Eating	1	1	1	1	1	1	1	1	1	1	1
Playing Traditional Opera	1	0	0	0	1	1	0	0	0	0	0
Watching Lantern	1	1	0	0	1	0	0	0	0	0	1
Examining Stone	1	1	1	1	1	1	0	0	0	0	0
Playing on the Fake Mountain	1	1	1	1	1	1	0	0	0	0	0
Feeding the Fish	1	1	1	1	1	1	1	0	0	0	0
Receiving Visitors	1	1	1	1	1	1	1	1	1	1	1
Wedding	1	0	0	0	0	0	0	0	0	0	0
Sacrificing	1	1	1	1	1	1	0	0	0	0	0
Making Fragrance	1	0	0	0	0	1	0	0	0	0	0
Buddha Blessing	1	0	1	1	1	0	0	0	0	0	0
Cultivating (Farming)	0	1	1	0	0	1	1	1	1	1	1
Carving the Horizontal Inscribed Board	1	1	1	1	1	1	0	0	0	0	0
Romance	0	0	0	0	0	1	1	0	0	1	1
People Watching	1	1	1	1	1	1	1	1	1	1	1
Enjoying the Sun	1	1	1	1	1	1	1	1	1	1	1
Sleeping	1	1	1	1	1	1	1	1	1	1	1
Overlooking	1	1	1	1	1	1	1	1	1	1	1
Resting	1	1	1	1	1	1	1	1	1	1	1
Chatting	1	1	1	1	1	1	1	1	1	1	1
Listening to the Rain	1	1	1	1	1	1	1	1	1	1	1
Watching Snow	1	1	1	1	1	1	1	1	1	1	1
Watching Frost	1	0	0	0	0	0	1	1	1	1	1
Feeling the Wind	1	1	1	1	1	1	1	1	1	1	1
Watching Cloud	1	1	1	1	1	1	1	1	1	1	1
Watching Mist	1	1	1	1	1	1	1	1	1	1	1
Watching Star	1	1	1	1	1	1	1	1	1	1	1
Sitting	1	1	1	1	1	1	1	1	1	1	1
Appreciating Plum Blossom	1	1	1	1	1	1	0	0	0	0	0
Listening Chirping of Cicada	1	1	1	1	1	1	1	1	1	1	1

Appendix A (cont'd)

Listening Bird Sound	1	1	1	1	1	1	1	1	1	1	1
Watching Sunrise	1	1	1	1	1	1	1	1	1	1	1
Watching Sunset	1	1	1	1	1	1	1	1	1	1	1
Associating (Connect in the Mind)	1	1	1	1	1	1	1	0	0	0	0
Appreciating Bamboo	1	1	1	1	1	1	0	0	0	0	0
Sitting Under the Shade	1	1	1	1	1	1	1	1	1	1	1
Boating	1	0	1	0	1	1	0	0	0	0	0
Leaning Upon a Balustrade	1	1	1	1	1	1	0	0	0	0	0
Planting Medicinal Herbs	0	1	0	0	0	0	0	1	1	0	1
Observing Mountains	1	0	0	0	1	0	0	0	0	0	0
Interacting with Red-Crowned Crane	0	1	1	0	0	0	0	0	0	0	0
Private Teaching	1	0	0	1	1	0	1	0	0	0	1
Smelling Osmanthus Fragrant	1	1	1	1	1	1	0	0	0	0	0
Interacting with Parrot	1	0	0	0	1	0	0	0	0	0	0
Practicing Meditation	1	1	1	1	1	1	1	0	0	0	0
Setting off Firecrackers	0	1	0	0	0	0	0	0	0	0	0
Petting Tiger	0	1	0	0	0	0	0	0	0	0	0
Swimming	0	0	0	0	0	0	0	0	0	0	1
Receiving Emperor	1	0	1	1	1	0	0	0	0	0	0
Drawing Well Water	1	1	1	1	1	1	0	0	0	0	0
Barbecue	0	0	0	0	0	0	1	0	1	1	1
Family Talking	1	0	0	0	0	1	1	1	1	1	1
Walking Dog	0	0	0	0	0	0	1	0	1	1	1
Planting Trees	1	1	1	1	1	1	1	1	1	1	1
Fruit Picking	1	0	1	0	1	1	1	1	1	1	1
Observing Insects	1	1	0	0	1	0	1	1	1	1	1
Watching Waterfall	0	0	0	0	1	0	0	0	0	0	0
Making Bosai	1	0	1	0	0	0	0	0	0	0	0
Exercising	1	1	1	1	1	1	1	1	1	1	1
Making Bonfire	0	0	0	0	0	0	1	1	1	0	1
Playing Ball Game	0	0	0	0	0	0	1	0	1	1	1
Playing Toys	0	0	0	0	0	0	1	1	1	1	1

Appendix A (cont'd)

Socializing	1	1	1	1	1	1	1	1	1	1	1

Appendix B: Means and standard deviation of the variables.

