DRAWING FOR COMMUNICATION

DISSERTATION

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School of The Ohio State University

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* * * *

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ABSTRACT

This research study on drawing for communication evolved from an interest in formulating a freehand perspective drawing instruction strategy for non art majors and adults without design training. The need for the drawing training has been expressed by different practitioners, in particular, those who are interested in developing an ability to produce quality realistic drawing from thought in order to create, communicate and exchange ideas. The focus of the study in the research phase was to investigate the 3-D grid perspective drawing instruction implemented on the entry level drawing class for design students; the method has proved to be successful in developing the desired drawing skill (Anderson, 1997).

The purpose of the study is to explore and propose a drawing instructional strategy and a concept of drawing for communication described from the perspective of and in terms of the discourse of interpersonal and socio-cognitive development. Vygotsky’s concept of the zone of proximal development is employed in the theoretical development of the study and the research investigation along the lines of sociocultural development.

In the beginning phase of the study, the interpretation of the 3-D grid drawing instruction utilized in this class is described with a particular focus on the process of the drawing production skill development itself. In the research phase, the paradigm of the
practice of drawing for communication was more fully developed, and two research propositions were generated. The interpretations of the instructional strategy, the use and form of semiotic tools, and the skill of drawing for communication introduced in the class were extended to include the means of training described within the context of the social and interpersonal communication exchanges of the class. A number of ways to address the concept of drawing for communication were generated from the perspective of the drawing acquisition process of adult learners. The designer communicative skill offered in this entry level design drawing class was described in terms of the development of skill in producing realistic drawing from visualization, the designer communication language skill development, and unique ways of producing drawing integrated/interacting with language production during the process of developing both skills through design studio transactions.

Implications of the findings of this study on drawing instructional strategy besides the potential for cognitive development include the potential for: complementing traditional drawing training and developing drawing training using other kinds of training tools, providing additional knowledge based on drawing production for visual art study, and providing a different approach to instructional strategy for general education. In conclusion, this researcher recommends future research on related topics for the purpose of expanding the concept of drawing for communication and popularizing the instructional strategy.
Dedicated to my parents
I am deeply grateful to Dr. Vesta Daniel, my advisor, for her intellectual guidance, her kindness, patience, and encouragement, which helped me to explore my topic through the dissertation process and to understand the meaningful practice of an educator. In this research study, I gained tremendously in my understanding of design education from Dr. Noel Mayo, co-advisor, in particular, from his educational philosophy which is integral in his practice. I would like to thank two of my committee members, Dr. Arthur Efland, for providing me with knowledge and guidance on the theoretical concepts underlying this study, and Dr. Georgiana Short, for her kindness and comments on case study research. I would like to thank the teaching staff of the class Design 199 and the student volunteers from the class who made the research phase of this study possible. I wish to thank all my friends here in Columbus who helped me with the technical production of this manuscript and offered mentor support and encouragement as well. I would also like to acknowledge Chulalongkorn University for a doctoral scholarship to support my first three years of doctoral education here at the Ohio State University.
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CHAPTER 1

INTRODUCTION

Problem and Needs in Drawing for Communication

Designers, engineers, and innovators need to communicate with each other and with non-professional people, and these transactions are significant as the core activities that traditionally define their professions. Though verbal and written skills are taught in all fields throughout every academic level, such skills alone have some limitations for communicating across professions in engineering and design cultures. Unlike verbal and symbolic training at the college level, drawing practice, which offers such benefits as visual-spatial skill and enhanced communication, is taught extensively in only a few professions as the major skill of their practice. Adults in other majors may have some visual skill from classes in drawing and the arts sometimes offered in childhood education. Nevertheless, visual communication ability and visualization skill are not highly developed capabilities of many people.

A decline in emphasis on realistic hand drawing skill in the art classes of general education can be perceived from Efland’s examination of major ideologies practiced in art education during the 20th century (Efland, 1990). Among the currents of the intellectual stream and social values that have influenced art teaching in childhood
education during this period, the most influential is the ideal of self-expression. This ideology, which began around the 1920’s and had repercussions throughout the 20th century, has been reflected in such beliefs as the notion that teaching realistic drawing skill will damage the child’s imagination and natural creativity. Another major critical idea is that training in representational drawing skill, which is included in creative problem solving, could contribute to scientific reductionism. By the end of the century, critics observed that the ideas underlying the major movements such as discipline-based art education could be symbolized by the way art learning had become a passive form of engagement, as art studio activities were no longer important assignments (p. 254).

The new approach in art teaching emphasized discovery and intended that students be their own agents in the production of knowledge. Despite the influence of these ideologies, the debate between those supporting the teaching of art content and studio skills and those seeing art as self-expression continued throughout the 20th century (p. 263).

The issue of insufficient freehand realistic drawing skill has been recently addressed in engineering colleges. The major concerns addressed by engineering educators and researchers are related to the need for different kinds of drawing training besides training in standard drafting skill since both drafting with traditional tools and CAD, Computer Aided Design, only benefit production of the final design representation. In a study of Ullman, Wood, and Craig (1990), the findings confirm that, besides serving as basic communication tools among practitioners, conceptual sketches and abstract graphic skills are in fact essential to the development of ideas throughout the design process. Another significant benefit of informal drawing is developing the
ability of engineering students to produce and explore ideas and viewpoints in multiple directions. Today’s students who have problems in producing and exploring multiple directions of ideas and viewpoints when utilizing the computer appear to benefit from informal drawing training (Lilly, 1999). Ullman et al. (1990) suggest that further study is needed on the methodology for examining drawing in support of the cognitive process and on drawing aids that enhance rapid sketching.

While researchers of engineering CAD are currently attempting to develop CAD technology that can provide better support to the initial sketching and subsequent development phase of the design process, many engineers now seek traditional training and practice with experts from areas of the arts and design (Mayo, 1999). Betty Edwards (1979/1989), one of the few art professors to write about and teach freehand realistic drawing in this era, has seen her book on teaching the drawing skills become one of today’s best selling art books. At present, there are few materials available for non-art majors and those without training in design who are seeking ways to acquire the skill of drawing for communication.

Research Questions

What comprises drawing for communication practice and what are the methods that could help facilitate such drawing skill for non-art majors and adults without design training?

These primary questions from the research proposal led to the establishment of two propositions for the research phase of this study. The first research proposition addresses the interpretation of the instructional strategy and skills of drawing for
communication introduced in a drawing class, described within the context of the actual social and communication exchange of the class. The second research proposition addresses the concept of drawing for communication when examined from the perspective of the student drawing acquisition process.

**Methodology**

The central aim of this research study is to conduct an investigation on successful drawing instruction for developing freehand realistic drawing skill using a three dimensional grid perspective. Since the late 80’s, drawing instruction utilizing a 3-D grid has been developed and implemented in the course called Design 199: Design, Visual Thinking and Problem Solving offered in the Department of Design at The Ohio State University. The 3-D grid instruction has proved to be very successful in training incoming industrial design students with basic perspective drawing skills in design within a shorter training time compared to instruction utilizing traditional drawing methods (Anderson, 1997). Unskilled students have demonstrated quick improvement of their perspective drawing skills, including the quality of images, ability to produce and explore their own creations, and visual-spatial communicative ability. Because the grid charts as well as the drawing instruction have been adjusted and improved regularly by the faculty coordinator and his staff, this investigation studies the most recent version of the tools, which were being utilized at the time this research was conducted, Spring quarter of 2003.

Participants of the study were university students from various majors and beginning level design students who had little background or no trained skill either in
producing freehand perspective drawing or in graphic communication and visualization. These students attended the drawing class Design 199 offered at the Ohio State University in Spring Quarter of 2003. The study observed two sections of the class Design 199. Interviews were conducted with the instructor of each class section as well as eight student volunteers, four from each class.

The social approach in the developmental concept proposed by Vygotsky has been employed by Western research studies in various interesting ways (Wertsch, 1985). This research study implements the developmental concept of Vygotsky as utilized in two areas of research that employ the concept to look into a particular issue of interest with questions specific to the issue. For the literature review, different successful methods of drawing instruction are gathered and examined along with research studies, particularly the study by John-Steiner (1985), which concentrates on describing the process of language production skill development itself with less emphasis on identifying social interaction and the use of language in social exchange. John-Steiner’s investigation makes extensive reference to Vygotsky’s study of second language skill development. Vygotsky’s concept of the zone of proximal development as interpreted and practiced in mainstream research in the social approach to learning will be implemented in the research phase of this dissertation. In the research phase, the research paradigm and methods of this study are developed according to the concept of the zone of proximal development. According to this transactional learning concept, this researcher will examine how the instructors provide adult learners with supporting devices, particularly, language in communication, the 3-D grids, and a supportive social environment, so that they are able to gain the skill of drawing for communication and
reach a level of consciousness which they would have been unable to achieve by themselves. The instructional strategy will be described in terms of the tutor’s tasks in cultivating each skill of drawing for communication introduced in this entry level design drawing class.

In this dissertation, the content is organized as follows: following the review of current drawing methods and tools in chapter 2, a discussion of Vygotsky’s zone of proximal development and construction of a conceptual framework for the research investigation is presented in chapter 3. A review of literature concerned with constructing communication concepts and observation criteria is presented in chapter 4. In chapter 5, preceding the research inquiry, selected drawing instructional methods from documents including art and design drawing manuals and a former study on the 3D grid drawing instruction of the class Design 199 written by Anderson (1997) are examined. Through an analysis of these documents along with discourse on the conceptual framework and communication criteria from chapter 3 and chapter 4, the research propositions are generated.

In chapter 6, details of the research methodology are discussed. This dissertation employs case study as its research strategy with the aim of furthering the interpretation of the concept of the 3-D grid drawing instructional method proposed in chapter 5 to include an interpretation of the training constructed within the context of the social interaction and exchanges of the class Design 199. Case study reports on the drawing classroom activity and about students from the class comprise chapters 7 and 8. An interpretation of the instructional strategy and discussion of the concept of drawing for
communication are presented in chapter 9. The research implications, recommendations, and conclusion are in chapter 9 as well.

**Purpose of the Study**

The purpose of this study is to construct a paradigm of the practice of drawing for communication, to explore its definition, and to formulate an instructional strategy that can help facilitate such drawing skill for non art majors and adults lacking design training.

**Significance of the Study and Implications**

The significance of the study to incoming design students and adults from other majors lies in the means of mediation provided by the use of 3-D grids to support social transactions that facilitate drawing production and drawing for communication. Along with enhanced communication, students’ achievement of conscious control of drawing skill and visual spatial communicative ability may improve their cognitive ability as well. Moreover, designers hope to change their dominant position in the practice of aesthetic and spatial design, which has been commented on by critics (Robbins, 1994; Boy, 1996), by helping the general public obtain the benefits of drawing skill, including visual communicative, cognitive, and investigative ability, to make it feasible for them to share creative tasks with others. It was anticipated that an interpretation of drawing instruction and skill in drawing for communication which includes language use in social transactions such as critiques and dialogue during design production would help this researcher explore the notion of drawing for communication or the designer’s
communicative skill. Such an interpretation might also make it possible to elaborate the practice of drawing instruction from a different perspective than the common perception of critics that it is solely representational drawing skill training. It is believed that the implications of the newly proposed concept of drawing practice and its instructional strategy will complement traditional drawing methods as well as contribute toward the development of drawing instruction using other kinds of tools, such as computerized training, that could help students develop both drawing skill and cognitive ability.

It is hoped that the research instruments constructed for this study will offer some methodological basis for future study in the area of drawing production in support of cognition. In addition, due to the decline of interest in freehand realistic drawing training in school art programs, it is hoped that the concept of drawing for communication and the instructional strategy constructed within the design studio culture and from a socio-cognitive perspective will draw the attention of art educators to the significance and potential benefit of drawing training in art studio education. While the drawing concept and its instructional strategy can be implemented in the studio art classroom, the research methodology can be implemented in future case study exploration to support wider application of the drawing concept and to complement the study of drawing production skill in visual art education as well.
CHAPTER 2

LITERATURE REVIEW OF
CURRENT DRAWING INSTRUCTIONAL METHODS
AND THE GRID SYSTEM IN DRAWING

2.1. The Investigation of Current Drawing Methods

Early in the investigation of drawing methods, this researcher began exploring instructional manuals for realistic drawing as well as for perspective drawing from three areas of study: art, design, and engineering. The materials found were gathered into three groups according to the source.

The first group includes drawing manuals written by respected art teachers who put together drawing lessons that have been used in their classrooms for many years. These techniques have proved to be very successful in establishing conscious control of the learners’ eye-hand coordination and enabling them to produce freehand realistic (perspective) images. These drawing methods are able to help the novice who cannot draw a straight line produce hand drawn realistic images successfully for the first time. Two famous drawing methods of the 20th century from this group were selected for investigation: the drawing method introduced in Kimon Nicolaides’ The Natural Way to
Draw, which utilizes contour drawing (1941), and the method of Betty Edwards introduced in Drawing from the Right Side of the Brain (1976/1989). The drawing instructions of these two respected art teachers have been approved by both amateurs and professionals because of the effectiveness of the training, which enables a learner to produce well-drawn realistic images in a relatively short training time. In fact, Betty Edwards’ Drawing from the Right Side of the Brain has not only been popular in the U.S. for many years, but also has been recognized worldwide.

In Drawing from the Right Side of the Brain, Edwards employs Roger Sperry’s neuroscientific study on the split brain to explain her ‘right brain drawing concept.’ Within such an approach, her drawing instruction can be described as techniques intended to help learners pause logical left brain functions to allow the right brain, which is responsible for drawing ability, to function fully. For example, the ‘upside-down’ drawing technique, in which a print image of a model is placed upside-down, enables novices to easily produce quality line drawing from the print image in their first trials. The author explains that such a technique is successful because the upside-down image of the model helps disconnect the symbolic meaning from the image or ‘quiet down the left brain.’ Without recognizing the model image as a face, learners can proceed with the drawing production and replicate the model portrait with ease. Besides her first book, Edwards offers similar drawing lessons with additional instruction on implementing the drawing practice for cognitive benefit in her second book, Drawing on the Artist Within (1986). However, this manual has not been as widely received as her first writing.
Another effective approach to drawing instruction, Kimon Nicolaides’ *The Natural Way to Draw* (1941), is also highly regarded among those who have gained drawing acquisition skill using his method. Nicolaides does not describe his drawing instruction in terms of techniques, aesthetics, or concepts. Instead, he compares drawing and the natural impulse to draw with the natural impulse to talk, and emphasizes a natural way of observation through physical contact with an object using all the human senses. For example, in his instruction of the famous ‘contour’ drawing, novices are instructed to draw without looking at their drawing paper, but to focus their eyes at any point on the contour of a model. As learners begin moving the pencil slowly on the paper to draw a replication image of the model, they have to convince themselves that the pencil’s point is touching the contour of the model as they glide their eyes slowly along the contour. Nicolaides’ “contour drawing” instruction, which is the first lesson in the book, appears to be widely recognized among practitioners because it is often cited as an important introductory lesson in today’s drawing manuals, including those of Edwards.

Despite the success of these methods, one criticism is that drawing exercises in both of these famous drawing manuals establish the skill for producing realistic drawing only by copying existing objects, models, and landscapes. These drawing manuals will be further examined and discussed in more detail in chapter 5.

The second group of drawing instruction methods examined by this researcher is comprised of drawing methods for training students in architecture and in design. According to this researcher, these design drawing methods can be distinguished as falling into three categories. The first category includes the drawing method which aims
to establish conscious control of perspective drawing skill for the novice who cannot
draw. The only method in this category is the 3-D grid drawing instruction implemented
in the drawing class Design 199. This drawing instruction is designed to enable
unskilled industrial design students to develop ability in producing perspective drawing
as a rendering skill in general and as externalization of thought in particular. The
second category includes drawing exercises offered in the majority of design drawing
manuals for incoming students who already have traditional drawing training. The
instruction aims to train learners who have already gained some degree of conscious
control and are able to produce realistic drawings from models, but need further training
to develop the drawing skill according to certain aspects of design practice, such as
three dimensional visual-spatial communication, creative sketching, and visualization
skill. Examples of these manuals include Porter (1979), Lockard (1968, 1982) and
Laseau (1989). The third category includes many interesting tools meant to be used as
drawing aids to assist in improving the speed and quality of perspective sketch
production during design transactions by those practitioners who have already gained
conscious control of drawing perspective as well as 3-D visual spatial communication
visualization skills. The traditional tools, typically found to be used for supporting both
the idea sketch in the early phases of design and representational drawing of concluded
works, include various projection techniques and drawing grids (Doblin, 1969; Eissen,
1990; Burden, 1992; Chen & Cooper, 1996). From examining recent digital tools, this
researcher maintains that these digital drawing aids have been developed to support the
different stages of idea construction in the design process-- ambiguous sketch,
proportional sketch, and perspective sketch -- as well as the transfer of ideas between

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stages. For example, digital clay (Gross & Schweikardt, 1998), has been constructed to support the interface between a freehand perspective sketch and 3-D digital model production of design practitioners.

The design drawing exercises are reviewed because they cover several aspects of communication within the profession. For example, Porter (1979) introduces exercises that train design students to produce perspective drawing for communicating concepts of space with an emphasis on mapping the relationship between creation and reality. Researchers in the field have also investigated various types and aspects of drawing in design practices, from drawing that helps explore and create new ideas to rendering drawing. However, except for the 3-D grid drawing instruction of the class Design 199, most design drawing training does not offer methods for the novice. For example, most lessons begin as if the learner already possesses at least the ability to produce a well-drawn freehand sketch from the traditional practice of drawing from a model. Moreover, the training is constructed exclusively for enabling future practitioners to work and socialize within their profession, e.g., as in the way visual-spatial skill or ability to communicate concepts of space is emphasized as one of the necessary bases in architectural training. Although the method enables practitioners to draw from their thought and imagination, not by copying, design drawing for creation is often criticized as a method that trains the learner to take things apart for examination. This may promote scientific reductionism when utilized in a problem solving manner. It is anticipated by this researcher that such drawing practice in the designer problem solving process may be viewed differently if described from the perspective of social cognition, which includes social transactions among those involved in making the
design along with its interpretation. Besides their function of externalizing new ideas for exploration, design drawings are recognized among practitioners to have value as various means of mediation during communication and social interaction in both the coaching process (Schön, 1983) and the social practice of design (Herbert, 1993; Robbins, 1994; and Pérez -Gómez & Pelletier, 1997). Further discussion of drawing for communication in design can be found in section 2.2.3 and section 2.2.4 of this chapter and in section 4.3 of chapter 4.

The third group of instructional manuals is from engineering drawing. All of the engineering drawing manuals examined for this review emphasize formal drafting, and the traditional pen-paper techniques appear to limit visualization within two-dimensional graphics. Perspective drawing is introduced only as presentational drawing of the final design, and only traditional projection methods are offered as a perspective technique. In recent engineering graphics manuals, the instructions have been updated to include discussion of communication aspects of drawing in engineering graphics, and different perspective techniques such as the 3-D grid for perspective construction during design sketch have been added (Bertoline, Miller, Nasman, & Wiebe, 1995; Dobrovolny & O’Bryant, 1984). Engineering drafting is recognized among industrial designers as drawing typically utilized at the final phase of design for communicating dimensions of the final design for production purposes. However, for engineers, the drawing method, which is rooted in mechanical drafting and manufacturing, has a long history in constructing engineering knowledge and practice. The effects of traditional graphic representation on engineers’ education and practice have been recognized and addressed by a number of scholars in the field. For example, Ullman et al. (1990)
investigate engineering drawing practices in both formal drawing and the informal sketch in order to provide insights into an understanding of graphic representations in mechanical design. The study reveals that the intensive drafting skills taught in both pen-paper and computer-aided drafting are of benefit only in representational drawing of the final design. The researchers have confirmed the need for more training in informal drawing such as conceptual sketching and in abstract graphic skills since they are found to be necessary in the development of ideas throughout the engineering design process but have seldom been offered in the engineering graphics classroom.

Suggested areas for further research include: methodology for investigating drawing in support of the cognitive process (i.e., the case of 2-D versus 3-D sketches); drawing methods which allow rapid sketching; and further investigation of the needs of the engineering designer. Lilly (1999) explains that although the traditional freehand sketch cannot compare with the advanced 3D modeling of the CAD and the mathematics knowledge required in handling today’s complex engineering tasks both in practice and in research, informal drawing and graphics skills are essential for engineering students. Learning freehand sketching appears to benefit those who lack the ability to produce and investigate multiple directions of ideas and viewpoints, a problem which often occurs particularly when those students utilize the computer. Moreover, graduates with drawing and graphics skills are preferred in industry because the skills enhance communicative ability both among professionals and with clients. The issue of graphic representation in scientific areas and engineering has been a major topic for exploration in cognitive science. Oft-cited studies included those of Larkin and Simon (1987), Koedinger and Anderson (1990), Cheng and Simon (1992) and a number of
works by S. M. Kosslyn as well as different works that H. Simon has co-authored. There are also studies in the specific area of creative cognition which look into issues of representation in the construction and communication of an idea (Smith et al., 1999). Additionally, some studies have constructed knowledge on visual representation and the dynamic process of idea construction by investigating representations and drawings in the architectural design process in comparison to those used in science and engineering (Suwa & Tversky, 1997, 2001, 2002). These cognitive science research studies appear to share the same interest in visual representation in relationship to the cognitive process.

