

SIMILARITIES AND DISSIMILARITIES OF LANDSCAPE ARTISTS

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ABSTRACT

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Landscape artists express their interpretations for landscapes in different media and by various tools. The choices of media, tools, and techniques to draw or paint are the artists' principles to differentiate them. This study discovers how similar and different these artists are. This research transforms artists' principles into the numerical data, and then analyzes the data through Principal Component Analysis (PCA). The raw data are from the techniques or characters that the author studies derived from articles and books, and the observations of artists' artworks. The selected artists are Mike Lin, Jon Burley, Robert Oliver, Michael Doyle, Robert Wood, William Kent, and Claude Monet. The result of PCA indicates that six valid dimensions explain all variances, and are based on one hundred and fifty-six principles. The first two components, with 48.66% variance explained, depict that the artist can be grouped to three different clusters: graphic artists, space designers, and painters.

Keywords: design arts, fine arts, design principles, architectural drawing, drafting techniques.

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CHAPTER 1: INTRODUCTION AND LITERATURE REVIEW

1.1 Introduction

Nature is a great treasure. It provides us the materials we need for living, entertainment opportunities, and even spiritual inspirations. In *Walden*, Thoreau (1882) stated that “I went to the woods because I wished to live deliberately, to front only the essential facts of life, and see if I could not learn what it had to teach, and not, when I came to die, discover that I had not lived” (p. 143). By embracing with nature, Thoreau tried to find what are essential to his spirit, not material needs, for living.

Natural scenes motivate people to create, and they attract artists to draw, paint, design, and modify them. Different artists present the landscapes in different ways. Landscape artists are the artists who present the landscapes how they understand it, using different media. It is a personal choice for them to choose what they extract from the natural scenes. It is also their preferences to decide what tools and media to present what they interpret what they see.

There are too many forms of landscape arts, and this study does not extend to the non-traditional formats other than papers and canvas. I select seven artists from different professions: architect, landscape architect, and landscape painter. Some artists are versatile, and with many skills. In this paper, we will roughly classify them into technical landscape drawers and landscape painters.

1.1.1 Landscape Architectural And Architectural Drawings

When people visit designers' offices and studios in the build environment field, such as landscape architects, architects, and interior designers, they usually could find many drawings on draft tables or walls. Although many offices use computer-rendering images to present their ideas as today's technologies evolve, the drawings still function as the record of their conceptual ideas, revisions for developing ideas, and formal presentations to their by builders. These drawings could be sketchy and freehand or rigorous and precise with hard-edged lines (Robbins and Cullinan, 1994).

The landscape architectural drawings and architectural drawings are different from landscape paintings or other arts. Architectural drawings make architectural ideas possible by the way how the designers brainstorm the ideas from their brains and experiences (Frascari, 2011); other designers in the build environment field also uses drawings to express and evolve their ideas in this way.

To effectively produce the drawings, there is much advices and suggestions from professionals. In this study, I collected their advice and suggestions as part of their principles.

1.1.2 Landscape Paintings

Paintings are classified into different genres. Genre is a style or category of art, and it has a category of painting called genre (Kleiner and Mamiya, 2005). Generally, the major genres of paintings are history, portraiture, genre, landscape, and still life (Newall and Pooke, 2007).

History genre depicts historical, religious, and mythological scenes, as well as the sacred figures; genre paintings present daily life; while still life genre pictures compositions of non-living objects, flowers, and fruit (Walsh, 1999).

1.2 Aim and Scope

The purpose of the study is to compare how similar these artists are and what the variables are to influence their relations. I also analyze the data of the principle variances by Principal Component Analysis (PCA) in Statistical Analysis System (SAS) program for dimension simplification.

1.3 Problem Statement

The aim of this paper is to study how similar the selected landscape artists are between each other. I would like to quantify all the data by collecting the artists' principles, and then use statistical method to analyze the data. During the process of converting all normative theories into quantitative data, I will address the following questions:

1. What are the major measurable variables for the landscape drawing and painting principles?
2. How similar or different the elements are among them?
3. Are all principles equally important, according to the metric approach?
4. How is the metric approach valuable for future studies?

1.4 The Artists

1.4.1 William Kent

William Kent is a versatile artist. He is a painter, interior and furniture designer, and landscape gardener. Kent was trained as a painter in Rome in his early days, and later as an architect (Jourdain, 1948).

Most of his art pieces are presented as historical paintings, interior decorations, and technical drawings of architecture and furniture. There are few landscape drawings or sketches left to show his garden design. Some examples shown in the book *The Work of William Kent* (Jourdain, 1948) are a drawing of Venus's Vale, located at Rousham, Oxfordshire, England (p. 158), and a sketch for the temple of the Mill and "Eyecatcher", in Rousham, Oxfordshire, England (p. 163). In *William Kent: Designing Georgian Britain*, Weber (2013) provides many other of Kent's landscape sketches.

In these sketches, Kent placed simple compositions, spacious white spaces, and vast grasslands and forests, with the highlights of few architectural elements. The topography was usually clear to inform viewers by the contrast of void and mass. Sometimes Kent drew the white space next to the shadow space with the forty-five degree strokes to show the relationship of void and mass, sometimes with white space and ink washes, and sometimes the white space and the combination of ink washes and pen strokes.

Kent always inserted architectural elements into landscapes, and the structures that often fit the topographic setting where they placed (Weber, 2013). The most famous structure that he put in landscape was ha-ha wall, a retaining wall without interrupted views of landscape. A ha-ha wall prevents access to a garden by animals.

1.4.2 Claude Monet

Claude Monet is a French Impressionist pioneer. He depicted the environments and the activities he has experienced, such as the leisure activities in Argenteuil, Paris' suburb. His landscape painting gains a worldwide recognition because his choices of colors and the light and atmosphere effects.

Monet's philosophy of painting was to paint what you really see. You should not paint what you think you ought to see, nor the object isolated as in a test tube; but the object enveloped in sunlight and atmosphere, with the blue dome of Heaven reflected in the shadows (Perry, 120). By painting what he sees, Monet abandons traditional approach to create landscape painting. For example, classical paintings always use dark neutral colors, like black or grey, for shadows. By observation, Impressionists see blue or purple shadows on snow.

Monet changed his painting styles through all the years. In his early years in painting, he studied in a classical school in Le Havre, and tried to enter in the official Salon (Galenson, 2006). This period of experience influenced his painting style as well. *The Woman in the Green Dress*, created in 1866 and displayed in Kunsthalle Bremen, was Monet's early entry for entering

in the Salon. In this painting, Monet painted dark background, and depicted a classical pose of Camille Doncieux, who was Monet's models for many other famous portrait paintings and his first wife.

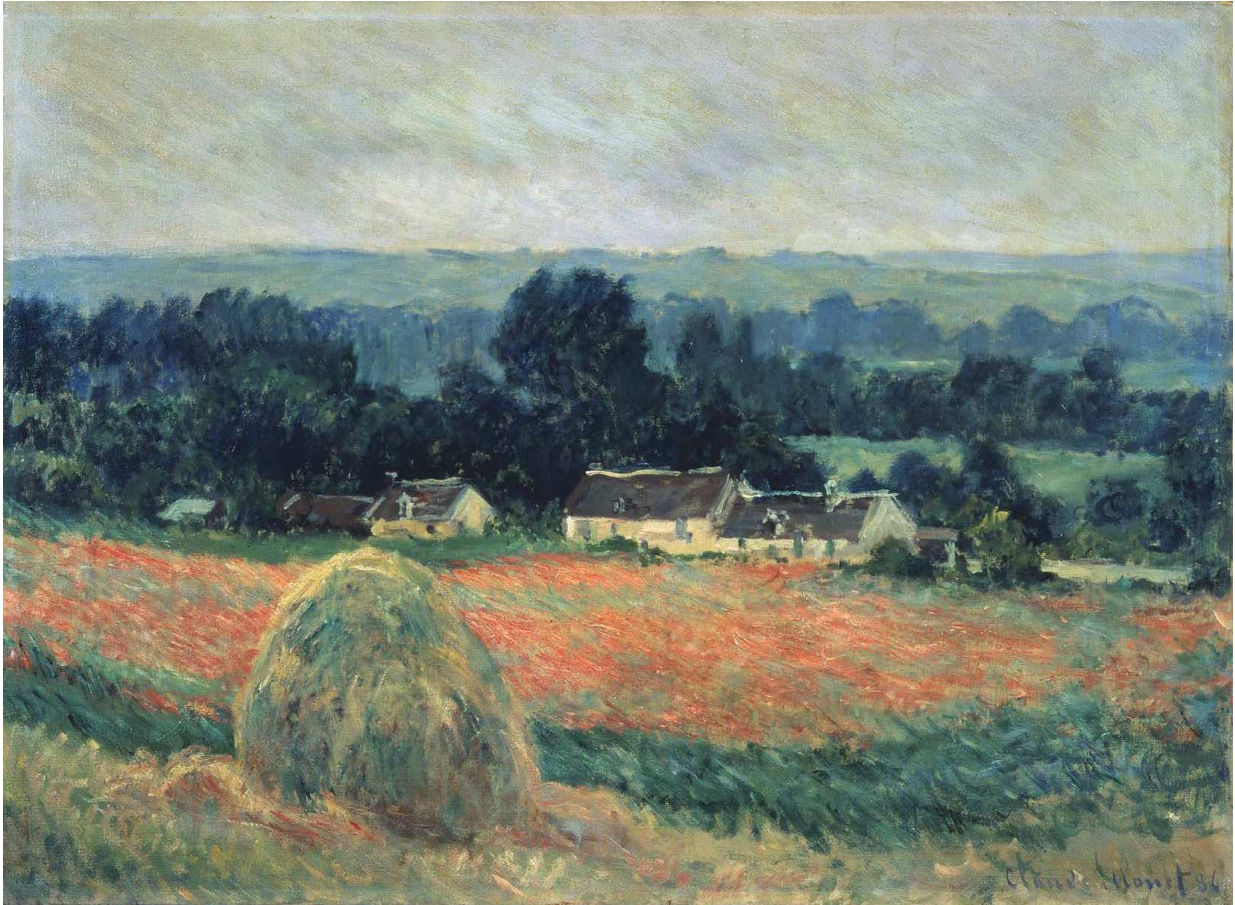


Figure 1: Haystack at Giverny. Monet, Claude (1840-1926). Hermitage, St. Petersburg, Russia. (Copyright ©2015 Scala / Art Resource, NY all right reserved used by permission).

In his later life, he changed his style and was an Expressionist. Most of his famous landscape paintings are painted in Giverny, including the famous water lily series. Giverny was a village that sits on the right bank of the River Seine. He moved in Giverny in 1883 and died in

1926. In this thesis, the most principles are from the observation of his late-life landscape paintings, and the selected articles and books.



Figure 2: Waterlilies, night effect. 1897-1898, oil on canvas, 73 x 1.00 m. Monet, Claude (1840-1926). Musee Marmottan-Claude Monet, Paris, France. (Copyright ©2015 Bridgeman-Giraudon / Art Resource, NY all right reserved used by permission).

1.4.3 Robert Wood

Robert Wood is a painter of the American landscapes. He was born in Sandgate, South England in 1889. Sandgate is near White Cliffs of Dover with scenic beauty along the Kent coast. His father was a painter, and influenced Wood's education of art at his early ages. During his youth, he studied painting nearby Folkstone, and moved to the United States with his friend after service in the Royal Army (Morseburg, 1998).

Flume (1983) divides Wood's life into three phases: the Early Years (1889-1924), the Texas Years (1924-1941), and the California Years (1941-1979). Although Wood spent a large amount of time in Texas and California, he used to traveled to and lived in many different cities in the United States. By going across the continent, he painted different landscapes as important records in his days.

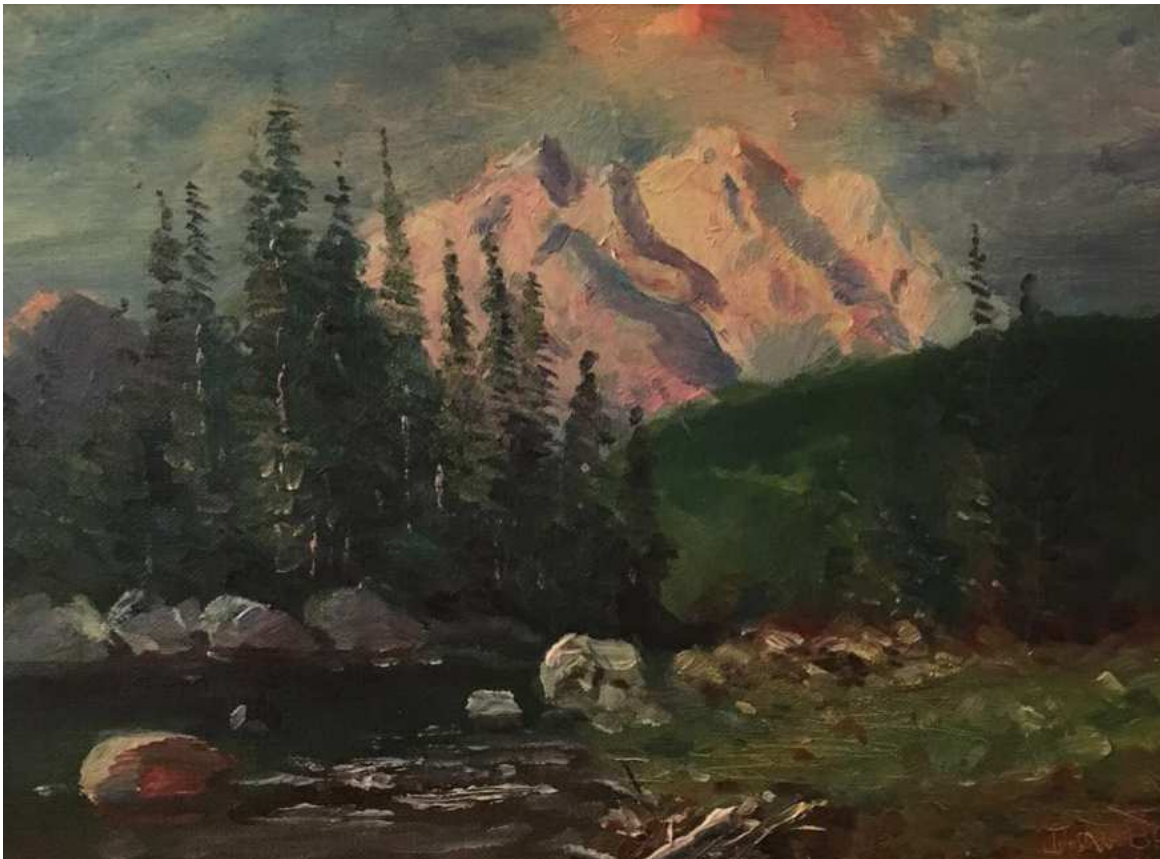


Figure 3: Painting example of Robert Wood (1971). (Copyright ©2015 Jon Burley all right reserved used by permission).

In the book *The Last Mountain, the Life of Robert Wood*, Flume described how Wood Painted. His painting style is between Realism and Abstractionism, and liked to explore the truth or the “heart” (p. 59) of the subjects that he painted. He painted what he saw, and interpreted

them into the canvases with a “light” (p.61) attitude. He told his students to be reasonable to what they could paint, and not to take themselves too seriously. Wood thought painters should enjoy painting as joyful experiences and have fun with these experiences; this is how Wood interpreted “light” (Flume, 1983, p.61).

1.4.4 Robert Oliver

Robert Oliver is a professional artist and author of *The Sketch* (1979) and *The Sketch in Colors* (1983) published by Van Nostrand Reinhold Company in New York. His paintings have gained recognition by winning many awards and being displayed in private collections across the nation. Oliver is also a professor teaching architectural graphic communications and architectural design at Arizona State University. He is also a member in both the American Institute of Architects and the American Watercolor Society.

Oliver believes that sketching is another form of drawing, and it is “loose, spontaneous, and not precise” (Oliver, 1979, p. 5). In his *The Sketch* (1979), Oliver introduces various techniques. It includes: what materials to choose, what sketch is, line and shape techniques to help form a sketch quickly and effectively, using tone and black strokes or values to create shadows, composition skills, how to draw perspective, creating thumbnail sketches, the relationship between figures and landscape, providing examples and critique, and showing sketch portfolio samples.



Figure 4: Line practice based on *The Sketch* (1979). (Copyright ©2015 Na Li all right reserved used by permission).

Similar to what Lin advocates in his workshop, most of Oliver's sketches are small in sizes, and he called them thumbnail sketches. Oliver uses less dots and lines in architectural structures than Lin, and Oliver does not intentionally leave gaps between lines. Oliver displays different styles of line works in his book. In most of the styles displayed in the book, the void and mass relationship plays a prominent role. Many illustrations have strong contrast from the white space left in planes to the dark shadow areas. Figure 8 shows my examples based on Oliver's sketch.

In *The Sketch in Color* (1983), Oliver lists his preferences for color choice both for watercolor and for marker as references. He does not use too many colors in one drawing, all the colors that he uses are relatively simple when compares to other artists. In fact, in both of

Oliver's watercolor and color-marker drawings, there are limited color palettes. Table 1 and Table 2 in Appendix will present what he uses in his drawings. Figure 9 is what I drew based on Oliver's drawings in *The Sketch in Color*. If you look at Figure 9 closely, the sunblock cover of the car actually uses two layers of colors: light gray and dark gray. Even though Oliver's color in each of his drawing is minimal, he intends to apply different values of same color to increase visual interests.



Figure 5: Marker practice based on *The Sketch in Color* (1983). (Copyright ©2015 Na Li all right reserved used by permission).

1.4.5 Michael Doyle

Michael Doyle is vice president and senior design architect at Commarts in Boulder, Colorado, and used to be instructor at the University of Colorado. Doyle (2007) wrote a book *Color Drawing: Design Drawing Skills and Techniques for Architects, Landscape Architects,*

and Interior Designers, (3rd Ed.). This book is widely used in design schools worldwide.

In this book, Doyle focuses on color drawing approach during the early phases of design process. He believes that people can design quicker and more effective when mastering the approach. Color drawing approach is always changing, adjusting depending on what you want to communicate with the design. Therefore, people should choose their own combination of approaches to help them the most, and Doyle's book is a good reference to start (Doyle, 2007).

In *Color Drawing*, Doyle starts the step-by-step drawings with a completed line drawing, uses knowledge of perspective, light, shade, and shadow to communicate the conceptual ideas about form, space, and place. Doyle introduces general tools and paper media in illustration process that realizes ideas in Part I, Chapter 1 – 5 (Doyle, 2007).

Chapter 1 presents the phenomena of color and light, and they illustrate the effect and techniques used in the entire book. Chapter 2 talks about different media and papers, such as charcoal pencil, pastels, and alcohol-based markers. Chapter 3 introduces different techniques to apply color media and digital tools to create impressions of materials. Chapter 4 uses the media, paper, and techniques to create an “encyclopedia of step-by-step approaches” (p. 1) to the common elements used by architects, landscape architects, and interior designers in illustration. In Chapter 5, Doyle shows how to draw scale elements in color, including automobiles and human figures (Doyle, 2007).

Chapter 6 in Part II shows color relationships: contrasts, unity, balance, proportion, and

rhythm. Chapter 7 explores different presentation effects by different media, such as Bristol, bond, tracing paper, mylar, and ink-jet paper. Chapter 8 focuses on the digital means for color drawing (Doyle, 2007).

1.4.6 Mike Lin

Mike Lin is a registered landscape architect, a member of the American Society of Landscape Architects (ASLA) and the American Society of Architectural Illustrators (ASAI). He is also an architect, an illustrator, an interior designer, an educator, and an author of *Architectural Rendering Techniques* (1985) and *Drawing and Designing with Confidence, a step-by-step guide* (1993). Currently, he is thinking publishing a new edition of *Drawing and Designing with Confidence, a step-by-step guide* by his own. Although he works in different fields, he is most renowned as a gifted and effective graphics educator. Mike has taught design and graphics workshops for more than 45 years. He has taught workshops at over 100 universities and many professional firms all around the world. According to his workshop's statement, over 250,000 students and design professionals have participated in the workshop.

His obtained his undergraduate degree in Architecture from Taiwan, and a Master of Science in Landscape Architecture from the University of Wisconsin. He has taught design, graphics, and presentation courses for thirty-five years. He has received many recognitions and awards, including the Outstanding Teaching Award from Kansas State University, due to his uniqueness and effectiveness teaching style. After he has given numerous graphic workshops and

seminars in his Kansas State University, he decided to open his own graphic workshop.

Lin's workshop is called BeLoose, it helps to improve participants' confidence in design and graphic ability. Lin's ambition to enrich participants' quality of life encourages people in his workshop. He is currently the President and Director of the BeLoose Graphic Workshop, and offers 2-day and 9-day workshops in Las Vegas, Nevada USA. The 2-day workshops can be conducted by request around the world.

His workshop covers all techniques in his book *Drawing and Designing with Confidence, a Step-by-Step Guide*. There are nine chapters in the book. Chapter 1 explains what is being loose. Being loose means you are willing to try, and represent all positive attitude that support you keep practicing until you have better skills. Chapter 2 described the line, composition, and color principles of good graphics. Chapter 3's topic is the rendering techniques for how to see, how to draw, and how to apply. Chapter 4 introduces different drawing media in design fields, which are different from naturalist landscape painters. Since the artist chooses the media too randomly and differently, the principles about how and what to choose in media will not be discussed in this research. Chapter 5 teaches how to do lettering, and chapter 6 shows how to draw entourage, such as people, vegetation, cars, furniture, skies, water, glass, and building materials. Chapter 7 explores perspective tools in detail. Chapter 8 encourages people keep exercising in different situations, and keeping a journal is a good way to make memory and exercise. Chapter 9 is different from Doyle's (2007) *Color Drawing: Design Drawing Skills and*

Techniques for Architects, Landscape Architects, and Interior Designers, (3rd Ed.), Lin introduces the design process, from establishing a program to a case study.