Variables	Mean	Std. Dev.
Painting	1	0
Making Poem	0.5454545	0.522233
Appreciating the Moon	1	0
Book Reading	1	0
Playing Instrument	1	0
Playing Chess	0.8181818	0.4045199
Tea Drinking	1	0
Wine Drinking	1	0
Feeding Birds	1	0
Angling	0.1818182	0.4045199
Spinning	0.1818182	0.4045199
Literati Gathering	0.5454545	0.522233
Gaming	1	0
Writing Calligraphy	0.5454545	0.522233
Appreciating Flowers	1	0
Embroidering	0.1818182	0.4045199
Constructing	1	0
Swinging	0.1818182	0.4045199
Lotus Picking	0.5454545	0.522233
Cuju (Soccer)	0.1818182	0.4045199
Grass Stem Fights	0.1818182	0.4045199
Examining Antique	0.6363636	0.504525
Eating	1	0
Playing Traditional Opera	0.2727273	0.4670994
Watching Lantern	0.3636364	0.504525
Examining Stone	0.5454545	0.522233
Playing on the Fake Mountain	0.5454545	0.522233
Feeding the Fish	0.6363636	0.504525
Receiving Visitors	1	0
Wedding	0.0909091	0.3015113

Appendix B (cont'd)

Sacrificing	0.5454545	0.522233
Making Fragrance	0.1818182	0.4045199
Buddha Blessing	0.3636364	0.504525
Cultivating (Farming)	0.7272727	0.4670994
Carving the Horizontal Inscribed Board	0.5454545	0.522233
Romance	0.3636364	0.504525
People Watching	1	0
Enjoying the Sun	1	0
Sleeping	1	0
Overlooking	1	0
Resting	1	0
Chatting	1	0
Listen to the Rain	1	0
Watching Snow	1	0
Watching Frost	0.5454545	0.522233
Feeling the Wind	1	0
Watching Cloud	1	0
Watching Mist	1	0
Watching Star	1	0
Sitting	1	0
Appreciating Plum Blossom	0.5454545	0.522233
Listening Chirping of Cicada	1	0
Listening Bird Sound	1	0
Watching Sunrise	1	0
Watching Sunset	1	0
Associating (Connect in the Mind)	0.6363636	0.504525
Appreciating Bamboo	0.5454545	0.522233
Sitting Under the Shade	1	0
Boating	0.3636364	0.504525
Leaning Upon a Balustrade	0.5454545	0.522233
Planting Medicinal Herbs	0.3636364	0.504525
Observing Mountains	0.1818182	0.4045199

Appendix B (cont'd)

Interacting with Red-Crowned Crane	0.1818182	0.4045199
Private Teaching	0.4545455	0.522233
Smelling Osmanthus Fragrant	0.5454545	0.522233
Interacting with Parrot	0.1818182	0.4045199
Practicing Meditation	0.6363636	0.504525
Setting off Firecrackers	0.0909091	0.3015113
Petting Tiger	0.0909091	0.3015113
Swimming	0.0909091	0.3015113
Receiving Emperor	0.3636364	0.504525
Drawing Well Water	0.5454545	0.522233
Barbecue	0.3636364	0.504525
Family Talking	0.6363636	0.504525
Walking Dog	0.3636364	0.504525
Planting Trees	1	0
Fruit Picking	0.8181818	0.4045199
Observing Insects	0.7272727	0.4670994
Watching Waterfall	0.0909091	0.3015113
Making Bosai	0.1818182	0.4045199
Exercising	1	0
Making Bonfire	0.3636364	0.504525
Playing Ball Game	0.3636364	0.504525
Playing Toys	0.4545455	0.522233
Socializing	1	0

Appendix C: Principal component analysis coefficient of each variable from SAS software.