2.2. Grid Systems in Drawing

2.2.1. Historic development and use of grid system in drawing

According to the literature in which the history of use of the square grid is discussed, there is no exact confirmation of when and where the tool was invented and first used in construction of drawings, paintings, and buildings. In tracking the history of the grid and perspective systems before the Renaissance period, many recent historians have conducted their search by tracing remnants of grid lines left on some historic mural paintings or the ground floor of ancient architectural structures and restructuring drawing grids from the remnants of the original. Their findings have produced a variety of speculations on the historical background of the tools. For example, one speculation is that the evolution of links between graphics and the concept of space occurred after the Mesopotamian and early Egyptian civilizations, according to
evidences such as the development of ground floor plans and the way spatial concepts are organized against a linear square grid (Porter, 1979).

2.2.2. The grid system and its relationship with the invention of the perspective system

The well-documented history of the drawing grid appears to date from the Renaissance period, when the implementation of the grid system was reestablished in relation to the invention of a perspective drawing system. A number of Renaissance scholars and practitioners, ranging from cartographers, artists, and practitioners in the optic sciences to architects and city planners, are credited for reviving the grid inherited from antiquity while developing and refining the tool to serve their own practices.

Historians refer to Florence, Italy during the early 15th century as the place and time when the grid was brought back and developed into the perspective system. Scholars point to many particular incidents and the general atmosphere of Florence in the early 15th century that initiated the development of a new way of seeing. Cartography and Euclid’s Optic are often referenced as central to the emergence of the perspective system. The flourishing of cartographic and geographic study made the city the center of the fields after the rediscovery of Ptolemy’s Geographia. Since ancient times, the grid has been considered an aspect of the development of the ideas and knowledge of the West. In cartography, the grid has been used for surveying purposes since the Roman Empire. Ptolemy’s Geographia, a work dating from around 140 A.D., demonstrates the possibility of using a regular mathematical grid system to map the entire world. In other words, Ptolemy shows that the earth can be comprehended in a uniform way within a single mathematics system. Critics such as Veltman (1977) have noticed a similarity between Ptolemy’s method of projecting the arcs of circles visibly
on a globe to the planar map and Renaissance perspective method. Besides the developments in the cartography field, another movement emerged from a citizens group which was interested in developing a structure comprising an abstract uniform linear coordinated system into a new way of apprehending visual space. Smith (2001) points out that although Europeans had been aware of Euclid’s *Elements* and *Optics* for about 1700 years, it was the 15th century enthusiasm that brought about the idea of intersecting the visual pyramid with a plane. In *Optics*, Euclid demonstrated theories about visual angles and introduced his formulation of extromissionist theory in terms of a visual angle and visual rays which travel from an observer’s eye to a surface in front. The visual pyramid represents a basic principle that space extends infinitely in three dimensions. The theory contributes to our understanding of Euclidean projective geometry, an ancient calculation familiar for such uses as helping determine the measurement of trees and objects in the far distance.

The emergence of a solution to the practical problem of projecting an array of objects existing in three dimensional space onto a two dimensional plane is often referenced to the work of Filippo Brunelleschi (1377-1446), Leon Battista Alberti (1404-1472), and Piero della Francesca (1420-1492). While Brunelleschi is well-known for his practical demonstration of the perspective method by producing the first painting in ‘true perspective,’ the other two scholars are known for drafting treatises on the technical procedures for constructing perspective drawing that contributed to later refinements and implications (Descargues, 1976/1982).

Leon Battista Alberti is recognized for the method ‘reticolato,’ or Alberti’s ‘grid’ or ‘grill,’ developed as a mechanical aid for the painter in producing a perspective
drawing from a landscape scene. In addition, his proposal expressed in the definition “the picture is a planar section of the visual pyramid” led to the introduction of a fundamental perspective technique which became more popular than the ‘grill’ and has remained in use until the present (Panofsky, 1927/1994). According to Panofsky, Alberti’s convenient and practical procedure derives from the systematic construction of elevation drawing for a visual pyramid and perpendicular plane. In fact, a one point perspective grid is considered to have made its first appearance as a checkerboard pattern in the demonstration of such a procedure. The perspective techniques introduced by Alberti reflect his broad range of specialties, and the knowledge has contributed to different areas of practice including architecture, philosophy, mathematics, painting, city planning, and land surveying. Well known figures who were influenced by and built their work upon Alberti’s theory include Albrecht Dürer (1471-1528), Leonardo da Vinci (1452-1519), and Piero della Francesca (1420-1492).

Piero della Francesca is recognized for moving perspective construction indoors onto the drawing board and introducing the procedure based on lines from a point of sight connecting a floor plan and elevation drawing, cut by a perpendicular plane. It has been pointed out by critics that this is in fact Alberti’s surveying method from his work called *Descriptio urbis Romae* (Picture of Rome) (Smith, 2001). From the 15th to the 19th centuries, a number of scholars from painting, architecture, mathematics, optics, and city planning furthered those two treatises and developed both the grid and perspective systems for drawing production resulting in technical as well as intellectual advancement for their practice during the period (Descargues, 1976/1982).
2.2.3. Meaning and purpose of the grid and perspective systems for drawing production in art and in design

According to critics’ discussions on the grid and perspective systems, it appears that the tools have different meanings to different groups of practitioners. For example, through examining the historical use of the grid in optics, cartography and land surveying, and in the study of semantics, Smith (2001) proposed a philosophical interpretation of how these grids in a transparent form affected a tiling of the portion of reality towards which they were directed. The meaning of the grid is also associated with the purpose and meanings of drawings that have been defined differently in terms of different groups of practitioners and different time periods. For example, when Alberti introduced his “reticolato” grid system, the perspective drawing aid was a part of his treatise on painting, *Della pitura* (1435-1436). This influential treatise of the time defended the view that the proper goal of the artist is to produce a picture that will represent the visible world as if the observer of the picture were looking through a window (Smith, 2001). The procedure included creating a square grid across an actual glass window in order to enable painters to transfer the scene visible through the window onto a correspondingly grided canvas (p.15). Painting at the time was a close adjunct to architecture, and, as described by historians, the aesthetic experience of the interior and the painting were seen as fused into one. However, as the centuries passed, the meaning of the grid in relationship to the window concept changed as paintings no longer retained the same relationship to reality and architecture as in the time when the perspective system was first introduced (Smith, 2001).
In Descargues’ examination of the history and evolution of perspective techniques, the meaning of the grid and perspective systems appears to shift along the line of the meaning and purpose of drawing in different practices, as well as in the intellectual narrative that was developed throughout the centuries. Descargues explains that the grid and perspective systems for drawing production were significant as tools of knowledge from the 15th century to the middle of the 19th century. They are comparable to photograph, radar, and satellite imaging technologies in the way they have been utilized to gather visual information both on the earth and in astronomy. The images enable us to construct knowledge and further advance our understanding of ourselves and our habitat. Therefore, before the invention of photography, scholars from mathematics, geometry, and cartography depended on the precision and validation offered by grid and perspective systems for their representational drawings of reality. In a contrary approach, the painters rejected the exact copy of reality and defended their way of producing perspective drawing as integral with the artists’ messages in communicating their sensibility, imagination, and personal vision. The tension between practitioners caused by the different means of using grid and perspective in supporting imagination and visualization appears to have contributed to the advancement of knowledge as it inspired the development of new perspective techniques and influenced the intellectual narrative of the time period. Descargues notes that, after the first half of the 19th century, the tension and interest in grid and perspective drawing techniques seems to have declined as artists moved into the impressionist era and the introduction of photography, cinema, and the new geometry appears to have shifted scientists’ focus into perfecting the new technologies. The new way of capturing reality through
photography appears to have replaced traditional ways of drawing perspective, and interest in developing perspective methods for drawing apparently diminished after the second half of the 19th century.

Lambert (1984) investigated drawings in Western art from the 15th through the 20th centuries and suggested four themes for exploring and discussing those drawings, which appear to have had multiple, overlapping meanings and uses. In her book, the author also discussed the meaning of grids and perspective systems in the four discussion themes in the course of her examination of the multiple overlapping purposes of drawing in the arts along those time periods. In the first theme, drawing techniques, the two traditional technical purposes of using the grid and perspective systems as drawing aids are for constructing a perspective drawing and for transferring a drawing. For the purpose of constructing a three-dimensional image, perspective methods assist artists in the production of a hand drawn illusion of a three dimensional scene in a two dimensional medium. After Alberti’s grid helped establish the theory that pointed the way for Dürer and others to further develop the tools, different mechanical aids for drawing perspective were introduced throughout the five century period. Perspective drawing aids appear in various forms. They include Alberti’s square grid procedure, mechanical tools such as the camera obscura and camera lucida, projective ray construction in linear perspective and aerial perspective on a drawing board, and a pre-printed grid perspective used as an underlay for drawing paper. As transferring techniques, the grid and perspective systems have served the purpose continuously from the past into the present. Among art practitioners, most drawing, including perspective drawing, is typically produced not only as the final work itself, but also as preliminary
work to be used for painting or for decorative patterns in other craft media. Therefore, a transfer technique is needed to move the original draft from paper onto the target surface. The square grid has been used most often for this purpose throughout the centuries. The tool also serves the purpose of enlarging or reducing an original image. Besides its usefulness in scaling the size of images, it also helps in the representation of foreshortening by acting as a guide to the relative proportion of the subject, as appears in the way Dürer utilized a square grid which was placed between the artist and his model. When utilized in this way, the square grid becomes a perspective drawing aid and can also be seen as a transfer technique which helps transfer the scene onto paper.

In the second theme, drawing as discipline, many of the drawing aids from the past are still utilized today as training tools, even though the tools are no longer used in the present practice. According to critics, 15th century tools such as Alberti’s grid are beneficial as instructional aids to help students understand perspective, but it is unlikely that the artists themselves will use this tool in their creative practice due to its strong parallax and the complexity of its use.

Grid and perspective systems for drawing have been significant in the training of Western artists and designers since the 15th century. In her investigation of drawings from the 15th to the 20th century, Lambert points out that, despite changes in theories behind drawing in the arts, the use of drawing with training as the primary purpose appears to have remained the same into the 20th century. The traditional training pattern starts with beginners copying from two dimensional works such as paintings and prints of established painters, then the next step is to draw from actual three dimensional objects and scenes. In this step, students will begin by drawing from static forms such
as antique sculptures, or drawing from the ‘round’, then they will draw from ‘life,’ which, according to the accepted practice, was restricted to drawing from models and landscape until the end of the 19th century. Drawing has always been seen as a means for acquiring manual dexterity. By the Renaissance period, drawing was also viewed as a means for gathering and sorting information into a system. The focus of training was then shifted from the principles of drawing to research observation. According to the manual by Leonardo da Vinci, beginners should start by studying perspective and proportion of all objects, followed by anatomy drawing until they are able to produce well-drawn body parts, and then they should try working from nature. During the 16th and the 17th centuries, drawing manuals specified that artists had to gain knowledge of anatomy, proportion, perspective, and geometry, though critics comment that these manuals appear to be of more benefit to professionals, such as engineers and draughtsmen, and to amateurs than to artists. During the same period, the idea that art should be taught and learned through precept rules appears to have become intense in many art schools of the time. For example, figure drawing was required to have proportion and facial expression conforming to a set of prescribed ideals, as drawing was finally identified with theoretical and intellectual aspects of painting and colors. Drawing aids such as grids and perspective systems therefore became significant parts of the validation systems of those theories. By the beginning of the 19th century, the London School of Design had published the first drawing manual for the purpose of enabling students to produce design and graphic patterns for different manufacturing products. The movement, which called for art to serve the machine, also became an invitation for individuality in the work of art. In the 20th century, drawing was no longer
included in formal education together with science, language, and mathematics as one of the important components of a sound academic background. Only art schools retained drawing production as an essential part of their curricula; for example, Kandinsky’s analytical drawing class at the Bauhaus focused on realistic (perspective) drawing from models and landscape as a vehicle for gaining observation, perception, and representation abilities.

The third theme, drawing for imagination, can be considered the most widely recognized role of drawing in art, as drawing is typically assumed to represent creation in art, artifacts, and machines. Lambert describes this as “thinking on paper”; it is not produced as an end in itself, but is said to be necessary in idea development similar to the way thought is clarified when put into words. Each practitioner appears to have his/her own ways of drawing out ideas and solutions in art and design since there seems to be no formal procedure for producing sketches. Nevertheless, common sketches produced in the practices of artists and designers can be roughly described as falling into three groups: sketches of artifacts’ form or overall layout, proportion and perspective sketches used in studying the relationship between parts, and sketches which take the design apart and show components. In terms of communication, painters usually produce sketches as personal works in progress and regularly consult with their visual ideas when painting their final works. Car designers and engineers need to produce elevations and perspective drawing sketches for communicating with their colleagues and with others who will work on translating an idea into reality. While the meanings and purposes of grids and perspective systems in this imaginative theme place emphasis on supporting thought construction and design creation, the only purpose of
the drawing aids for the next theme is for supporting the production of well-drawn images.

The fourth theme, drawing for utility, includes drawings that are produced for all other reasons except for the sake of the images themselves. They include, for example, presentation drawing for assisting client visualization, drawing to be used for production of a finished work in other media such as instructions for manufacturing furniture, diagrams and technical illustrations, and drawing to produce records that can be used as a pattern for later production.

2.2.4. Meanings of drawing grids and perspective systems in design studio transactions

In another context, besides Lambert’s study of drawing in Western art history, multiple meanings and purposes of drawing are discussed by design writers in their discussion of the issue of design drawing as drawing for communication. The meanings and purposes of drawing grids and perspective systems are often considered in the course of such discussions. Porter (1979) explains that historically artifacts and architecture are known to have been created by skilled craftsmen and builders without utilizing sketches or any working drawings; only small models or simple plans and elevations drawn at the site were used to assist in construction. The development of drawing techniques that made it possible for drawings to be produced away from the construction site in fact established the “drawing office” or the profession (Robbins, 1994). As designers were freed from the custom and limitations of the site, it helped to expand their imagination, improve the control of the structure during construction, and enable the construction of intellectual knowledge while expanding design discipline. Because there is a the need to maintain communication due to the communal nature of
the design practice, perspective drawing appears to be the most cost effective, convenient, and easily accessible tool for designers, clients, builders, lawyers, and everyone else involved in the process. Both trained and untrained professionals are able to read perspective drawing. The spatial representation allows them to move through a design in relation to architectural space, which is a benefit to communication between the designer and others, as well as to communication among the designers themselves when constructing an idea.

The meaning and purpose of design drawing for both interpersonal communication and self-communication have been recognized and extensively discussed. For example, design drawing is described as a pragmatic process (Lockard, 1982), and the training emphasizes drawing for communicating concepts of space and visualization sketches for communicating thought and invisible systems involved in the design process (Lockard, 1982 and Laseau, 1989). Both square grid and perspective are regarded as integral parts of these drawing and training practices. Drawings used by architects in their own thinking and in the design process are sometime regarded as internal conversation through three kinds of drawings: the referential sketch or record of discovery; preparatory study for documentation and experimentation in the inquiry process; and definitive drawing for answering questions rather that posing them (Robbins, 1994). A number of research studies in the 90’s examined drawing production for transactions in actual architectural studio practice and updated interpretations of the significance of drawing practices and drawing tools when used for both communication and externalization of ideas in the creative process. For example, tools and techniques that support the ease of drawing production and enhance the speed
of perspective sketches, such as perspective grids, have always been essential to designers as they make the communication process possible. Research studies confirm that only rapid production of a well drawn image during communication (about 8 seconds per one chunk of data) will allow the sketch to become an external representation which helps reduce working memory load, therefore contributing to facilitation of inference and problem solving (Larkin & Simon, 1987; Koedinger & Anderson, 1990; Ullman et al., 1992). Moreover, unlike scientists and engineers, designers do not draw sketches from finished ideas in their minds but they draw to try out ideas. In the process of idea construction, the sketchy lines and forms, or “instability of spatial representation,” benefit the designer by enabling the reorganization of external representation and promoting novel interpretations (Suwa & Tversky, 2002). Design practitioners agree that freehand 3-D sketches on a 2-D medium offer the greatest richness and ambiguity to support this initial stage of idea construction (Gross & Schweikardt, 1997). In the design process, square grids and perspective grids are the traditional tools found to be most often utilized when designers need to bridge the ambiguous stage of early idea formation and production of proportional and perspectives sketches in the early creation of products or buildings. Besides drawing grids, different CAD programs have recently been designed with more advanced features for supporting idea construction and exploration in ambiguous sketches, proportional sketches, and perspective sketches, as well as providing drawing aids to bridge those idea sketching stages. For example, Digital Clay® provides a means to support freehand drawing interface for a 3-D design. It includes features such as converting a 2-D freehand sketch into a 3-D digital model, which is easier to manipulate.
than a material mock-up model (Gross & Schweikardt, 1997). Therefore, both drawing aids that enable rapid sketching and instruction to facilitate freehand drawing skill acquisition are emphasized as necessary throughout the dynamic process of communication and idea construction.

For representational drawing in design, grid and perspective systems are utilized to support the production of well-drawn images representing the concluding idea without having to support the creative cognition process in constructing ideas. Unlike drawing for idea construction, the designer will draw a representation of the final agreement resulting from communal work among designers, client, builders and others involved. Any tools or techniques that are efficient and available for producing perspective representation of the completed work are considered suitable since the drawing is no longer involved with inquiry and problem-solving processes. There is no need for drawing aids that support quick sketches in order to make drawing an external representation which assists in the thought process by extending memories during the construction of ideas. Manuals such as those of Doblin (1969), Eisen (1990), and Burden (1992) have collected various sketches and projection techniques to be used for both idea construction and representation of final designs.
CHAPTER 3

THE THEORICAL ASPECTS

VYGOTSKY’S CONCEPT OF THE ZONE OF PROXIMAL DEVELOPMENT

3.1. Discussion of the Term Cognitive Apprenticeship, Scaffolding, and the Zone of Proximal Development.

The concept of the zone of proximal development, a proposal involving psychological development, was formulated and introduced around 1930 by a Soviet psychologist, L. S. Vygotsky. The notion has only recently come to be appreciated in the West, especially since it appeared in the book Thought and Language (1962), an English translation of Vygotsky’s 1934 publication Thinking and Speech (Bruner, 1985). Vygotsky’s framework, which is grounded in the social dimension of learning, is recognized as one of the major influences in the recent shift in Western educational psychology from its traditional focus on individual development. Since 1962, several studies have been conducted in English to clarify and further the interpretation of Vygotsky’s proposal, as well as to utilize the expanded versions of the theory in examining practices in American education. The terms “scaffolding” and “cognitive apprenticeship” are examples of well-recognized applications of Vygotsky’s theories established through these American research studies. In this literature review, the terms
scaffolding and cognitive apprenticeship will be discussed within the context of an overview of Vygotsky’s zone of proximal development. Research studies published in the United States which explore the three frameworks will be considered together to help clarify these terms.

**Vygotsky’s zone of proximal development**

Lev Semenovich Vygotsky (1896 – 1934) was a Soviet psychologist and semiotician of the early twentieth century. According to Wertsch (1985a), his work is widely recognized because many of his ideas are relevant to and accommodate the problems and pitfalls of disciplinary fragmentation between the study of psychological phenomena (traditionally practiced as scientific reductionism) and the study of social phenomena. The discrepancy has been recognized by many of the philosophers of this century, and there have been several attempts to establish a theory and practice to provide an overarching connection between natural and cultural knowledge. Vygotsky provided insight into the nature of meaning in sign systems (especially human language). According to Wertsch, this can be considered the groundwork for Vygotsky’s interpretation of the genetic relationship between social and individual processes. Vygotsky’s understanding of this relationship is the core of his approach and has offered a remedy to studies which isolate the individual in the social sciences. To coordinate these areas of inquiry, Vygotsky proposes that semiotic processes are part of both serve as a bridge between them.

Recognizing that social relationships underlie all high level mental functions, Vygotsky focused his research on a transformational process which begins in social activities and experience between people, or interpsychology, and then through the
knowledge of language, social interactions, and contexts, moves inward as part of the individual’s cognitive development or intrapsychology. Vygotsky’s analysis is an attempt to clarify the significant moment in the transformation process, in order to understand higher mental functioning within the individual on the intrapsychological plane. The zone of proximal development (1934) is one of many phenomena Vygotsky conceptualized in order to construct substantial knowledge on the relationship between interpsychology and intrapsychology. The notion was introduced in the task of examining two major practices in educational psychology, psychological assessment and the process of instruction.

The zone of proximal development is defined as the distance between a child’s actual development level as determined by independent problem solving and his/her potential development as determined through problem solving under adult guidance or in collaboration with more capable peers. As a methodology for analysis of a child’s intellectual ability, the framework was intended to help in obtaining an overall assessment, both of the child’s actual abilities, measured through a completed task (individual performance), and the child’s potential abilities, which are measured during the ongoing process of development with peer assistance. Vygotsky criticizes the traditional standardized testing in that it focuses only on the intrapsychological aspect of accomplishment and is unable to predict future growth. As a useful construct in relation to processes of instruction, Vygotsky’s formulation provides a theory that emphasizes the social dimension of learning and development. He explains that instruction and development exist in a complex relationship. Even though children can do more with peer assistance, this is not necessarily an indication that they have a high potential

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ability. The zone of proximal development can only be determined through the interplay between the child’s level of development and a particular form of instruction. As clarified by Bruner (1985), the zone is involved particularly with achieving “consciousness and control.” The development process begins with an adult providing the learner with a vicarious form of consciousness until the learner is able to master his/her own action through his/her own consciousness and control. Bruner also states that Vygotsky referred to the acquisition of language as it provided a paradigm for the explanation of the zone. In the “acquisition” situation, children learn to speak a language by collaborating with an adult for communication purposes until the language they have mastered becomes internalized, and they are able to produce and control their own dialogue. Stone and Wertsch (1985) propose that the communication metaphor or this internalization of the zone can be found also in Vygotsky’s semiotic analysis. In his analysis, the internal plan of consciousness emerges through “the emergence of control over external sign forms.” The main insight is that semiotic principles such as the distinction between meaning and object reference are regarded as underlying the use of such external sign forms.