Different from *Architectural Rendering Techniques* (1985), *Drawing and Designing with Confidence, a step-by-step guide* (1993) uses abundant illustrations from his workshop students. I attended to his 2014 workshop in January, and recorded his lectures by producing illustrations. Figure 5 and Figure 6 show the most techniques covered in *Drawing and Designing with Confidence, a step-by-step guide* (1993).

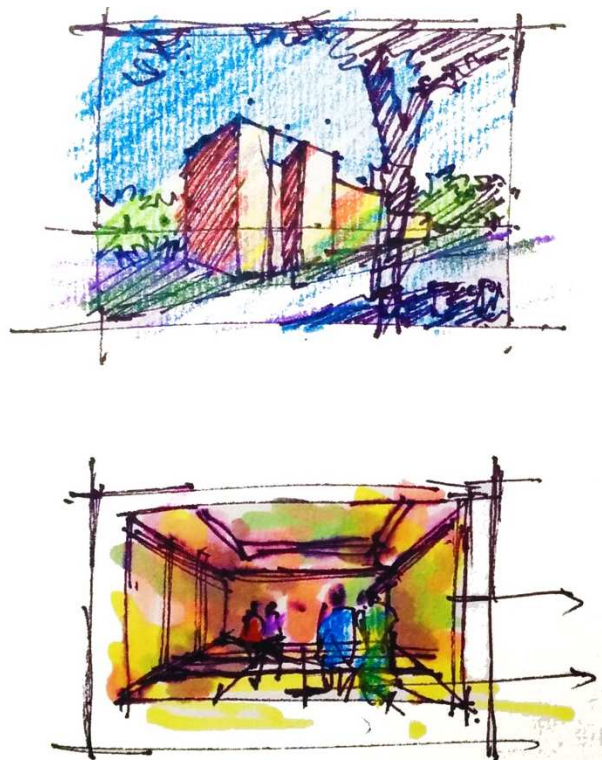


Figure 6: Thumbnails practice in 2014 BeLoose Workshop, Las Vegas, NV. (Copyright ©2014 Na Li all right reserved used by permission).



Figure 7: Barn practice in 2014 BeLoose Workshop, Las Vegas, NV. (Copyright ©2014 Na Li all right reserved used by permission).

Table A in Appendix shows Lin's choice for marker colors. He groups colors based on similar chroma and different values, and each group have four to five colors, the colors in each group look harmonious. Figure 7 shows my practices of using watercolor in BeLoose workshop, and it reveals his secret to how to use watercolor: to blend colors by watering brushes right after applying one color.

One interesting thing about Mike Lin's BeLoose workshop is that he addresses that being loose does not mean being scrappy. You must be serious and be careful with the line, colors, and compositions. Being loose only means you must be confident, and believe in you

that you will be better after you practice. In order to encourage people, correctly and effectively, to achieve enhance their life qualities, he admits that he even studied psychology researches.



Figure 8: Watercolor practice in 2014 BeLoose Workshop, Las Vegas, NV. (Copyright ©2014 Na Li all right reserved used by permission).

1.4.7 Jon Burley

Dr. Jon Burley is a registered Landscape Architect, a Fellow of the American Society of Landscape Architects, and an associated professor in Michigan State University. Mazure and Burley (2009) stated that Burley started to draw and paint since early teenage years with great enthusiasm (as cited in Burley and Machemer, 2015).

Since 2002, Dr. Burley has worked with many international scholars. Through invitation,

Dr. Burley “has given lectures and seminars at about 30 universities around the world and has visited 41 countries”, such as France, China, Portugal, Turkey, and Nepal. He has produced more than 1000 sketches and 200 oil paintings from around the world, has published over 300 papers and abstracts, “has over 5,000 books in his personal library, owns 8 guitars”, and creates his own garden “filled with magnolia trees (“Dr. Jon Bryan Burley”, 2015, para. 1).



Figure 9: Caribou. (Copyright ©2015 Jon Burley all right reserved used by permission).

Dr. Burley paints in his own way. He does not use colors that objects are expected to have. Figure 1 shows his pink and purple clouds floating in the grey sky as background, purple and blue field as foreground, and the caribou in the middle-ground. Figure 2 gives another example to show that Dr. Burley uses unusual colors in his paintings.

Dr. Burley does not only use unexpected colors in his oil paintings, but also in his marker drawings. His favorite marker is Copic, a Japanese brand. It has a brush end, and create smooth strokes. Figure 3 and Figure 4 are his marker drawings, one was drawn in Macau, by looking out at Macau church façade from a hilltop; and the other was drawn in his trip to China in 2015.

Comparing Dr. Burley's oil paintings and marker drawings, the most important difference is that void and mass relationship is prominent in his marker drawings. Let us compare the marker drawings both produced by Dr. Burley. In Figure 3, only the people are delineated; while Figure 4 has the outlined shrubs in the foreground. From the observation, you might deduce that Dr. Burley uses colors to paint first, and then delineate other objects.



Figure 10: Snake I. (Copyright ©2015 Jon Burley all right reserved used by permission).

Since many landscape painters influenced Dr. Burley starting in his high school, I was interested in determining which cluster of artists he would belong to. In other words, is he more similar to the naturalist landscape painters, or to the conventional drawing technical professionals?



Figure 11: Macau Gate, Macau, China. (Copyright ©2015 Jon Burley all right reserved used by permission).



Figure 12: Marina Sands Hotel, Singapore. (Copyright ©2015 Jon Burley all right reserved used by permission).

1.5 Analysis Techniques

1.5.1 Cluster Analysis

One of human's primitive ability is to group similar objects to produce a classification. This ability assists human to survive in old days, such as group poison and non-poison vegetation. Now, classification helps human organize large data set, so people can understand the objects easily and retrieve information efficiently. In addition, if the data can validly group into a small number of clusters, each group label will describe the data similarities and differences concisely (Everitt, Landau, Leese, and Stahl, 2011). For example, it will be useful if a software development company classifies the large numbers of respondents to their smartphone application's new feature from their users' preferences; they can group the positive responses to identify what core needs the costumers want, and then to create a popular product. Cluster analysis is the name for numerical methods of classification. Besides, the exploration of different large databases by cluster analysis and other multivariate analysis techniques help extract useful information or knowledge (Liu, 2011).

Cluster analysis is a multivariate technique to group observation by possessed characteristics (Tryon, 1939). Many fields of researchers use it group cluster of objects, for example: ecologist can use it determine which objects of a forest are similar with the vegetation growing on them; medical researchers use it determine which diseases have similar incidence patterns; marketing researchers use it determine which brands of products the public perceives

similarly. Mathematical methods of classification even simply cluster analysis for researchers-it stores the data (characters, usually expressed in number) of the object instead of the real object (Romesburg, 1984). Cluster analysis aims to group data points based on their properties: similar data points are in same groups, and dissimilar data points in different groups.

Cluster analysis has different categories based on different criteria (Withanawasam, 2015). This paragraph will introduce some common ones. There are two categories of clustering based on the cluster's membership function: hard or crisp clustering and fuzzy or soft clustering, a data point may belong to two or more clusters with some probabilities. Model-based clustering models data by a standard statistical model, and it gives a probability distribution over clusters (Withanawasam, 2015). K-means uses algorithms, in hard clustering, to measure central tendencies in focus, and it assign data K sets and dimensions of clusters (Dolićanin, Kajan, Randjelović, and Stojanović, 2015). In addition, cluster analysis can have two categories as hierarchical and partitional clustering (Gan, Ma, and Wu, 2007).

Hierarchical cluster analysis is one of the most common cluster analysis applications, employed more than ten times as often than other non-hierarchical cluster analysis (Romesburg, 1984). It can be divided to *divisive* and *agglomerative* hierarchical algorithms. A *divisive* hierarchical algorithm starts with one large cluster, the top, containing all the data from data set and continue splitting clusters to the bottom; while *agglomerative* hierarchical algorithms start from the bottom to the top keeping merging clusters (Gan, Ma, and Wu, 2007). Unlike

hierarchical *split* (divisive) or *merge* (agglomerative) clusters, partition clustering bases on predefined number of clusters, and has no links between clusters (Dolićanin, Kajan, Randjelović, and Stojanović, 2015).

There are some main steps in hierarchical cluster analysis, and it is a similar procedure to how one employs Principal Component Analysis (PCA):

1. Collect a data matrix. Its columns stand for the objects analyzed by clusters, and its rows stand for the object attributes.
2. Choose how to standardize the data matrix.
3. Use the data matrix or the standardized data matrix to compute all pairs of objects' values of a resemblance coefficient to measure the similarities.
4. Process the values of the resemblance coefficient by a clustering method to show the hierarchy of similarities among all pairs of objects (Romesburg, 1984).

Incomplete or heuristic cluster analysis technique is also one of major conventional clustering techniques. In this category, multi-dimensional data reduces their dimensions through analysis. Principal Component Analysis (PCA) is one example that fits in this category; its goal is to produce a graphical presentation (Höppner and Klawonn, 1999).

1.5.2 Principal Component Analysis (PCA)

Principal Component Analysis (PCA) is a systematically data-reduction procedure to

produce a conceptually coherent set of variables (Dunteman, 1989). When observations are valid, a large number of independent variables, extracted from objects, can be minimized to a smaller number of uncorrelated 'latent' variables or components (Kroonenberg, 1983). The principal components are linear. PCA can apply in many other analyses, such as regression analysis, cluster analysis, and in conjunction with other multivariate analysis methodologies; it even can detect outlying and influential observations (Dunteman, 1989).

PCA performs in sequent steps, and the steps are:

- Initial extraction of the components

The total number of components equals to the variables' number, but usually only the first components are considered (Franco and Marradi, 2013). The first valid principal component represents most of variance in data, and the sequent valid principal component accounts for succeeding smaller portion of variance in data (Suhr, 2005). “An eigenvalue represents the amount of variance captured by a given component” (O'Rourke and Hatcher, 2013, p. 16).

- Determining the number of meaningful components to retain

Because the total extracted number of components equals to the number of variables, it is necessary to determine the meaningful components for rotation and interpretation. Usually the first principal components are meaningful, and others are trivial variance (O'Rourke and Hatcher, 2013). The eigenvalue-one criterion, also named as the Kaiser-Guttman criterion is a common criterion of solving the number-of components. This method retains and interprets all

components with eigenvalues greater than 1 (Guttman 1954, and Kaiser 1960, 1970). Each observed variable accounts for one unit of variance to the total variance. To reduce the dimensions for the dataset, only “meaningful” variances will retain. Meaningful amount of variance will be accounted for, when the component with an eigenvalue greater than 1. These components weigh more than had been contributed by individual variables (O'Rourke and Hatcher, 2013, p. 61).

- Rotation to a final solution

After extracting the initial components, PRINCOMP will create an un-rotated pattern matrix. The rows represent the variables being analyzed, and the columns represent the retained components. The numbers in the matrix are component loadings. A component loading is a term used where a coefficient that appears in a factor pattern matrix or a factor structure matrix. In a simple situation, an analysis results in orthogonal components where component loadings are equivalent to bivariate correlations between the observed variables and the components (O'Rourke and Hatcher, 2013).

If we want to interpret the correlating relation between the variables and the components, an un-rotated factor pattern is difficult to interpret. To interpret, we need to perform rotation. O'Rourke and Hatcher (2013) state that a rotation is “a linear transformation that is performed on the factor solution” (p. 21) for simplify interpretation. Varimax rotation, as an orthogonal rotation, is one of the most one used. It maximizes the variance of a column, instead of a row, of

the factor pattern matrix (O'Rourke and Hatcher, 2013). However, for our study, the result of clusters is clear, and the rotation is not needed.

- Scree plot graph and other graphs

The result of PCA is expressed in diagrams. On the Cartesian diagram, the first extracted component sits on the x-axis, and the second on the y-axis. Both the axes range from the component loadings, and are analogous to the correlation coefficients. The intersection of the x-axis and y-axis is coordinated as (0, 0); it can be called baricentre or origin of the axes.

Baricentre divides each axis to positive and negative sections, and I, II, III, and IV quadrants, from right upper quadrant to right lower quadrant counter-clockwise. The further distance from baricentre (0, 0), the higher loadings the variables have (Franco and Marradi, 2013).

The data plotted in this research closely lies in a two dimensional plane. The two-dimension property enables researchers to display the data matrix by a simple and direct visual presentation, instead of a chunk of numbers (Jolliffe, 1986). In this thesis, you will see many graphs to present the data, the PCA procedure, and the analysis result.

- Interpreting the diagram

To interpret the result is to determine what is measured for each retained component, to identify the high-loading variables on a component, and determine what these variables share in common. Before determining what is measure for each component to retain, one fact should be noted is that there are only two or three components worthy to interpret, and others collect

invalid “dross” (Franco and Marradi, 2013, p. 83).

In the result, the greater eigenvalue indicates that the component reproduces the greater proportion of the total variance of the matrix. After one establishes the numbers of the components, we use component loadings to interpret the components. The component loadings quantify the linear relation between a variable and a principal component as correlation coefficients. “The higher the absolute value of a component loading, the more important the relative variable will be considered for that component” (Franco and Marradi, 2013, p. 82).

There are no rules to decide which number will be more important for the component. Stevens (2002) defines that if an absolute value is greater than 0.4 and less than -0.40, a loading is consider to be large. Kline (1994) and Hair, Anderson, Tatham, and Black (1998) recommends ± 0.30 is the minimal value for significant loadings. Cattell (1978) even suggests $\pm .15$.

1.5.3 Statistical Analysis System (SAS)

Statistical Analysis System (SAS) program is a major statistical analysis and reporting program since 1970s. It was a powerful data-management computer program, and it enables users choose different statistical procedures to analyze and generate data. The data report can be various forms (Florini and Six, 1986).

Users can perform the different procedures in SAS, such as CLUSTER, PRINCIPAL COMPONENTS, FACTOR, COMPARE, MEANS, et cetera. PRINCOMP performs a PCA by

input data indifferent formats in SAS program. The data can be raw data, correlation matrix, covariance matrix, or others (O'Rourke and Hatcher, 2013).

1.5.4 Information Visualization

Information visualization converts written and numerical information to a visual form, such as chart, table, and graph. It provides a graphic way to data manipulation and comprehension (Fayyad, Grinstein, and Wierse, 2001). In addition, information visualization bridges data and information. It provides methods and tools to manipulate data to information (Mazza, 2009).

There are many benefits for information visualization. It helps people communicate ideas, and create or discover the problem itself (Card, Mackinlay, and Shneiderman, 1999). Information visualization can amplify cognition. For example, a diagram helps people group information, reduce search and working memory by using element's location to group information, and support a tremendous number of easy-understanding perceptual inferences (Larkin and Simon, 1987). In addition, it increases recognition resources (Sears and Jacko, 2007), such as it help expand the working memory when solving a problem (Norman, 1993). Last, it interacts with computer programs to help interpret abundant and abstract data.

1.5.5 Conclusion

Statisticians have been using different mathematical methods to analyze and describe data for many years. Diagrams are effective and powerful tools to convey the concise information

derived from data mining. The statisticians even started using diagrams to convey complicated information long time ago (Fayyad, Grinstein, and Wierse, 2001). I will use diagrams as the visual representation of the data. The diagrams will present the artist and principle patterns and relations in tables and charts.

One of my research questions is to explore the similarities or differences of the landscape artists' drawing or painting principles. Based on the previous studies, cluster analysis that groups objects and exams similarities or differences fits my research the best. Amongst many cluster analysis techniques, PCA is preferred because its simple and effective representation of the clusters of data. SAS is used as a powerful and efficient computer program to run PCA efficiently, instead of calculating all equations by our own. In Chapter 4, result section will still concisely explain the equations used in PCA for my research.

CHAPTER 2: METHODOLOGY

2.1 The Landscape Drawing Or Painting Principles

Most of the following principles are the books and articles I read during the research, and sometimes they are from my observations to their famous art pieces or the resources that are easy to obtain. Since they are from different professions and prefer different media and tools, I tend to choose the general principles for landscape arts.

2.1.1 William Kent

1. Asymmetry garden layout inspired from Chinese painting and gardens.
2. Employ contrast light and shadow, the liberal use of sculpture, vases, colonnades, small temples, and obelisks, either against a dark background of foliated trees or to be a focal point of a vista.
3. To create a place with a great variety, never use straight lines and regular designs as Chinese gardens.
4. The uniform growth of foliage is associated with architecture forms.
5. The layout was formal near the house.
6. Modify existing elements to create a sequence of painter-like composition for open views. For example, move pools in a depression of a large wood into a rustic frame of a cascade.

7. Use groups of trees or extensive lawn to break uniform (Jourdain, 1948).
8. Break up the formality of woodland or open ground.
9. Enlarge or obscure view for the information that you want to convey.
10. Mix various evergreens and flowering shrubs for composition.
11. Mix different architectural styles in the sketches: Gothic, Classical, thatched, heavily rusticated, even Chinese.
12. Sketches and designs can be loose.
13. White space is prominent.
14. Have distinct foreground, middle ground, and background (Weber, 2013).

2.1.2 Claude Monet

Gwynn (1934) outlined some principles and techniques as following:

15. Paint objects, light, and shade caught up in a whirl of emotion.
16. Water must not be transparent.
17. Clouds need not to be transparent, but airy and vaporous.

Russell (2010) introduced Monet's painting routines as:

18. Look at nature to understand what to paint.

19. Keep practicing no matter what moods you have.
 20. Do not be afraid of starting over.
 21. Paint alone.
 22. Use suggestive and implied colors and shapes instead of descriptive ones.
 23. “Through the exploratory process of painting, contemplating, changing and, occasionally, demolishing and starting again, the strokes of paint proceeded slowly, uncertainly, towards a vision he 'felt' but did not yet know how to realize in paint, but which gradually through trial and error revealed itself” (p. 116).
 24. Avoid distorted perspective.
 25. Do not look at your old paintings, so as you can avoid the same errors.
- Gordon and Eddison (2002) summarized his techniques as:
26. Grow flowers to observe the palette of flowers, constant presence, and constant changes.
 27. Do not resemble others.
 28. Create an organic garden, with Japanese bridge, water lily pond, and various species of plants thriving on stream banks.
 29. Draw the colors and shapes; do not think of them as objects.

Perry (1927) concluded the following principles in *Reminiscences of Claude Monet from 1889 to 1909*:

30. The first painting should cover as much of the canvas as possible, no matter how roughly, because doing this can determine the whole tone.
31. Notice the change effects to “get a true impression of a certain aspect of nature and not a composite picture” (p. 121).
32. Every young painter should train him or her to sit near his canvas and learn how it would look at a distance, and keep practicing.
33. No painter could paint more than one half hour outdoor and keep the picture true to nature.

Eisendrath (1957) described Monet’s techniques as following:

34. Use color pair. Blue, green, and yellow can strengthen complementary spots of orange, red, and violet respectively.
35. Use symbols and motifs to draw and paint.
36. Collect other artists' drawings and paintings.
37. For any object, always draw a series of drawings.
38. Use a limited palette of colors: Monet uses colors in Table 1.

Table 1: List of Monet's Color Palette (Heard, 2006).

Flake white
Cadmium yellow
Vermilion
Deep madder
Cobalt blue
Emerald green
Lead white (modern equivalent = titanium white)
Chrome yellow (modern equivalent = cadmium yellow light)
Cadmium yellow
Viridian green
Emerald green
French ultramarine
Cobalt blue
Madder red (modern equivalent = alizarin crimson)
Vermilion
Ivory black (but only if you're copying a Monet from before 1886)

39. Colors were often used straight from the tube or mixed on the canvas.
40. Work from dark to light.
41. Be enthusiastic.
42. Draw objects and shadows as flat coloristic elements. For example, silhouette the haystack shapes to make them read as flat against the background of sky and landscape, and permit their shadows to be used as additional flat coloristic elements.

2.1.3 Robert Wood

Robert Wood himself did not write a textbook as Doyle, Lin, and Oliver, but Flume wrote

The Last Mountain, The life of Robert Wood for him. Following are some Wood's principles from Flume's (1983) book:

43. "Generally, never mix more than three colors" (p. 63).
44. "Pat on Paint with heel of brush" (p. 63).
45. "Get back and view painting from distance every 20 minutes" (p. 63).
46. "Cohesion: Two wet paints sticking together" (p. 63).
47. "Patience: Do not hurry" (p. 63).
48. "Always cut in rather than paint into object (sky cut into trees)" (p. 63).
49. "Brown Sauce School: Darks mostly from Europe" (p. 63).
50. "For distant, lacy trees, pat in with large brush" (p. 63).
51. "Never put too much texture into sky" (p. 63).
52. Paint seascape laid back in water with smaller strokes.
53. "Generally use warm undercoating for seascape sky" (p. 63).
54. Always employ less detail in distant trees or mountains.
55. "Generally warm the bottom of a breaking wave" (p. 63).
56. "Never paint things as 'cool' as you see them" (p. 63).

57. "Scratch in heavy grass or water with end of brush" (p. 63).
58. "Small leaves: Use small sable brush" (p. 63).
59. "Reflected lights are as important as highlights" (p. 63).
60. "Don't flare butts of trees too much" (p. 63).
61. "Those who can, Do. Those who can't, TEACH" (p. 63).
62. "Paint with natural or fluorescent light" (p. 63).
63. "When starting on a dry painting, coat with Medium" (p. 64).
64. "Always add Yellow Ochre to yellow to cut brashy effect" (p. 64).
65. "Tie things together: Grass into rocks, limbs into limbs, etc" (p. 64).
66. "For distant twig effect, scratch with end of brush" (p. 64).
67. "Roll brush: That's why they are round" (p. 64).
68. "Fallen leaves: Texture first with dark, then dry. Then scumble on" (p. 64).
69. "Generally paint tree limbs up or down at 45 degrees" (p. 64).
70. "Tree reflections: Short, vertical strokes" (p. 64)
71. "Hold paint brush like it is going to fall out of your hand" (p. 64).
72. "Crawling paint: When paint does not adhere to canvas" (p. 64).