Activities	Prin1	Prin2	Prin3
Painting	0	0	0
Making Poem	0.18887	-0.048148	-0.017608
Appreciating the Moon	0	0	0
Book Reading	0	0	0
Playing Instrument	0	0	0
Playing Chess	0.104486	-0.015263	0.03585
Tea Drinking	0	0	0
Wine Drinking	0	0	0
Feeding Birds	0	0	0
Angling	0.105828	0.266951	0.179995
Spinning	0.088836	0.170863	-0.268708
Literati Gathering	0.18887	-0.048148	-0.017608
Gaming	0	0	0
Writing Calligraphy	0.18887	-0.048148	-0.017608
Appreciating Flowers	0	0	0
Embroidering	0.088836	0.170863	-0.268708
Constructing	0	0	0
Swinging	-0.096726	0.055674	0.046766
Lotus Picking	0.18887	-0.048148	-0.017608
Cuju (Soccer)	0.087042	0.007674	0.162082
Grass Stem Fights	0.105828	0.266951	0.179995
Examining Antique	0.162544	-0.032838	-0.039033
Eating	0	0	0
Playing Traditional Opera	0.120385	0.22571	-0.081631
Watching Lantern	0.065419	0.105763	0.328127
Examine Stone	0.18887	-0.048148	-0.017608
Playing on the Fake Mountain	0.18887	-0.048148	-0.017608
Feeding the Fish	0.162544	-0.032838	-0.039033
Receiving Visitors	0	0	0
Wedding	0.074669	0.237721	0.007441
Sacrificing	0.18887	-0.048148	-0.017608
Making Fragrance	0.088836	0.170863	-0.268708

Appendix C (cont'd)

Buddha Blessing	0.14373	0.091145	0.076158
Cultivating (Farming)	-0.122717	-0.168003	-0.152395
Carving the Horizontal Inscribed Board	0.18887	-0.048148	-0.017608
Romance	-0.091684	0.048863	-0.218894
People Watching	0	0	0
Enjoying the Sun	0	0	0
Sleeping	0	0	0
Overlooking	0	0	0
Resting	0	0	0
Chatting	0	0	0
Listen to the Rain	0	0	0
Watching Snow	0	0	0
Watching Frost	-0.14576	0.185397	0.021905
Feeling the Wind	0	0	0
Watching Cloud	0	0	0
Watching Mist	0	0	0
Watching Star	0	0	0
Sitting	0	0	0
Appreciating Plum Blossom	0.18887	-0.048148	-0.017608
Listening Chirping of Cicada	0	0	0
Listening Bird Sound	0	0	0
Watching Sunrise	0	0	0
Watching Sunset	0	0	0
Associating (Connect in the Mind)	0.162544	-0.032838	-0.039033
Appreciating Bamboo	0.18887	-0.048148	-0.017608
Sitting Under the Shade	0	0	0
Boating	0.141571	0.144571	-0.140507
Leaning Upon a Balustrade	0.18887	-0.048148	-0.017608
Planting Medicinal Herbs	-0.096644	-0.112369	0.201038
Observing Mountains	0.105828	0.266951	0.179995
Interacting with Red-Crowned Crane	0.068948	-0.249828	0.075551
Private Teaching	0.034838	0.193391	0.172531
Smelling Osmanthus Fragrant	0.18887	-0.048148	-0.017608

Appendix C (cont'd)

Interacting with Parrot	0.105828	0.266951	0.179995
Practicing Meditation	0.162544	-0.032838	-0.039033
Setting off Firecrackers	0.04211	-0.227425	0.210014
Petting Tiger	0.04211	-0.227425	0.210014
Swimming	-0.074626	0.046247	0.097559
Receiving Emperor	0.14373	0.091145	0.076158
Drawing Well Water	0.18887	-0.048148	-0.017608
Barbecue	-0.161328	0.056877	0.008752
Family Talking	-0.124272	0.186833	-0.197219
Walking Dog	-0.161328	0.056877	0.008752
Planting Trees	0	0	0
Fruit Picking	-0.06726	0.242471	-0.152511
Observing Insects	-0.092332	0.138216	0.311131
Watching Waterfall	0.067314	0.120432	0.234047
Making Bosai	0.093217	0.096871	-0.075438
Exercising	0	0	0
Making Bonfire	-0.154765	0.040544	0.054724
Playing Ball Game	-0.161328	0.056877	0.008752
Playing Toys	-0.18887	0.048148	0.017608
Socializing	0	0	0

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