Whether the zone of proximal development serves practitioners as methodology or as paradigm, the proposal has received high respect for helping practitioners succeed in avoiding the cultural ignorance and reductionism in traditional psychological practice. The concept of the zone of proximal development has motivated many studies. In this review of literature, materials will be organized into three areas that Vygotsky addressed, which have been expanded by many researchers. According to Wertsch (1985a), the three major concerns Vygotsky addressed in formulating the zone of
proximal development include: an analysis of intelligence testing procedures; the relationship between instruction and development; and mediation issues and the influence of sociohistorical processes at the social institutional level.

First, among the studies that concentrate on analysis of intelligence testing procedures, Brown and Ferrara (1985) experimented with the use of adult prompts to access a child’s potential level on some tasks after measuring the actual level of development with an IQ test. They found that the index of IQ score correlated with the index of learning speed. However, IQ score does not help predict the level of student cognition. Only interpsychological performance with adult prompts can provide information on learning speed and degree of transfer. Brown and Ferrara found that even among a group of students with the same range of IQ scores, the students have different learning profiles. For instance, the first profile includes fast learning, wide transfer, and high IQ; the second profile includes slow learner, narrow transfer, and low IQ, etc. These learning profiles, which help us understand a child’s potential ability, are usually hidden behind the IQ score for individual performance.

Second, a number of studies concentrate on the relationship between instruction and development. According to Vygotsky, instruction has a very significant role in development. He focuses on how interpsychological function can be structured through instruction so that the growth of intrapsychological functions within the individual will be maximized (Wertsch, 1985). The instruction that he mentions is in skills that have an essential impact on development such as language and mathematical skills, not technical skills such as typing. These skills can be obtained through a particular process of instruction involving the child and an adult who provides language hints and other
forms of assistance. Often cited research studies which explore the relationship between instruction and development and are considered the groundwork for later studies in the West include those of Bruner (1975, 1976) and Rogoff et al. (1983). Bruner and Rogoff criticized the traditional belief in the solitary development of children’s cognition and examined the social interaction between adults and children, focusing on younger children than those Vygotsky had studied.

**Scaffolding**

Bruner, who is knowledgeable in Vygotsky’s theory and was invited to write an introduction for the book *Thought and Language* (1962), mentioned the term “scaffolding” in his 1975 article. Bruner identified the term “scaffolding” as a process provided by a mother which enables a child to carry out a task or achieve a goal that would be beyond his unassisted efforts. He and his colleagues conducted a research study to examine this tutoring process (Bruner et al., 1976). They studied a group of children making building block constructions with the assistance of adults who followed particular guidelines in providing assistance. The objective was to create systematic descriptions of how children respond to different forms of aid. Bruner (1985) later examined this research in relation to the concept of the zone of proximal development in his study of scaffolding, focusing on the form of semiotic mediation involved during those problem-solving activities. Wertsch comments that although Bruner was able to pinpoint certain complex processes of social and cognitive development that mark development in infancy, the processes may be considered only as a kind of pre-cursor of the zone of proximal development, not the zone itself. Recent researchers such as Rogoff et al. (1983) have investigated adult – infant interaction,
particularly from the perspective of the zone of proximal development. By observing infants operating a jack-in-the box with an adult, the researchers were able to identify transitions in the interaction during the development of communication abilities: from attempting to maintain joint attention, to managing the joint use of the toy, and to managing the social relationship using symbolic communication.

Apprenticeship has been recognized for centuries as a professional skill training process for the scientist and artist. Among language educators, apprenticeship has been mentioned as an example which is parallel to the language acquisition process (Bruner, 1978) and has been used as a metaphor in discussion of language development (1983). In child development, Rogoff and several other researchers have continued the socio-cultural research on infant development, extending the concept of Vygotsky by including the notion of apprenticeship as a model for children’s cognitive development which relates the individual and the social world. Such studies as the work of Rogoff and Lave (1984) and Scribner (1984) have guided many later studies. One example is Brown, Collins, and Duguid (1989). Drawing on recent studies in the way cognition is manifested in everyday activities, they propose the term “cognitive apprenticeship” as teaching practice which honors the situated nature of knowledge, as an alternative to conventional practices which ignore the influence of school culture on what is learned.

By examining two examples of mathematics instruction, they were able to identify certain key features of this cognitive apprenticeship approach used in teaching. The researchers also formulated the cognitive apprenticeship techniques (Collins, Brown and Newman, 1989) which are most utilized in today’s instruction. In their formulation of cognitive apprenticeship techniques, there are six teaching methods:
modeling, coaching, scaffolding, articulation, reflection, and exploration. The six methods are divided into three groups. The first group, comprised of modeling, coaching and scaffolding, is designed to help students to acquire cognitive and metacognitive knowledge and skills by means of observation and guided practice. The second group, articulation and reflection, is expected to enable students to benefit from observation of the expert problem solving process and to control their own problem solving practice. The third group is exploration, which considers learning strategies in making inquiry into new domains and enables students to formulate problems and knowledge independently.

The concept of scaffolding and cognitive apprenticeship is expanded and utilized in many studies in the area of socio-cognitive development. In these research studies, scaffolding often refers to strategies used in instructional procedure, techniques which can be described as various forms of support provided by a teacher or expert. Cognitive apprenticeship is identified as an educational practice concentrating on the student’s engagement in activities with scaffolding or various forms of support. Both terms represent instruction through higher level strategies. These research studies include the work of Beed, Hawkins, and Roller (1991). They discuss two forms of scaffolding, incident scaffolding, in which an adult unintentionally teaches children specific communication strategies, and strategic scaffolding, in which an adult supports children in problem solving situations. The researchers have expanded the latter into contingent scaffolding by adding a pattern of responses for the withdrawal of support, and observed the use of such scaffolding in many instructional situations. Meister and Rosenshine (1992) review fifty studies in which students were taught through cognitive
strategies and successful teachers utilized the scaffolding procedure. By examining the way those teachers taught, the researchers were able to construct a set of procedures as a guideline for instructional strategy for writing which offer the student both well-constructed skills and writing ability for high level cognitive thinking. They also capture and address teaching techniques for each procedure. For instance, in order to present new cognitive strategies, the teacher can introduce a concrete prompt, model the skill, and think aloud for students. Those who have utilized cognitive apprenticeship techniques (the techniques of Collins, Brown and Newman, 1989) in developing multimedia courseware include Bruijn (1995), Chee (1995), and Shabo et al. (1997). Also, many articles written by language educators describe how teachers have integrated the concepts of scaffolding and cognitive apprenticeship into their classrooms in order to bridge the gap between knowing and doing. Dixon, Carnine and Kameenui (1993) improvised to create the use of thinking sheet and cooperative learning group as a scaffolding method to teach writing for students who do not succeed in the typical curriculum. Cudd and Roberts (1993) developed a scaffolding procedure for young students who have problems in making the transfer from book language to their own writing. Their sentence expansion tools and processes include a sentence stem for children to complete, peer editing of the writing, and encouraging students to add detail to their writing by drawing. Hosenfeld, Cavour and Bonk (1996) integrate the four strategies of reading intervention with a cognitive apprenticeship framework for the foreign language classroom. The objective is to provide daily teaching activities or a set of lesson plans which could foster both language and thinking skills in foreign language education.
Third, a large body of research has concentrated on mediation issues and the influence of the sociohistorical process at the social institutional level. Vygotsky addresses three types of social phenomena in formulating the proposal of the zone of proximal development: interpsychology, intrapsychology, and social institutional phenomena. With reference to concern about the issue of the decontextualization of mediation means, he states that sociohistorical processes at the social institutional level influence interpsychological functioning in the zone of proximal development.

Vygotsky’s assistant, Luria (1976), conducted early, often cited research. He studied Uzbek villagers in remote Russia and found that they perceived and interpreted the abstract characteristics of visual stimuli differently from Westerners. For instance, the complete circle was called a plate, the color brown was referred to as the color of a decayed tooth, and they refused to combine color skeins of wool into meaningful abstract categories as those colors were considered uniquely different from each other.

Luria concluded that instruction is necessary in order to cultivate the ability to see visual images as abstract or detached from social context, the pre-requisite of being able to utilize the sign system for mediation purposes. Writers in the area of design, such as Csikszentmihalyi (1995) and Lupton and Miller (1996), cite Luria’s work as they criticize artists and designer writers who assume that the visual stimuli aspects of artworks are universal and will provide the same meaning and create the same sense of direct and immediate effect on every viewer. In Wertsch (1985), the research studies mentioned include Sax et al. (1984) and Griffin and Cole (1984). Both studies suggest that the social institution context in which the interpsychological function occurs causes this function found in the zone of proximal development to vary widely. Wertsch
restates the main concern of Sax’s studies, generally, that the majority of tasks carried out in the zone of proximal development are socioculturally specific. In Sax’s analysis of adults’ methods in solving simple number problems, arithmetic, as a sociohistorically specific semiotic system, is found to influence the adult’s representation of the goal structure of the task. The arithmetic system and its uses are identified as not universal but instead dependent on the sociohistorical context. Griffin and Cole (1984) examine the nature of interactions in the zone of proximal development. They state that the engagement of children in leading activity like play, formal learning and work, together with the context of the institution, cause changes in the nature of the interaction and the zone of proximal development.

According to Vygotsky’s proposal, learning occurs in both interpsychological and intrapsychological development, with symbols, tools, and other people assisting in the mediation process, a process in which social interaction becomes internalized and a part of an individual’s mental processes. Among recent research studies which examine the use and form of mediation within the zone of proximal development is the study of Carter et al. (1999). Carter invoked Vygotsky’s framework in examining science tools as mediators of students’ learning about circuits. The researchers found that the science tools provided by the teacher and the way the teacher verbalized and utilized the tools in the lab did not help students understand the circuit; therefore, they concluded that the tools did not achieve the mediator purpose. They propose that, in order for the tools to be within the students’ zone of proximal development, the students should be allowed to use the tools to design their own experiments and test their own hypotheses about their concepts. Jones et al. (1998) studied peer tutoring instruction in science teacher
education in order to understand the changes and development in the science teacher’s knowledge of science and science pedagogy. In this constructivist-based graduate science methods course, peers, students, instructors, readings, and tools were found to mediate the development of content and pedagogical knowledge within the zone of proximal development. King, Staffieri and Adelgais (1998) examine the effects of tutorial interaction structured to help same-ability, same-age peers scaffold each other’s higher order thinking, and their study confirms the possibility of such tutorial scaffolding. Duncan (1996) examines the effects of incorporating cognitive apprenticeship into the writing class for industrial and technical teacher education. The study concentrates on a comparison between two types of apprenticeship, thinking aloud modeling and scaffolding.

There are many studies on the computer as an external tool which suggest that interaction with this technical tool could mediate higher learning. For example, Globerson et al. (1989) studied the Computerized Reading Partner program, comparing the different kinds of assistance provided. Regarding the computer as a zone of proximal development, they examine the possibilities of the tool in providing a learner higher level thinking and metacognitivelike guidance.

3.2. Vygotsky’s Concept of the Zone of Proximal Development Provides a Paradigm for Constructing an Investigation of Realistic Hand Drawing Skill Training Using a Three Dimensional Perspective Grid

All three notions -- cognitive apprenticeship, scaffolding, and the zone of proximal development -- have been developed by scholars who recognized and honored
the significance of culture and social interaction in children’s cognitive development. As indicated earlier, the concept has recently been more widely appreciated in the West since the study defining the zone of proximal development (1934) was published in English in 1978. Bruner and his colleagues honor the zone of proximal development as the foundation for an instructional strategy called “scaffolding,” which they developed in 1976. Cognitive apprenticeship was formulated later along these lines, inspired by traditional apprenticeship or skilled training from the past, as a method in which the student gains awareness of the situated nature of knowledge through observation and practice instead of study. These mediation techniques, constructed from observing interaction between adult tutors and children during educational engagement, were extended to cover transactions including scaffolding, modeling, and various other forms.

In this research study on drawing for communication, the background of the study on drawing for communication began in an interest in developing a paradigm of practice and instruction strategy to train freehand perspective drawing skill in adults with no skill or beginner level drawing skill. The drawing instructional device which is the focal for observation in this study is a three dimensional grid, which is a familiar tool for assisting in the production of hand drawn perspectives among architects and designers, though it is rarely found in use as a training tool for unskilled learners in the traditional drawing classroom. Since the late 1980’s, a form of drawing instruction using the 3D grid has been developed and implemented in the class Design 199 for incoming design students as well as new students in industrial design. According to an investigation by Anderson (1997), the grid structure has proved successful in enabling
unskilled adults to draw perspective images of objects and the interior of a room and to communicate their designs in great detail. In other words, the three dimensional grid enables novices who cannot draw to produce quality perspective hand drawn images from thought similar to those of a skilled practitioner who has already gained conscious control of the ability to do perspective drawing, but within a shorter training time. The success of the drawing instruction using a 3D grid in the class Design 199 to train unskilled learners to produce a perspective image at such an expert level caught the attention of this researcher. During the past twenty years, I have seen the tool used for the most part as a grid utilized as a drawing aid to enhance the speed and quality of drawing production by practitioners who have already gained conscious control of hand drawn perspective image production and are skilled in design visualization. They can pick up and use the tool without much need for instruction.

According to Bruner (1985), the essence of the zone of proximal development is in the way skilled members of the culture arrange supporting tools and environment so that children can reach levels of consciousness beyond those achievable through their unassisted efforts. In applying such a framework to this research scenario, the course Design 199’s drawing instruction using a perspective grid can be seen as a mediation process and device that has been successful in assisting students to achieve an advanced level of drawing skill beyond that attainable through their unassisted efforts. The advantages offered by the 3-D grid instruction, as described earlier, include: students’ ability to produce images from thought, the ability to use external representation to explore and manipulate ideas, and the ability to render a representative drawing of concluding ideas. By framing the research scenario in this way, this researcher has been
able to determine that the scaffolding mechanism, or the drawing instruction using a perspective grid, appears to be within the students’ zone of proximal development. This research will focus on the development of the drawing acquisition process in literate adults and on semiotic mediations including scaffolding and cognitive apprenticeship mechanisms involved in both collaborative and individual activities during the process of acquiring drawing skill according to the concept of the zone of proximal development.

3.3. The Methodology of the Zone Offers Methods and Analyses for Exploring the Drawing Acquisition Process and the Semiotic Mediation Process and Devices Useful in the Process of Acquiring Realistic Drawing Skill According to the Concept of the Zone of Proximal Development

The issue of drawing production for communication has been a topic of discussion and investigation among many areas of study. According to the earlier review of drawing instructional methods in chapter two, cognitive science and design appear to be among the few areas that have investigated realistic perspective drawings in which researchers have been introduced as active participants in studio transactions. However, in those studies, the subjects are experienced design practitioners who have already gained conscious control of their perspective drawing skill and are expert in visual spatial communication and visualization. By locating this research according to the concept of the zone of proximal development, this researcher is able to implement the methodology of the zone to investigate and analyze instruction and development issues common among adults who cannot draw during the process of gaining conscious
control of perspective drawing skill. The unique methodology of the zone, which allows exploration of certain issues in the process of drawing skill acquisition, will be implemented to help fulfill the objectives of this study, in developing a paradigm of practice by formulating a drawing instructional strategy and examining a concept of drawing for communication, as follows.

3.3.1. Interpretation of drawing instruction using a 3-D grid will become the basis for formulating instructional strategy

Lee (1985) identifies the notions of activity and human consciousness adopted from Marx’s praxis-interactionist thesis as two fundamental working concepts underlying Vygotsky’s theory. They contribute to a perspective that, as the nature of practical activity determines human consciousness, consciousness only develops through a human being’s interaction with the world. Bruner (1985) examines Vygotsky’s developmental theory in comparison to the perspective of the traditional educational paradigm of the twentieth century and provides the interpretation that, in Vygotsky’s basic belief, the fundamental vehicle of education is social interaction, not the student’s individual performance. In learning which is transactional in nature, students will be guided in entering into the culture through induction by skilled members of the culture, who will provide various forms of assistance surrounded by social convention and in the manner of intellectual prostheses. This is in contrast to other Western learning paradigms where students are regarded as lone organisms acting against nature in different models. A number of scholars have embraced Vygotsky’s social psychology approach to child development and helped construct teaching strategies necessary for an advanced level of development that students cannot reach by
themselves, without assisted efforts, such as those provided under this transactional framework.

In this investigation, the interpretation of drawing instruction using the 3-D grid will become a basis for formulating drawing instruction strategy. The instruction and the 3-D grid, which appear to be within the zone of proximal development, will be transcribed in relationship to the development of both the drawing production skill development and the learner’s cognitive development. In the examination process, non-verbal tools will be examined not as language, but as a language like system functioning in parallel to language activity. When viewing the drawing instruction in relation to practical skill development, drawing instruction using the 3-D grid is seen to enable a learner to achieve “practical intelligence,” which is described by Hickmann (1985) as the ability to use tools to mediate action in order to achieve specific goals. In this case, it is the ability to draw a replica image of any specified thing. Actions involving verbal and non-verbal tools or drawing instruction using the 3-D grid will be captured and characterized toward formulating the tutoring process. An early work of Bruner et al. (1976) on “scaffolding” provides an example of strategy construction which interprets language actions of a successful tutoring method in terms of techniques such as modeling the task, coaching, etc. for practical skill development.

When viewing the drawing instruction in relationship to cognitive development, successful drawing instruction using the 3-D grid will be examined in terms of multifunctional speech forms or mediation that enables intervention in meaning construction resulting in newly constructed consciousness in the acquisition process. The emergence of higher mental processes can be identified according to two
phenomena, the development of word meaning and the development of egocentric and inner speech. While the development of word meaning appears as metacognition activity, the development of egocentric speech can be identified as the activity of unification between two diverse speech processes, or the point when the learner becomes able to produce his/her own design. In other words, according to Hickmann’s description of this cognitive developmental stage, successful mediation is seen as enabling learners to utilize linguistic skill or dialogue to penetrate the use of a tool and transform its basic functions (1985). Activities of the mediation process and devices that initiate the emergence of cognition will be captured as techniques in the drawing strategy for cognitive development.

In the literature that has been reviewed so far, the majority of successful instruction methods appear to approach conscious control in a chronological order corresponding to practical skill and cognitive development. The organization of those techniques can be described according to Vygotsky’s two developmental phases, before and after children are able to use language for communication. The strategies used in the beginning of the training are for assisting in the process of gaining conscious control of the practical skill. Then, after this acquisition, the latter group of techniques is for supporting and inducing the construction of new consciousness during the use of such skills to participate in transactions. All investigations on successful strategies for developing first language verbal ability in young children have confirmed Vygotsky’s two developmental phase concept, which has also originated from investigations of spontaneous first language verbal development between children and adults. Under this two-stage approach to instructional strategy, the critical point in the instruction appears
to be between the modeling tasks and skill acquisition. For example, a scaffolding procedure by Cudd and Robert (1993) was introduced for young students who have a problem in transferring book language into their own writing. In traditional second language instruction, the challenge was located in instructional strategy that could “defossilize” the copy mode of students in the early stage of language skill development and enable them to produce their own words in conversation (John-Steiner, 1985).

However, not all successful instructional strategies for skill acquisition share a similar two-stage approach to the acquisition process. For example, John-Steiner’s investigation reveals differences among successful second-language instructional strategies for adults. Therefore, in formulating this drawing instructional strategy, the work will be set to investigate the drawing instruction in its relationship to practical skill and cognitive development but without an attempt to define the stage of the development. It is anticipated that the investigation will capture different approaches to acquisition processes in drawing instruction using the 3-D grid if there are any.

3.3.2. The process of acquisition of perspective drawing skill with the support of the 3-D grid will be characterized as a concept of drawing for communication.

3.3.2.a. The process of acquisition of perspective drawing skill examined in relationship to the development of drawing production skill for communication. According to scholars, Vygotsky examined several developmental issues, both the acquisition of language skill for communication itself and the development of higher mental processes underlying the language acquisition paradigm, though the latter is the concept which is explored in the mainstream research studies that have adopted his developmental theory. For the study of the development of language skill itself, the
framework offers an alternative method that enables language teachers to investigate language production skill development, including speaking and writing, since the majority of research studies in language instruction tend to be constructed from the comprehension mode of communication (Hickmann, 1985).

In his study of the development of language production skills, such as writing skill, Vygotsky described the acquisition process in terms of the transformation and unification of diverse developmental processes. John-Steiner (1985) offers the clarification that, in Vygotsky’s concept, development of one skill never occurs as a single schema nor can it evolve independently of other developmental processes. For example, in acquiring a written form of language, children have begun by acquiring speech through spontaneous processes with adults since their early childhood. For Vygotsky, the writing event is considered a social phenomenon in which a student “communicates with a white piece of paper,” not just “a simple extension or translation of spoken language into written symbols” (p.348). Under such a frame, as a student begins writing, a transformation has occurred between thought (thinking in speech) and writing. This is possible through a unification of the two diverse developmental processes, thought, which is a spontaneous process, and writing, which is considered a conscious process.