73. "Mix paint on canvas as much as possible" (p. 64).
74. "There is always more Green in fall scenes than you realize" (p. 64).
75. "Never use pure white or black – add a color to each" (p. 64).
76. "Try to use Burnt Umber instead of black" (p. 64).
77. "Don't get leaves too sharp" (p. 64).
78. "Foam holes in surf larger than in front" (p. 64).
79. "Slightly blue the edges of distant trees" (p. 64)
80. "Flowers in foreground with heavy textures to make stand up" (p. 64)
81. "Reflections in smooth water: Like a mirror" (p. 64)
82. "Use extreme highlights to last of painting" (p. 64).
83. "As you come forward, color, contrast and detail intensify" (p. 64).
84. "Use Compound S-curves" (p. 64)
85. "Generally use Yellow Ochre in tree greens" (p. 64)
86. "Seascape sand; both warm and cool colors" (p. 64)
87. "Sky always darker at top than at bottom" (p. 64)
88. "Shadow: Use the darkest component of the object shadowed" (p. 64)

89. "Foreground shadow more intense" (p. 64)
90. "Reflections never the same intensity as the thing reflected" (p. 64)
91. "Usually try to make one strong horizontal line and a vertical line" (p. 64).
92. "Center of interest 1/3 in from sides" (p. 64)
93. "Try to use odd numbers of objects (1,3,5 trees, etc.)" (p. 64).
94. "Cadmium colors: Gives life to color mixture" (p. 64)
95. "Don't overdo highlights" (p. 64).
96. "To darken a color, add the darkest component of the mixture" (p. 65).
97. "In spring scenes, do not overdo the bright greens" (p. 65).
98. "Name signature should be small; use a No. 4 round sable" (p. 65)
99. "Reds are powerful colors – use sparingly" (p. 65).
100. "Zinc Yellow makes White look whiter than it is" (p. 65).
101. "Use more detail in base of distant mountains" (p. 65).
102. "In forest paint light shafts behind trees for more depth" (p. 65)
103. "Use complementary colors for 'punch'" (p. 65).
104. "To gray any color, use its complementary" (p. 65).

105. "Usually the darkest part of a tree foliage is in center of tree" (p. 65).
106. "Overbrushing on canvas scrubs the life out of paint" (p. 65)
107. "Use rags for glazing or wiping painting instead of paper towels" (p. 65).
108. "Use complementary colors for contrast as well as shadows" (p. 65).
109. "Soften the edge of shadows" (p. 65).
110. "Avoid bright colors at edges of painting" (p. 65).
111. "Sketch painting with charcoal, pencil or diluted blue paint" (p. 65)
112. "Seldom use colors straight out of tube" (p. 65).
113. "Get three light values from everything you paint" (p. 65).
114. "Glaze distant mountains for atmosphere effect with blue-white" (p. 65)
115. "Don't overwork rocks" (p. 65).
116. "Alizarin Crimson and Ultramarine Blue are transparent colors; good for shadows"
(p. 65)
117. "Shadows are usually thinner than the object shadowed" (p. 65).
118. "Have animals looking into the painting" (p. 65).
119. "Usually paint toward yourself (sky first)" (p. 65).

120. "If nothing goes right, set aside and get to it another day" (p. 65).
121. "Try to have three or four paintings going at the same time (some drying)" (p. 65).
122. "Do not use dryers in your painting" (p. 65).
123. "Media: ½ Linseed Oil and ½ Turpentine" (p. 65)
124. "Receding colors grayed with complementary" (p. 65)
125. "Simplicity and honesty" (p. 61)
126. "Don't think you can do a masterpiece on your first or second try. Please be reasonable with yourself" (p. 61).
127. "Enjoy painting. All you feel as you paint will be reflected in your work" (p. 61).
128. "Painting is a joyful experience. So - have fun" (p. 61).

2.1.4 Robert Oliver

Oliver (1979) published his first book *The Sketch*, and below are some of his principles in drawing:

129. Make positive and true lines by gliding motions of finger, wrist, elbow, and shoulder.
130. Shoulder movement can create faster and stronger sketch than with finger movements.

131. "The more variety of line, the more interesting the result" (p. 20).
132. "Geometric shapes constitute the framework of the many objects in a sketch" (p. 23).
133. Use geometric shapes to represent symbols and forms, and they form the basis for sketching rapidly.
134. To sketch landscape forms, general shape of the foliage mass must be represented first, then show the detail of leaf configuration and trunk structure.
135. Detail gives reality to the sketch.
136. Tone, uniform or variable, on surfaces increases and enhances the apparent depth, dimension, and interest.
137. Dark foreground provides an exclamation point and make sketch exciting.
138. Tone plus black or intense line strokes in an area can create variable tones.
139. There are three steps to create tones: uniform tone, variable tone, and tone plus black.
140. Shadows create a sense of dimension, reality, mood, and focus.
141. Beware of the real shadows and its relationship with sun's location and objects or scenes.
142. Observe "how shadows perform and know how to manipulate them to the advantage

of the sketch" (p. 41).

143. Use geometric procedures to construct shadows.

144. The value change should exist in all shadows, and both of value changes and shadow create a 3-D effect.

145. Most activity in values should locate in the center of interest.

146. Reflected light in shadows makes some areas lighter than other shadows.

147. High contrast, dark against light, creates depth.

148. The shift of high-contrast can shift the area of interest.

149. Shadows and shades (dark) alone can define the shapes.

150. The composition of the sketch is to compose line, shape, detail, and tone plus black in an organized and effective statement.

151. Raise or lower the line of center and lateral of interests can provide a more interesting division of space within the picture format.

152. "The composition of a picture should be in equilibrium or balance, with the center of interest falling at the balance point or fulcrum. There are exceptions to this, however, when wants to achieve more dramatic effects" (p. 49).

153. Adding perspective to planes and values creates a more accurate illusion of depth,

also known as deep space.

154. Foreground, background, and middle ground make a composition.

155. Avoid scattering whites and tones, because it results in a monotonous and spotty picture.

156. The whites, middle tones, and darks should have a linkage across and through the composition.

157. After developing an eye for perspective, people can use charts beneath transparent paper to construct a sketch of credibility.

158. Thumbnail sketch is a way to record scenes in very loose and broad terms.

159. Detail should not be used in executing thumbnail sketch. Instead, it should be simple, quick, suggested and implied, and loose.

160. Thumbnail sketching helps train the eyes to see proportion.

161. Figures and landscape provide scales, animation, and interests in a sketch.

162. Keep figures and landscape simple, but with authentic characteristics.

163. Use head, legs, arms, foot direction, loathing indications, and accessories to provide direction, animation, or meaning to the figure.

2.1.5 Michael Doyle

164. The best way to see the world around you is to draw.

165. Refrain from judging your product too harshly.

166. Persistence makes progress.

167. Quickly sketching a loose image of your idea or vision directly from your mind onto paper is important.

168. Use line extension (overlap corner): the slightly crossing lines emphasizes the connection

169. Use line snap (hit-go-hit): slightly darkening the ends of the lines.

170. Use heavier lines to emphasize distance between objects and the background where are necessary.

171. Use light lines to indicate materials, patterns, and distant objects.

172. Observe shade and shadow and practice drawing them will help you be able to eyeball shade and shadow.

173. Make your line works small.

174. Keep your linework thin, because photocopy enlargements enlarge it.

175. Pick the sun direction and angle that best reveals the forms and spaces in the

drawing.

176. Next, consider which surfaces are in shade and which are sunlit (divided by casting edges).

177. Pick a vertical casting edge, and decide where you want the shadow to fall.

178. Keep vertical shadows in the same direction and sun angle.

179. The shadow of a vertical casting edge that falls on a vertical surface is also vertical.

180. The shadow of horizontals cast shadows parallel to themselves whether they fall on the ground or a nearby parallel vertical surface.

181. Limit to a few general lighting directions for the non-sunlit/illumination in the interior drawings.

182. First, start with the major light sources - daylight or artificial lighting. The surfaces in shade and further to the lighting sources are darker and dimmer than other surfaces, and the larger surfaces in an interior are gradients of value and color.

183. Second, interior shadows should not be darker or more contrast than exterior shadows. The edges of interior shadows are diffuse because the soft and indistinct sources of light. Although interior shadows are gradually darker at their original edges.

184. The best way to build skills is to create numerous quick studies from observations.
185. Light-to-dark shading (chiaroscuro) creates three-dimensional effects.
186. Use the darker color of the object for shadow, and it should be darker than other light surfaces.
187. Because of simultaneous contrast, use complementary color for shades and shadows.
188. Use gradation in color illustration for more realistic and dynamic effects.
189. The objects where are further should use light colors with more grays.
190. Light, strong, and vivid colors appear to be illuminated or to glow when surrounded by darker backgrounds.
191. There are three groups of tones: light, medium, or dark; and three spatial planes: foreground, middle ground, and background.
192. Ted Kautzky will assign light, medium, and dark tones into each plane.
193. In evening exterior views, background is illustrated as a medium tone, middle ground as a light tone, and foreground as a dark tone.
194. Choose different hue, value, and chroma for different audiences.
195. Touches of white gouache or metallic colors are good final touches/accents for reflection light.

196. Combining color media, either similar or different, is legitimate for color mixing and adjustment, only when the media are compatible.
197. What we perceive everything surrounding it is in less detail than what the objects really are, so do not stick with little details.
198. Use quick sketch in early stages of the design process: to quickly assemble form, space, proportion, scale, and character of a project into pictures for feedbacks.
199. Sketches transform a space into a place via line, color, light, materials, pattern, texture, and furnishings.
200. Shade and shadow should appear transparent, and the distinctness of the shadow edges should adjust as the lighting conditions change.
201. Interior shadows are subtle, and they have indistinct edges, multiple shadows, and gradation values of shadows.
202. Use shadows, not too dark, to anchor the objects.
203. Use straightedge for buildings, so they would remain delicate and true.
204. Apply marker base first, then details, texture, contrast, shades and shadows, reflections, and highlights.
205. Tree in foreground: draw trunk and main branches, then add fine branching,

shadows, and texture, finally finish with ground shadow.

206. Tree in middle and background: apply color to the background, then add trunks, main branches, shadows beneath the trees, and finally finish with fine branching.

207. Contrast colors is used to communicate the project's various aspects.

208. Design principles apply to sketches are unity, balance, rhythm, proportion.

209. When you draw, decide what level of information you must communicate, determine the audience, and how much time the drawings are worth (Doyle, 2007).

2.1.6 Mike Lin

Lin (1993) wrote his book *Drawing and Designing with Confidence, a Step-by-Step Guide*, and listed some principles as following:

210. Observation reinforces “what you know and give you incentive to produce quality work” (p. 1).

211. Watch how other professionals draw.

212. Collect good graphic examples.

213. Imitate good graphics to refine drawing skills, but do not allow it to be a crutch.

214. Never be discouraged, and be confident.

215. Think and draw in a new or unconventional way.

216. Be loose, and “do not be afraid of making mistakes or taking risks” (p. 2).
217. Practice.
218. Persevere to produce good graphics.
219. Ask knowledgeable professionals to criticize your work.
220. Attempt to improve skills and increase understandings of knowledge.
221. Share and verbalize your skills to others.
222. Use wide and flat edge of pens, pencils, and brushes to create different line qualities, such as “fuzzy line, hit-go-hit, and freehand line” (p. 6).
223. Draw fuzzy lines, which is “light and delicate” (p. 6).
224. “Hit-go-hit” (p. 6): draw a line with distinct beginning and ending.
225. Leave professional gaps between lines.
226. “Professional Dot” (p. 6): draw a dot after a line.
227. Overlap the intersecting corners of lines.
228. Draw clean, crisp, and straightedge lines.
229. Use freehand lines.
230. Draw light, thin, and fuzzy lines to help plot perspective.

231. Use continuous line that is a single, nonstop, and quickly drawn.
232. Repeat lines.
233. Draw a line with variable width.
234. Draw even-thick and even-dark lines.
235. Draw thinner lines for soft and lifelike appearance.
236. Draw a slightly darker outline for objects, it is called punch line or profile line.
237. Put thick lines next to thin line to create three-dimensional look lines.
238. Draw thin outlines and thick hatches in the outlines.
239. Use thick strokes to create “toned surfaces” (p. 8).
240. Use 45-Degree stroke, because they are quick and easy to draw.
241. Create gradual value change.
242. When drawing a gradual value change, allow some lines to cross the edges slightly.
243. Use stripes for interest, shadow patterns, angles of slope, and slick appearance.
244. Use dots to create texture and detail.
245. Start with small-size sketches.
246. Spending less time and leaving more white space create better drawings.

247. Leave white border along the edges.
248. Leave white space to attract attention.
249. Make Zig-Zag compositions.
250. Create contrast tones to create three-dimensional effects.
251. Avoid spotty areas, and connect value by a medium tone between dark and light tones.
252. Draw shade and shadow to provide “punch, depth, and realism” (p. 10).
253. Create an asymmetrical composition for reducing monotony.
254. Hide the eye line.
255. Create focal point, and it is not necessary to be the center of paper.
256. Draw dark foreground versus light background.
257. Color wheel contains yellow, blue, red, green, purple, and orange. We only need to use these colors to create a pencil drawing.
258. Use complementary colors or color pairs, such as “red and green, blue and orange, purple and yellow” (p. 10).
259. Use three sequential colors from the color wheel.

260. Use all colors to create interesting drawing.
261. “Once a color is used, it must be applied throughout the entire drawing” (p. 11).
262. Work from light colors to dark colors.
263. “Apply color to an entire area, ... while still maintaining some white space and gradual value change” (p. 11).
264. “Use a light color in white space to connect two objects” (p. 11).
265. Shade objects with black or mix color pair to create earthy tone.
266. Draw two-tone contour lines, one tone is dark, the other is light.
267. Use monochromatic tone to present values of objects.
268. Use collage for subtle color and value changes.
269. Reduce the composition to two parts: the object, positive space, and the background, negative spaces.
270. Use a closed contour line to draw objects, and “bleed the outermost edges of an object off the edge of the page” (p. 25).
271. Use abstract solid colors for values of objects.
272. Only use tone values of objects, instead of combine values and lines to delineate its forms.

- 273. Only use strokes to present objects' value.
- 274. Combine the tone and line strokes to present values of objects.
- 275. Use stippling, or drawing dots to render value changes of objects.
- 276. Use different media: regular pencil, carpenter pencil, black colored pencil, charcoal pencil, colored pencil, pastel, ink, ink wash, marker, watercolor, tempera, airbrush, acrylic, and combinations of two media.
- 277. Use different types of paper: yellow tracing paper, mylar, and sepia print paper,
- 278. Use perspective charts to drawing building and courtyard.
- 279. Use paraline drawing or axonometric projection to show spatial relationship.
- 280. Draw with both hands.
- 281. Drawing upside down.
- 282. Draw from memory.
- 283. Trace image from slide.
- 284. Sketch from out-of-focus slides.
- 285. Keep a journal in graphics.

2.1.7 Jon Burley

In *From Eye to Heart: Exterior Spaces Explored and Explained*, Mazure and Burley mentioned following principles (Burley and Machemer, 2015):

1. Use bright colors as pinks, reds, oranges, and blues paints, inspired by Howard Merriam.
2. Be carefree and light hearted, but serious and dedicated.
3. Begin with markers, then colored pencil, and finally adding a line/contour drawing.
4. When using makers first, draw the shadows and let the light reveal itself.
5. “Never be in a hurry. Before starting to draw, sit and view the scene, think about composition, perspective, what to feature and what to not draw” (Burley and Machemer, 2015, p. 431).
6. “Think about how to show the vastness of space on a flat piece of paper” (Burley and Machemer, 2015, p. 431).
7. “Always draw on site, enjoying the experience; with people watching, it will force one to be better and to do their best; and as Mike Lin says ‘Be loose’” (Burley and Machemer, 2015, p. 432).
8. “It does not matter which color is used first, just pick one and draw, pick another and draw; when all the colors are used (six or seven), you are done” (Burley and

Machemer, 2015, p. 432).

9. “It is best to use a pastel palette (earth tone) as dark colors make mud” (Burley and Machemer, 2015, p. 432).
10. “Blend the colors together in layers (without any order) and the painting will seem more like a unified image in the same light” (Burley and Machemer, 2015, p. 432).
11. “Never use just one color to indicate a surface or object” (Burley and Machemer, 2015, p. 432).
12. “Often add people for scale” (Burley and Machemer, 2015, p. 432).
13. “Use color jump (every color should be everywhere)” (Burley and Machemer, 2015, p. 432).
14. “Use professional dots with the colors” (Burley and Machemer, 2015, p. 432).
15. “Never use only the typical expected color to indicate what the object is, such as blue for water” (Burley and Machemer, 2015, p. 432).
16. “Gray is the kiss of death and should not be used; instead use blue, purple and green for shadows-- this is quite different than the advice of others” (Burley and Machemer, 2015, p. 432).
17. “Use a blender to show atmospheric depth (an airy or fade-out feeling)” (Burley

and Machemer, 2015, p. 432).

18. “Finish the drawing with the contour line (silhouette), using the line to give boundaries to the light and darkness-- this is the opposite of most recommended approaches” (Burley and Machemer, 2015, p. 432).
19. “Color should cross the boundaries of contour lines” (Burley and Machemer, 2015, p. 432).
20. “Use hit-go-hit and professional gaps for lines” (Burley and Machemer, 2015, p. 432).
21. Draw for pleasure and to make memories.
22. “It is important to practice, practice, practice” (Burley and Machemer, 2015, p. 432).
23. “I do not necessarily like rules for drawing, because if you have to remember the rules, one can easily be overwhelmed” (Burley and Machemer, 2015, p. 432).
24. “I often stress the key to success is constantly being willing to grow and learn” (Burley and Machemer, 2015, p. 432).
25. “To be a landscape architect, usually one must be able to draw well. Because drawing develops the sensibilities to see and understand, drawing also helps to generate ideas, so one learns through drawing. Finally drawing is a communication

tool, and good drawing helps to sell a project to the client and users” (Burley and Machemer, 2015, p. 432).

26. “I do not necessarily like rules for drawing, because if you have to remember the rules, one can easily be overwhelmed” (Burley and Machemer, 2015, p. 432).

2.2 Data Collection

The landscape drawing and painting principles derive from the collection of above principles and the observation of the artists’ drawings and paintings. There are total 156 variables, and are categorized to six parts heavily based on how Mike Lin groups his principles: attitude technique, color, composition, line, and order. In the following parts of this thesis, I would use the principle codes to represent all nominal principles for clean-layout tables. Table 2 to Table 7 list what the principle codes represent.

2.2.1 Attitude

Table 2: Attitude list of landscape drawing or painting principles their codes.

Principle Code	Principle
Attitude	
A 1	Be willing to try instead of being afraid to start
A 2	Be carefree and light hearted, but at the same time serious and dedicated
A 3	Never hurry
A 4	Draw for pleasure
A 5	Do not necessarily need rules for drawing
A 6	To be a landscape architect, usually one must be able to draw well
A 7	Try to have three or four paintings going at one time
A 8	Be simple and honest

Table 2 (cont'd).

A 9	Be reasonable with your progress
A 10	“TEACH those who cannot, and let those who can, Do” (Flume, 1983, p. 63)
A 11	Be confident.
A 12	Be loose.
A 13	Practice.
A 14	Be persistent.
A 15	Paint alone.
A 16	Be willing to share.

2.2.2 Technique

Table 3: Technique list of landscape drawing or painting principles their codes.

Principle Code	Principle
Technique	
T1	Observe.
T2	Notice the changing effects.
T3	Watch demonstration.
T4	Collect examples.
T5	Imitation.
T6	Be creative.
T7	Ask for and accept criticism.
T8	Start Small.
T9	Start with quick sketches.
T10	Use perspective charts to drawing building and courtyard.
T11	Use paraline drawing or axonometric projection to show spatial relationship.
T12	Draw with both hands.
T13	Drawn in upside down.
T14	Draw from memory.
T15	Tracing image from slide.
T16	Keep a journal in graphics.
T17	Think about how to show the vastness of space on a flat piece of paper.
T18	Always draw on site.
T19	Finish the drawing with the contour line (silhouette), using the line to give boundaries to the light and darkness.
T20	“Often add people for scale” (Burley and Machemer, 2015, p. 432).
T21	Use geometric shapes.
T22	Detail is to define and give reality to the sketch.

Table 3 (cont'd).

T24	Shade and shadow should appear transparent.
T25	Interior shadows are more subtle and less contrast; they have indistinct edges, multiple shadows, and gradation values of shadows.
T26	The distinctness of the shadow edges should adjust as the lighting conditions change.
T27	Reflected light in shadows make some areas lighter than other shadows.
T28	Reflected lights are as important as highlights.
T29	Use geometric procedures to construct shadows on objects.
T30	Use head, legs, arms, foot direction, clothing indications and accessories to provide direction, animation, or meaning to the figure.
T31	Get back and view painting from distance.
T32	Always cut in rather than paint into object.
T33	Seascape reflected on water is with smaller strokes.
T34	Scratch in heavy grass, water, or distant twigs with end of brush.
T35	For detailed features, use smaller tips or brushes.
T36	Roll brushes: that is why they are round.
T37	Do not overdraw or overpaint.
T38	Use rags for glazing or wiping painting instead of paper towels.
T39	Do not use dryers in your painting.
T40	Limit light resources.
T41	Use suggestive and implied colors and shapes instead of descriptive ones.
T42	Apply color media on a black-and-white photocopy or laser print of a line drawing.
T43	Line works and shades and shadows are on one side, colors are on the other side.
T44	Combining sketch and photo to present conceptual ideas.
T45	Apply design principles to sketches.
T46	Choose different hue, value, and chroma for different audiences.
T47	Decide what level of information you must communicate and how much time the drawings are worth, by the audience.
T48	Paint objects, light, and shade spontaneously and in a whirl of emotion.
T49	Avoid distorted perspective.
T50	Do not look at your old paintings, so as you can avoid the same errors.
T51	The first painting should cover as much of the canvas as possible.
T52	Use symbols and motifs to draw and paint.
T53	For any object, always draw a series of drawings.