In addition to writing skill acquisition, John-Steiner explores Vygotsky’s 1935 paper on childhood multilingualism and reveals that the author views second language acquisition as similar to writing skill acquisition, and that the distinction between the native and second language is seen as parallel to the distinction between thought and writing. According to Vygotsky, the development of new language skill after learners
have already gained conscious control of their first language verbally is always different from the acquisition process of their first skill. Even when the spontaneous process of the first language learning condition is reproduced for second language learning, the development of the new language skill will turn out differently. However, despite these differences, the two diverse processes always unite internally. In her examination of the development of second language production skills such as speaking and writing, John-Steiner adopts Vygotsky’s perspective on bilingualism to examine the shifting line of the two language development in terms of the dynamic nature of the connection between language and thought. Underlying this perspective, the researcher regards second language acquisition as a process of separation of the native language from the new language being acquired at the production level while they are united internally at verbal meaning and thought levels.

In this investigation, the development of perspective drawing skill using 3-D grid instruction will be examined in relation to the development of thought (thinking in speech), or other kinds of development that may be identified in the investigation. Keeping in mind the mechanism of the shifting line between two developments, the drawing skill acquisition process will be investigated, discussed, and characterized.

3.3.2.b. The acquisition of perspective drawing skill is examined in relation to the cognitive development concept of the zone of proximal development. Bruner (1985) explains that the acquisition of language skills for communication provides a paradigm for the internalization of concepts underlying the zone of proximal development. Wertsch and Stone (1985) describe internalization, or the transformation of consciousness in terms of social phenomena, as the way external activities are
transformed to create internal processes. Children’s cognitive development begins when they come to recognize the social significance of external sign forms that have been in use in their social communication. Their new proposal has introduced an alternative way of conceptualizing the relationship between internal and external activities in the development of higher mental processes, and provides a theoretical basis for many issues Vygotsky studied.

The development of word meaning and the development of egocentric and inner speech are significant moments in the transformation process Vygotsky has defined in order to understand higher mental function within the individual on the intrapsychological plane. As in the development of word meaning, different functions of social semiotic devices are identified during the acquisition of drawing skill. As described by Wertsch and Stone (1985), as learners develop practical skill in using a sign system and the ability to utilize the skill for communication, the human cognitive development is transformed through the internalization process, and this can be captured in the activity-semiotic transformation of the meaning of semiotic devices. In drawing skill development, the emergence of cognition will be captured from meanings of both drawing and instructional aids, which are expected to undergo transformation within and between the two developmental phases, before and after the learner is able to use drawing skill for communication. Examples of research studies that will be relied upon for guidance in this investigation include those of Ninio and Bruner (1978) and Bruner (1985). During the process of drawing skill development, another related cognitive phenomenon is the development of egocentric and inner speech. The egocentric is an intermediate speech form described as the unification of two diverse
processes which bridges between external interpsychological functioning and internal intrapsychological functioning, and typically goes underground as a student masters the language skill for communication. Inner speech is the egocentric speech which has gone underground and is usually described as preserved functions of social interaction in thought as well as in a person’s individual behavior. This research study will investigate and characterize egocentric speech in terms of when and how it emerges and undergoes transformation, from the beginning of drawing skill development until the learner’s drawing skill acquisition is complete. More details on these cognitive phenomena of the zone, as well as on design research studies, e.g., cognitive visualization skill training (Vásquez de Velasco et al., 2001), will be discussed in the next chapter.
CHAPTER 4

REVIEW OF LITERATURE TO BE USED IN CONSTRUCTION OF
THE COMMUNICATION CONCEPT AND OBSERVATION CRITERIA

In this literature review, I build an understanding of communication concepts by examining material from three different fields. Selected proposals from the disciplines of psychology, communication, and design will be discussed toward the aim of constructing conceptual and observable communication criteria for this research study. The proposals from each field can be distinguished by the way its scholars have constructed their framework implicitly from the language and interaction within their group of practitioners, concerning questions evolving from their past and current investigation. First, in the review of the proposals from psychology, Vygotsky’s theory will be emphasized as his approach to research analysis is the methodological basis of this investigation on drawing for communication. Due to the unique construction of the theory, this researcher would like to propose a discussion of the communication concepts in the development theory in terms of the intertwining of three activities -- the processes of acquisition, mediation, and higher mental development. In the second group, proposals from the communication discipline, the issues of representation and different forms of language in communication will be examined. In the final section,
review of proposals from design disciplines, the focus is on spatial representation
drawing and knowledge designs researchers construct by intertwining theories about
cognition and communication with the use of projective devices typically utilized for
creative practices. The review is expected to provide some guidance on communicating
with spatial representation for this research study of drawing for communication, in
which the investigation will be focused on perspective drawing. The researcher has a
background in drawing training from design education.

4.1. Communication Concepts in Psychology

In their recent collection, *Rethinking Psychology*, Harré et al. (1995) addressed
a unified theme that originates with Bruner’s concern that the understanding of meaning
was no longer the central issue in psychology. For example, in his 1990 article, Bruner
re-articulated his original concept of cognitive psychology, which called for the study of
meaning and meaning-making. He voiced disappointment in the way cognitive
psychology had developed into a science of information processing.

Harré (1995) explained three major proposals that had been tried out in the
science of psychology over the preceding 50 years. Recently, some discontent had been
focused on what had been called the first cognitive revolution, which involved a
revolution to overturn two former proposals, including both behaviorism and
computational cognitive science. Both appeared to regard human beings as passive or
mere spectators of their own reactions to the environment and of processes over which
they have no control. During the era of behaviorism, psychology was known as the
statistical study of relations between input and output, described objectively and
abstractly with reference to an ideal individual. The practice was somehow regarded as a positivist formulation. In the computational cognitive science proposal, psychological concepts were derived from the analogy of the brain as computer, or between thinking and running computer programs. Psychology became the creation and testing of hypotheses describing the nature and working mechanisms of human information processing or hidden mental processes. In the second cognitive revolution called by Harré the “discursive turn,” psychology returns to the study of active people, singly or in groups, using materials and symbolic tools to accomplish all sorts of projects according to local standards of correctness. As the natural approach has been adopted in psychology, the field has turned to the study of public and private discourse or intentional use of various symbolic systems by active and skilled persons, either as individuals or in group collaboration. The mind is no longer a mental machine processing information. Language use is just one among many discursive practices. In summary, the second cognitive revolution represents an attempt to correct the slippage that occurred in the first cognitive revolution, which regarded cognition as abstract, and turned it into a formal process of information processing.

Influences of Vygotsky’s theory on movements in psychology can be seen throughout the 20th century. According to Harré et al. (1995), three traditional approaches that were neglected in the psychology of the past have been rediscovered and have been credited with providing intellectual support for the recently constructed second cognitive revolution. These include phenomenology, symbolic interactionism, and the idiographic mode of inquiry. In particular, symbolic interactionism, which has long been known as a unique American sociological and social psychological
perspective, is rooted in the ideas of the early American pragmatists Dewey, Peirce and Mead. This joined forces with the theories of Wittgenstein and Vygotsky and was brought into psychology (Denzin, 1995). The key features of symbolic interaction can be described as: self and identity, communication as culture, social structure and social relationships. In this new era in psychology, challenges from post structuralism and feminism have expanded these features to include gender identity; interpretive interactionism in cultural studies; self experience, and self-expression. Harré (1995) also credited the work of Jerome Bruner on narratological studies (1990) as an important source contributing toward the recognition of the second cognitive revolution. The author suggests that further detail on the characteristics of the revolution can be found in a number of recent psychological proposals, including those of discursive psychology, linguistic anthropology, narratology, etc. The recent proposal of dialogical psychology by Shotter (1995), which explores the problem of representation in perception is an example of a proposal largely influenced by the work of Vygotsky.

**The communication Concept in Vygotskian Theory**

Scholars demonstrate different approaches in discussing Vygotsky’s developmental theory. For example, Lee (1985) explained that, because Vygotsky’s formulation of psychology and methodology was focused on the investigation of consciousness, many Marxist tenets, particularly those concerned with the relationship between consciousness and practical activity at the social level, were featured. They comprise assumptions on interactions, productivity and functionalism, the dialectical nature of consciousness, and nature versus culture. Wertsch (1985) addressed Vygotsky’s thesis through three related topics: method, the theory of activity and
consciousness, and the social origin of individual mental processes. Hickmann (1985) interpreted Vygotsky’s development theory as an attempt to integrate three concerns: the relationship between social interactive and higher mental processes, the linguistic mediation of both kinds of processes, and the multifunctionality of language.

In terms of reviewing the communication concept in Vygotsky’s developmental theory in a way applicable to this research study, this researcher would like to propose a discussion of communication concepts through examination of the intertwining of three activities: acquisition, mediation, and higher mental development.

4.1.1. Acquisition of language skill for communication provides a means for internalization as a basis for development

According to Wertsch and Stone (1985), there are several efforts in psychology which contribute toward conceptualizing the relationship between internal and external activity. Vygotsky proposed a new concept formed by assimilating social theory and semiotic theory with the psychological concepts available during his time. The main focus of his new proposal was the conceptualization of the relationship between internal and external activity in the development of higher mental processes. Commenting on the work of other Western theorists, Vygotsky argued that these activities are not identical and that they are related under a developmental relationship in which external processes are transformed to create internal processes, not a process in which the external activity is simply transferred to existing planes of consciousness. Although the new formula appears to be similar to Piaget’s internalization or “interiorization via reflective abstraction” (p.163), the major concern of Vygotsky’s internalization is with social processes, and the account is primarily based on semiotic analysis.
Bruner (1985) helped clarify how the process of gaining conscious control of language skill for communication can explain the internalization process, which, in fact, is a principle of higher mental development described in the zone of proximal development. In Vygotsky’s explanation of spontaneous language development, children learn to speak their first language by collaborating with an adult for communication purposes until the language they have mastered becomes internalized and they are able to produce and control their own dialogue. The process of transformation of children’s consciousness in terms of different social phenomena occurs throughout the language acquisition process. In other words, the internalization of the zone happens when adults start providing various forms of support and children attempt to establish and continue correspondence, until they begin to gain conscious control and advanced language production skill.

4.1.2. Mediation in instructional practice initiates internalization and therefore makes the development possible.

The new psychological proposal was formulated as a theoretical basis for many issues Vygotsky was studying at the time, including the notion of the zone of proximal development, which was introduced as a concept for approaching issues in the assessment of children’s cognition and evaluation of instructional practice. Bruner (1985) emphasized that the notion of the zone focuses on how skilled members of the culture arrange the use of “prosthetic devices,” coaching, and other supporting environmental features so that children can reach consciousness beyond their present level. Under this transactional learning concept, many scholars have helped to reinterpret Vygotsky’s claim, and it has been proposed that psychology will become
“the search for the reality that intervenes between the external world and human mind” (Wertsch, 1985), and that the link is in fact human activity and/or semiotic instruments (Wertsch and Stone, 1985). From the perspective of a social approach to teaching and learning, Bruner and his team (1976) laid the groundwork on constructing the instructional strategy “scaffolding” in their investigation of a successful tutoring process. They demonstrated that mediations or social transactions are not only key features that initiate transformation and make possible the acquisition of language skill for communication, but also initiate the process of cognitive development.

4.1.3. Higher forms of thought are developed through acquisition of language skill

In social transaction, children develop higher forms of thought by differentiating various levels of generality and communication; the event can be explained through application of the semiotic principles underlying the use of external sign form in the transaction. Wertsch and Stone (1985) observe that communication metaphors or the internalization of the zone can also be found in Vygotsky’s semiotic analysis, in which the internal plan of consciousness emerges through “the emergence of control over external sign form.” The author’s insight is that semiotic principles can be regarded as underlying the use of such external sign form. In fact, Vygotsky described the emergence of higher mental processes in relationship to the achievement of conscious control over external sign form, through the delineation of semiotic principles. In order to understand higher mental functions within the individual on the intrapsychological plane, semiotic analysis attempts to clarify two significant moments in the transformation process, the development of word meaning and development of egocentric and inner speech.
4.1.3.a. The development of word meaning: the transformation of meanings of semiotic devices during internalization. According to Lee (1985), Vygotsky recognized the semiotic mediation of practical activity, especially the incorporation of speech into human consciousness, as a fundamental mechanism for transforming human cognitive development along social dialectical lines, which is a continuation of the biological line of early childhood development. Through his examination focusing on goal-directed activity which transforms its user, Vygotsky suggests the use of some external means to reach a goal by introducing different types of externally mediated activity/actions and discusses two types of external mediator, tool and sign. Tools are external instruments controlled by a person to achieve specific goals. A sign, such as a knot used as a mnemonic device, can give feedback and, in turn, control its user by helping him remember. But the most significant sign system for Vygotsky is language, which, in his view, is a mediating device and not an isolated semiotic device like the mnemonic knot.

As a mediating device, language is a system of reversible sign, operating socially under the principles of multifunctionality, communication and generalization. For example, speech is considered reversible due to the potential of the word as both stimulus and response. Based on its multifunctional quality, language can be used as a means in many types of goal directed activity. Its use as a functional means can be observed in various interactive situations, including getting someone to do something, providing information, and promising. In fact, two major functions shaping speech are communication or social contact and such forms of representation as reference and prediction. While the former link language to social action, the latter link language to encoding properties in multiple levels of generality both in its surface forms and self-
reflexivity functions. In parallel to Lee’s interpretation, Hickmann (1985) pointed out that Vygotsky’s semiotic analysis and developmental theory interpret the use of sign within two macro-functions: the interpersonal/communicative function and cognitive/representational function. In other words, the same sign mediates both processes.

4.1.3.b. The development of egocentric and inner speech: two types of speech form in relationship to newly constructed consciousness. According to Lee (1985), Vygotsky proposed that egocentric speech serves as a bridge between external interpsychological functioning and internal intrapsychological functioning and claimed as well that the cognitive development occurs first in social, then egocentric, and then internal speech. The proposal is intended to counter Piaget’s notion that egocentric speech should be regarded only as speech for oneself with no regard to others (i.e., creative self expression), and that it has some consequences to their higher mental development when children continue using this kind of self-regulative speech in communication settings. In Vygotsky’s notion, egocentric speech has to evolve in a social communication context and does not disappear as children begin to socialize. It goes underground and becomes inner speech after children have mastered language skill for communication.

In the research study on the child’s development of abstract scientific concepts and complex patterns of motivation from their origins in early child language, Vygotsky furthered his analysis of higher mental function processes. He found that, during socialization, a new form of consciousness is created through children’s differentiation in social structure and language and children’s psychological operations on the
properties of speech (multifunctional, generalized, and dialectical). Once the representational function of speech is differentiated from the other pragmatic goal-directed communication functions and is used to represent other functions in egocentric speech, children infuse these language functions with a new level of generality and therefore transform and create new inter-functional connections among psychological processes. The incorporation of language is recognized as a complete change in the child’s psychological organization, and becomes the foundation for both abstract conceptual thought and more complicated motivational structure in inner speech.

A study concerning the newly structured consciousness was conducted through the investigation of the development of scientific concepts and complex patterns of motivation during play. The investigations were attempts to understand two aspects of language. First is the use of language to represent the referential aspect of language, which results in the development of logic and abstract thought. Second is the use of language to represent mean-end and interpersonal aspects of communication interaction, which result in the development of inner speech and linguistically mediated motivation. The examination reveals that, in scientific concept development, abstract thought occurs through the systematic interweaving of language of different levels of generality and reversibility. The unification of two dialectically related but contrasting vectors of development is possible based upon the differentiation of the representational function of language during egocentric speech development in transaction. In inner speech development, language influences the mediation of affect and motivation. Vygotsky’s view of the way play develops as the linguistic mediation of the meaning-object relation was derived from observing the way children play as they transform the
Vygotsky articulated a process by which these forms of mediation by meaning link play to the development of inner speech and the higher mental development. Because of the importance of these developmental processes, Vygotsky was concerned about the participation of adults and children in social interaction, not for the purpose of producing and mastering word meaning but to engage in communication and mutual regulation in order for children to develop higher forms of thought. In fact, Vygotsky proposed his account of egocentric and inner speech in connection with this vital communication engagement (Wertsch and Stone, 1985).

4.2. Discussion of Selected Proposals from the Communication Discipline

4.2.1. Issue of representation

In communication, the term representation has become a major issue of discussion in an atmosphere created by paradigm shift. Krippendoff (1998) describes the way communication has grown from journalism into a new paradigm within a rather short period, considering that the movement began after World War II. Although it emerged from the practice of journalism, communication can no longer be regarded as a written product representing a message, but is seen instead as the transmission of information from a sender to receiver via channels where this information is variously...
encoded, decoded and processed. In place of the search for the truth of the report, concern is focused toward such questions as who? saying what? to whom? through which channel? and with what effect? The traditional media study, which emphasized the media as representations, without concern for process and human social involvement, has become a paradigm of the past.

A number of scholars have questioned the appropriateness of the traditional paradigm and provided reflection aimed toward a new structure for understanding the communication process. They include, for example, the concept of media ecology by Postman (1974) and the concept of orality and literacy by Ong (1982). Neil Postman (1974) proposed the development of an ecological perspective as a constructive concept in communication study. The concept has finally helped establish significant recognition of communication as an example of knowledge reconstruction along the lines of the ecological concept. The distinction of the media ecology paradigm is that the researcher did not intend the concept to be introduced as a written theory for people to follow. Instead, the essence of the proposal lies in interactive transactions. It represents an attempt to connect different communication systems and processes in a complex network, and to study communication processes by focusing on an exploration of the relationships among the elements, not the elements themselves. According to this promise, Postman and his team provided an example by: building a team of researchers to work on the paradigm; including students in the team; allowing the exploration to grow while seeking to find out the direction and extent of the work; and publishing their ongoing work in the discipline journals. In the process of context analysis, which is a methodology of media ecology, they studied the elements of relationships in the
communication process by focusing on the inquiry, “not on who says what to whom through what medium, etc., but on how the who, what, whom, and the medium are interrelated” (p.4). Hence, the study of media is no longer limited to the issue of the content embodied or symbolic representation, but centers on the dynamic relationships among technology, people, and their interactive environments.

Under the perspective of the new approach to media in communication, Ong (1982) gave a comprehensive interpretation of different media in his concept of orality and literacy. The terms orality and literacy refer to two groups of people who have basic differences in their methods of organizing knowledge -- a culture rooted primarily in oral communication and a culture rooted in writing. His examination of the tools of communication, including writing, print, oral memory, and narrative, went beyond the tools’ practical functions and the symbolic representation of certain static entities such as objects in myths. For Ong, these language production technologies are not just complements to speech, or memory aids like knots. Instead, they move aural language into a new sensory medium, transform speech and thought, and reconstruct the human life world. The author describes these technologies in terms of a different recognition of the role of media in human transaction, a new notion of the nature of medium, the way each medium communicates, and its role in relationship with society. In particular, consciousness is reconstructed by the media, since our consciousness is rooted in a dialectical nature. In such a perspective, a tool such as word processing can be seen in two distinct ways when used and viewed under the two different perspectives of writing and printing reconstructed consciousness. When reading the same column in a newspaper, readers with orality consciousness will feel the presence of the author while
readers with writing constructed consciousness will comprehend and respond as if the author were far away or absent. The new perspective on the media can be observed in writing in communication. For example, in Technopoly by Postman (1993), the author describes technology according to three different distinct cultural groups that possess three different types of consciousness of technology. The discussion aims to examine technology beyond an optimistic perspective and to explore other aspects such as the effects of new technology and its authority in our lives.

4.2.2. Different forms of language in communication

From a linguistic perspective, viewing a linguistic system as the fundamental organization of the reconstruction of consciousness, Silverstein (1985) clarified that the way Vygotsky perceives linguistics in delineating his development theory is in fact in terms of the instrumental nature or pragmatic function of language. Language in a mature form can be seen as providing externalization of rational thought along with a communicative function as well as internalization. This comprises part of the organization of rational thought in an individual’s relationship to the external world, including objects and other people. Apparently, Vygotsky did not view the emerging forms of the instrumental functions of linguistic sign in thought processes as having concrete characteristics. In his cognitive study, thought processes such as representational and computational processes occur before and independent of language (or signs that are grounded into a system).

In the area of communication, discussions of the instrumental functions of linguistic sign are found among works in discourse analysis. Kreckel (1981) explains that though everyone shares the definition of discourse as language above the sentence
level and situated language in use, the practice of discourse analysis varies according to
the different disciplines that implement the methods. In the areas of psychology and
sociolinguistics, discourse analysis is an investigation into how communicants transmit
and interpret messages in natural discourse and on which cues in the conversation these
messages depend. Traditional key features which respond to these investigation
questions are addressed in such topics as the pragmatics of discourse, conceptual
organization of reality, etc. The pragmatic nature of language or verbal behavior is
sometimes regarded as the science of language use. Within such a definition, discussion
centers around questions of use by whom, which kind of language, and under what
conditions. Two major topics in the condition discussion are preconditions for
communication and the specific communicative context or situation. For another
traditional key feature, the conceptual organization of reality, Kreckel (1981) discussed
concepts related to cognition, particularly the acquisition and organization of
knowledge, in terms of understanding what is said. Examples of elements involved in
the conceptual organization of reality in discourse include: acquisition of knowledge or
the relationship between words and the world under terms such as concept; shared
versus common knowledge; concept as part of sign; codes and sub codes; and different
coding systems.

Discussion of the pragmatic meaningfulness of a sign connected with its
ongoing usage in contexts of communication can be observed in such works as
Vygotsky’s developmental theory. According to Silverstein (1985), when Vygotsky
considered tools at the mediation level, he described the pragmatic linguistic functions
in connection with teaching and cognitive development. In the context of egocentric
development, transformation is regarded as a dual process, an intertwining between contrasting values of linguistic signs of the pragmatic function of language as a communicative organization of external sign and the propositional nature of language as internal cognitive organization. In the context of inner speech development, the transformation is described as a means-end structure, in terms of conceptualizing the equivalence of the propositional-performative as they could be used for a particular object, and subordinating one means-end schema to another.

The pragmatic nature of language in reconstructed consciousness and its significance to constructivism is discussed by Ortany (1993). In his examination of metaphor, language, and thought, Ortony describes two values of linguistic sign, literal language and non-literal language, so as to provide a paradigm for his explanation of the distinction between non-constructivist and constructivist perspectives on metaphor. Literal language is described as the essence of logical positivism due to the notion that, through the medium of language, reality can be precisely captured in clear, unambiguous, and testable statement. Since reality should be literally describable, metaphor is regarded by the non-constructivist as unimportant, vague, and inappropriate for scientific discourse due to its inability to provide accurate descriptions of physical reality. However, for the constructivist, meaning is not directly perceived but needs to be constructed. Therefore, both creative activity and the comprehensive quality offered by non-literal language are required. The constructivist perspective increases the significance of the non-literal perspective of metaphor in both language and thought. Recently, scholars have demonstrated interest in different non-literary structures that organize the conceptualization and implementation of metaphor along the constructivist
perspective. For example, in linguistics, there has been increased attention to
performance and pragmatic language, as well as to the nature of text. Petrie and Oshlag
(1993) proposed effective use of metaphor in education, viewing the nature of metaphor
as speech act instead of language entity. And from architecture, Schön (1993) proposed
the generative metaphor.

4.3. Communication Concepts in Design, Communicating with Spatial
Representation

It has long been known that many historic artifacts and architectures were
created by skilled craftsmen and builders without the aid of any detailed design
drawings or engineering drawings. There is archeological evidence for only small
models or simple plans or elevations drawn at sites to assist in some historical
constructions (Porter, 1979). It was not until the beginning of the twentieth century that
the “drawing office” completely took control of creation from the skilled artisans and
the foreman. Since drawing techniques have become highly developed and able to
handle the image construction of complex space, representation drawings have become
the most cost effective and convenient tool in communication among those who work in
such construction processes as they have replaced direct manipulation of three
dimensional objects and space in the design and construction process. Drawing allows
designers to work away from the site, to be freed to expand their imagination, to control
the whole structure of construction, to locate themselves in the structure of social
relations, and to construct intellectual knowledge while expanding the field (Robbins,
1994).
All reviewed materials on design drawing regard design drawing as drawing for communication. This literature review will look at spatial representation according to two groups of materials. First are 70’s and 80’s drawing manuals that discuss drawing for communication in terms of tools and signs used for achieving specified goals. In this aspect, drawing is a transparent medium, neutral, and always incomplete since it serves the purposes of externalizing an exploration of tentative ideas and representing design works and processes during communication. Second are design writings from the 90’s to the present that examine design drawing at the level of mediation, where spatial representation is viewed as a multifunctional device mediating both social interaction and cognitive processes.

4.3.1. Design drawing as a communication medium at the tool and sign level

A number of twentieth century drawing manuals for architects and designers regard design drawing as drawing for communication. They emphasize visual and spatial representations and manipulation of the representations, in order to utilize the medium to achieve certain goals. As Robbins (1994) pointed out, architecture drawing of the modern age can be described as using relational, projective, and geometrical techniques. Designers use two and three-dimensional techniques for both personal representation such as communicating with themselves as they conceptualize and experiment with a new design, and for conventional representation when communicating with others in the social production and materialization of a design. In fact, their drawings are intended to present an architectural object in the way designers choose view it, and are not concerned with any subjective association between image and object or any universal logic, as many have thought. Different types of drawing are
utilized in order for designers to provide various vantage points from which their design
ideas are conceptualized, developed, presented, and realized. Typical conventional
drawings include elevation, which offers face and surface visualization; a plan
providing horizontal organization; axonometrics, which offers volume penetration; and
perspective, to allow us to move through a design in relation to architectural space.
Besides the common types of drawing designers share with everyone in the design
process from builders to laypersons, designers also invent personal drawing styles when
sketching ideas for themselves and others. Examples include a combination of doodling
and projection, the use of color code, improvising overlay techniques, and small
graphics drawn at a corner of a photograph when the designer wants to point out a
certain thing in the design.

Examination of some of the oft-cited design drawing manuals for this literature
review has led to the conclusion that all the materials regard design drawing as drawing
for communication, although each manual has different emphasis in drawing
instruction. While some manuals, such as those of Doblin (1969) and Eissen (1990),
concentrate only on perspective techniques such as projection and grid for producing
presentational drawing, other writings, in particular, Lockard (1968 and 1982), Porter
(1979), Laseau (1989 and 2000), and Burden (1992), place their emphasis on both
technique and different meanings of drawing in design. It is noticeable that the drawing
manuals in the latter group appear to share a similar focus in their discussion of drawing
practice. The shared focus includes emphasis on communication in representational
drawing and reference to psychological concepts of human information processing in
relationship with the drawing. In the manuals, spatial representation drawings appear to
be described in terms of the pragmatic nature of language. The design drawing instructions rarely discuss the projective device in terms of language entity and/or the visual language of Arnheim and Gombrich, which has been criticized in visual art and graphic design. Rather, they provide lesson plans on how to communicate through design drawing by emphasizing key features, including: roles of communicants; different types of drawing to be used for communication with different groups of associates; situation and context of the interaction; and various ways of connecting drawing with reality, such as concept, index, coding, etc. Additionally, these design drawing manuals distinguish two areas where representation drawing should be utilized in design communication: drawing for communicating concepts of space (spatial experience) and abstract graphics in relation to the design process or graphic thinking, which includes graphic visualization of thought, invisible systems, and problem solving processes.

4.3.2. Design drawing as a communication medium at the mediation level

A methodology and framework from the communication discipline appear to be common in recent design writing. In place of discussion of the artifacts’ material properties or the stylistics analyses seen in essays of the past, design writers employ the communication framework to examine the artifacts’ roles and their functions within the process of communication and within a social network established by communication. Recent discussion of design drawing moves away from the traditional media model and the use of drawing in terms of tool and sign as isolated semiotic devices, to viewing the drawing medium at the mediation level. Among the different design issues, such as representation, aesthetics, and social aspects, that have been explored under the
communication framework, this review will focus specifically on research studies on drawing production and cognitive development. The following are examples of proposals that explore drawing production in terms of social interaction and mediation of cognitive processes in design process transactions.

4.3.2.a. Drawing as inquiry in the problem setting process. Due to a dilemma in major areas of study such as science where there is increasing awareness that real, practical situations often do not lend themselves to theories and techniques established and promoted within the curricula, Schön (1983) foresaw the need to construct an epistemology from ‘minor professions.’ The author suggests that training in an architectural studio demonstrates the advantage of practice under conditions of uncertainty, complexity, and uniqueness. In the study, the epistemology is formulated by transcribing the practice and coaching during studio critique sessions where students and a teacher participate in the communicative process by drawing and talking with each other.

The kind of inquiry undertaken in the studio is regarded as the core of architectural practice. Drawing is an essential part of the inquiry, particularly in the problem setting process. Schön explained that drawing offers practitioners the possibility to construct virtual worlds in each frame and to experiment with them. If a designer utilized verbal tools alone, such a practice would become a technical problem solving process; such a process is characterized by an inquiry stance, as suggested by the terms objectivity, control, and distance, terms central to the model of technical rationality. Instead, with the use of drawing and verbal communication with a coach, students set and solve problems through a different structure of inquiry, as named by
Schön, “the reflection-in-action process.” The inquiry is a transaction taking place in a situation in which knowing and doing are inseparable (research-in-practice) (p.68). The epistemology of the practice emphasizes the effort of reframing the problems and conducting an experiment to discover what consequences and implications can be made to follow from the reframing. Drawing helps construct a representation of the real world of practice and offers a designer a virtual world within which to experiment, construct, and manipulate.

4.3.2.b. Drawing as manifestation of the instability of interpretation of external representation. The research study by Schön (1983) has introduced to later researchers, such as Suwa and Tversky (2002), recognition of the importance of the freehand sketch to the dynamic construction of an idea and guided them to further study on the benefits of instability in interpretation of external visual representation to the design process. According to the researcher, several studies on such forms of external representation as diagrams, sketches, napkin sketches, etc. reveal their benefits to inference and problem solving. For example, the external representations help reduce working memory load as all elements in the calculation do not need to be kept in mind during the operation. They also serve as cues for retrieval from long term memory. In an investigation of spatial schemas in depiction, both visual-spatial and metaphorical representations were found to promote discovery and inference (Tversky, 2001). In order not to impair the cognitive process, it is important that the method of generating external representation be rapid and flexible (Herbert, 1993); the speed of drawing production should be about 8 seconds per one chunk of data (Ullman et al., 1990).
Suwa and Tversky (2002) comment that the previous research has focused on benefits of visual representations on calculation, memory, and inference that can be achieved from stable external representations such as those used in science and mathematics. However, instability in interpretation of external representation also has unique advantages that can be of benefit in a few areas, such as design. Through sketch production, information can be represented in various forms, views, and levels of abstraction. From investigation of transactions during the design studio process, the researchers revealed that designers draw sketches to try out various uncertain ideas, instead of drawing out ideas already fully formed in their minds. During the dynamic process of idea construction, the sketchy external representation offers them alternative ways of perception and allows reorganization, therefore promoting novel interpretations as new relations and features are unintentionally discovered. This finding on the instability of interpretation of external representation is part of a wider investigation on ways designers use representation to discover and develop design ideas.

4.3.2.c. Drawing as cognitive visualization skill development. From observation of the production of perspective drawings during discussion in the design analysis process, Vásquez de Velasco et al. (2001) concluded that the analytical hand-drawn perspectives produced during the transaction are important both in communication and in terms of development of design students’ cognitive visualization skills because the practice involves different transference processes such as transference between thoughts and image production, and transference in the production of perspective images from different viewing angles. Particularly since the ability to draw usually feeds the ability to imagine, this analytical hand drawing appears to help sharpen students’ abilities in
visualization as well as in the creation and representation of ideas. However, the researchers comment that the use of advanced CAD modeling, which has recently replaced the need to produce hand drawn perspectives of different view angles corresponding to analysis and discussion, has eliminated such practice opportunities for students. Therefore, they propose an instructional strategy they have developed using computer drawing tools to help train freehand perspective drawing, which could mediate the development of cognitive visualization skill, or the third eye skill, in design students. In their study (2001), the proposed instructional strategy utilizing the CAD for constructing hand drawn perspective is compared with traditional analysis drawing using a perspective grid in training design students in the “third eye” cognitive visualization ability.

4.3.2.d. Drawing as an active participant in formulating the design. Herbert (1993) concentrated on architectural study drawing or the drawing done during the initial sketch and design development phases. He points out that in art and in literature, critical analysis typically focuses on interpreting already complete works such as a picture or the product of some design or artistic process. In architecture, this type of analysis typically focuses on the completed building. Herbert argues that the role of study drawing is not that of passive recording but of active participation in formulating the design. In his criticism, he observes that the traditional graphic visualization tools or study media (such as those of Porter (1979) and Laseau (1989)), which are common and considered neutral in design practice, are in fact problematic and not transparent. Unlike representation drawing of a completed design, study drawing is always incomplete, contingent, evolving in real time, and is always poised between an unresolved past and
an unpredictable future. Understanding study drawing, as a part of the graphic thinking processes, requires considering how mental and graphic processes interact in the real time of the design task.

In Herbert’s study, the new concepts of study drawing are constructed from an understanding of how the drawing is used as an active participant to produce discursive acts, including words and sketches, by design professionals who have been trained in the design epistemology of drawing practice. The newly proposed concepts of study drawing include: a concept of graphic ambiguity or uncertainty and intervention, a concept of the work place or mental mapping, and a concept of the integration of context and exploration drawing. Application of the research is aimed toward improving designer practice and developing teaching media in the design studio. Other goals of the research are to extend the newly proposed concepts of study drawing from hand drawing to the CAD system.

In summary, it is my observation that, although there are many studies on mediation of the cognitive process through design drawing production, all of the investigations described were conducted with transactions between designers who had already gained conscious control of perspective drawing skill. I have not yet found a study that investigates the cognitive process of design students during the processes of acquiring drawing skill. This may be because incoming students are expected to have some drawing skill prior to entering the field, a skill which will later be developed to an advanced level as they go through various courses of design transactions. It is noticeable that lessons in design drawing manuals are aimed for learners who already have some drawing ability, not for beginners who cannot draw at all.
CHAPTER 5

DOCUMENT ANALYSIS AND INTERPRETATION

PRECEDING THE RESEARCH INQUIRY

5.1. Frame of the Interpretation of Drawing Instructional Method and Tools
Utilized in the Drawing Class, Design 199

Following the initial overview of realistic and perspective drawing methods in chapter two, this researcher decided to focus attention on those drawing instructions that are effective in establishing freehanded drawing skill for novices, enabling them to gain both conscious control of well-drawn perspective drawing and the ability to produce perspective drawing as externalization of thought or their own creations. In examination of these effective drawing instructions along the conceptual framework and communication criteria established in chapter 3 and chapter 4, this researcher, who uses English as a second language, noticed some similarity between the instructional processes of the drawing methods and those used in instruction of English as a second language. Such a comparison was later developed into a constructed frame for reviewing these drawing methods by implementing second language instructional concepts such as those of John-Steiner (1985), whose work originated from Vygotsky’s concept of bilingual skill development.
According to research studies by major scholars focusing on ways learners gain conscious control of language, skills, or knowledge for communication, Vygotsky’s theory and method are the basis of the mainstream research in this area. In particular, Vygotsky’s perspective on the process of language development itself has been adopted by both first language and second language teachers for investigating language production skills such as speaking and writing. In contrast to first language verbal skill, in which the skill development process can be identified in two chronological phases, before and after children are able to use language for communication, Vygotsky revealed from his study that the two phases occur differently in bilingual skill development. Since the second language cannot be developed independently of first language skill, the development of second language production skill will turn out differently even when introduced along the lines of the spontaneous process of first language instruction, although the two languages always unite internally. Vygotsky’s proposal characterizing the acquisition of first and second languages and emphasizing the unification of the two distinct processes is introduced to replace the traditional associationist model of bilingual acquisition. John-Steiner (1985) employs the idea to investigate successful strategies literate adults utilize in developing their second language abilities in both well constructed second language production skill and the ability to use the skill in the cognitive process. Through Vygotsky’s concept of the dynamic relationship between language and thought occurring during the shifting line of the development of two languages, John-Steiner’s investigation is centered on the ways bilingual adults are able to separate two languages at the production level, then unite them again internally at the meaning level and thought level. The researcher is not
interested in what happens in the learner’s head during the transformation, but concentrates on strategies and semiotic tools that can intervene in the event of separation/integration between the first language verbal process and the new language speaking or writing, thus enhancing the success of second language acquisition. An example of the effective strategies found to be used by literate adults in John-Steiner’s pilot study is taking lecture notes in the new language (1985).

5.2. An Examination of Successful Drawing Methods as Instructional Strategies that have Different Approaches to the Event of Separation/Integration between Speech and Drawing Production in Drawing Acquisition

Employing John-Steiner’s perspective on second language acquisition based on Vygotsky’s concept, the successful realistic drawing techniques will be examined in this review as instructional strategies that have different approaches to the event of separation/integration between speech and drawing production in drawing acquisition. From this perspective, this researcher sees the successful drawing methods discussed earlier as parallel to second language strategies in three ways. First are drawing instructions that approach drawing acquisition by establishing conscious control of drawing skill through a process of separating speech from drawing production. Second are drawing methods that concentrate on establishing the ability to use the skill for communication by a process of integrating speech during drawing production. Third are drawing methods that assist in both construction of well-drawn images and integration of thought and speech at the same time. From my experience of learning a second language, the first two categories are comparable to traditional language instruction
where language learning occurs outside a social context. Such training usually begins by memorizing sentences and reproducing them in writing and pronunciation without any embedded contextual meaning. The practice usually helps beginners block off the first language thought and speech, therefore enabling them to imitate the phrase sound. Then, the second step is a period in which the teacher attempts to “de-fossilize” the copy mode with various techniques in order to enable students to produce their own speech and use the second language at the cognitive level (John-Steiner, 1985). The third group is a recent practice sometimes known as the immersive approach, in which students, from the beginning, learn to speak meaningfully words that are already in a sentence of conversation during an attempt to communicate verbally with peers who are native speakers of the target language in a real social situation. In this instruction, the teacher will arrange social activities and provide different types of scaffolding to assist speech production that enables the novice to get started at the beginner’s level and later to progress in his/her level of competency. Although production of second language verbal skills and production of realistic drawing are not the same, the following review is an attempt to re-examine drawing methods according to the three instructional strategies discussed above.

5.2.1. Drawing methods that concentrate on establishing the ability to separate speech from drawing production, which results in production of a well-drawn image from a model

It is quite interesting that this key technique for producing freehand drawing of realistic images has been discovered since the 1500’s. Well-known examples of such techniques from history include the early surveyor techniques introduced by Aberti, an
Italian builder, and Dürer’s grid device for painters invented for the purpose of making a record of a landscape and a model. Kimon Nicolaides’ contour drawing and Betty Edwards’ ‘Drawing on the Right Side of the Brain’ are two successful drawing instructions of the 20th century that approach drawing acquisition with this strategy, and they have been selected for discussion in this review.

Drawing on the Right Side of the Brain provides beginner level drawing lessons for unskilled learners who want to develop necessary basic skills for realistic drawing production. In the manual, Dr. Edwards gathers different drawing methods, including Durrer’s grid device and Nicolaides’ contour drawing, under her concept of left-right brain drawing, which she constructs by employing knowledge from neuroscientific study on the split brain by Dr. Roger Sperry (1968). In her first book, the main emphasis is on training the learner’s right brain by presenting such conditions and work that the right hemisphere will take on the job while the left hemisphere will be inhibited in its functions. The idea behind the author’s drawing concept is that a normal human being always operates with an integrated brain. People of all ages who are capable of verbal communication are already capable of drawing simple graphics integrated with thought and speech. However, the right brain functions are often underdeveloped as the majority of adults stop drawing at a young age. Since the left brain functions such as language and logical thought tend to dominate the other side, the adults become frustrated when they try to learn to draw again as they keep producing simple symbolic graphics with a quality equal to their childhood level at the time they stopped drawing. Therefore, according to the author’s left-right brain drawing concept, in order to improve drawing ability, drawing lessons are specifically planned toward helping
separate the functions of the two sides of the brain and training the student to draw using the right brain only. For example, in order to draw a perspective image, Dürer’s grid is introduced together with sighting practice as a set of tools which will help the learner turn down the left brain function in questioning illusion in the proportion of an image they draw from a scene in front. The author refuses to introduce the Renaissance perspective method because it will turn on the left brain mode, initiating an attempt to integrate logical thought and language with the image, thus interfering with drawing production.

In my opinion, unlike other realistic drawing techniques that simply provide drawing instruction, the way the left-right brain drawing concept is utilized in the instruction helps offer instant feedback on skill improvement, and thus the novice can progress quickly and with ease. Dr. Edwards’ lesson plan begins with exercises such as vase drawing which are designed to help novices to recognize the difference between their consciousness when producing simple symbolic images with an integrated brain and their consciousness when they draw by “turning down their left brain.” Then, the following four main lessons are drawing exercises on edge, negative-positive spaces, relationship and proportion, and logical lighting and shadow. The training progresses through different techniques that have been organized to help the learners gradually improve their right brain functions with exercises that block left brain functions, including speech and logical thinking, during drawing production. According to Dr. Edwards’ teaching experience, the practices dramatically increase a learner’s ability to see and draw in greater detail. The main purpose of the training is that a student should become skilled in using only the right brain when producing drawing to the point where
the practice becomes automatic, like “riding a bicycle”, and therefore be able to produce quality realistic drawing from a model or landscape with ease and confidence every time.

As I examined Dr. Edwards’ first book, *Drawing from the Right Side of the Brain*, together with her second book, *Drawing on the Artist Within*, her instruction strategy became clear to me. In her first book, the strategy appears to be to use left-right brain drawing concepts to help the student gain skill in pausing in logical thought and speech during drawing production until the skill becomes automatic. Then, the integration of speech and thought into drawing production in terms of cognitive benefit is introduced later in her second manual. In the training of her first book, the emphasis is only on enabling the student to produce realistic drawing with high quality details, not on how to unite drawing an image with meaning at the thought level. When going through the exercises that enable them to produce realistic drawings from models, learners are allowed to focus only on edge, negative-positive spaces, relationship and proportion, and light and shadow during drawing production. For example, in the beginning, shadow will be drawn, not as it logically corresponds to an object, but as negative-positive space observed in the scene in front. Exercises on logical lighting and on uniting these elements in terms of seeing the “whole picture” in a Zen concept are introduced later at the end of the manual. In the second book, the author starts to introduce drawing production in terms of cognitive processes such as creation and problem solving, although she points out that neither of her manuals includes a designer visualization drawing method (p.132).
In contrast to Betty Edwards’ method, in Kimon Nicolaides’ book The Natural Way to Draw (1941), the author’s approach to a drawing instructional method is much more traditional, with lessons in drawing anatomy. There is no main concept which frames the practice. Learners need to follow instructions closely from the beginning to the end. His famous contour drawing, the first lesson of the book, is found either cited or adapted in many drawing books that have proved to be successful as training manual, including Betty Edwards’. It is the most widely recognized and unique training technique used to pause speech and logical thought during the production of realistic drawing from a model. Therefore, I include Nicolaides’ method in the same category of drawing instructional strategy as Edwards’ method.