2.2.3 Color

Table 4: Color list of landscape drawing or painting principles their codes.

Principle Code	Principle
Color	
C1	Use color pair/color jump.
C2	Use sequential colors.
C3	Use color rainbow.
C4	Use color repeat.
C5	Use light color.
C6	Use solid color.
C7	Connect color.
C8	Use earthy color.
C9	Use tone value.
C10	Use line value.
C11	Combine tone or line value.
C12	Use gradual value change.
C13	Use value to connect of shadow and shade.
C14	Use high contrast of light and shadow.
C15	Use monotone.
C16	Use a limited palette of colors.
C17	Use a pastel palette (earth tone) as dark colors to make mud.
C18	Blend the colors together in layers (without any order).
C19	Never use just one color to indicate a surface or object.
C20	Never use only the typical expected color to indicate what the object is, such as blue for water.
C21	Shadows are usually thinner than the shadows on the object.
C22	Use the darker color of the object for shadow, and it should be darker than other light surfaces.
C23	Use a blender to show atmospheric depth (an airy or fade-out feeling).
C24	“Generally, use warm undercoating for seascape sky” (Flume, 1983, p. 63).
C25	Generally, warm the bottom of a breaking wave.
C26	Never paint things as “cool” as you see them, paint with natural or fluorescent light.
C27	Don’t flare butts of trees too much.
C28	Always add Yellow Ochre to yellow to cut brashy effect.
C29	To gray any color, use its complementary.
C30	Avoid bright colors at edges of painting.
C31	Get three light values from everything you paint.

Table 4 (cont'd).

C32	Glaze distant mountains for atmosphere effect with blue-white.
C33	Create a harmony color palette.
C34	Limit your color use for each mix and layering.
C35	Water must not be transparent.
C36	Clouds need not to be transparent, but airy, and vaporous.

2.2.4 Composition

Table 5: Composition list of landscape drawing or painting principles their codes.

Principle Code	Principle
Composition	
K1	Use collage.
K2	Use positive/negative spaces.
K3	Less is more.
K4	Don't touch edges.
K5	Use white space, or mass & void.
K6	Create zig-zag shapes and forms.
K7	Have dark and light effects.
K8	Use shade and shadow, and it defines the shapes of objects.
K9	Create a variety.
K10	Be asymmetrical.
K11	Make eye line hidden.
K12	Create focal point.
K13	Use dark or intense foreground/light background.
K14	Most activity in values should locate in the center of interest.
K15	The composition of the sketch is to compose line, shape, detail, and tone plus black in an organized and effective statement.
K16	Move the focal point or central line for lateral of interests or dramatic effects for more dramatic effects.
K17	The composition of a picture should be in equilibrium or balance.
K18	Adding perspective to the interplay of planes and values, a more accurate illusion of depth, known as deep space, is created.
K19	Foreground, background, and middle ground make a composition.
K20	Usually the darkest part of a tree foliage is in center of tree.
K21	Don't overwork rocks.
K22	Soften the edge of shadows.
K23	Tie things together: Grass into rocks, limbs into limbs, and etc.
K24	Have animals looking into the painting.

Table 5 (cont'd).

K25	The layout of space was formal near the house.
-----	--

2.2.5 Line

Table 6: Line list of landscape drawing or painting principles their codes.

Principle Code	Principle
Line	
L1	“Chisel the point” (Lin, 1993, p.6).
L2	Draw fuzzy line.
L3	Draw hit-go-hit.
L4	Draw professional gap.
L5	Draw professional dot.
L6	Color should cross the boundaries of contour lines.
L7	Draw mechanical line.
L8	Draw freehand line.
L9	Draw construction line.
L10	Repeat line.
L11	Draw variable line or stroke.
L12	Draw even-thick and clean-edge line.
L13	Draw thinner line.
L14	Draw punch line.
L15	Draw 3-D line.
L16	Combine thin and thick strokes.
L17	Draw 45-Degree Stroke.
L18	Draw lines over edge.
L19	Draw stripes.
L20	Keep your linework thin, because photocopy enlargements enlarge everything.

2.2.6 Order

Table 7: Order list of landscape drawing or painting principles their codes.

Principle Code	Principle
Order	
O1	Use markers or paints first, then colored pencil and finally adding a line/contour drawing to finish.

Table 7 (cont'd).

O2	Work from dark to light.
O3	“It does not matter which color is used first, just pick one and draw” (Burley and Machemer, 2015, p. 432).
O4	General shape of the foliage mass must be represented first, then show the detail of leaf configuration and trunk structure.
O5	There are three steps to create tones: uniform tone, variable tone, and tone plus black.
O6	Work from further space to close.

2.3 Analysis Procedure

According to literature review, there are general steps to conduct a PCA study. This section will adjust and explain the steps for my study.

- Initial extraction of the components.

I extracted the 368 landscape drawing or painting principles of Mike Lin, Jon Burley, Robert Oliver, Michael Doyle, Robert Wood, William Kent, and Claude Monet from books, journal articles, and each artist’s drawings and paintings. Then I compared each principle, and group them in different categories, as order, line, composition, attitude, technique, and color as shown in Table x to Table x in section 2.3.

The principles are reduced to 156 principles, because some principles are similar, and some principles only applies for a typical group. For example, architectural technique drawers use different media than the landscape painters. Architectural drawers use tracing paper, pencil, and charcoals when the landscape painters usually paint in oil paints or other painting media. I tend to find some universal rules for the drawing and painting techniques in landscape genre, instead of analyze the media that different professionals tend to use.

After I interpret these principles into different groups, I created Table A. In Table A, when the artist uses the principles in their most famous drawings, paintings, or publishing books, the grid marks as 1; otherwise, it is 0. The numbers will be coded for PRINCOMP procedure in SAS. Table h, in Appendix, shows the coding scrip written for the procedure in SAS.

- SAS data analysis.

When processing data in SAS, this study performs principal. The reasons to employ PRINCIPAL are because PRINCCOMP procedure in PRINCIPAL summarizes data and detects linear relationships, and MEANS procedure computes “descriptive statistics for variables across all observations and within groups of observations (SAS Institute Inc., 2012, p. 762).”

After the data runs in SAS, it will produce a table for the eigenvalues of the covariance matrix. The table in SAS contains the eigenvalues, the difference, the proportion, and the cumulative of the eigenvalues for the principal components. Row 1 provides information about the first extracted component, and so forth. In the grid where the heading of Eigenvalues interacts with the row, it represents the number of the eigenvalue for the row.

As our literature review studies, the eigenvalues produced in SAS shows the meaningful principal components when the values are not zero. If the values are zero, the components are too trivial to analyze. The eigenvector coefficient, represented as the eigenvalue, shows the strength correlation of the eigenvalue that the variable obtains. The objects are similar when the coefficients are close; while they are different when the coefficients vary.

- Standardize the data matrix.

The variables, the landscape drawing or painting principles in this study, will have the same weight after standardization, and be valid for future analysis. Equation 1 is used for this procedure:

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

Where:

X = Value for variable

\bar{X} = Mean for variable

SD_n = Standard Deviation of for variable

Then we will use Equation 2 to calculate the score of each observation, the artist in this research:

$$\begin{aligned} \text{Principle score} = & \left[\left(\frac{X_1 - \bar{X}_1}{SD_1} \right) k_1 \right] + \left[\left(\frac{X_2 - \bar{X}_2}{SD_2} \right) k_2 \right] + \left[\left(\frac{X_3 - \bar{X}_3}{SD_3} \right) k_3 \right] + \dots + \\ & \left[\left(\frac{X_{156} - \bar{X}_{156}}{SD_{156}} \right) k_{156} \right] \end{aligned}$$

Where:

X_n = Value for variable n

\bar{X}_n = Mean for variable n

SD_n = Standard Deviation of for variable n

k_n = Individual principal component coefficient for n

After we have the principle scores, there are no large-loading numbers greater than ± 0.20 for any component to identify the most influential variances; therefore, I choose ± 0.15 as to index the important loadings in my matrix.

- Scatter plots to measure the similarities.

Figure 13 to Figure 15 and Figure A1 to A12 in Appendix show the scatter plots for the principle scores. In the graphs, the scores of the x- axis represents one principal, the y-axis the other. The artist can be placed in the graph, and each artist's coordinate is created by the two components as (x, y) in the Cartesian diagram. After placing the artists, we can analyze their relationship by looking at the clusters on the graph. The closer the points are, the more similar the artists are. In this study, I use component 1 to component 2, component 1 to component 3, and component 2 to component 3 scatter plots to study the relationships among the artists.

CHAPTER 3: RESULTS

3.1 Database

If the artist uses the principle, he scores a 1; if not, he scores 0. Table 8 represents the raw data for PCA procedure, and we code these numbers in SAS for analysis. The script that puts in SAS is shown in Table A5 in Appendix.

Table 8: List of principle for the selected artists, 1 means the artist uses the principle, 0 means he does not.

Principle Code	Artist						
	Mike Lin	Jon Burley	Robert Oliver	Michael Doyle	Robert Wood	William Kent	Claude Monet
A1	1	1	1	1	1	0	1
A2	1	1	0	1	0	0	0
A3	0	1	0	0	1	0	1
A4	1	1	0	0	1	0	0
A5	0	1	0	0	0	1	1
A6	1	1	1	1	0	0	0
A7	0	0	0	0	1	0	1
A8	0	1	0	0	1	0	0
A9	0	1	1	0	1	0	1
A10	0	1	0	0	1	0	0
A11	1	0	0	0	0	1	0
A12	1	1	1	0	1	1	1
A13	1	1	1	1	1	1	1
A14	1	1	1	1	1	1	1
A15	1	0	0	0	0	0	1
A16	1	1	0	0	1	1	1
T1	1	1	1	1	1	1	1
T2	0	0	0	0	0	0	1
T3	1	1	1	1	1	0	0
T4	1	0	0	0	0	0	0
T5	1	1	1	1	0	1	0
T6	1	1	0	1	1	1	1

Table 8 (cont'd).

T7	1	1	0	1	1	1	1
T8	1	1	1	1	0	0	0
T9	1	1	1	1	0	0	0
T10	1	0	1	1	0	0	0
T11	1	0	1	1	0	0	0
T12	1	0	0	0	0	0	0
T13	1	0	0	0	0	0	0
T14	1	1	1	1	1	0	1
T15	1	0	0	0	0	0	0
T16	1	1	0	0	1	0	1
T17	0	1	0	0	0	0	0
T18	0	1	0	0	1	0	1
T19	0	1	0	0	0	0	0
T20	1	1	1	1	0	1	0
T21	1	0	1	1	0	1	0
T22	1	1	1	1	1	1	0
T23	1	1	1	1	1	1	1
T24	0	0	0	1	1	0	1
T25	0	0	0	1	0	0	0
T26	0	0	0	1	0	0	0
T27	0	0	1	1	1	1	1
T28	0	0	1	1	1	0	1
T29	1	1	1	1	0	0	0
T30	1	1	1	1	0	0	1
T31	0	0	0	0	1	0	1
T32	0	0	0	0	1	0	1
T33	0	0	0	0	1	0	0
T34	0	0	0	0	1	0	1
T35	1	1	1	0	1	0	0
T36	0	0	0	0	1	0	0
T37	1	1	1	1	1	1	0
T38	0	0	0	0	1	0	0
T39	0	0	0	0	1	1	1
T40	1	1	1	1	0	1	0
T41	0	1	0	1	0	0	1
T42	0	0	0	1	0	0	0
T43	1	0	0	1	0	0	0
T44	0	0	0	1	0	0	0
T45	1	1	1	1	1	1	1
T46	0	0	0	1	0	0	0
T47	0	0	0	1	0	0	0

Table 8 (cont'd).

T48	0	0	0	0	0	0	1
T49	1	0	1	1	1	0	1
T50	0	0	0	0	0	0	1
T51	0	0	0	0	0	0	1
T52	0	1	0	0	0	0	1
T53	0	1	0	0	1	1	1
C1	1	1	0	0	0	0	1
C2	1	0	0	1	1	0	1
C3	1	1	0	0	1	0	1
C4	1	1	0	1	1	0	1
C5	1	0	0	1	1	1	1
C6	1	1	1	1	1	0	0
C7	1	1	1	1	1	0	1
C8	1	0	0	0	1	1	0
C9	1	1	1	1	1	1	1
C10	1	0	0	1	0	1	0
C11	1	0	1	1	0	1	0
C12	1	1	0	1	1	1	1
C13	1	1	1	1	1	1	1
C14	1	1	0	1	1	1	0
C15	0	0	0	0	0	1	0
C16	1	1	1	1	1	0	1
C17	1	1	0	0	1	0	0
C18	0	1	0	1	1	0	1
C19	1	1	0	1	1	1	1
C20	0	1	0	0	1	0	1
C21	0	0	0	0	1	1	1
C22	1	1	1	1	0	1	0
C23	1	1	0	0	0	0	0
C24	0	0	0	0	1	0	0
C25	0	0	0	0	1	0	0
C26	1	1	0	1	1	0	1
C27	1	1	1	1	1	1	1
C28	0	0	0	0	1	0	0
C29	0	0	0	0	1	0	0
C30	1	0	1	0	1	1	0
C31	1	0	0	0	1	0	0
C32	0	0	0	1	1	0	0
C33	1	1	1	1	1	1	1
C34	1	0	1	1	1	1	0
C35	0	0	0	0	0	0	1

Table 8 (cont'd).

C36	0	0	0	0	0	0	1
K1	1	0	0	0	0	0	1
K2	1	1	1	1	1	1	1
K3	1	1	1	1	1	1	0
K4	1	0	1	0	0	0	0
K5	1	1	1	1	1	1	0
K6	1	1	1	1	1	1	1
K7	1	1	1	1	1	1	1
K8	1	1	1	1	1	1	1
K9	1	1	1	1	1	1	1
K10	1	1	1	1	1	1	1
K11	1	1	1	1	1	1	1
K12	1	1	1	1	1	1	1
K13	1	1	1	1	1	0	0
K14	1	0	1	1	1	0	1
K15	1	0	1	1	1	1	0
K16	1	1	1	1	1	1	1
K17	1	1	1	1	1	1	1
K18	1	1	1	1	1	1	0
K19	1	1	1	1	1	1	0
K20	0	0	0	0	1	0	0
K21	0	0	0	0	1	0	0
K22	1	1	0	1	1	1	1
K23	1	1	1	1	1	1	1
K24	0	0	0	0	1	0	0
K25	0	0	0	0	0	1	0
L1	1	0	1	0	0	0	0
L2	1	0	1	0	0	0	0
L3	1	1	1	0	0	0	0
L4	1	1	1	1	0	0	0
L5	1	1	0	1	0	0	1
L6	1	1	1	1	0	0	0
L7	1	0	1	1	0	0	0
L8	0	1	1	1	1	1	1
L9	1	0	1	1	0	0	0
L10	1	0	1	1	0	1	0
L11	1	1	1	0	1	1	1
L12	1	1	1	0	0	0	0
L13	1	1	1	1	0	1	0
L14	1	1	1	0	1	1	0
L15	1	0	0	0	1	0	0

Table 8 (cont'd).

L16	1	1	1	1	1	1	1
L17	1	1	1	1	1	0	0
L18	1	1	1	0	0	0	1
L19	1	1	1	1	0	1	0
L20	0	0	0	1	0	0	0
O1	0	1	0	1	0	0	0
O2	0	1	0	0	1	0	1
O3	0	1	0	0	1	1	1
O4	1	0	1	1	0	0	0
O5	1	0	1	1	0	0	0
O6	0	1	0	0	1	0	0

3.2 Principal Component Analysis Results

Table 9 presents the eigenvalues of the covariance matrix derived from the SAS Program.

My raw data are the scores for the landscape artist's drawing or painting principles. The output of SAS program can have simple statistics, such as mean values, standard deviations, and eigenvalues of the covariance matrix, scree plot of eigenvalues and cumulative variances.

According to the previous studies in PCA, the eigenvalues of the six principal components are greater than 1.00, and therefore worthy to interpret; while other principal components are trivial and will not be discussed further. The succeeding proportions of first six principal components are 32.32%, 16.34%, 15.72%, 14.28%, 11.45%, and 9.89% respectively.

Looking at the proportion of the principal components, the first principal component has absolutely the greatest influence than others. However, the difference between the two succeeding principal components from the second to the sixth principal component is less than 3.00%, although the difference between the second and the sixth principal component is 6.45%.

The result is more clear in Figure 13 that only the first six principal components have valid eigenvalues, and other 150 components have zero eigenvalues.

Table 9: Principal Component Analysis eigenvalues of the covariance matrix derived from the SAS Program.

	Eigenvalue	Difference	Proportion	Cumulative
PRIN1	43.6364359	21.5838079	0.3232	0.3232
PRIN2	22.0526280	0.8301654	0.1634	0.4866
PRIN3	21.2224626	1.9469712	0.1572	0.6438
PRIN4	19.2754914	3.8191477	0.1428	0.7866
PRIN5	15.4563437	2.0997053	0.1145	0.9011
PRIN6	13.3566384	13.3566384	0.0989	1.0000
			

Figure 12 is the Scree Plot of the principal components derived from SAS, and it presents the cumulative number and the proportion of the variance matrix. In the Variance Explained figure, the solid line represents the proportion, we can see that the first component has the highest value, and other five components are close to each other. To simplify the study, we will merely discuss the first principal component later when we explore the relation between different artists.

The six principal components, shown in Table 10, all have three types of eigenvector coefficients: positive coefficients, negative coefficients, and near-zero coefficients. As shown in Table e, there is no coefficient greater than 0.4 or smaller than -0.4 for the principal components. It means we do not have any strong index for each principal component. However, there are several coefficients greater than 0.15 or smaller than -0.15 for all principal components except

for the first component. These coefficients are the weak indexes for each component. Because a correlation of 0.2 only explains 4% of the variation in the other (Habing, 2003), the result indicates that we have no significantly important factors, but only less important ones. Table A4 in Appendix lists the weak index for each principal component, except for the first principal component where it has no large-loadings.

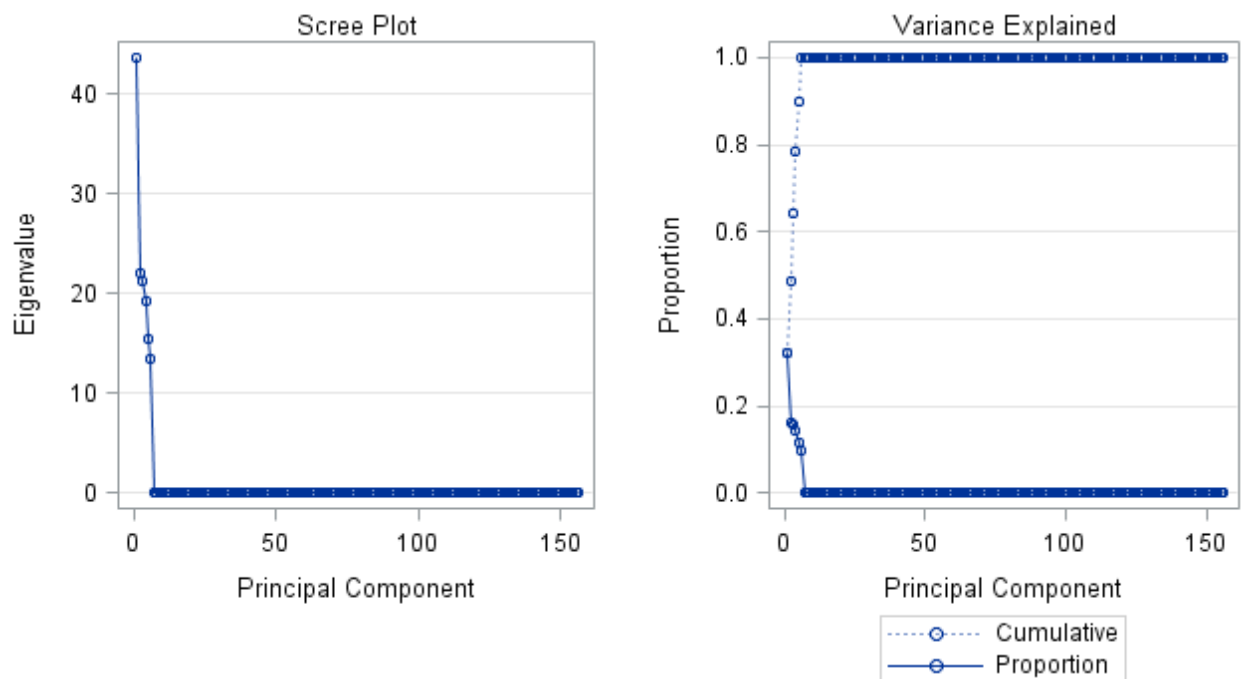


Figure 13: Scree plot for principal component.

SAS PRINCOMP produces a table to illustrate the mean and standard deviation of the observed variables as shown in Table A6 in Appendix. We can use the variable values in Table 10 and means and standard deviations derived from SAS in Table A6 in Appendix to calculate our principle scores based on Equation 1.