However, when examining all the exercises together, not just the famous contour drawing, it is obvious that Nicolaides’ approach to drawing techniques is a lot different from Edwards’ approach. In those drawing lessons, issues of three dimensions, perspective, proportion, and creative problem solving are never mentioned. However, the way Nicolaides’ book progresses from the first contour lesson to an advanced level of drawing skill is quite interesting and makes me wonder whether I should include the strategy in group three of the review instead. The author does not have the intention of blocking off logical thought and speech entirely in order to enable students to produce drawing as in Dr. Edwards’ method. This can be seen particularly in his techniques that help the learner begin and advance their skill in blocking and unblocking logical thought and speech during drawing production. Those techniques include pairing contour drawing with gesture drawing in the first lesson, memory drawing (p.41), and right angle study (p.71). In memory drawing, the learner memorizes three different
quick poses of a model, then makes gesture drawings from memory snapshot images. After several practice drawing, students will begin to draw from a moving model by producing gesture drawings of two or three snapshot images, then combine contour drawing with gesture drawing. In the reverse pose technique, the student will make a gesture drawing of the model as if he were posed in the opposite direction. In the right angle study, the student will draw as if he has viewed the model from the left side instead of the front where he is actually sitting. In my view, these practices not only support cognitive visualization training but appear to help the learner depart from the copy mode of drawing as well.

5.2.2. Drawing methods that concentrate on developing the ability to integrate thought and speech with drawing during production

Two different examples of drawing strategies in this group that I find interesting are Edwards’ second book, Drawing on the Artist Within (1986), and drawing manuals for architectural design. These include such manuals as those of Porter (1979), Lockard (1968 and 1982), and Laseau (1989 and 2000). In Edwards’ second drawing book, the author points out that ability to draw also enhances the learner’s creative ability, which she considers another purpose of realistic drawing practice. By introducing different ways of integrating drawing with verbal and analytical thought, the author believes that students will be enabled to see novel ideas, which is the key to creative ability, and to reach solutions for target problems as well. She observes that drawing can also be seen as cognitive training, not just artistic training (p.130).

In my opinion, Edwards has offered an interesting and broad range of suggestions on integrating drawing with verbal expression and thought, in contrast to
design visualization, which focuses only on analytical methods and three-dimensional
visual spatial skills. In her second book, the author introduces right brain drawing
practice again by repeating her four exercises on edge, negative-positive spaces,
relationship and proportion, and light and shadow. In each exercise, the author adds
suggestions on alternative viewing or utilization of these four drawing components. The
suggestions include seeing paradox, Gestalt perception, analog drawing, chart and
diagram, etc. In terms of using drawing for communication, these examples of
integrating drawing with speech and thought offer a variety of ways of externalizing
idea and meaning construction beyond conveying content, although the mechanism of
graphic representation appears to be limited within two dimensions. My comment on
this method is, when the students learn to draw by copying from a model, although they
are producing realistic perspective drawing, they are not conscious of three dimensional
space in the images, but only see drawing components such as edge and
negative/positive space. Adding the visual spatial consciousness to realistic drawing
might help expand the integration between drawing and speech into different types of
connections with reality. It might help expand the use of drawing for communication,
and therefore better support cognitive development. Moreover, the traditional practice
of regarding drawing as visual language by considering drawing elements to be parallel
with words and grammar, as often mentioned by Edwards, might limit the range of
communication and the effectiveness of using this drawing method for cognitive
training as well (Lupton & Miller, 1996).

Design drawing manuals appear to have a specific focus in their exercises for
integrating thought and speech in drawing production. Every design visualization book
addresses the need to train design students in both the traditional practice of realistic hand drawing from model and landscape, and perspective drawing as a visual representation skill which supports visual spatial thinking. While the first practice enhances such abilities as perception, observation and presentation, the latter is significant to three dimensional visualization and communication of the concept of space. Different drawings used in design and different means embedded in each of those drawings in practice become topics that are addressed in many drawing manuals. Porter (1979) feels the need to establish drawing exercises for new design students. The author explains that, although students have perspective drawing experience from the traditional practice of copying a model or landscape, as well as skill in graphic interpretation of ideas, he is concerned about the remoteness of paper design from the real world. Porter then introduces drawing exercises focusing, first, on an abstracting process for visualizing ideas as a combination of images and words that chart the relationship between creation and reality. The second focus is on drawing exercises to help students understand the spatial potential of design drawing, and on perspective drawing and model lessons that accommodate exploration and expression of three-dimensional space. The spatial potential of design drawing includes: a means for creating feedback from spatial experience; a vehicle for quickly exploring an idea; and a dialogue between two and three dimensions in the context of other modes of representation. Perspective drawing and mock-up model lessons are also aimed to train students who only draw non-spatially to be able to develop a three dimensional visual representation skill which supports visual spatial thinking. The author addresses issues concerning the need for students to understand different graphic representations of ideas.
that have been used in design both as enrichment/reduction of design concepts, and as a convenient vehicle for a spatial code. Moreover, he is concerned that students should recognize the implications of both limitations and creative potential that different kinds of drawing could have on their spatial thinking.

Other design drawing manuals appear to have similar concerns. For example, Lockard (1982) points out that designers draw floor plans, columns, and openings not only to try out how to rearrange them in some stylistic order, but also for negotiating invisible functional patterns of reality in order to manage interior space. Some of these patterns of reality include environmental factors such as location, shade/ lighting, and circulation of wind and heat, and social factors such as social practices, social participants, privacy, etc. Additional graphic visualization of thought, invisible systems and problem solving processes are always drawn as visualization aids for design development, manipulation, and communication of the essence of ideas in the design process, but not to be translated directly into building appearance. In his manual, Lockard therefore introduces both drawing exercises focused on the ability to produce drawing as a means of externalizing and evaluating tentative and exploratory design, and perspective observation sketch exercises for developing the basic skill of spatial structuring. He emphasizes that drawing helps lead and record design concepts, as well as making the design transparent by visually representing the work and design processes to designers and others. Similarly to Porter (1979) and Lockard (1982), Laseau (1989) introduces drawing exercises focusing on development of visualization skill for exploring and communicating ideas, as well as the ability to communicate the concept of three-dimensional space using perspective drawing. In visualization graphics, the
The researcher would like to upend concerning limitation of these design drawing exercises for producing perspective drawing integrated with speech and thought. First, the practices appear to limit the range of visual communication within graphics visualization skill training and the 3-D visual spatial skill for communicating the concept of space. Second, the methods might not be helpful for untrained learners who have not yet gained basic conscious control of realistic drawing from traditional training such as that offered by Edwards’ right brain drawing method (1976/1989).
5.2.3. Drawing methods that assist in both construction of a well-drawn image and integration of thought and speech at the same time

The drawing instructional strategy in this group does not intend to separate the training into two sections by having the novice go through an initial training to develop the ability to pause verbal and logical thought during drawing production until the skill becomes automatic. Instead, the untrained learner will draw with verbal and logical thought from the beginning, and a support structure is used to enable the student to produce drawing of three-dimensional objects during communication. Drawing instruction using the 3-D grid perspective implemented in the class Design 199, which is the center of this research study, is seen by this researcher as an instructional strategy within this group. Preceding the research investigation, description of the 3-D grid drawing instruction of Design 199 written in a former study by Anderson (1997) is examined and interpreted by this researcher. By applying Vygotsky’s social instructional concept to view the 3-D grid perspective drawing production, a student producing drawing by himself is described as a social phenomenon where the student communicates with a piece of paper. In this social phenomenon, the transformation occurs between two lines of development, thought (speech), which is a spontaneous process, and drawing production, which is a conscious process, though in the event, speech does not transform into a visual form of words and grammar, but in terms of meanings. Following the pattern of John-Steiner’s interpretation of Vygotsky’s concept of the unification of two divergent processes during language production skill acquisition, in this case, two diverse processes occur at the same time, the unification of thought and drawing at the meaning level, and the separation of the two at the
production level. Viewing the process in such a frame, this researcher sees the support structure (or semiotic tools/strategy) as intervening in the process only at the image production level but not interrupting the entire ongoing communication process (transformation process). Therefore, it appears that the learners are able to draw a basic 3D object with the appearance of perspective while conscious of its 3D volume, surfaces and its location from the beginning of their training.

From examining the sequence of the 3-D grid perspective drawing instruction implemented in Design 199, in order to help the novice get started in this training, there are various exercises designed to accompany the use of the 3-D grid (Anderson, 1997). The lesson plan begins with drawing simple shapes such as a cube using the 3-D grid, which enables the novice to produce a well proportioned perspective image with logical thought or consciousness of the cubic object from the beginning instead of consciousness of edge and positive negative space as in the other methods. The lesson on locating the cube in different places on the 3-D grid is seen as another interesting introduction to developing visualization skill using a 2-D visual representation tool to communicate 3-D space. Different drawing exercises utilizing the 3-D grid are organized so as to help the learners progress in their drawing competency. In his thesis, Anderson (1997) compares drawing practice using the pre-printed 3-D grid with traditional hand drawn point-plane perspective, in which students need to construct a perspective optic line themselves every time they draw 3-D objects and space. When using this drawing training strategy, the pre-printed 3-D grid appears to outperform the traditional practice.
At this point, there are many questions that need to be investigated in order to better describe the paradigm of the practice of drawing for communication observed in the practice of the drawing class Design 199. This researcher would like to address two research propositions in order to further the development of the paradigm of the practice of drawing for communication beyond the interpretation recently put forth in the document analysis.

5.3. Research Propositions

The first research proposition involves formulation of the drawing instructional strategy. As indicated in chapter 3, Vygotsky’s zone of proximal development is employed in the construction of the research methodology of this study. In the earlier interpretation presented in section 5.2 of this chapter, the concept of drawing instruction utilizing the 3-D grid is characterized in terms of the immersive strategy of second language teaching and learning methods. Nevertheless, according to Vygotsky, developmental schemas are different in detail for different types of skill acquisition. In fact, drawing skill is different in many ways when compared with second language skill. Moreover, such an interpretation, based on selected portions of the reviewed literature, was focused particularly on describing the process of drawing production skill development together with the learner self-communication process without any emphasis on identifying social interactions and the use of language in interpersonal exchange involved in the skill development process. Through implementation of the transactional learning concept of the zone in the research phase, the development of the paradigm of practice can be more fully developed by extending the interpretation of the
instructional strategy and the use and form of semiotic tools to include the means of
training described within the context of the actual social and interpersonal
communication exchanges observed in the drawing classroom.

The second research proposition involves examining the concept of drawing for
communication. According to the conceptual framework developed in chapter 3, the
drawing acquisition process will be characterized in terms of the concept of drawing for
communication. Thus, the concept of drawing for communication generated from the
perspective of the drawing acquisition process of the novices would involve: skill
development, cognitive development, and the process of communication. However,
such factors as leading activities (formal learning, work, play) together with social
context can cause changes in the nature of the interaction of the zone itself (Griffin and
Cole, 1984). In addition, it appears that learners come to the class Design 199 with
different levels of drawing skill (Anderson, 1997). For these reasons, the investigation
will yield some variations within and between the three developmental factors in the
drawing acquisition process mentioned earlier due to the contrasting background skills
and learning situations of the students. Another question that has recently come up
concerns whether the mediation means of the 3D grid can be shifted according to the
background drawing training and skill of the student. This researcher has concluded
from the review of literature that the 3D grid can be utilized effectively with both
novices and students who need only minimal support to expand their drawing ability
from non-spatial to spatial drawing and to gain the ability to draw from thought instead
of copying a model.
CHAPTER 6

RESEARCH METHODOLOGY

The central aim of this dissertation is to conduct a research study on successful drawing instruction for developing freehand realistic drawing skill using a three dimensional grid perspective. The investigation focuses on drawing instruction utilizing 3-D grids which has been developed and utilized successfully in a drawing class at the Ohio State University, Design 199: Design, Visual Thinking, and Problem Solving. The drawing instruction has proved to be very successful in training new industrial design students as well as students from other majors basic perspective freehand drawing skills in design within a relatively short training time. In the beginning phase of the study, the emphasis is placed on theory development through critical review of current drawing methods, communication theories, and Vygotsky’s zone of proximal development. The prior work helps construct some theoretical basis for this research along the lines of social cognitive development and the concept of the zone of proximal development. Proceeding with the research inquiry, selected drawing manuals and archival documents of a former study on the Design 199 teaching materials are examined by document analysis. Through the development of a conceptual framework and the analysis of the
documents, propositions on the instructional concept of the drawing class, Design 199, and the concept of drawing for communication are generated.

In this research phase, the aim is to do an in-depth investigation into the social communication of the class in relationship to those teaching materials. It is hoped that the interpretation of the 3-D grid instruction will be furthered by incorporating means of training that are generated within the social situations and exchanges of the drawing class, Design 199. In addition, the concept of drawing for communication will be illustrated through examination of the learners’ drawing skill acquisition processes in relation to the actual classroom communication and social interactions. The investigations along the two propositions are anticipated to yield significant information that will further the development of the paradigm of the practice of drawing for communication. The following are the research strategy and research design structured for this dissertation to gather and examine in considerable breadth and depth those data sources that involve the communication process and social interactions of the drawing class Design 199.

6.1. Case Study Research Method

6.1.1. Discussion of the case study research strategy

Case study research strategy is the preferred choice for this dissertation methodology over other research strategies. The case study method has been developed from a data collection method into a comprehensive research strategy by scholars such as Stake (1988, 1994) and Yin (2003) and has been utilized effectively resulting in successful investigations in numerous fields (Schön, 1985, 1991; Sutton, 1996). Yin
provided opinions and discussion on case study research in his latest book, *Case Study Research* (2003), and there are certain points that this researcher would like to address here as they display how the case study research method will be of benefit as the approach of this dissertation topic and its research inquiry.

In his first insight, Yin proposed the case study not merely as a data collection tactic but as a comprehensive research strategy (p. 14). It is widely recognized that the strategy helps us understand complex social phenomena while retaining meaningful characteristics of real life events, such as individual life cycle, neighborhood change, and international relations (p. 2). Yin’s description of the method covers the logic of design, data collection techniques, and certain approaches to data analysis. Secondly, Yin viewed case study research as distinct from “qualitative research,” particularly when the qualitative research is regarded as identical to the ethnographic research method, a method which observes close-up details of the natural world in a participant-observation fashion and avoids any theoretical assumptions to precede or frame the investigation. In contrast, case study practices always accept a mixture of evidence from both qualitative and quantitative data sources, and the source of evidence does not have to be direct detail from observation only. The case study research method can be utilized, conducted, and written according to many intentions. It could be a descriptive illustration of a case, or generalizations derived from multi-case evidences. Third, the research study situations for which the case study is the preferred method over other research strategies can be described in two sets of technical characteristics: the scope of the research study, and characteristics of data collection and analysis strategies. The scope of the empirical inquiry of a research investigation must cover contemporary
phenomena in real life contexts when the phenomena and contexts are not treated as distinguishable, in other words, when contexts are neither separated nor controlled as in a laboratory experiment. As a result, another set of technical situations involving data collection and analysis strategies has to be characterized. The research inquiry has to deal with such distinct situations as, in one result, the existence of more variables of interest than data points. In another result, the inquiry might depend on multi-sources of evidence, and they would need to be converged. The most distinct technical situation which makes the case study research the preferred method of this research study is that case study research accepts the advantages of theoretical propositions that were previously developed as guidelines to data collection and analysis processes.

When comparing case study research with the four other research methods (experiment, survey, archival analysis, and history), Yin identified three conditions that indicate whether case study research is the method of choice. The case study will be most likely to benefit a research study with one or more of the following situations: the forms of the research questions are how and why; the investigator has no control over actual social-behavioral events; and/or the study focuses on contemporary events more than historical events.

6.1.2. Limitation of the method

Following the earlier explanation which supported the decision to use the case study for this research, I would also like to discuss the limitations of the method that I have become aware of so far through the use of this method. The explanation will address both technical conditions of the method itself and the way utilization of the
method has influenced this researcher to manage the research technical situation as well
as her biases in collecting and reporting the data.

Despite the fact that the case study method has been developed and utilized
effectively in investigations of numerous fields, there some traditional negative views of
the case study research practice. One major criticism is pointed toward the loosely
systematic practice, a contrasting characteristic when compared to many qualitative
methods that are embedded with both a particular paradigm aspect and validating
practices in their rigorous procedures. Moreover, a number of well written texts on such
qualitative research methodology are available (Anderson, 1990; Atkinson &
Hammersley, 1994; Erickson, 1986; Lather, 1986, 1991) . On the other hand, in
proceeding to conduct legitimate case study research, it is necessary for case study
researchers to work rigorously to establish a systematic practice for their research
methodology themselves. The work can be based either on development of a theoretical
framework or on a systematic research design which includes data collection, analysis,
and a written report.

In this research study, in preparing to conduct the research, a lot of work was
done on developing a theoretical framework from Vygotsky’s social developmental
theory, selected literature on communication theory, and a selected group of current
drawing methods. As a result, I have customized a particular lens to view my data and
established my methodology. The systematic practices established include paradigm
aspects, legitimacy practices, logic to link data to the propositions, and criteria to
interpret the findings. Hence, there are many social interactions from the field that I
have chosen not to include in the data report and discussion if I feel that they are not
relevant in terms of corresponding to the original research questions and the inquiry along the theoretical frame I have established.

According to Yin (2003), the second concern in practicing case study research is with the issue of generalization. In order to achieve its goal of expanding theory construction, this research study will exercise “analysis generalization.” The practice generalizes case studies to a research proposition, instead of to a population or universe. It allows even one case study to be generalized on the theoretical level, but not at the level of characterizing research samples. Analysis generalization will be exercised during both cross case and single case analysis in the data analysis phase of this study.

The third concern is with the lengthy and unreadable records of case study reports of the past (Yin, 2003). Especially because ethnographic research practices are often adopted by case study researchers, including the use of detailed observation from participant-observation only and the long period of time the researcher remains in the field. However, these practices are not requirements in quality case study research since the inquiry does not depend solely on ethnographic evidences.

The investigation of this research study was conducted in the classroom of a ten week quarter system. The interviews with instructors and students were done within the relatively short period of six weeks during the ten week session of the drawing class in Spring Quarter 2003.

Unlike reports of ethnographic studies, the case study report of this research study will be a story-telling generated through the research strategies described in the research design. In the following section of this chapter on research design, the discussion will illustrate how five major components in research design help lead the
story line, provide instruction for uniting different sources of information from the field, and create an outline for concluding the story.

6.1.3. How this researcher is presented in the case study report

In his discussion on the significance of the story about field experiences researchers write for themselves and others, Denzin (1994) addressed the way writers usually structure certain interactions that occur among the writer, the readers, and the text. Because in their story, writers always present their unique self in the text, a subject matter for which they have authority over the interpretation. Therefore, the researcher’s choices of situated self, presentation practices, and rules are crucial factors when telling his/her experiences.

The researcher of this research study is an oriental female with dual background education of graduate studies and professional training in industrial design and in packaging science. This researcher currently holds a university teaching position in an industrial design department where she teaches both subjects. Even though I have experience in teaching industrial design, I have never taught drawing using the 3-D grid. In this situation, I enter the field considering myself a novice observing experts teaching in the drawing classes. These are classrooms that I learned about from consultation with the faculty coordinator of the class and from reviewing the class by going over teaching materials with a former teacher prior to conducting the study, but I had never before visited the actual investigation site. In fact, the drawing classes belong to a design department where I neither work nor am an alumna. I also entered the class as a graduate student observer from a next door department, art education, who was conducting a study about drawing teaching and learning for her dissertation. As an
outside observer, it was my decision that the least possible of intrusion in the learners’ classrooms was the most appropriate. Therefore, I conducted the classroom observation as a passive observer using only note taking, and without audio or video recording tools. Audio tape recording was only used during one on one interview sessions with subjects outside the classroom.

Such a decision on observation technique has challenged the limitations of this researcher as well as her research technical situations. Though I was familiar with the use of design criticism in design studio class from my experience as an industrial design instructor, the limitations of my note taking ability might not have allowed me to record information during classroom observation in fine detail because English is not my first language. The challenge in this situation was an attempt not to clarify, edit, or evaluate those observed phenomena myself from my own single perspective due to my familiarity with design classroom practice from my background experience of teaching and training in design. Recognizing such a situation, I have attempted to re-check any incomplete information and questionable phenomena from the classroom observation with either the class faculty coordinator or the teaching assistant whenever I have a chance. Being a passive observer also created another challenge for me; when observing class and conducting the interview. I was often asked to give some input on the students’ design work as they became acquainted with me, although I always politely refused to give any evaluation or comments due to my researcher situation and out of respect for the teacher of the class I was observing. After acknowledging the interactive nature of the class, I realized that the practice of passive observer was not so simple as planned in this observed classroom situation.
6.2. Research Design

6.2.1. Roles of theory development in research design

According to Yin (2003), theoretical development is an essential part of the case study research design prior to data collection. This is in contrast to ethnographic research, in which the researcher can proceed to the data collection quickly and avoid any theoretical work to preset the conceptual construction. In case study research, the development of a rich theoretical framework is necessary not only for establishing the rigorous systematic procedure of the research methodology, but also for guiding a theoretical proposition for the research inquiry. As the framework is established, it will gradually clarify research design components including the research questions, research propositions, units of analysis, logic connecting data to propositions, and criteria for interpreting the findings.