Table 10: Principal Component Analysis coefficient from SAS program.

	PRIN1	PRIN2	PRIN3	PRIN4	PRIN5	PRIN6
A1	0.001894	0.049901	0.192316	0.065527	0.015944	-0.074086
A2	0.081817	0.013924	0.121644	-0.005554	-0.096181	0.135715
A3	-0.12722	0.037427	0.088445	-0.038855	-0.061488	-0.026401
A4	-0.014563	0.158726	0.092808	-0.083707	-0.001013	0.093706
A5	-0.073161	-0.11807	-0.028308	-0.128656	-0.082069	0.03756
A6	0.125842	0.011755	0.110101	-0.016266	-0.044815	-0.030611
A7	-0.136386	0.025776	0.028358	0.068576	0.061442	-0.023854
A8	-0.063662	0.146909	0.047458	-0.063523	-0.118603	-0.017747
A9	-0.083195	0.035258	0.076902	-0.049566	-0.010122	-0.192727
A10	-0.063662	0.146909	0.047458	-0.063523	-0.118603	-0.017747
A11	0.046242	-0.011687	-0.094759	-0.07893	0.105143	0.177784
A12	-0.057957	0.034775	-0.013578	-0.171995	0.121425	-0.043039
A13	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
A14	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
A15	-0.027991	-0.078943	0.103638	-0.007212	0.168739	0.109223
A16	-0.09312	0.029313	0.002128	-0.121493	0.037787	0.148862
T1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
T2	-0.097729	-0.136729	0.063813	0.027059	0.066159	-0.014426
T3	0.077167	0.144563	0.099538	0.029797	-0.038896	-0.046212
T4	0.061592	0.034813	0.069983	-0.03637	0.151683	0.155432
T5	0.136386	-0.025776	-0.028358	-0.068576	-0.061442	0.023854
T6	-0.06226	0.003068	0.016325	0.015149	-0.072642	0.23522
T7	-0.06226	0.003068	0.016325	0.015149	-0.072642	0.23522
T8	0.125842	0.011755	0.110101	-0.016266	-0.044815	-0.030611
T9	0.125842	0.011755	0.110101	-0.016266	-0.044815	-0.030611
T10	0.128559	-0.002142	0.047543	0.08519	0.072761	-0.025985
T11	0.128559	-0.002142	0.047543	0.08519	0.072761	-0.025985
T12	0.061592	0.034813	0.069983	-0.03637	0.151683	0.155432
T13	0.061592	0.034813	0.069983	-0.03637	0.151683	0.155432
T14	0.001894	0.049901	0.192316	0.065527	0.015944	-0.074086
T15	0.061592	0.034813	0.069983	-0.03637	0.151683	0.155432
T16	-0.083668	0.062044	0.137931	-0.064573	0.045768	0.083506
T17	-0.003842	0.019653	0.08847	-0.14348	-0.166278	-0.006542
T18	-0.12722	0.037427	0.088445	-0.038855	-0.061488	-0.026401
T19	-0.003842	0.019653	0.08847	-0.14348	-0.166278	-0.006542
T20	0.136386	-0.025776	-0.028358	-0.068576	-0.061442	0.023854

Table 10 (cont'd).

T21	0.12722	-0.037427	-0.088445	0.038855	0.061488	0.026401
T22	0.097729	0.136729	-0.063813	-0.027059	-0.066159	0.014426
T23	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
T24	-0.083521	-0.001059	0.035488	0.18422	-0.029771	0.008658
T25	0.057957	-0.034775	0.013578	0.171995	-0.121425	0.043039
T26	0.057957	-0.034775	0.013578	0.171995	-0.121425	0.043039
T27	-0.044732	-0.042189	-0.122738	0.139312	0.011306	-0.11533
T28	-0.039496	-0.003228	0.023945	0.173508	0.021594	-0.157668
T29	0.125842	0.011755	0.110101	-0.016266	-0.044815	-0.030611
T30	0.062152	-0.093033	0.170039	0.003141	0.002154	-0.044707
T31	-0.136386	0.025776	0.028358	0.068576	0.061442	-0.023854
T32	-0.136386	0.025776	0.028358	0.068576	0.061442	-0.023854
T33	-0.078345	0.170006	-0.027203	0.061472	0.013163	-0.01637
T34	-0.136386	0.025776	0.028358	0.068576	0.061442	-0.023854
T35	0.029462	0.156556	0.081265	-0.094418	0.050353	-0.072619
T36	-0.078345	0.170006	-0.027203	0.061472	0.013163	-0.01637
T37	0.097729	0.136729	-0.063813	-0.027059	-0.066159	0.014426
T38	-0.078345	0.170006	-0.027203	0.061472	0.013163	-0.01637
T39	-0.125842	-0.011755	-0.110101	0.016266	0.044815	0.030611
T40	0.136386	-0.025776	-0.028358	-0.068576	-0.061442	0.023854
T41	0.012712	-0.082758	0.166767	0.013579	-0.049399	0.125514
T42	0.057957	-0.034775	0.013578	0.171995	-0.121425	0.043039
T43	0.092602	0.000003	0.064726	0.105054	0.023438	0.153735
T44	0.057957	-0.034775	0.013578	0.171995	-0.121425	0.043039
T45	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
T46	0.057957	-0.034775	0.013578	0.171995	-0.121425	0.043039
T47	0.057957	-0.034775	0.013578	0.171995	-0.121425	0.043039
T48	-0.097729	-0.136729	0.063813	0.027059	0.066159	-0.014426
T49	0.004443	0.02343	0.080439	0.161896	0.141148	-0.05232
T50	-0.097729	-0.136729	0.063813	0.027059	0.066159	-0.014426
T51	-0.097729	-0.136729	0.063813	0.027059	0.066159	-0.014426
T52	-0.078677	-0.090687	0.117958	-0.090179	-0.077552	-0.016241
T53	-0.128559	0.002142	-0.047543	-0.08519	-0.072761	0.025985
C1	-0.02827	-0.058169	0.157166	-0.10804	0.036461	0.095081
C2	-0.039969	0.023558	0.084974	0.158502	0.077484	0.118565
C3	-0.083668	0.062044	0.137931	-0.064573	0.045768	0.083506
C4	-0.04676	0.041029	0.161613	0.062491	-0.043919	0.124814

Table 10 (cont'd).

C5	-0.04525	-0.012847	-0.055884	0.122873	0.07253	0.187268
C6	0.077167	0.144563	0.099538	0.029797	-0.038896	-0.046212
C7	0.001894	0.049901	0.192316	0.065527	0.015944	-0.074086
C8	-0.013185	0.109544	-0.105738	-0.028586	0.105289	0.150718
C9	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
C10	0.083195	-0.035258	-0.076902	0.049566	0.010122	0.192727
C11	0.12722	-0.037427	-0.088445	0.038855	0.061488	0.026401
C12	-0.06226	0.003068	0.016325	0.015149	-0.072642	0.23522
C13	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
C14	0.027797	0.084955	-0.096137	0.093033	0.019429	0.181152
C15	-0.004443	-0.02343	-0.080439	-0.161896	-0.141148	0.05232
C16	0.001894	0.049901	0.192316	0.065527	0.015944	-0.074086
C17	-0.014563	0.158726	0.092808	-0.083707	-0.001013	0.093706
C18	-0.086238	0.012837	0.098046	0.082764	-0.147348	0.004032
C19	-0.06226	0.003068	0.016325	0.015149	-0.072642	0.23522
C20	-0.12722	0.037427	0.088445	-0.038855	-0.061488	-0.026401
C21	-0.125842	-0.011755	-0.110101	0.016266	0.044815	0.030611
C22	0.136386	-0.025776	-0.028358	-0.068576	-0.061442	0.023854
C23	0.044732	0.042189	0.122738	-0.139312	-0.011306	0.11533
C24	-0.078345	0.170006	-0.027203	0.061472	0.013163	-0.01637
C25	-0.078345	0.170006	-0.027203	0.061472	0.013163	-0.01637
C26	-0.04676	0.041029	0.161613	0.062491	-0.043919	0.124814
C27	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
C28	-0.078345	0.170006	-0.027203	0.061472	0.013163	-0.01637
C29	-0.078345	0.170006	-0.027203	0.061472	0.013163	-0.01637
C30	0.03084	0.107375	-0.117281	-0.039297	0.156655	-0.015607
C31	-0.012977	0.158652	0.033138	0.019443	0.127689	0.107717
C32	-0.015792	0.10475	-0.010554	0.180843	-0.083859	0.020658
C33	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
C34	0.078677	0.090687	-0.117958	0.090179	0.077552	0.016241
C35	-0.097729	-0.136729	0.063813	0.027059	0.066159	-0.014426
C36	-0.097729	-0.136729	0.063813	0.027059	0.066159	-0.014426
K1	-0.027991	-0.078943	0.103638	-0.007212	0.168739	0.109223
K2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
K3	0.097729	0.136729	-0.063813	-0.027059	-0.066159	0.014426
K4	0.095936	0.02459	0.041564	-0.039906	0.173761	-0.061803
K5	0.097729	0.136729	-0.063813	-0.027059	-0.066159	0.014426

Table 10 (cont'd).

K6	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
K7	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
K8	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
K9	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
K10	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
K11	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
K12	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
K13	0.077167	0.144563	0.099538	0.029797	-0.038896	-0.046212
K14	0.004443	0.02343	0.080439	0.161896	0.141148	-0.05232
K15	0.078677	0.090687	-0.117958	0.090179	0.077552	0.016241
K16	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
K17	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
K18	0.097729	0.136729	-0.063813	-0.027059	-0.066159	0.014426
K19	0.097729	0.136729	-0.063813	-0.027059	-0.066159	0.014426
K20	-0.078345	0.170006	-0.027203	0.061472	0.013163	-0.01637
K21	-0.078345	0.170006	-0.027203	0.061472	0.013163	-0.01637
K22	-0.06226	0.003068	0.016325	0.015149	-0.072642	0.23522
K23	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
K24	-0.078345	0.170006	-0.027203	0.061472	0.013163	-0.01637
K25	-0.001894	-0.049901	-0.192316	-0.065527	-0.015944	0.074086
L1	0.095936	0.02459	0.041564	-0.039906	0.173761	-0.061803
L2	0.095936	0.02459	0.041564	-0.039906	0.173761	-0.061803
L3	0.08486	0.036344	0.1005	-0.137885	0.041045	-0.061044
L4	0.125842	0.011755	0.110101	-0.016266	-0.044815	-0.030611
L5	0.012712	-0.082758	0.166767	0.013579	-0.049399	0.125514
L6	0.125842	0.011755	0.110101	-0.016266	-0.044815	-0.030611
L7	0.128559	-0.002142	0.047543	0.08519	0.072761	-0.025985
L8	-0.061592	-0.034813	-0.069983	0.03637	-0.151683	-0.155432
L9	0.128559	-0.002142	0.047543	0.08519	0.072761	-0.025985
L10	0.12722	-0.037427	-0.088445	0.038855	0.061488	0.026401
L11	-0.057957	0.034775	-0.013578	-0.171995	0.121425	-0.043039
L12	0.08486	0.036344	0.1005	-0.137885	0.041045	-0.061044
L13	0.136386	-0.025776	-0.028358	-0.068576	-0.061442	0.023854
L14	0.030807	0.132846	-0.059946	-0.154187	0.042809	-0.022164
L15	-0.012977	0.158652	0.033138	0.019443	0.127689	0.107717
L16	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
L17	0.077167	0.144563	0.099538	0.029797	-0.038896	-0.046212

Table 10 (cont'd).

L18	0.015755	-0.060338	0.145623	-0.118751	0.087827	-0.071245
L19	0.136386	-0.025776	-0.028358	-0.068576	-0.061442	0.023854
L20	0.057957	-0.034775	0.013578	0.171995	-0.121425	0.043039
O1	0.041917	-0.011714	0.079046	0.022088	-0.222854	0.028271
O2	-0.12722	0.037427	0.088445	-0.038855	-0.061488	-0.026401
O3	-0.128559	0.002142	-0.047543	-0.08519	-0.072761	0.025985
O4	0.128559	-0.002142	0.047543	0.08519	0.072761	-0.025985
O5	0.128559	-0.002142	0.047543	0.08519	0.072761	-0.025985
O6	-0.063662	0.146909	0.047458	-0.063523	-0.118603	-0.017747

Here shows how we calculate each principle scores for Mike Lin, the other principal scores for other artists are similar to this procedure:

$$\text{Principal component 1 score} = \left[\left(\frac{1-0.857}{0.378} \right) \times 0.002 \right] + \left[\left(\frac{1-0.429}{0.535} \right) \times 0.082 \right] + \left[\left(\frac{1-0.429}{0.535} \right) \times (-0.128) \right] + \dots + \left[\left(\frac{0-0.286}{0.488} \right) \times (-0.064) \right] = 6.071$$

$$\text{Principal component 2 score} = \left[\left(\frac{1-0.857}{0.378} \right) \times 0.050 \right] + \left[\left(\frac{1-0.429}{0.535} \right) \times 0.014 \right] + \left[\left(\frac{1-0.429}{0.535} \right) \times 0.122 \right] + \dots + \left[\left(\frac{0-0.286}{0.488} \right) \times 0.147 \right] = 1.896$$

$$\text{Principal component 3 score} = \left[\left(\frac{1-0.857}{0.378} \right) \times 0.192 \right] + \left[\left(\frac{1-0.429}{0.535} \right) \times 0.122 \right] + \left[\left(\frac{1-0.429}{0.535} \right) \times 0.088 \right] + \dots + \left[\left(\frac{0-0.286}{0.488} \right) \times (-0.048) \right] = 3.056$$

$$\text{Principal component 4 score} = \left[\left(\frac{1-0.857}{0.378} \right) \times 0.066 \right] + \left[\left(\frac{1-0.429}{0.535} \right) \times (-0.006) \right] + \left[\left(\frac{1-0.429}{0.535} \right) \times (-0.039) \right] + \dots + \left[\left(\frac{0-0.286}{0.488} \right) \times (-0.064) \right] = -1.615$$

$$\text{Principal component 5 score} = \left[\left(\frac{1-0.857}{0.378} \right) \times 0.016 \right] + \left[\left(\frac{1-0.429}{0.535} \right) \times (-0.096) \right] + \left[\left(\frac{1-0.429}{0.535} \right) \times (-0.061) \right] + \dots + \left[\left(\frac{0-0.286}{0.488} \right) \times (-0.119) \right] = 5.409$$

$$\text{Principal component 6 score} = \left[\left(\frac{1-0.857}{0.378} \right) \times (-0.074) \right] + \left[\left(\frac{1-0.429}{0.535} \right) \times 0.136 \right] +$$

$$\left[\left(\frac{1-0.429}{0.535}\right) \times (-0.026)\right] + \dots + \left[\left(\frac{0-0.286}{0.488}\right) \times (-0.018)\right] = 4.473$$

All component scores for all artists are represented in Table 11.

Table 11: Principle scores for the artists.

Artist	PRIN1	PRIN2	PRIN3	PRIN4	PRIN5	PRIN6
Mike Lin	6.071247	1.895868	3.056161	-1.615249	5.409153	4.473226
Jon Burley	-0.319133	1.189804	4.242892	-5.766064	-5.502713	0.033538
Robert Oliver	6.161192	-0.153415	-0.785682	-0.662179	2.546231	-7.124811
Micheal Dolye	5.735334	-1.739108	0.653469	7.518374	-4.256147	1.303654
Robert Wood	-7.752862	8.502109	-1.309223	2.687098	0.461380	-0.495841
William Kent	-0.187387	-2.495569	-9.255805	-2.864370	-0.558848	2.244059
Claude Monet	-9.671064	-6.837910	3.071189	1.182825	2.318978	-0.436961

CHAPTER 4: DISCUSSION

4.1 Relationship Among The Artists

The scatter graphs where we put one principal component on the x-axis, and the other on the y-axis help us visually identify clusters. Figure 14 illustrates the clustering relationship among the seven artists based on the first two principal components. The x-axis shows the scores for component 1 of all artists, and y-axis the scores of component 2 for all artists.

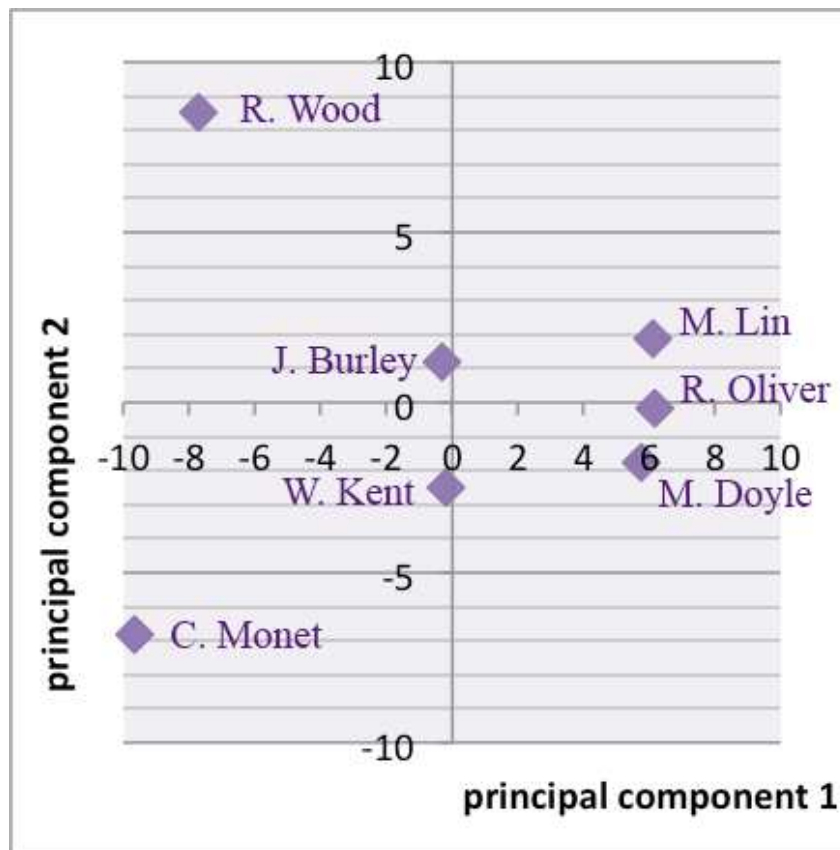


Figure 14: A scatter graph showing the relationship of the selected landscape artists, based on the scores of principal component 1 and 2.

Figure 14 shows three clusters of the seven artists. There are three groups divided by 0 of x-axis: the positive group, the negative group, and near-zero group. The positive cluster includes Michael Doyle, Mike Lin, and Robert Oliver. They are all architects and teach graphic communications for architectural designs. The negative cluster includes Claude Monet and Robert Wood who are both natural landscape painters. The near-zero cluster includes Jon Burley and William Kent, both of them are space designers; although Burley is a landscape architect, and besides being a landscape designer, Kent is also an painter and architect.

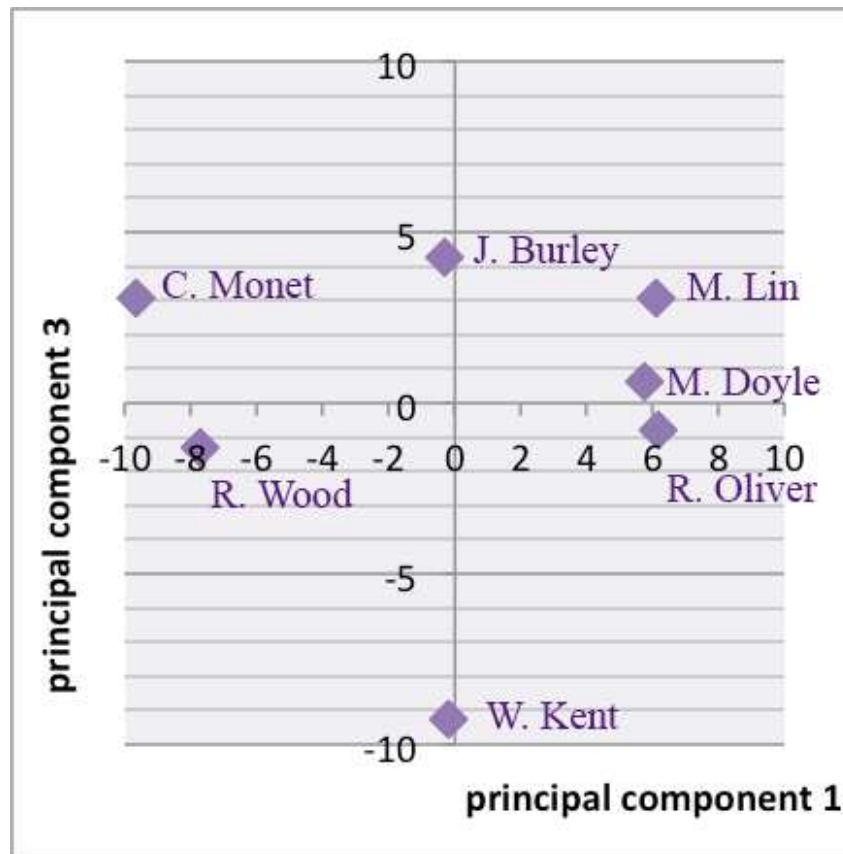


Figure 15: A scatter graph showing the relationship of the selected landscape artists, based on the scores of principal component 1 and 3.

Table g also shows the cluster results when plot principal component 1 and 3 and principal component 2 and 3 based on Figure 15 and Figure 16. PC in Table 12 means principal component. When we compare principal component 1 to principal component 3, shown in Figure C, Michael Doyle, Mike Lin, Robert Oliver are grouped in the positive cluster; William Kent the negative cluster; Jon Burley and William Kent the near-zero cluster. In Figure 14, the reasons why Burley and Kent in the near-zero group is far-away from each other are the positive and negative variables are discussed in section 4.2.