For this dissertation, the theoretical development from chapter one to chapter five has established a certain conceptual frame. At the beginning of this dissertation, the intent as stated in chapter one was to investigate a unique, successful drawing method from the perspective of and in the discourse of interpersonal and socio-cognitive development. The drawing instructional method utilizing 3-D perspective grids of the drawing class Design 199 was to be the center of this investigation. Review of the drawing methods and focused theoretical concepts are presented in chapters 2 through 5, as the aim of the research study is to propose a drawing instructional strategy and a concept of drawing for communication constructed from a theoretical foundation and research investigation along the lines of sociocultural development. The interpretation
of the 3-D grid drawing instruction preceding the research inquiry and formulation of the two research propositions is proposed in chapter 5.

The work in the research phase is intended to further the development of the paradigm of the practice of drawing for communication beyond the interpretation discussed in chapter 5. The five research design components of this research investigation can be described as follows.

First are case study research questions. The questions on drawing instructional strategy include: how can the drawing instructional strategy be described within the context of the classroom situational and social exchange, and how does the 3-D grid as well as other semiotic tools and strategies of the drawing classrooms prohibit or encourage the drawing instruction? The question on the concept of drawing for communication places interest on how the drawing for communication concept can be illustrated within real classroom social exchanges where each student develops drawing skill in terms of his/her own situation, as the students come to class with different background experiences and drawing skill levels.

Second are research propositions. Due to the aim of investigating the drawing instructional method and in order to extend the interpretation recently put forth in chapter 5, the first research proposition addresses the interpretation of the instructional strategy and skill of drawing for communication introduced in the drawing class by describing them within the context of the social and communication exchanges of the class. The incorporation of classroom communication and social exchanges will yield better illustration of the drawing instructional strategy and semiotic tools and strategies that support the success of the drawing instruction. The second research proposition
addresses the concept of drawing for communication from the perspective of the student drawing acquisition process. The prior conceptual framework introduced in chapter 3 suggested that the concept of drawing for communication generated from the investigation of a beginning level design drawing classroom would involve skill development, cognitive development, and communication processes, when characterized along the lines of the zone of proximal development. It was anticipated that investigation of the drawing acquisition process of a group of non-design major students with contrasting background skills and learning situations would yield some variations within and between the three developmental factors of the zone: drawing skill development, cognitive development, and communication processes. Consequently, the concept of drawing for communication for adults of both non-art and design major backgrounds would be illustrated.

Third are units of analysis. According to the attempt to further the development of a paradigm of the practice of drawing for communication observed in the drawing class 199 by extending the interpretation along lines of the two research propositions, there would be two units of analysis in this case study research. For the investigation of the first proposition, the unit of analysis is the drawing instructional strategy and the subunits of the study are the two drawing class sections. For the investigation of the second research proposition, the unit of analysis is the drawing acquisition process which will be characterized in terms of the concept of drawing for communication, and the subunits of the study are eight individual student volunteers from the drawing classes.
The last two important components of research design are the logic connecting data to the propositions and criteria for interpreting the findings. For an explanation of the fourth ingredient of the research design, the logic connecting data to propositions, I have elaborated such a procedure in section 6.2.3 on an embedded single-case design and in the explanation of data analysis which comprises the last topic of this chapter.

The fifth component of the research design, the criteria for interpreting the findings, includes document analysis in which the researcher constructs meanings and identifies changes and relationships from certain spatial configurations captured in the narrated story. It is a narrative description of the instructional setting along with teachers’ narratives and students’ comments on the training in which they were participating. The findings will also be interpreted according to the semiotic meaning system of Vygotsky’s concept of the zone of proximal development. The theoretical construction involves discussion to compare/contrast the findings with concepts and meanings of existing drawing instructional methods, studies on drawing skill and cognitive development, designer drawing practices and communication, and the developmental concept of the zone. Further details on the procedure are in the data analysis section of this chapter.

6.2.2. Criteria for conducting quality case study research, construct validity

In this case study research, the practice of construct validity is planned for different phases of the research study in order to ensure the valid measurement of evidences and phenomena so that they will not be identified only through the subjective viewpoint of the researcher. The set of tactics for establishing the construct validity include: using multiple sources of evidence, establishing chains of evidence, and the
practice of member check. This research study collected data from four sources: documentation, archival records, focused interview, and direct observation. In reporting the data or the classroom story telling, these evidences from the four different sources will be corroborated by data triangulation to address each fact in the story. The tactic of maintaining a chain of evidences between the research question and case study report involves amply citing those evidences in relation to the case study database and making sure that both phenomena and procedures are consistent with the research protocol. The member check tactic is practiced during audio recorded interview by asking subjects to restate answers or checking any questionable phenomena, and during the data report phase by having an expert informant review the draft.

6.2.3. An embedded, single-case design

An embedded, single case design (Yin, 2003) has been adopted for structuring the implementation of case study research in this dissertation. In this research study, the paradigm of the practice of drawing for communication observed in the practice of the drawing class 199 is the original phenomenon of interest. In other words, it is the target for exploration and is identified as the “single case” in this case study structure. As mentioned earlier in section 6.2.1, two research propositions and their units of analysis for conducting the investigation were generated to help expand the development of the paradigm of the practice of drawing for communication. Thus, the two embedded units of analysis within this single-case design would be the drawing instructional strategy and the drawing acquisition process characterized by the concept of drawing for communication. These units would also be the targets of the investigation of this study.
For the first research proposition involving formulation of the drawing instructional strategy, the initial interpretation developed in chapter 5 described the concept of the 3-D grid instructional strategy as parallel to that of the immersive strategy of second language teaching and learning. A more complete description of the drawing instructional strategy was anticipated from further investigation of the classroom communication and social exchanges. To pursue this proposition, the embedded unit of analysis no.1, which is the drawing instructional strategy, was
investigated by selecting two sections of the Design 199 drawing class as subunits of the study for observation and collecting interviews. The rationale for using two class sections or two subunits in conducting the study was for replication of the event of interest, the 3-D grid drawing instructional strategy. The main goal of the replication procedure was to further develop the initial drawing instructional concept proposed earlier into a rich theoretical framework through observation of two class sections taught by two experienced teachers and by having both TAs together with the faculty coordinator describe the drawing instruction of Design 199 to this researcher. Another reason for selecting two class sections for observation was that the faculty coordinator, who is the expert in this drawing instructional strategy, did not teach the class himself that quarter. The two class sections were selected because they could be expected to yield similar results in demonstrating the main concepts of the drawing instruction of the Design 199 drawing class. Due to the fact that the instructor of each class was considered a skilled teacher in 3-D grid drawing instruction and the instructors appeared to have similar experience and practice in teaching Design 199. In general, teaching associates are always trained by the same faculty coordinator of the class Design 199, and they are required to teach under the same class syllabus using the same set of handouts in order to maintain the most identical drawing instruction possible in every section of the drawing class. For the selected drawing classes, both instructors had been trained together as they began teaching the class at the same time (Autumn quarter 2002). They had continued in the position and developed their skill in teaching with this drawing instructional concept together as well through regular meetings until the present. On the other hand, there would be some contrasts in teaching style, within a
predictable level, because, although both instructors were classmates in the same design program and had similar skill in teaching Design 199, they had different backgrounds in drawing skill as well as in professional training and practice. These contrasts could result in some differences in the instructional detail accompanying the main concept of the 3-D grid instruction they both practiced, though such details on certain drawing and teaching techniques could be beneficial if they add to the description of the drawing instruction according to the course plan.

The second research proposal involves constructing a concept of drawing for communication characterized in terms of the learners’ drawing acquisition process. The previously developed conceptual framework indicated that the concept of drawing for communication for non-art and design majors, according to the zone, would be illustrated in the drawing acquisition processes of a group of non-design major students with contrasting background skill and learning situations. The acquisition process characterized along lines of the zone involves skill development, cognitive development, and communication processes. To pursue this proposition, the embedded unit of analysis no. 2, which is the learner’s drawing acquisition process, was investigated by selecting eight student volunteers from the two sections of the Design 199 drawing classes mentioned earlier for observation and interviews. Each individual student is a subunit of the study. The logic for conducting the study with the eight selected students was that they offered contrasting background skills and learning situations. The goal of the procedure was to enrich the concept of drawing for communication with various themes generated from the different acquisition processes of those contrasting subunits since they would yield variations within and between the
three factors in the zone developmental concept. The eight subunits were selected under two criteria, first, because they demonstrated satisfactory progress in learning with the 3-D grid drawing instruction and, second, because these learners started out with different levels of drawing skill and studio experience, and had interesting and different ways of developing their drawing skill as well as the ability to participate in the class studio critiques.

6.3. Data Collection

6.3.1. Protecting the welfare of human subjects participating in research activities

Because the case study research conducted for this dissertation involves the use of human subjects, the research protocol was submitted for review prior to my entering the field and was approved by the Ohio State University Institutional Review Board. Therefore, this research was conducted according to the required practices as specified in the approved research protocol in order to ensure that the welfare of human subjects participating in the research activities would be protected. Such practices include, for instance, obtaining informed consent from subjects before beginning the interviews and assuring that any data I collected would not be personally identifiable, as the subjects would be given fictitious names in the transcription of any records as well as in my dissertation writing.

6.3.2. Location and participants of the research study

Location of the research study

This research study was conducted at the Ohio State University, Columbus, Ohio, where the 3-D grid drawing instruction has been implemented in the class Design
Design, Visual Thinking, and Problem Solving. There were three sections of the class Design 199 offered in Spring Quarter 2003, from which I selected two sections for this research observation. The sections met according to different time schedules but in the same classroom, which was a first year undergraduate student design studio, a classroom/studio which belongs to the Department of Design. The classroom/design studio measures 33.75 ft. x 24.75 ft., with a high ceiling of 11 ft. The room is well lit with fluorescent ceiling lighting and natural lighting coming from tall glass windows that lie along the whole length of one side of the room. In the front center of the room, there is a teacher’s desk and chair, with a blackboard located behind on the wall of the room representing the width. The teacher’s desk, which measured 6 ft. x 3 ft. x 2.75 ft. (LxWxH), served various purposes during the drawing instruction, including that of a place where the instructor could give drawing demonstrations and have students gather around and observe. It was also used as a stand where students set up their drawing display boards to present their work in front of the class during the studio critique every week. Students’ desks measured 3 ft. x 2 ft. x 3 ft. (LxWxH), with tall stool seating. Once in a while, students would work on their drawing in class, but most of the time the assignments were homework and needed to be completed before class time. There were 23 – 27 student desk sets, and they were usually arranged in five rows. During class observation, I usually occupied seating at the back corner of the classroom, in the fourth row or fifth row desk by the window, though I often moved closer to the front of the class during the studio critique sessions for a better viewing location. In fact, the instructors of both sections I observed always encouraged a social atmosphere and always asked students to feel free to move from their desks to gather closer together.
when participating in discussion during studio critiques and demonstrations. This studio had no art work displays in the room because it was also used as classroom/studio for other classes throughout the day. In this Design 199 class, the instructor usually brought with her examples of drawing manuals and drawing work for demonstrations during class time. Students were also encouraged to check out recommended readings and drawing manuals from the OSU library, and to browse through the Design 199 final projects of students from past quarters, which were stored in room 280 of the same building.

For the focused interviews, I conducted one on one audio recorded interviews outside the classroom using different locations near the drawing classroom that were available at the appointment times. The locations included: the design graduate student lounge, where I interviewed the two instructors from the selected sections of the drawing class; the small computer studio across the hall opposite the drawing classroom, where I interviewed students from the evening section of the drawing class; and the art education conference room, where I interviewed students from the afternoon section of the drawing class. These three interview locations and the Design 199 classroom were located in the same building at OSU. In addition, there were three occasions on which I conducted a second interview in the reserved study room on the fourth floor of the Engineering Library building.

Participants of the research study.

There were eleven participants in this research. Participants from the instructor group included the faculty coordinator of the class Design 199 and the two teaching associates who were teaching the two selected drawing class sections, as indicated
earlier. There were eight students from the two drawing classes, who voluntarily participated in one on one audio tape recorded interviews conducted outside the classroom.

The faculty coordinator of the class Design 199 was a senior professor in the Department of Design and one of the most widely recognized experts in the profession. He is currently an eminent scholar in art and technology and, besides teaching, also has his own design practice. This professor has a significant dual role in this research study. First, he is one of the dissertation advisers of this researcher. Second, he is an expert informant on the topic of 3-D grid drawing instruction for incoming design students. The professor first introduced the 3-D grid into drawing instruction of the class Design 199 in the late’80s and has led the teaching staff and student researchers in the on-going design and development of both the drawing tools and the instructional methods for this class until the present. Therefore, according to his dual role, the professor will give advice and read the written draft of this dissertation not only as an advisor, but also as an expert informant of this research study. Particularly in this research phase, he has closely monitored and provided support in all the stages of development, including the preparation prior to entering the field, the field work, and the analysis and report of the study.

When I first began conducting the class observation, I sat in on all three sections of the class Design 199 that were offered during that quarter. As suggested by the faculty coordinator, I later narrowed my observation down to two sections that were taught by skilled instructors, as their instruction best demonstrated the main teaching concept, or the 3-D grid drawing instructional strategy. Each section was taught by a
different teaching associate, and I will call the two TAs by the names Andrea and Paula. The TAs are friends and classmates as they were both in their first year of graduate study in the M.F.A. program in design in the Department of Design at the time of the study. They started teaching the Design 199 drawing class in the same quarter, Autumn 2002, and it was during their third quarter of teaching the class, in the Spring of 2003, that I conducted the study. The TAs were trained on the 3-D grid drawing instruction together by the faculty coordinator of Design 199 prior to beginning teaching the class, and they regularly consulted with each other during the course each quarter to improve their instruction.

Though Andrea and Paula were considered skilled instructors according to their performance and the extent of their teaching experience with the 3-D grid drawing instruction, they had quite different backgrounds in drawing training as well as in their professional practices. TA-Andrea had received a Bachelor of Fine Arts majoring in interior design. She had never taught drawing before she began teaching the Design 199 drawing class. As a trained interior designer, she occasionally used to draw the grids herself to assist in drawing construction but had not developed her first perspective drawing skill with the preprinted 3-D grid charts. TA-Paula received her Bachelor’s degree with a double major in fine arts and communication. She had already earned a master’s degree in international education prior to beginning her study toward the second master’s degree in design here at OSU. Paula obtained her skill in drawing, sculpture making, and painting, from training in a fine arts school and had seven years’ experience in teaching those subjects before coming to OSU. But she had neither developed her drawing skill with the 3-D grid instruction nor taught drawing using the
3-D grids before she started teaching the Design 199 drawing class. Although I had a chance to meet with both TAs to introduce myself only one time before observing their classes in Spring Quarter, both TAs cooperated with me throughout the course of the interviews and class observation. They both learned about my research study through my email correspondence and from the faculty coordinator of the class Design 199, who was also their advisor, and who had given me permission to observe the Design 199 drawing classes.

Among the eight student participants of the one on one audio tape recorded interviews outside the classroom, there were four from each class section. I will call the student participants from Andrea’s class by the names Kim, Vicki, Claire, and Brian. The student participants from Paula’s class will be called by the names June, Pam, Mike, and Dan. All student participants were undergraduate students except for Dan, who had already earned his bachelor’s degree in a non fine arts major. Like the majority of students in the class, Kim, Vicki, Pam, Mike, and Dan took the drawing class 199 in order to develop their portfolios for application to design as their major. Brian had recently been accepted into the design program and had started the program in the current Autumn quarter. For these six students, the class would count as one of the prerequisite courses for incoming students of Design. Unlike the majority of the students in the class, Claire and June took Design 199 as a fulfillment of their elective credits. While Claire was a freshman in Communication, June was a senior from the Department of Textiles and Merchandizing.

I usually asked the TAs for their suggestions concerning selection of the research participants before I and/or the TA verbally approached those particular
students about whether they were interested in participating in this study on a voluntary basis. All participants selected were among those making progress in the classes, as noticed by the TAs and me. In Andrea’s class, Kim and Brian were approached about my research interview by TA-Andrea. Claire was approached by me, and Vicki herself approached me to express her interest in participating in my study. For the other drawing class, I approached Pam myself while TA-Paula approached June, Mike, and Dan for me as she saw interesting differences in development among them. Those eight participants gave verbal agreement and then signed consent forms to participate in the study. Further details of the background of each student participant will be discussed in chapter 8 as part of the analysis of the concept of drawing for communication practice.

6.3.3. Four sources of evidence: interview, classroom observation, documentation, and archival records

Documentation. Documentary information is considered one of the key sources of evidence for this research study. In fact, research propositions were developed earlier through an examination of documentary evidence. Documents that will be used in this case study research include the drawing class Design 199 handouts and former studies of the 3-D grid drawing instruction of this Design 199 class. The emphasis will be on close examination and discussion of recent versions of the class handouts, such as class syllabus, the set of 3-D grid charts, drawing examples, drawing instruction, etc.

Archival records. Recent survey data of the two class sections will be used as data base information for this research study.

Focused interview. For this research study, one on one interviews with each participant were conducted outside the classroom using audio tape record with their
permission through informed consent. Though the interviews were conducted in a conversational manner which allowed open-ended answers, there were three sets of questions prepared, one set for teacher associates and two sets for students. Following the advice of the faculty coordinator, this researcher prepared a guideline similar to the survey format accompanying the first set of student interview questions in order to help freshmen and those who were new to art and design to better their understanding of the questions in their first interview. Each teacher associate was interviewed only once for the short period of an hour. Each student participant was interviewed twice for a short period of approximately 25 minutes for the first interview, and 45 minutes for the second interview. There were a couple of students who needed to schedule a third interview appointment due to a technical situation such as being unable to finish all the questions in the second interview. Among the eight students, one student was interviewed only once because he was not interested in scheduling the second interview.

Direct observation. The last crucial source of evidence was obtained through classroom observation. This researcher conducted this data collection as a passive observer with no interaction or participation during the classroom instruction, a phenomenon which this researcher had no control over. The only tool used to record the observation was note pad and writing tools, and there were no audio or video tools involved. The data collection was simply a written record of speech events as well as behavior in general without any formal protocol to measure specific types of behavior. Two of the three sections of the class Design 199 offered during Spring Quarter 2003 were selected to conduct the classroom observation.
6.4. Data Analysis on the Instructional Strategy of Drawing for Communication

6.4.1. Unit of analysis and unit of data collection

Since the investigation involves describing the 3-D grid drawing instruction, the embedded unit of analysis no. 1 was the drawing instructional strategy. Data collection sources were both institutional and individual. Those evidences from the institution include: documentation such as class syllabus and instructional materials, class observation notes on communication and social exchanges during instruction, and archival records, which consist of recent student survey data on the drawing training from the two class sections. The data from individuals include the expert comments from the faculty coordinator, the TAs’ interview responses about their teaching practices with the drawing instructional techniques, and students’ interview responses concerning their training with the instructor and the drawing instructional method.

6.4.2. Report of the drawing class activity

This researcher’s visit to the Design 199 drawing classroom and her report of the 3-D grids drawing instruction is described as the chronological event of the perspective drawing lessons. In this report, the event of the perspective drawing instruction is delineated in three parts. The introduction to the 3-D grids is accompanied by an exercise of designing a desk and a chair. The next drawing exercise is an interior design of the students’ own bedrooms. It is followed by a drawing exercise on redesigning any product of the student’s choice. The report on the 3-D grid drawing instruction is the researcher’s narrative, written by combining the classroom documents and archival records with class observation notes and instructors’ comments on drawing instruction practices. The instructors’ commentaries include expert comments of the
faculty coordinator of Design 199 and comments of the two TAs. A few students’
commentaries about their drawing instruction are included, using notes taken from this
researcher’s classroom observation.

6.4.3. Data analysis for describing the 3-D grid drawing instructional strategy

According to the theory underlying the research proposition, the focus of this
data analysis on drawing instructional strategy will rely on two areas of interest
following prior studies conducted along the lines of the concept of the zone of proximal
development. Guided by major studies of scholars in the area of scaffolding and
cognitive apprenticeship, such as those of Bruner (1976, 1985), the two emphases are,
first, describing the drawing instructional strategy; and second, characterizing semiotic
tools/strategies and the supportive social environment that encourages the success of the
3-D grid drawing training.

In the first interpretation describing the 3-D grid drawing instructional strategy,
a narrative of the practice of the teaching method demonstrated in each class section as
well as in both class sections considered together will be presented to explain the
drawing instructional strategy. In the second interpretation characterizing/identifying
appropriate semiotic tools/strategies that encourage the success of the 3-D grid drawing
training, the narrative of the practice generated in each class section and both class
sections together will be discussed. Those certain configurations in the narrative that
were developed into semiotic tools and strategies will be characterized as to how they
supported or hindered the success of the drawing training.
6.5. Data Analysis on the Concept of Drawing for Communication

6.5.1. Unit of analysis and unit of data collection

Since the proposal involves illustrating the concept of drawing for communication, the embedded unit of analysis no. 2 was the drawing acquisition process, which will be characterized in terms of the concept of drawing for communication. Data collection sources were both institutional and individual interviewees. Data from the institution includes documentation such as the class syllabus, which addresses all required class work and studio activities, and archival records comprised of recent student survey responses on the students’ background skills and their progress in the drawing class. Data from individual interviewees include the TAs’ responses concerning comments and support they provided for individual students, and student participants’ responses about their drawing skill level before class, challenges they faced and how they overcame them, and how they were able to keep up with class work and studio critiques. Another kind of data is this researcher’s class observation notes on those students’ participation in studio critiques as well as their activities in the classroom.