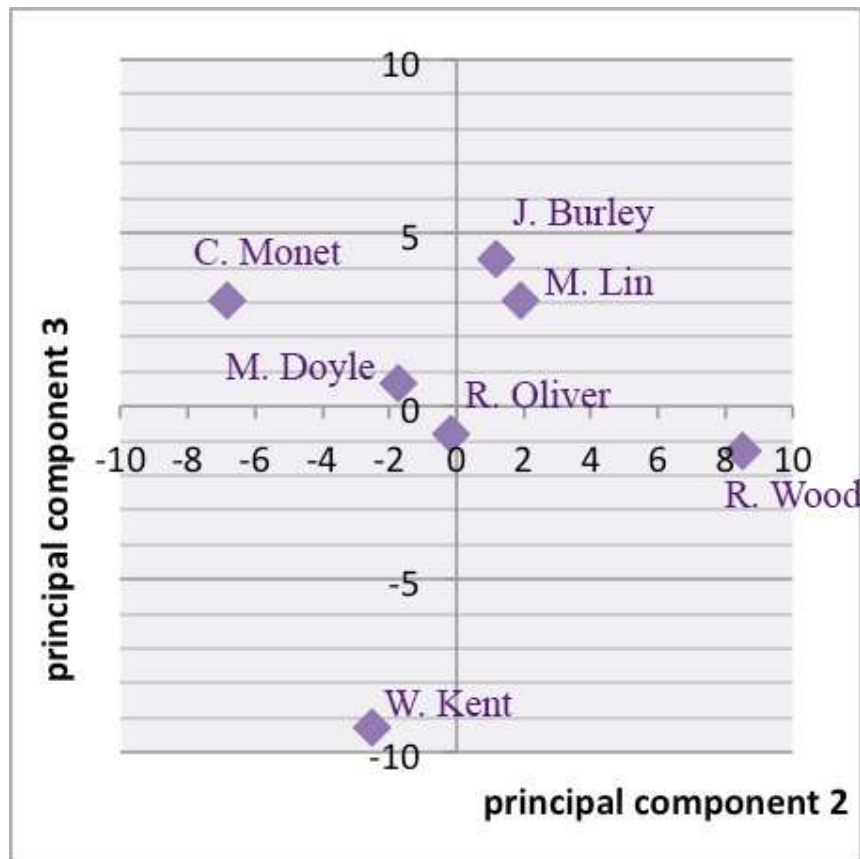


Figure 16: A scatter graph showing the relationship of the selected landscape artists, based on the scores of principal component 2 and 3.

In Figure 16, the clusters are not as clear as Figure 14 and Figure 15, I group Robert Wood in the positive group; Claude Monet are grouped in the negative group; Michael Doyle, William Kent, Mike Lin and Robert Oliver are in the near-zero group. In near-zero group, the William Kent is further than other artists. The negative variables that influence the result are listed in Table A9 in Appendix.

Table 12: List of positive, negative, and near-zero groups in six principal components.

	Positive	Negative	Near Zero
PC 1 to PC 2	Michael Doyle, Mike Lin, Robert Oliver	Claude Monet, Robert Wood	Jon Burley, William Kent
PC 1 to PC 3	Michael Doyle, Mike Lin, Robert Oliver	William Kent	Jon Burley, William Kent
PC 2 to PC 3	Robert Wood	Claude Monet	Jon Burley, Michael Doyle, William Kent, Mike Lin, Robert Oliver

4.2 Discussion Of The Principles

One of the most impressive suggestions from the artists as well as the designers is to keep practicing. For example, I used to witness Jon B. Burley and Paul Nieratko from landscape architecture department at Michigan State University, Bill Johnson, the founder of JJR, James Richards, the awarded graphic educator and designer, Mike Lin, the famous graphic educator encourage students keep drawing in their own methods. When people practice, we create muscle memory. So does drawing. When you form muscle memory by drawing an object, you actually build a memory template where to draw. This helps you draw quickly and confidently (Tomlinson, 2010).

The most obvious result of the clusters is Figure 14 (p.81). According to the literature review, the first principal component has the largest portion of loading, which means the first principal component is the most important measurement one can count on, and then is the next largest principal component. So, let us focus on Figure 14, where emphasizes the first two principal components.

Table 13: Numbers of positive, negative, and zero variables in principal component 1.

Principal Component 1	Positive Variable Numbers	Negative Variable Numbers	Near Zero Variable Numbers	Total (100.00%)
Attitude	4	10 (62.50%)	2	16
Color	10	22 (61.11%)	4	36
Composition	8	6	11 (44.00%)	25
Line	16 (80.00%)	3	1	20
Order	3 (50.00%)	3 (50.00%)	0	6
Technique	28 (52.83%)	22	3	53

* The bold numbers with the percentage of the total variance in each category are the most influential elements for forming the positive, negative, and near-zero group, respectively.

In Figure 14, there are three clusters. The positive cluster: Michael Doyle, Mike Lin, and Robert Oliver; the negative cluster: Claude Monet and Robert Wood; the near-zero cluster: Jon Burley and William Kent.

From Table 13, we can conclude that the line, the technique, and the order principles are the most important causes to attribute Doyle, Lin, and Oliver into the positive group. Comparing to some of the artists' artworks that we displayed in this research, we can see the line elements are probably more dominant in these drawings than those of other artists, such in Figure 4 (p. 10) and Figure 7 (p. 16). The artists in positive group also intent to be more willing to stress the

sequences of drawing procedure. What is more, they would like to share more instructions to others about the techniques summarized from their experiences and observations than would the other artists who we studied in this research.

The attitude, color and order principles are the largest influences to group Monet and Wood together. They are grouped for a variety of the attitudes, like A3: Never be in a hurry, A4: Draw for pleasure, A5: Do not necessarily need rules for drawing, and A12: Be loose. In the meanwhile, the positive group is influenced by an encouraging attitude of being willing to try or not being afraid of the bad results, and the near-zero group is affected by an attitude of being persistent of practicing.

The color principles as factors grouping Monet and Wood are underlining the richness of the colors the most, then, the color contrast, and the last, color graduation or change. From observing their painting styles, Figure 1 (p.5) and Figure 3 (p.7), the colors are probably the most prominent elements to differentiate Monet and Wood from others. Even they use limited colors as some other artists, however, oil paints might create depth and texture variations, then bringing more color effects of oil paintings than that created by other drawing or painting tools.

Composition principles are the critical reason for grouping Burley and Kent together. The most highlighted principle is to create a dynamic space, such as K2: Use positive/negative spaces, K9: Create a variety, and K10: Be asymmetrical. From my own observation, both of Burley and Kent prefer to use void space to create a depth for their drawings. Their drawings

also share another common fact, speaking of composition, that they include clear and definite layers, such as background, middleground, and background.

Although Monet and Wood are both in the negative group, they are both far away from each other based on x-axis. The sixty-six negative variables of principal component 1 are the reasons why they are in the same cluster. The seventy-three positive variables of principal component 2 cause Wood placed in the negative y-axis. The forty-nine negative variables in principal component 2 that cause Monet in the negative y-axis are. Table A7 and Table A8 list the positive, the negative, and the zero variables for principal component 1 and principal component 2 respectively.

In principal component 2, the *composition* category has 44.00% (11/25) positive variables and 8.00% (2/25) negative variables. In the *attitude* category, 56.25% (9/16) are the positive variables of the total variables, and 18.75% (3/16) are the negative variables. The *color* category has 58.33% (21/36) positive variables and 25.00% (9/36) of negative variables. 30% (8/20) of the *line* principle variables are positive and 45% (9/20) negative. The *order* principle variables have an equal portion as 50% (3/6) to 50% (3/6) of the positive and the negative values. The portion of the technique principles is 39.63% (21/53) positive variables to 43.40% (23/53) negative variables. According to the above data, the reasons why Monet and Wood are apart along y-axis in the same group are their attitudes, the uses of colors, and the ways of

composing elements on their canvases. We do not discuss the variables with zero values here because they have little influence to drive Monet away from Wood.

The numbers of the landscape artists' drawing or painting principles classify the artists into different group; however, can the numbers represent everything?

Mike Lin defines his BeLoose workshop as a place to learn for life, instead of only for graphic skills. In his workshop, he used Wand Carter's *To Achieve Your Dreams, Remember Your ABC's* (Lange, 1993) to encourages people to purchase their dreams. He gives advices to make money, such as to "buy real estate", "get married and have kids", and buy the things that you want now and "work hard to pay it back" (Lin, 2013, para. 2). He provides suggestions for people's life, and he often said something in his workshop: "do not allow yourself to become discouraged", "success is all in the state of mind", "don't let trouble troubles you, until trouble troubles you", and "be humble to be ahead" (Lin, 2013, para. 1). All above principles are not included in graphic skills, and not reflected in the numbers. I believe these are the essentials to differentiate him from other artists, although the cluster groups him with other graphic educators.

4.3 Future Implication And Suggestions

This research builds a model to group different landscape artists, and analyze how their principles differentiate one from another. Our result lists the principle variables that influence the differences between different clusters and even the artists in the same cluster. According to

Figure A7, the different professions, grouped in different clusters, uses different combinations of the principles. For example, Doyle, Lin, and Oliver are grouped together, in Figure A7, because of the positive principle variables in principal component 1, listed in section 4.1. These principles form a guide for the people who want to improve their graphic skills of architectural design. People who want to learn the techniques for natural landscape painting, especially oil paintings, they will look at the principles with the negative values in component 1. The principles with zero value of principal component 1 will be great references for the people who want to design landscape.

I selected the drawing or painting principles based on my own knowledge. It combines history, arts, design principles, and related sciences studies, during my recent six-and-half-year experience since 2009. My own experience and selection of the books, articles, and paintings limit my understanding and interpreting the principles. This limitation is hard to diminish in a short time, due to my scope of knowledge, and it influences how the data is collected and organized in this paper. For example, the principle coded as T23 to T29 (in Technique group) all discuss about shadow and shades, heavily distributed by Doyle (2007) from his book *Color Drawing, Design Drawing Skills and Techniques for Architects, Landscape Architects, and Interior Designers*. They could form in their own group, and help analyze other artists' principles.

Furthermore, some artists try different techniques as they age. It is hard to define that an artist using a certain principle or not. Some artists change their styles, just as they change their drawing or painting principles. This happens naturally as people grow. For example, Claude Monet and Jon Burley drew landscape paintings in classic styles in their early times. Then, they excel in both reducing their color choices and creating different styles by their own. Different drawing or painting media will drive artists come up with different techniques. Lin and Doyle would say use different pencils, such as color pencil, charcoal pencil, carpenter pencil and et cetera; while Monet and Wood would never mention about the above principles. In future studies, if the number of the artists for different fields would add, the different media choices as the principles might compare in different fields.

The number of the artist for each field, such landscape architecture, architecture, or landscape painter, can be expanded in future. They come from different countries, different times, and use different medium. For example, in this paper, Lin, Burley, Oliver, Doyle, and Wood are all Americans, consist of 71.42% of the total artists. Maybe there could be more artists from each Continent, except for Antarctica. My other preferred landscape painters include Louis Audie and Carl Walter Meyer from South Africa, Gustave Klimt, Joseph Mallord William Turner from England, Dong Yuan from China (he painted my hometown landscape paintings), Katsushika Hokusai from Japan, and Prafull Bhimraj Sawant from Indian.

Finally, the number of the selected fields can add up, too. In this paper, the artists are from landscape architecture, architecture, and landscape painter fields. People from other specific field would join the artist team, like a Japanese woodblock artists, Hokusai. Hokusai is famous for his great wave Hokusai influenced many French impressionist and post-impressionist. The most famous people are Monet and Vincent van Gogh. In some painting from Monet and van Gogh, they painted Hokusai's paintings.

APPENDIX

APPENDIX

Table A1: Color choices of markers by Mike Lin.

Group 1
Cool Grey #1
Cool Grey #2
Cool Grey #3
Cool Grey #5
Cool Grey #7
Group 2
Sapphire Blue
Blue Glow
Sky Blue
Electric Blue
Dutch Blue
Group 3
Pale Lime
Turquoise Green
Aqua
Blue Green
Group 4
Cream
Pale Olive
Olive
Dark Olive
Group 5
Willow Green
Grass Green
Nile Green
Emerald Green
Group 6
Linden Green
Group 7
Maize
Banana

Table A1 (cont'd).

Pale Sepia
Sepia
Group 8
Buff
Suntan
Mocha
Burnt Umber
Group 9
Sunset Pink
Flesh
Blush
Brick Red
Maroon
Group 10
Powder Pink
Salmon
Deep Salmon
Scarlet
Group 11
Pale Indigo
Violet Light
Purple Sage
Purple Iris
Violet
Group 12
Cadmium Orange

Table A2: Color choices by Robert Oliver (Oliver, 1983, p. 46 & 74).

Watercolor that are the replacements to a Winsor and Newton small 12 pan watercolor kit.	Marker colors used in <i>The Sketch in Color</i> (1983)
Alizarin Crimson	Yellow Green
Vermillion	Spanish Olive
Cadmium Orange	Pale Olive
Burnt Sienna	Olive
Ultramarine Blue	Oriental
Manganese Blue	Yellow Brown

Table A2 (cont'd).

Cerulean Blue	Terra Cota
Thalo Blue	Dark Brick Red
Raw Umber	Brick Red
Yellow Ochre	Pale Blue
Cadmium Yellow Light	Manganese Blue
Thalo Green	Blue Green Blue
	Mariner Blue
	Putty
	Clay
	Dark Bark
	Brick Beige
	Fuchsia
	Vermillion
	Buttercup Yellow
	Mauve
	Peach
	Warm Grey #2
	Cool Grey #2

Table A3: Color choices by Robert Wood (Flume, 1983, p. 61).

Alizarin Crimson
Brown Madder
Brown Madder Alizarin
Burnt Sienna
Burnt Umber
Cerulean Blue
Cobalt Blue
Chromium Oxide Green
Cadmium Red Lightest
Cadmium Yellow Deep
Cadmium Yellow Light
Cadmium Yellow Medium
Ivory Black
Naples Yellow
Prussian Blue

Table A3 (cont'd).

Sap Green
Ultramarine Blue
Viridian Blue
Van Dyke Brown
White
Yellow Ochre
Yellow Zinc
Permalba White

Table A4: Principal Component Analysis coefficient for each variable from SAS.

	Weak Index	
PRIN1	N/A	N/A
PRIN2	A4	Draw for pleasure.
	T33	Seascape reflected on water is with smaller strokes.
	T35	For detailed features, use smaller tips or brushes.
	T36	Roll brushes: that is why they are round.
	T38	Use rags for glazing or wiping painting instead of paper towels.
	C17	Use a pastel palette (earth tone) as dark colors to make mud.
	C24	“Generally, use warm undercoating for seascape sky” (Flume, 1983, p. 63).
	C25	Generally, warm the bottom of a breaking wave.
	C28	Always add Yellow Ochre to yellow to cut brashy effect.
	C29	To gray any color, use its complementary.
	C31	Get three light values from everything you paint.
	K20	Usually the darkest part of a tree foliage is in center of tree.
	K21	Don't overwork rocks.
	K24	Have animals looking into the painting.
	L15	Draw 3-D line.
PRIN3	A1	Be willing to try instead of being afraid to start.
	T14	Draw from memory.
	T30	Use head, legs, arms, foot direction, clothing indications and accessories to provide direction, animation, or meaning to the figure.
	T41	Use suggestive and implied colors and shapes instead of descriptive ones.
	C1	Use color pair/color jump.
	C4	Use color repeat.
	C7	Connect color.
	C16	Use a limited palette of colors.

Table A4 (cont'd).

PRIN3	C26	Never paint things as “cool” as you see them, paint with natural or fluorescent light.
	K25	The layout of space was formal near the house.
	L5	Draw professional dot.
PRIN4	A12	Be loose.
	T24	Shade and shadow should appear transparent.
	T25	Interior shadows are more subtle and less contrast; they have indistinct edges, multiple shadows, and gradation values of shadows.
	T26	The distinctness of the shadow edges should adjust as the lighting conditions change.
	T42	Apply color media on a black-and-white photocopy or laser print of a line drawing.
	T44	Combining sketch and photo to present conceptual ideas.
	T46	Choose different hue, value, and chroma for different audiences.
	T47	Decide what level of information you must communicate and how much time the drawings are worth, by the audience.
	T49	Avoid distorted perspective.
	C2	Use sequential colors.
	C15	Use monotone.
	C32	Glaze distant mountains for atmosphere effect with blue-white.
	K14	Most activity in values should locate in the center of interest.
	L11	Draw variable line or stroke.
	L14	Draw punch line.
PRIN5	L20	Keep your linework thin, because photocopy enlargements enlarge everything.
	A15	Paint alone.
	T17	Think about how to show the vastness of space on a flat piece of paper.
	T19	Finish the drawing with the contour line (silhouette), using the line to give boundaries to the light and darkness.
	C30	Avoid bright colors at edges of painting.
	K1	Use collage.
	K4	Don't touch edges.
	L1	Chisel the point.
	L2	Draw fuzzy line.
PRIN6	O1	Use markers or paints first, then colored pencil and finally adding a line/contour drawing to finish.
	A9	Be reasonable with yourself.

Table A4 (cont'd).

PRIN6	A11	Be confident.
	T6	Be creative.
	T7	Ask for and accept criticism.
	T43	Line works and shades and shadows are on one side, colors are on the other side.
	C5	Use light color.
	C8	Use earthy color.
	C10	Use line value.
	C12	Use gradual value change.
	C14	Use high contrast of light and shadow.
	C19	Never use just one color to indicate a surface or object.
	K22	Soften the edge of shadows.

Table A5: Principal Component Analysis script written in SAS.

```

TITLE ARTIST ORDINATION;
TITLE 7 ARTISTS;
TITLE 12 November 2015;
* OBSERVATION NUMBER, ARTIST NAME *;
* 10 ATTITUDE VARIABLES *;
* 6 ATTITUDE VARIABLES 4 TECHNIQUE *;
* 10 TECHNIQUE VARIABLES *;
* 10 TECHNIQUE VARIABLES *;
* 10 TECHNIQUE VARIABLES *;
* 10 TECHNIQUE VARIABLES *;
* 9 TECHNIQUE VARIABLES 1 COLOR*;
* 10 COLOR *;
* 10 COLOR *;
* 10 COLOR *;
* 5 COLOR 5 COMPOSITION *;
* 10 COMPOSITION *;
* 10 COMPOSITION *;
* 10 LINE *;
* 10 LINE *;
* 6 ORDER *;
DATA ART1;
INPUT
NUM NAME $
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10
A11 A12 A13 A14 A15 A16 T1 T2 T3 T4
T5 T6 T7 T8 T9 T10 T11 T12 T13 T14
T15 T16 T17 T18 T19 T20 T21 T22 T23 T24
T25 T26 T27 T28 T29 T30 T31 T32 T33 T34

```

Table A5 (cont'd).

T35 T36 T37 T38 T39 T40 T41 T42 T43 T44
T45 T46 T47 T48 T49 T50 T51 T52 T53 C1
C2 C3 C4 C5 C6 C7 C8 C9 C10 C11
C12 C13 C14 C15 C16 C17 C18 C19 C20 C21
C22 C23 C24 C25 C26 C27 C28 C29 C30 C31
C32 C33 C34 C35 C36 K1 K2 K3 K4 K5
K6 K7 K8 K9 K10 K11 K12 K13 K14 K15
K16 K17 K18 K19 K20 K21 K22 K23 K24 K25
L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
L11 L12 L13 L14 L15 L16 L17 L18 L19 L20
O1 O2 O3 O4 O5 O6

;

CARDS;

1 ML

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1 1 1 1 1 1 1 0 1 1
1 1 1 1 1 1 1 1 1 1
1 1 0 0 0 1 1 1 1 0
0 0 0 0 1 1 0 0 0 0
1 0 1 0 0 1 1 0 1 0
1 0 0 0 1 0 0 0 0 1
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1 1 1 0 1 1 0 1 0 0
1 1 0 0 1 1 0 0 1 1
0 1 1 0 0 1 1 1 1 1
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1 1 1 1 1 1 1 1 1 0
0 0 0 1 1 0

2 JB

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1 1 1 1 1 0 0 0 0 1
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0 0 1 1 1 1 0 1 0 0

Table A5 (cont'd).

1 1 1 1 0 1 1 1 1 0
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1 1 1 1 1 1 1 1 0 0

Table A5 (cont'd).

```

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0011111111
1110001101
1111111111
1111111110
0000000100
1001111000
011001
6 WK
0000100000
1111011000
1110000000
0000011110
0010000000
0010110000
1000000010
0001001111
1111000101
1000010010
0110001101
1111111001
1111001101
0000000101
1011010010
001000
7 CM
1010101010
0111111100
0110000001
0101000011
0011011101
0000101000
1001111111
1111010100
1100101111
0000110000
0101111000
1111111010
1100001100
0000100100
1000010100
011000
RUN;
PROC PRINT;
VAR NUM;

```

Table A5 (cont'd).

```

RUN;
PROC MEANS;
RUN;
PROC STANDARD MEAN=0 STD=1;
VAR A1 A2 A3 A4 A5 A6 A7 A8 A9 A10
A11 A12 A13 A14 A15 A16 T1 T2 T3 T4
T5 T6 T7 T8 T9 T10 T11 T12 T13 T14
T15 T16 T17 T18 T19 T20 T21 T22 T23 T24
T25 T26 T27 T28 T29 T30 T31 T32 T33 T34
T35 T36 T37 T38 T39 T40 T41 T42 T43 T44
T45 T46 T47 T48 T49 T50 T51 T52 T53 C1
C2 C3 C4 C5 C6 C7 C8 C9 C10 C11
C12 C13 C14 C15 C16 C17 C18 C19 C20 C21
C22 C23 C24 C25 C26 C27 C28 C29 C30 C31
C32 C33 C34 C35 C36 K1 K2 K3 K4 K5
K6 K7 K8 K9 K10 K11 K12 K13 K14 K15
K16 K17 K18 K19 K20 K21 K22 K23 K24 K25
L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
L11 L12 L13 L14 L15 L16 L17 L18 L19 L20
O1 O2 O3 O4 O5 O6;
RUN;
PROC MEANS;
RUN;
PROC PRINCOMP COV OUT=PL1;
VAR
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10
A11 A12 A13 A14 A15 A16 T1 T2 T3 T4
T5 T6 T7 T8 T9 T10 T11 T12 T13 T14
T15 T16 T17 T18 T19 T20 T21 T22 T23 T24
T25 T26 T27 T28 T29 T30 T31 T32 T33 T34
T35 T36 T37 T38 T39 T40 T41 T42 T43 T44
T45 T46 T47 T48 T49 T50 T51 T52 T53 C1
C2 C3 C4 C5 C6 C7 C8 C9 C10 C11
C12 C13 C14 C15 C16 C17 C18 C19 C20 C21
C22 C23 C24 C25 C26 C27 C28 C29 C30 C31
C32 C33 C34 C35 C36 K1 K2 K3 K4 K5
K6 K7 K8 K9 K10 K11 K12 K13 K14 K15
K16 K17 K18 K19 K20 K21 K22 K23 K24 K25
L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
L11 L12 L13 L14 L15 L16 L17 L18 L19 L20
O1 O2 O3 O4 O5 O6;
RUN;

```

Table A6: The MEANS Procedure from the SAS software program.

Variables	Mean	Std Dev
A1	0.8571429	0.3779645
A2	0.4285714	0.5345225
A3	0.4285714	0.5345225
A4	0.4285714	0.5345225
A5	0.4285714	0.5345225
A6	0.5714286	0.5345225
A7	0.2857143	0.4879500
A8	0.2857143	0.4879500
A9	0.5714286	0.5345225
A10	0.2857143	0.4879500
A11	0.2857143	0.4879500
A12	0.8571429	0.3779645
A13	1.0000000	0.0000000
A14	1.0000000	0.0000000
A15	0.2857143	0.4879500
A16	0.7142857	0.4879500
T1	1.0000000	0.0000000
T2	0.1428571	0.3779645
T3	0.7142857	0.4879500
T4	0.1428571	0.3779645
T5	0.7142857	0.4879500
T6	0.8571429	0.3779645
T7	0.8571429	0.3779645
T8	0.5714286	0.5345225
T9	0.5714286	0.5345225
T10	0.4285714	0.5345225
T11	0.4285714	0.5345225
T12	0.1428571	0.3779645
T13	0.1428571	0.3779645
T14	0.8571429	0.3779645
T15	0.1428571	0.3779645
T16	0.5714286	0.5345225

Table A6 (cont'd).

T17	0.1428571	0.3779645
T18	0.4285714	0.5345225
T19	0.1428571	0.3779645
T20	0.7142857	0.4879500
T21	0.5714286	0.5345225
T22	0.8571429	0.3779645
T23	1.0000000	0.0000000
T24	0.4285714	0.5345225
T25	0.1428571	0.3779645
T26	0.1428571	0.3779645
T27	0.7142857	0.4879500
T28	0.5714286	0.5345225
T29	0.5714286	0.5345225
T30	0.7142857	0.4879500
T31	0.2857143	0.4879500
T32	0.2857143	0.4879500
T33	0.1428571	0.3779645
T34	0.2857143	0.4879500
T35	0.5714286	0.5345225
T36	0.1428571	0.3779645
T37	0.8571429	0.3779645
T38	0.1428571	0.3779645
T39	0.4285714	0.5345225
T40	0.7142857	0.4879500
T41	0.5714286	0.5345225
T42	0.1428571	0.3779645
T43	0.2857143	0.4879500
T44	0.1428571	0.3779645
T45	1.0000000	0.0000000
T46	0.1428571	0.3779645
T47	0.1428571	0.3779645
T48	0.1428571	0.3779645
T49	0.7142857	0.4879500

Table A6 (cont'd).

T50	0.1428571	0.3779645
T51	0.1428571	0.3779645
T52	0.2857143	0.4879500
T53	0.5714286	0.5345225
C1	0.4285714	0.5345225
C2	0.5714286	0.5345225
C3	0.5714286	0.5345225
C4	0.7142857	0.4879500
C5	0.7142857	0.4879500
C6	0.7142857	0.4879500
C7	0.8571429	0.3779645
C8	0.4285714	0.5345225
C9	1.0000000	0.0000000
C10	0.4285714	0.5345225
C11	0.5714286	0.5345225
C30	0.5714286	0.5345225
C31	0.2857143	0.4879500
C32	0.2857143	0.4879500
C33	1.0000000	0.0000000
C34	0.7142857	0.4879500
C35	0.1428571	0.3779645
C36	0.1428571	0.3779645
K1	0.2857143	0.4879500
K2	1.0000000	0.0000000
K3	0.8571429	0.3779645
K4	0.2857143	0.4879500
K5	0.8571429	0.3779645
K6	1.0000000	0.0000000
K7	1.0000000	0.0000000
C12	0.8571429	0.3779645
C13	1.0000000	0.0000000
C14	0.5714286	0.5345225
C15	0.2857143	0.4879500

Table A6 (cont'd).

C16	0.8571429	0.3779645
C17	0.4285714	0.5345225
C18	0.5714286	0.5345225
C19	0.8571429	0.3779645
C20	0.4285714	0.5345225
C21	0.4285714	0.5345225
C22	0.7142857	0.4879500
C23	0.2857143	0.4879500
C24	0.1428571	0.3779645
C25	0.1428571	0.3779645
C26	0.7142857	0.4879500
C27	1.0000000	0.0000000
C28	0.1428571	0.3779645
C29	0.1428571	0.3779645
K8	1.0000000	0.0000000
K9	1.0000000	0.0000000
K10	1.0000000	0.0000000
K11	1.0000000	0.0000000
K12	1.0000000	0.0000000
K13	0.7142857	0.4879500
K14	0.7142857	0.4879500
K15	0.7142857	0.4879500
K16	1.0000000	0.0000000
K17	1.0000000	0.0000000
K18	0.8571429	0.3779645
K19	0.8571429	0.3779645
K20	0.1428571	0.3779645
K21	0.1428571	0.3779645
K22	0.8571429	0.3779645
K23	1.0000000	0.0000000
K24	0.1428571	0.3779645
K25	0.1428571	0.3779645
L1	0.2857143	0.4879500

Table A6 (cont'd).

L2	0.2857143	0.4879500
L3	0.4285714	0.5345225
L4	0.5714286	0.5345225
L5	0.5714286	0.5345225
L6	0.5714286	0.5345225
L7	0.4285714	0.5345225
L8	0.8571429	0.3779645
L9	0.4285714	0.5345225
L10	0.5714286	0.5345225
L11	0.8571429	0.3779645
L12	0.4285714	0.5345225
L13	0.7142857	0.4879500
L14	0.7142857	0.4879500
L15	0.2857143	0.4879500
L16	1.0000000	0.0000000
L17	0.7142857	0.4879500
L18	0.5714286	0.5345225
L19	0.7142857	0.4879500
L20	0.1428571	0.3779645
O1	0.2857143	0.4879500
O2	0.4285714	0.5345225
O3	0.5714286	0.5345225
O4	0.4285714	0.5345225
O5	0.4285714	0.5345225
O6	0.2857143	0.4879500

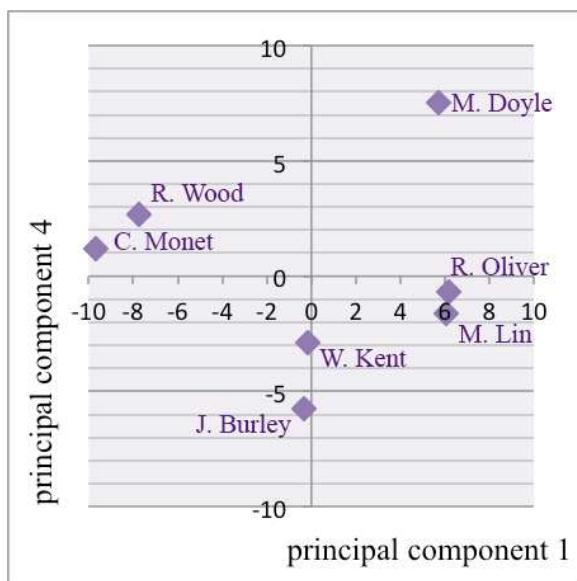


Figure A1: A scatter graph showing the relationship of the selected landscape artists, based on the scores of principal component 1 and 4.

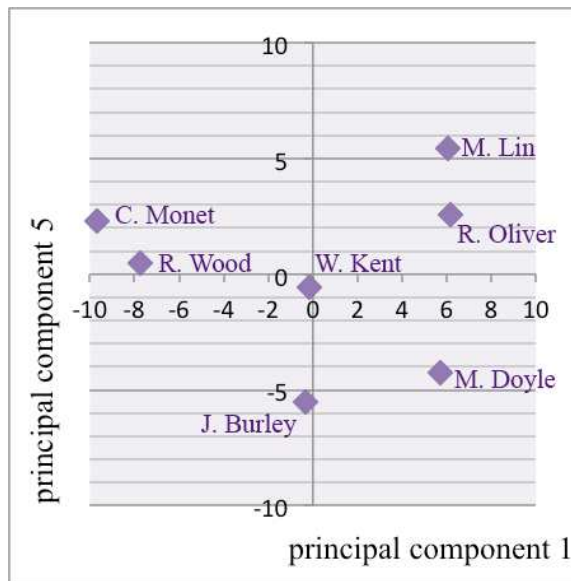


Figure A2: A scatter graph showing the relationship of the selected landscape artists, based on the scores of principal component 1 and 5.

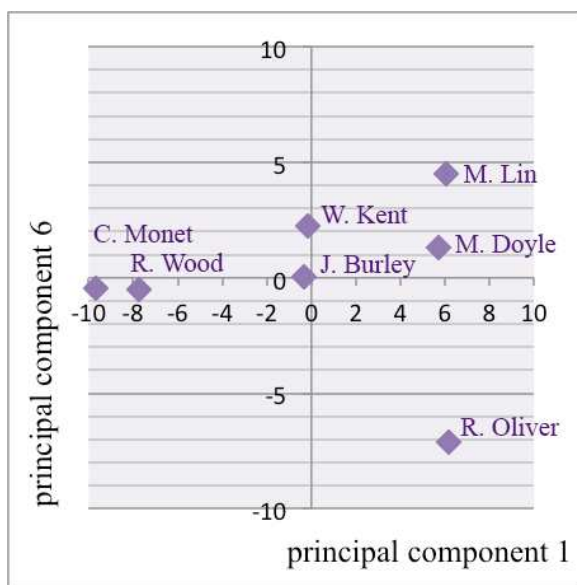


Figure A3: A scatter graph showing the relationship of the selected landscape artists, based on the scores of principal component 1 and 6.

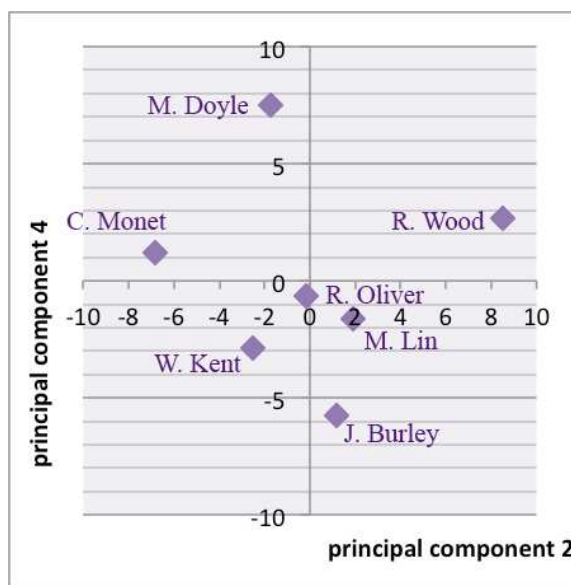


Figure A4: A scatter graph showing the relationship of the selected landscape artists, based on the scores of principal component 2 and 4.

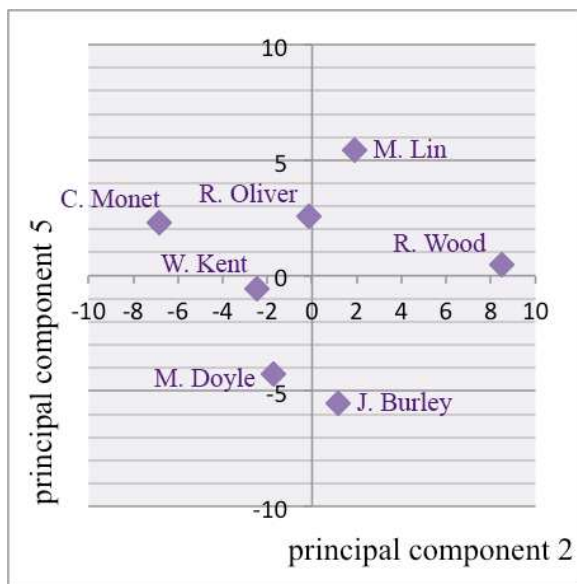


Figure A5: A scatter graph showing the relationship of the selected landscape artists, based on the scores of principal component 2 and 5.

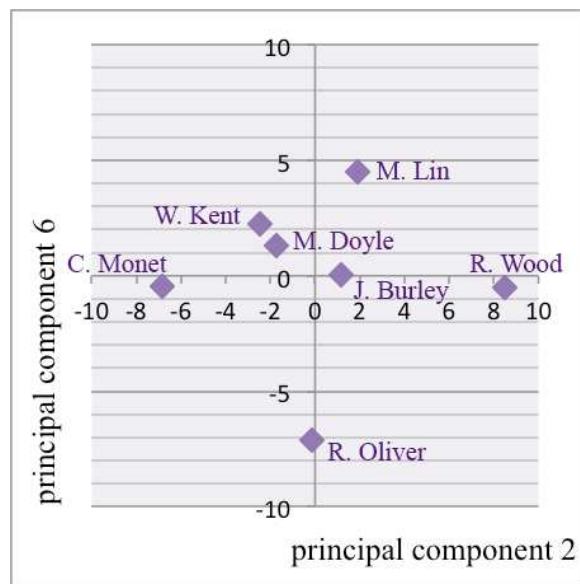


Figure A6: A scatter graph showing the relationship of the selected landscape artists, based on the scores of principal component 2 and 6.

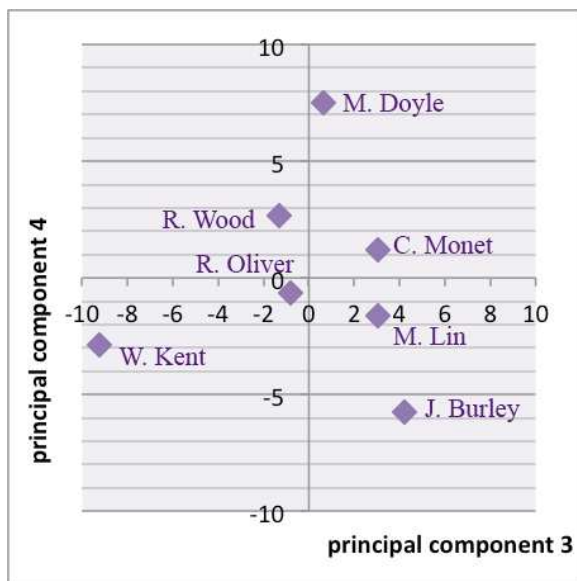


Figure A7: A scatter graph showing the relationship of the selected landscape artists, based on the scores of principal component 3 and 4.

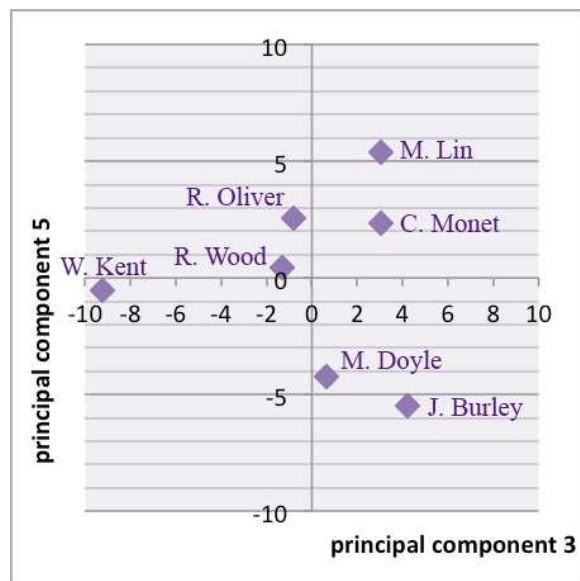


Figure A8: A scatter graph showing the relationship of the selected landscape artists, based on the scores of principal component 3 and 5.

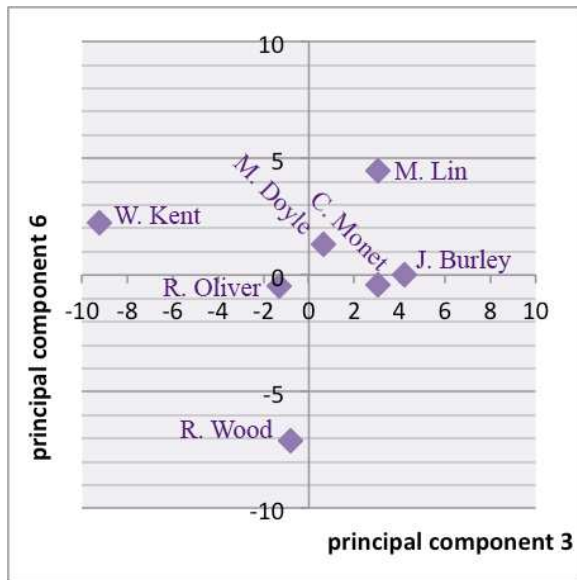


Figure A9: A scatter graph showing the relationship of the selected landscape artists, based on the scores of principal component 3 and 6.

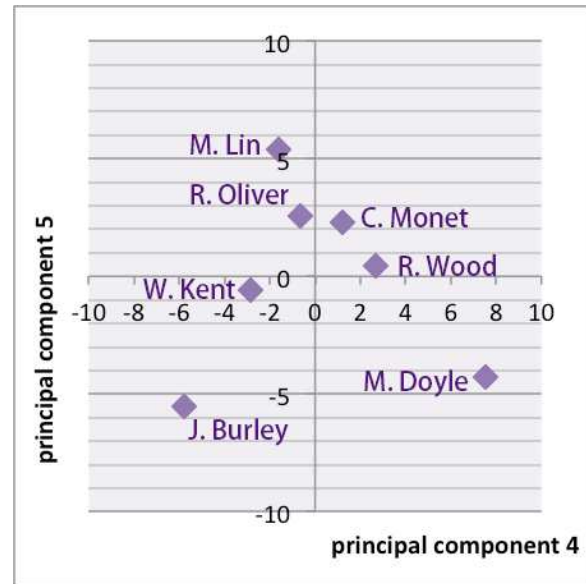


Figure A10: A scatter graph showing the relationship of the selected landscape artists, based on the scores of principal component 4 and 5.

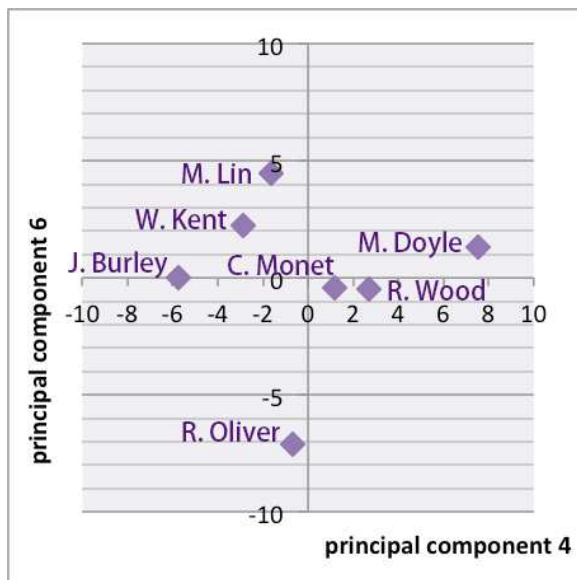


Figure A11: A scatter graph showing the relationship of the selected landscape artists, based on the scores of principal component 4 and 6.

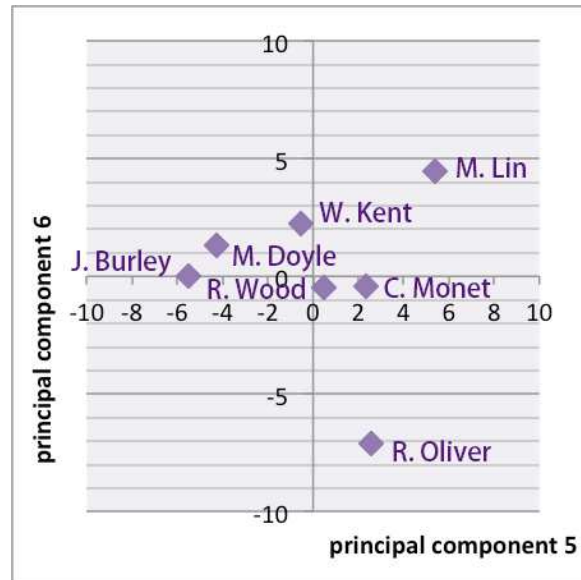


Figure A12: A scatter graph showing the relationship of the selected landscape artists, based on the scores of principal component 5 and 6.

Table A7: The principle variables with the positive, the negative, and zero values in principal component 1.

Positive Variable	
A1	Be willing to try instead of being afraid to start.
A2	Be carefree and light hearted but at the same time serious and dedicated
A6	To be a landscape architect, usually one must be able to draw well.
A11	Be confident.
C6	Use solid color.
C7	Connect color.
C10	Use line value.
C11	Combine tone or line value.
C14	Use high contrast of light and shadow.
C16	Use a limited palette of colors.
C22	Use the darker color of the object for shadow, and it should be darker than other light surfaces.
C23	Use a blender to show atmospheric depth (an airy or fade-out feeling).
C30	Avoid bright colors at edges of painting.
C34	Limit your color use for each mix and layering.
K3	Less is more.
K4	Don't touch edges.
K5	Use white space, or mass & void.
K13	Use dark or intense foreground/light background.
K14	Most activity in values should locate in the center of interest.
K15	The composition of the sketch is to compose line, shape, detail, and tone plus black in an organized and effective statement.
K18	Adding perspective to the interplay of planes and values, a more accurate illusion of depth, known as deep space, is created.
K19	Foreground, background, and middle ground make a composition.
L1	Chisel the point.
L2	Draw fuzzy line.
L3	Draw hit-go-hit.
L4	Draw professional gap.
L5	Draw professional dot.
L6	Color should cross the boundaries of contour lines.
L7	Draw mechanical line.
L9	Draw construction line.
L10	Repeat line.
L12	Draw even-thick and clean-edge line.

Table A7 (cont'd).

L13	Draw thinner line.
L14	Draw punch line.
L17	Draw 45-Degree Stroke.
L18	Draw lines over edge.
L19	Draw stripes.
L20	Keep your linework thin, because photocopy enlargements enlarge everything.
O1	Use markers or paints first, then colored pencil and finally adding a line/contour drawing to finish.
O4	General shape of the foliage mass must be represented first, then show the detail of leaf configuration and trunk structure.
O5	There are three steps to create tones: uniform tone, variable tone, and tone plus black.
T3	Watch demonstration.
T4	Collect examples.
T5	Imitation.
T8	Start Small.
T9	Start with quick sketches.
T10	Use perspective charts to drawing building and courtyard.
T11	Use paraline drawing or axonometric projection to show spatial relationship.
T12	Draw with both hands.
T13	Drawn in upside down.
T14	Draw from memory.
T15	Tracing image from slide.
T20	“Often add people for scale” (Burley and Machemer, 2015, p. 432).
T21	Use geometric shapes.
T22	Detail is to define and give reality to the sketch.
T25	Interior shadows are more subtle and less contrast; they have indistinct edges, multiple shadows, and gradation values of shadows.
T26	The distinctness of the shadow edges should adjust as the lighting conditions change.
T29	Use geometric procedures to construct shadows on objects.
T30	Use head, legs, arms, foot direction, clothing indications and accessories to provide direction, animation, or meaning to the figure.
T35	For detailed features, use smaller tips or brushes.
T37	Do not overdraw or overpaint.
T40	Limit light resources.
T41	Use suggestive and implied colors and shapes instead of descriptive ones.
T42	Apply color media on a black-and-white photocopy or laser print of a line drawing.
T43	Line works and shades and shadows are on one side, colors are on the other side.

Table A7 (cont'd).

T44	Combining sketch and photo to present conceptual ideas.
T46	Choose different hue, value, and chroma for different audiences.
T47	Decide what level of information you must communicate and how much time the drawings are worth, by the audience.
T49	Avoid distorted perspective.
Negative Variable	
A3	Never be in a hurry.
A4	Draw for pleasure.
A5	Do not necessarily need rules for drawing.
A7	Try to have three or four paintings going at one time.
A8	Be simple and honest.
A9	Be reasonable with yourself.
A10	“TEACH those who cannot, and let those who can, Do” (Flume, 1983, p. 63)
A12	Be loose.
A15	Paint alone.
A16	Be willing to share.
C1	Use color pair/color jump.
C2	Use sequential colors.
C3	Use color rainbow.
C4	Use color repeat.
C5	Use light color.
C8	Use earthy color.
C12	Use gradual value change.
C15	Use monotone.
C17	Use a pastel palette (earth tone) as dark colors to make mud.
C18	Blend the colors together in layers (without any order).
C19	Never use just one color to indicate a surface or object.
C20	Never use only the typical expected color to indicate what the object is, such as blue for water.
C21	Shadows are usually thinner than the shadows on the object.
C24	“Generally, use warm undercoating for seascape sky” (Flume, 1983, p. 63).
C25	Generally, warm the bottom of a breaking wave.
C26	Never paint things as “cool” as you see them, paint with natural or fluorescent light.
C28	Always add Yellow Ochre to yellow to cut brashy effect.
C29	To gray any color, use its complementary.
C31	Get three light values from everything you paint.
C32	Glaze distant mountains for atmosphere effect with blue-white.

Table A7 (cont'd).

C35	Water must not be transparent.
C36	Clouds need not to be transparent, but airy, and vaporous.
K1	Use collage.
K20	Usually the darkest part of a tree foliage is in center of tree.
K21	Don't overwork rocks.
K22	Soften the edge of shadows.
K24	Have animals looking into the painting.
K25	The layout of space was formal near the house.
L8	Draw freehand line.
L11	Draw variable line or stroke.
L15	Draw 3-D line.
O2	Work from dark to light.
O3	“It does not matter which color is used first, just pick one and draw” (Burley and Machemer, 2015, p. 432).
O6	Work from further space to close.
T2	Notice the changing effects.
T6	Be creative.
T7	Ask for and accept criticism.
T16	Keep a journal in graphics.
T17	Think about how to show the vastness of space on a flat piece of paper.
T18	Always draw on site.
T19	Finish the drawing with the contour line (silhouette), using the line to give boundaries to the light and darkness.
T24	Shade and shadow should appear transparent.
T27	Reflected light in shadows make some areas lighter than other shadows.
T28	Reflected lights are as important as highlights.
T31	Get back and view painting from distance.
T32	Always cut in rather than paint into object.
T33	Seascape reflected on water is with smaller strokes.
T34	Scratch in heavy grass, water, or distant twigs with end of brush.
T36	Roll brushes: that is why they are round.
T38	Use rags for glazing or wiping painting instead of paper towels.
T39	Do not use dryers in your painting.
T48	Paint objects, light, and shade spontaneously and in a whirl of emotion.
T50	Do not look at your old paintings, so as you can avoid the same errors.
T51	The first painting should cover as much of the canvas as possible.

Table A7 (cont'd).

T52	Use symbols and motifs to draw and paint.
T53	For any object, always draw a series of drawings.
Zero Variable	
A13	Practice.
A14	Be persistent.
C9	Use tone value.
C13	Use value to connect of shadow and shade.
C27	Don't flare butts of trees too much.
C33	Create a harmony color palette.
K2	Use positive/negative spaces.
K6	Create zig-zag shapes and forms.
K7	Have dark and light effects.
K8	Use shade and shadow, and it defines the shapes of objects.
K9	Create a variety.
K10	Be asymmetrical.
K11	Make eye line hidden.
K12	Create focal point.
K16	Move the focal point or central line for lateral of interests or dramatic effects for more dramatic effects.
K17	The composition of a picture should be in equilibrium or balance.
K23	Tie things together: Grass into rocks, limbs into limbs, and etc.
L16	Combine thin and thick strokes.
T1	Observe.
T23	Beware of the real shadows and its relationship with sun's location and objects or scenes.
T45	Apply design principles to sketches.

Table A8: The principle variables with the positive, the negative, and zero values in principal component 2.

Positive Variables	
A1	Be willing to try instead of being afraid to start.
A3	Never be in a hurry.
A4	Draw for pleasure.
A7	Try to have three or four paintings going at one time.
A8	Be simple and honest.
A9	Be reasonable with yourself.
A10	"TEACH those who cannot, and let those who can, Do" (Flume, 1983, p. 63)
A12	Be loose.

Table A8 (cont'd).

A16	Be willing to share.
C2	Use sequential colors.
C3	Use color rainbow.
C4	Use color repeat.
C6	Use solid color.
C7	Connect color.
C8	Use earthy color.
C14	Use high contrast of light and shadow.
C16	Use a limited palette of colors.
C17	Use a pastel palette (earth tone) as dark colors to make mud.
C19	Never use just one color to indicate a surface or object.
C20	Never use only the typical expected color to indicate what the object is, such as blue for water.
C23	Use a blender to show atmospheric depth (an airy or fade-out feeling).
C24	“Generally, use warm undercoating for seascape sky” (Flume, 1983, p. 63).
C25	Generally, warm the bottom of a breaking wave.
C26	Never paint things as “cool” as you see them, paint with natural or fluorescent light.
C28	Always add Yellow Ochre to yellow to cut brashy effect.
C29	To gray any color, use its complementary.
C30	Avoid bright colors at edges of painting.
C31	Get three light values from everything you paint.
C32	Glaze distant mountains for atmosphere effect with blue-white.
C34	Limit your color use for each mix and layering.
K3	Less is more.
K4	Don't touch edges.
K5	Use white space, or mass & void.
K13	Use dark or intense foreground/light background.
K15	The composition of the sketch is to compose line, shape, detail, and tone plus black in an organized and effective statement.
K18	Adding perspective to the interplay of planes and values, a more accurate illusion of depth, known as deep space, is created.
K19	Foreground, background, and middle ground make a composition.
K20	Usually the darkest part of a tree foliage is in center of tree.
K21	Don't overwork rocks.
K22	Soften the edge of shadows.
K24	Have animals looking into the painting.
L1	Chisel the point.

Table A8 (cont'd).

L2	Draw fuzzy line.
L11	Draw variable line or stroke.
L12	Draw even-thick and clean-edge line.
L14	Draw punch line.
L15	Draw 3-D line.
L17	Draw 45-Degree Stroke.
O2	Work from dark to light.
O3	“It does not matter which color is used first, just pick one and draw” (Burley and Machemer, 2015, p. 432).
O6	Work from further space to close.
T3	Watch demonstration.
T4	Collect examples.
T6	Be creative.
T7	Ask for and accept criticism.
T12	Draw with both hands.
T13	Drawn in upside down.
T14	Draw from memory.
T15	Tracing image from slide.
T16	Keep a journal in graphics.
T18	Always draw on site.
T22	Detail is to define and give reality to the sketch.
T31	Get back and view painting from distance.
T32	Always cut in rather than paint into object.
T33	Seascape reflected on water is with smaller strokes.
T34	Scratch in heavy grass, water, or distant twigs with end of brush.
T35	For detailed features, use smaller tips or brushes.
T36	Roll brushes: that is why they are round.
T37	Do not overdraw or overpaint.
T38	Use rags for glazing or wiping painting instead of paper towels.
T43	Line works and shades and shadows are on one side, colors are on the other side.
T53	For any object, always draw a series of drawings.
Negative Variables	
A5	Do not necessarily need rules for drawing.
A11	Be confident.
A15	Paint alone.
C1	Use color pair/color jump.

Table A8 (cont'd).

C5	Use light color.
C10	Use line value.
C11	Combine tone or line value.
C15	Use monotone.
C21	Shadows are usually thinner than the shadows on the object.
C22	Use the darker color of the object for shadow, and it should be darker than other light surfaces.
C35	Water must not be transparent.
C36	Clouds need not to be transparent, but airy, and vaporous.
K1	Use collage.
K25	The layout of space was formal near the house.
L5	Draw professional dot.
L7	Draw mechanical line.
L8	Draw freehand line.
L9	Draw construction line.
L10	Repeat line.
L13	Draw thinner line.
L18	Draw lines over edge.
L19	Draw stripes.
L20	Keep your linework thin, because photocopy enlargements enlarge everything.
O1	Use markers or paints first, then colored pencil and finally adding a line/contour drawing to finish.
O4	General shape of the foliage mass must be represented first, then show the detail of leaf configuration and trunk structure.
O5	There are three steps to create tones: uniform tone, variable tone, and tone plus black.
T2	Notice the changing effects.
T5	Imitation.
T10	Use perspective charts to drawing building and courtyard.
T11	Use paraline drawing or axonometric projection to show spatial relationship.
T20	“Often add people for scale” (Burley and Machemer, 2015, p. 432).
T21	Use geometric shapes.
T24	Shade and shadow should appear transparent.
T25	Interior shadows are more subtle and less contrast; they have indistinct edges, multiple shadows, and gradation values of shadows.
T26	The distinctness of the shadow edges should adjust as the lighting conditions change.
T27	Reflected light in shadows make some areas lighter than other shadows.
T28	Reflected lights are as important as highlights.

Table A8 (cont'd).

T30	Use head, legs, arms, foot direction, clothing indications and accessories to provide direction, animation, or meaning to the figure.
T39	Do not use dryers in your painting.
T40	Limit light resources.
T41	Use suggestive and implied colors and shapes instead of descriptive ones.
T42	Apply color media on a black-and-white photocopy or laser print of a line drawing.
T44	Combining sketch and photo to present conceptual ideas.
T46	Choose different hue, value, and chroma for different audiences.
T47	Decide what level of information you must communicate and how much time the drawings are worth, by the audience.
T48	Paint objects, light, and shade spontaneously and in a whirl of emotion.
T50	Do not look at your old paintings, so as you can avoid the same errors.
T51	The first painting should cover as much of the canvas as possible.
T52	Use symbols and motifs to draw and paint.
Zero Variables	
A13	Practice.
A14	Be persistent.
C9	Use tone value.
C13	Use value to connect of shadow and shade.
C27	Don't flare butts of trees too much.
C33	Create a harmony color palette.
K2	Use positive/negative spaces.
K6	Create zig-zag shapes and forms.
K7	Have dark and light effects.
K8	Use shade and shadow, and it defines the shapes of objects.
K9	Create a variety.
K10	Be asymmetrical.
K11	Make eye line hidden.
K12	Create focal point.
K16	Move the focal point or central line for lateral of interests or dramatic effects for more dramatic effects.
K17	The composition of a picture should be in equilibrium or balance.
K23	Tie things together: Grass into rocks, limbs into limbs, and etc.
L16	Combine thin and thick strokes.
T1	Observe.
T23	Beware of the real shadows and its relationship with sun's location and objects or scenes.
T45	Apply design principles to sketches.

Table A9: The principle with the positive, the negative, and zero values in principal component 3.

Positive Variables	
A1	Be willing to try instead of being afraid to start.
A2	Be carefree and light hearted but at the same time serious and dedicated
A3	Never be in a hurry.
A4	Draw for pleasure.
A6	To be a landscape architect, usually one must be able to draw well.
A7	Try to have three or four paintings going at one time.
A8	Be simple and honest.
A9	Be reasonable with yourself.
A10	“TEACH those who cannot, and let those who can, Do” (Flume, 1983, p. 63)
A15	Paint alone.
A16	Be willing to share.
C1	Use color pair/color jump.
C2	Use sequential colors.
C3	Use color rainbow.
C4	Use color repeat.
C6	Use solid color.
C7	Connect color.
C12	Use gradual value change.
C16	Use a limited palette of colors.
C17	Use a pastel palette (earth tone) as dark colors to make mud.
C18	Blend the colors together in layers (without any order).
C19	Never use just one color to indicate a surface or object.
C20	Never use only the typical expected color to indicate what the object is, such as blue for water.
C23	Use a blender to show atmospheric depth (an airy or fade-out feeling).
C26	Never paint things as “cool” as you see them, paint with natural or fluorescent light.
C31	Get three light values from everything you paint.
C35	Water must not be transparent.
C36	Clouds need not to be transparent, but airy, and vaporous.
K1	Use collage.
K4	Don't touch edges.
K13	Use dark or intense foreground/light background.
K14	Most activity in values should locate in the center of interest.
K22	Soften the edge of shadows.
L1	Chisel the point.
L2	Draw fuzzy line.

Table A9 (cont'd).

L3	Draw hit-go-hit.
L4	Draw professional gap.
L5	Draw professional dot.
L6	Color should cross the boundaries of contour lines.
L7	Draw mechanical line.
L9	Draw construction line.
L12	Draw even-thick and clean-edge line.
L15	Draw 3-D line.
L17	Draw 45-Degree Stroke.
L18	Draw lines over edge.
L20	Keep your linework thin, because photocopy enlargements enlarge everything.
O1	Use markers or paints first, then colored pencil and finally adding a line/contour drawing to finish.
O2	Work from dark to light.
O4	General shape of the foliage mass must be represented first, then show the detail of leaf configuration and trunk structure.
O5	There are three steps to create tones: uniform tone, variable tone, and tone plus black.
O6	Work from further space to close.
T2	Notice the changing effects.
T3	Watch demonstration.
T4	Collect examples.
T6	Be creative.
T7	Ask for and accept criticism.
T8	Start Small.
T9	Start with quick sketches.
T10	Use perspective charts to drawing building and courtyard.
T11	Use paraline drawing or axonometric projection to show spatial relationship.
T12	Draw with both hands.
T13	Drawn in upside down.
T14	Draw from memory.
T15	Tracing image from slide.
T16	Keep a journal in graphics.
T17	Think about how to show the vastness of space on a flat piece of paper.
T18	Always draw on site.
T19	Finish the drawing with the contour line (silhouette), using the line to give boundaries to the light and darkness.

Table A9 (cont'd).

T24	Shade and shadow should appear transparent.
T25	Interior shadows are more subtle and less contrast; they have indistinct edges, multiple shadows, and gradation values of shadows.
T26	The distinctness of the shadow edges should adjust as the lighting conditions change.
T28	Reflected lights are as important as highlights.
T29	Use geometric procedures to construct shadows on objects.
T30	Use head, legs, arms, foot direction, clothing indications and accessories to provide direction, animation, or meaning to the figure.
T31	Get back and view painting from distance.
T32	Always cut in rather than paint into object.
T34	Scratch in heavy grass, water, or distant twigs with end of brush.
T35	For detailed features, use smaller tips or brushes.
T41	Use suggestive and implied colors and shapes instead of descriptive ones.
T42	Apply color media on a black-and-white photocopy or laser print of a line drawing.
T43	Line works and shades and shadows are on one side, colors are on the other side.
T44	Combining sketch and photo to present conceptual ideas.
T46	Choose different hue, value, and chroma for different audiences.
T47	Decide what level of information you must communicate and how much time the drawings are worth, by the audience.
T48	Paint objects, light, and shade spontaneously and in a whirl of emotion.
T49	Avoid distorted perspective.
T50	Do not look at your old paintings, so as you can avoid the same errors.
T51	The first painting should cover as much of the canvas as possible.
T52	Use symbols and motifs to draw and paint.
Negative Variables	
A5	Do not necessarily need rules for drawing.
A11	Be confident.
A12	Be loose.
C5	Use light color.
C8	Use earthy color.
C10	Use line value.
C11	Combine tone or line value.
C14	Use high contrast of light and shadow.
C15	Use monotone.
C21	Shadows are usually thinner than the shadows on the object.
C22	Use the darker color of the object for shadow, and it should be darker than other light surfaces.
C24	“Generally, use warm undercoating for seascape sky” (Flume, 1983, p. 63).

Table A9 (cont'd).

C25	Generally, warm the bottom of a breaking wave.
C28	Always add Yellow Ochre to yellow to cut brashy effect.
C29	To gray any color, use its complementary.
C30	Avoid bright colors at edges of painting.
C32	Glaze distant mountains for atmosphere effect with blue-white.
C34	Limit your color use for each mix and layering.
K3	Less is more.
K5	Use white space, or mass & void.
K15	The composition of the sketch is to compose line, shape, detail, and tone plus black in an organized and effective statement.
K18	Adding perspective to the interplay of planes and values, a more accurate illusion of depth, known as deep space, is created.
K19	Foreground, background, and middle ground make a composition.
K20	Usually the darkest part of a tree foliage is in center of tree.
K21	Don't overwork rocks.
K24	Have animals looking into the painting.
K25	The layout of space was formal near the house.
L8	Draw freehand line.
L10	Repeat line.
L11	Draw variable line or stroke.
L13	Draw thinner line.
L14	Draw punch line.
L19	Draw stripes.
O3	"It does not matter which color is used first, just pick one and draw" (Burley and Machemer, 2015, p. 432).
T5	Imitate
T20	"Often add people for scale" (Burley and Machemer, 2015, p. 432).
T21	Use geometric shapes.
T22	Detail is to define and give reality to the sketch.
T27	Reflected light in shadows make some areas lighter than other shadows.
T33	Seascape reflected on water is with smaller strokes.
T36	Roll brushes: that is why they are round.
T37	Do not overdraw or overpaint.
T38	Use rags for glazing or wiping painting instead of paper towels.
T39	Do not use dryers in your painting.
T40	Limit light resources.
T53	For any object, always draw a series of drawings.

Table A9 (cont'd).

Zero Variables	
A13	Practice.
A14	Be persistent.
C9	Use tone value.
C13	Use value to connect of shadow and shade.
C27	Don't flare butts of trees too much.
C33	Create a harmony color palette.
K2	Use positive/negative spaces.
K6	Create zig-zag shapes and forms.
K7	Have dark and light effects.
K8	Use shade and shadow, and it defines the shapes of objects.
K9	Create a variety.
K10	Be asymmetrical.
K11	Make eye line hidden.
K12	Create focal point.
K16	Move the focal point or central line for lateral of interests or dramatic effects for more dramatic effects.
K17	The composition of a picture should be in equilibrium or balance.
K23	Tie things together: Grass into rocks, limbs into limbs, and etc.
L16	Combine thin and thick strokes.
T1	Observe.
T23	Beware of the real shadows and its relationship with sun's location and objects or scenes.
T45	Apply design principles to sketches.

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