6.5.2. Report of eight student participants from the drawing class

In this study on the concept of drawing for communication, the practices of drawing for communication from contrasting subunits will be described on an individual basis through discussion of the drawing acquisition process of each student. As explained in the research proposition, novices develop conscious control of their drawing skill acquisition during their attempt to use the newly developed skill for communication. It was anticipated that discussion of the processes of skill acquisition
from eight contrasting subunits would yield ample variation in the practice of drawing for communication among people of non art and design majors. For each subunit or each student, the record of the practice of drawing for communication is the researcher’s narrative description of a student participant’s drawing acquisition process, which involves the student’s drawing skill development, cognitive development, and communication process. The researcher narrative was written by combining the class documentation, this researcher’s observation notes, with interview records of the TAs and of each student participant. The class documentation includes student’s required work and activities according to the syllabus and archival records about the student’s background skill. This researcher’s observation notes record the students’ studio participation and their progress. A student’s interview record includes statements about his/her skill before and after the drawing lesson and challenges they overcame. Instructors’ commentaries include those of the faculty coordinator about student development in general and those of the TAs, based on quotations taken from the interviews about their comments on each student participant from their classes and the support they provided for each of the student.

6.5.3. Data analysis for describing the concept of drawing for communication

According to the conceptual framework and research proposition previously developed, the concept of drawing for communication for people of non art and design majors will be characterized from the drawing acquisition processes of incoming design students and students from other majors in a beginning level design drawing classroom. When described along lines of the zone of proximal development, the skill acquisition process involves: skill development, cognitive development and communication
processes. The emphasis of this analysis is to enrich the concepts of drawing for communication with eight different themes generated on eight contrasting subunits of the study. It was anticipated that contrasting background skills and learning situations among those students would yield considerable variation within and between the three factors in the development toward conscious control of drawing acquisition according to the concept of the zone.

Eight volunteer students with contrasting backgrounds in drawing skill and learning situations represent the eight subunits investigated in this study. In the interpretation describing the concept of drawing for communication, eight subunit analyses will be used to illustrate the concept of drawing for communication for people of non art and design majors. Themes from a narrative of each student’s drawing acquisition process generated on each single subunit will be discussed. Hence, the concept of drawing for communication will comprise different themes developed from a narrative of the drawing acquisition processes of eight contrasting subunits of this study.
7.1. The Class Design 199: Concept, Description, and Requirements

The class ‘Design 199: Design, Visual Thinking and Problem Solving’ is an undergraduate level course in the category studio/lecture offered by the Department of Industrial, Interior, and Visual Communication Design at the Ohio State University. In the university course bulletin of Spring quarter 2003, the 3 credit hour course is described as an introduction to drawing and problem solving in the context of design with emphasis on materials, tools, and rapid visualization. The course is offered three times a year in Autumn, Winter, and Spring quarters, and while the number of sections open in each quarter may vary, there is a limit of 15 seats in each class section. In Spring Quarter 2003, the class met two times a week, on Tuesday and Thursday; each period lasted about one hour forty minutes.

The course syllabus explained that the concept of the class Design 199 has been developed with the purpose of quickly instilling confidence and drawing skill in students, enabling them to illustrate their design ideas accurately with enjoyment. Students will develop their skill using materials and processes typically utilized by design professionals. According to the course description, the aims of the training are
focused toward developing the ability to communicate design ideas efficiently by
centering on a drawing process involving the use of translucent paper, perspective
charts, and photocopies. An instructor will provide a drawing demonstration
accompanied by set of design drawing examples. The expected outcome of the drawing
exercises is to produce a portfolio of design work which may be used for application to
design as a major, and to develop the students’ ability to communicate design ideas to
themselves and others using freehand drawing skill.

The faculty coordinator of the class furthered the description given in the
bulletin, saying that, currently, the course is intended for incoming design students who
are interested in applying to design as their major. Hence, the course plan integrates
freehand drawing exercises within design projects of the three major areas of study in
the design department: industrial design, interior design, and visual communication.
Through the process of building their portfolios for application, incoming students will
have a chance to receive an overview and to try out studio work in the three areas to
help them in their decision concerning which major area they want to study. TA Andrea
added in her interview that it is a good opportunity for a student to develop a well-
rounded portfolio containing his/her studio work in all three major areas, industrial,
interior and visual communication design. This helps show the extent of the design
ability of the student. Both TA Andrea and TA Paula reminded their students to
emphasize display of the particular work in the area to which the students wanted to
apply as their majors.

The first set of surveys collected at the beginning of the fourth week of the
quarter also revealed that the majority of the class attendees were students who planed
to apply to design. Sixteen out of the twenty-one students who filled out the first survey indicated that they were taking the class Design 199 as part of the process of becoming design students. The group was comprised of many future applicants and a few students who had recently been accepted into the design program. Those students who were in the process of applying took the course to build a portfolio that could be used as part of the application. For both the new design students and the future applicants, the class would apply toward their prerequisite credits for the design program. There were five out of the twenty-one students who were taking the class for elective credits and other reasons. Those reasons included an alternative to a required course in textiles and merchandizing. One student in my focus interview who already had a major and took the class for elective credit, later stated that she took the class to explore the possibility of switching majors after trying out and doing well on these drawing and design exercises. In addition, thirteen out of the twenty-one students, or about two-thirds of the students in the first survey, responded that they were taking the class both as an academic requirement and to pursue their own interest in developing their perspective drawing skills.

Based on an examination of the course requirements given in the syllabus, this researcher would like to describe the listed requirements as falling into two areas: project requirements and participation requirements. This is due to the researcher’s interest in the relationship between social participation and drawing skill development. Project requirements include the need to produce an outcome which exceeds the minimum project requirement, with the student consistently striving for the highest standards in design concepts and execution, and meeting all project deadlines.
Participation requirements include: attending to all regularly scheduled classes and participating in project presentations and discussions; exchange and sharing of information while cooperating with peers and instructors; and the need to develop a positive response to faculty and student input and to help each other grow and enjoy the educational process.

According to this researcher’s class observation, the course requirements listed were introduced to students on the first day of class as the TAs went through the syllabus verbally. Throughout the quarter, both instructors also provided support to help students meet both project requirements and participation requirements. For project requirements, besides giving drawing demonstrations with examples in class, the TAs also provided individual assistance to students in correcting their technical drawing problems, as well as in improving their designs since many students were striving to produce the best possible portfolio to be used for entry into the design department as a design major. For participation requirements, on the first day of class both TAs verbally emphasized the importance of participation in all class meetings and the critique sessions that were scheduled in almost every class, in terms of how the students’ participation would affect skill development as well as their evaluation by instructors.

Moreover, throughout the quarter, both instructors provided support and helped moderate the class presentations and discussions as well. For example, in the first critique session when each student had to present his/her first homework assignment to the class, TA Andrea began by explaining the practice of constructive criticism, and gave some guidelines for the student presenters in introducing and talking about their works. After each presenter finished, she led the class discussion by inviting other
students to share their comments. Students in the class then started to take turns expressing their ideas and making comments on the presenter’s work. Afterward, the instructor began her critique, using inquiry to help guide the discussion. TA Andrea explained later in the focus interview that students not only learn drawing but also need to develop the ability to critique each other. In TA Paula’s class, the students appeared to sit quietly during critique sessions, listening to the ongoing inquiry process between the instructor and student presenter in front of the class. In order to get students to participate, the instructor then used various techniques such as making adjustments in the setup of the critique, initiating a question/answer conversation during her instruction, and having students take turns doing drawing demonstrations in class. In this class, it appeared that social exchange occurred a lot during one on one consultation with the instructor within and outside the critique sessions, but discussion among peers happened in small groups outside the critiques. TA Paula later explained that she emphasized individual assistance since each student has his/her own set of problems, questions, and individual requests. From the class observation, this researcher views the differences in social interaction between the two drawing class sections as two different styles of teaching and will discuss them in additional detail during the reports on class activity for each assignment in the next section.

In their responses to the survey questions, students ranked both class participation and the instructor’s consultation as significantly beneficial to their skill development in all three design assignments that involved freehand perspective drawing training. Although the majority of the responses came from TA Andrea’s class, students from both TA Andrea’s and TA Paula’s class sections who participated in the research
focus interviews credited their instructors highly on the way individual assistance helped improve their drawing ability and the quality of their work.

Because in this research study the main focus is on the instruction of freehand perspective drawing using a perspective grid chart, the two class sections will be described in terms of the chronological order of the perspective drawing training of the class Design 199 without including an examination of the last drawing assignment which was a visual communication design assignment.

7.2. The First Day of Class: An Introduction to the Drawing Method

On the first day of class, from the class observation, both class sections appeared to be conducted as scheduled in the course plan. The first set of handouts distributed in this class was comprised of: class syllabus, a set of product design grid charts, and photocopies of designers’ chairs and different designs of products and tools already on the market. Instructors began by giving an overview introduction to the class. They went through the syllabus to discuss requirements, evaluation and grading, course readings, and the supply list. Following the introduction, the instructor distributed letter size 20lb paper for the class to work on for the first set of drawing exercises which were to be done in class prior to drawing instruction. After students had finished their drawings, the instructors began demonstrations of perspective drawing using the perspective grid charts and explained the homework assignment.

According to the faculty coordinator, this first drawing exercise given in class prior to perspective drawing instruction is intended to help instructors understand the background drawing skill of each student. This first set of in class drawing assignments
was comprised of four freehand drawing exercises. Students were to produce: one
drawing of a 10 ft. cube with a figure next to it in 1-point and 2-point perspective; one
drawing of a chair with a figure next to it in 1-point and 2-point perspective; and one
drawing of a desk with a figure next to it in 1-point and 2-point perspective. Then,
students were given a set of grid charts to assist in the production of another cube
drawing without any instruction. During the process, instructors observed and collected
the finished drawings for each student’s individual folder. The student were informed
that all their work assignments would be collected from the beginning so that the
instructor could determine the students’ progress through comparison with their earlier
work.

After these exercises, the instructors began the instruction on perspective
drawing using the perspective grid chart. The process included explaining the concepts
underlying use of perspective grid charts and the drawing method using the grid
perspective and overlay translucent papers. For the concept of the grid chart, instructors
began by first explaining the concept of one point and two point perspective theory
using vanishing points, a horizontal line, and the location of eye level. According to the
faculty coordinator, it is very important that students understand the perspective
principles through these elements of the vanishing point method before using the grid.
He emphasized that the perspective principle needs to be taught quickly in class. After
the students experience perspective drawing using vanishing points, they will
understand the concept of the perspective grid and the way it helps ease the frustration
of the traditional vanishing point method by providing the right perspective viewing
angles. The faculty coordinator explained that often when novices draw perspective
from vanishing point(s), they neither understand the process nor have the skill to do it well. Their drawings then turn out wrong because they do not show what the students wanted to show, and these novices become frustrated with having to redraw it all over again using the vanishing point(s) method. By using the grid chart, students can see the desired view angle whether it is 1-point or 2-point, above or below eye level, right in the grid before they construct their design drawings.

The second element that the faculty coordinator emphasized was the use of translucent paper with the grid chart, not just the grid perspective alone. The purpose of using translucent paper is that it allows students to make corrections without having to erase anything. When a student wants to make a change in a line, he/she does not have to remember the existing line after erasing in order to draw a new line. With each overlay, students are able to make a change without erasing so that they are able to view evidences of their past editing (Figure 7.1).

In his own terms, the faculty coordinator regarded the grid perspective as providing “basic information” and the translucent paper as providing an “opportunity to make changes without erasing,” or make changes while the layers of overlay help in retaining the early ideas of construction. When looking at both tools together, the professor explained the drawing process as follows:

…if I have the basic shape and want to change something, I have all the information right there. I don’t have to [re]sketch many, many things. I can tell where the lines are and correct them, make them better. Quickly, you can design a chair, a desk, whatever. The transparency helps us see the grid and change the
overlay until you get want you want. This way, you can design chairs, create five chairs, things you have never thought about before by using the overlay. The faculty coordinator also described how the tools enhance students’ creativity:

…once they discover that they can draw without having to start from scratch, it takes their fear away. One problem of vanishing point[s] is that they have to invest a lot of energy in drawing those. And when they discover they have the wrong view, the frustration comes that they have to start all over. Grids take away that fear. They will realize that it did not take that long to start over. The break even point comes when they realize there is no real pain involved, no great time involved. Now they can think creatively without the mechanical frustration of the vanishing point[s]; they can become fully creative.

From this researcher’s classroom observation on the two class sections, though the overall instruction of both class sections went on according to the course plan described earlier, there were differences between them in details of the explanation of the perspective principle and the demonstrations of drawing using perspective grid charts.

In TA Andrea’s class, the instructor approached the explanation of the vanishing point perspective drawing theory using a drawing demonstration of constructing the grid perspective with vanishing points and a horizontal line. The instructor first introduced the 2-point perspective product design grid chart as a starting point before demonstrating how the grid perspective is constructed in relationship to the important elements of vanishing point perspective drawing theory. The concept of 1-point perspective was also demonstrated in a similar fashion using the 1-point perspective
product design grid chart. On the first day of this class section, the instructor actually produced many grid perspectives using these vanishing point elements by drawing slowly on the chalk board in order to explain the vanishing point concept and the grid perspective concept, and to answer students’ questions with actual demonstrations. TA Andrea explained during the interview that her skill and understanding of the grid perspective came from her interior design training during her undergraduate years. She often had to produce the grid herself in order to obtain grids with the desired viewing angles, as she needed them to assist in perspective construction of the interior of a room and different objects illustrated in her interior design perspective drawing.

For the demonstration of chair drawing using a 2-point perspective grid chart, TA Andrea had an enlarged laminated 2-point perspective product design grid chart set up on the chalk board in front of the class. Students were asked to move their seats to gather closer to the demonstration. The instructor began the drawing process by drawing a wire frame of a cube in perspective using the grid chart by tracing those preprinted perspective grid lines without having to construct vanishing lines from vanishing points. The grid square on the chart also offered measurement in perspective, which allowed the cube to be drawn with the desired dimensions, length, width, and depth of the chair from the beginning. Then, after explaining the drawing concept with the term “carving the box into a chair”, the instructor began by drawing the main structure of the chair. In order to “carve the box,” the instructor began plotting spots on the perspective wire frame of the cube or the support structure, to the desired dimensions of the seat height, thickness of seat, leg and chair back. Then, she drew lines connecting those plotted locations with the support of the perspective frame and the
preprinted grid lines. The main structure of the chair was drawn first, followed by
details such as arm rest, chair back, thickness of wood, chair legs that were located
further back, etc., which were pinpointed later through drawing demonstration. The
instructor explained both in the demonstration and during the interview that, when the
rough idea of the shape of the chair is complete, students need to put on another layer of
paper overlay and begin refining it, then use another overlay layer and continue to
change the design a little bit more. However, because the translucent overlay was not
available for the classroom demonstration, the process of refining drawing in the
demonstration was done through redrawing and erasing the marker lines. After the 2-
point perspective drawing demonstration of a chair, the instructor then demonstrated
how to draw a desk and a chair in 2-point perspective when the chair is located behind
the desk. Adding a graphic of a human scale figure with the drawing was emphasized as
this helps illustrate the dimensions of the chair and the desk. Following the
demonstration, the instructor asked for volunteers to take turns producing the
perspective drawing of a chair on this enlarged perspective grid in front of the class as
they had just seen in the earlier demonstration.

In TA Paula’s class, the instructor approached the concept of 1-point and 2-point
perspective by having students observe objects in the real world scene before
introducing the vanishing point(s) and horizontal line in a drawing demonstration of
those elements. The 1-point perspective was demonstrated with a scene of a chair which
was placed in front of the chalk board with the front width of the seat parallel to the
board and the wall, facing a viewer who was looking at the chalk board. The 2-point
perspective was demonstrated with a scene of a chair placed in the corner of the room,
with the corner of the seat pointed toward the viewer and the seat parallel to both sides of the wall. In this researcher’s opinion, the explanation appeared to correspond to the TA’s drawing training. TA Paula had her drawing training in fine arts and was accustomed to drawing from models and scenery observed in the real world. In the interview, TA Paula explained that “…in fine arts, you learn how to see, how to observe, and then you learn how to apply it on the paper.” She went onto make the comparison that, when teaching drawing in design, she asks students about how to see the difference between 1-point and 2-point perspective. But when she teaches fine arts drawing, she instead takes students to observe objects in scenery outdoors and asks them to draw the scene.

After the introduction of vanishing point(s) perspective theory, the instructor began a demonstration of perspective drawing using the grid chart with an enlarged laminated grid chart set up on the chalk board in front of the class. In this class section, the instructor used a 1-point perspective interior grid for the drawing demonstration, which started with a box drawing followed by a chair drawing.

From the observation on the first day of class, the main concern appeared to be with helping students understand and develop the ability to use a grid to assist in freehand perspective drawing. After the demonstration, both instructors were quite busy answering questions and helping students with their drawing problems. Use of the overlay translucent paper was introduced and discussed only briefly on this first day, but later the emphasis was increased during the critique of students’ drawing homework.
Difficulty in drawing with the grid charts observed in the two class sections on the first day appeared to occur for both students who had little or no knowledge of perspective drawing and the vanishing point method and students who had some understanding of the vanishing point but had problems adjusting to drawing with the grid. For example, in TA Paula’s class, some students appeared to have some background in the vanishing point method and were able to draw a complete cube, a desk, and a chair with horizontal edges vanishing to a point but had problems with the grid chart, such as being unable to locate the cube or being unable to draw a completed cube on the interior grid chart the instructor used in the demonstration. One female student appeared frustrated as she tried to locate the vanishing point in order to draw a cube in the interior grid. In TA Andrea’s class, students had fewer problems understanding and/or transferring knowledge from the vanishing point system to the 2-point perspective product design grid chart used in the demonstration, but seemed to be overwhelmed by the density of lines provided by the product design grid and had difficulty tracing the grid lines that were located further back. In chapter 8, the development of students from both class sections in relationship to their background drawing skill will be further discussed and examined in detail.

Despite the differences in the detail of the explanations of the perspective methods, the instructors in both class sections recommended that their students consult the same set of readings on perspective techniques after class. One reading was a chapter on perspective techniques from the book Drawing and Designing with Confidence by Mike W. Lin (1993). Another was a three page handout which gave additional explanation of the vanishing points method and provided exercises to help
students understand perspective drawing by pinpointing common mistakes in different perspective illustrations of line drawing of boxes. Both TAs strongly encouraged students to make appointments or come by during their office hours to obtain individual help on their questions and drawing problems. The TAs had office hours of two hours twice a week for consultation after class, and their students were notified about these office hours both on the syllabus and by verbal reminder in class.
1. Place the first overlay over the 3-D grid, draw basic chairs

2. Add the second overlay, refine the basic chairs

3. Add another overlay, keep on designing the chair

Figure 7.1: The 3-D grid drawing demonstration.
7.3. Instructional Report on the First Homework Assignments: Desk and Chair Designs and Exercises on Drawing Circles in Perspective

In accordance with the course syllabus, after students were given drawing demonstrations on how to use the grid charts and how to draw desks and chairs using the charts on the first day of class, they were given a homework assignment to produce drawings, each on letter size paper, using perspective grid charts. In that quarter, the first day of class was Tuesday; therefore, students had only one day to do their first homework assignments and have them ready for critiques in the next class, which was Thursday. On the first homework assignment, students needed to produce one drawing of a 10 ft. cube with a figure next to it in 1-point and 2-point perspective, one drawing of a chair with a figure next to it in 1-point and 2-point perspective, and one drawing of a desk with a figure next to it in 1-point and 2-point perspective. All drawing was to be done in freehand using the grid charts. For the second homework assignment, which was due for the next class on Tuesday, students were to design three desks and three chairs, producing three finished chair design drawings and three finished desk design drawings. For the third homework assignment, which was due for the next Thursday class, students were to produce two finished chair drawings and two finished desk drawings in tight line drawing.

According to this syllabus schedule, the set of assignments would take four classes from the first day of class when the instructor demonstrated the production of drawing using perspective grid charts until Thursday of the second week, when the last homework assignment was due for the critique.
Besides the schedule of homework assignment of this drawing project, this researcher would like to explain also the drawing classroom activity as guided by the syllabus. During these first two weeks, the three major activities in class, as described in the syllabus, were the studio critique and students’ review of each other’s works, the instructor’s lecture and demonstration, and explanation/discussion of the next homework assignment. For every critique session throughout the quarter, it was required that the homework drawings on letter size paper be attached to each student’s individual display panel, which had been prepared before class and was ready to be displayed at the time each student took his/her turn presenting the homework in front of the class. On the second day of class, which was Thursday, students were scheduled to present their first homework and review other students’ work during the studio critique. In the lecture following the critique, the instructors explained page format and title bar, demonstrated chair and desk designs, distributed handouts with examples of those designs, and gave homework assignments. The third day of class began with the critique session of the homework assignments of drawing three chair and three desk designs. The students reviewed each other’s work, and refined their design concepts. The fourth day of class began with a critique session on the last homework assignment on chair and desk design, two finished chair drawings and two finished desk drawings in tight line, which were due for the critique, in which students reviewed each others’ works. After the critiques, instructors demonstrated how to draw circles in perspective, and students practiced drawing cylindrical objects in class. There was only one homework assignment, for which students were to produce drawings of two bottles and two of any other cylindrical objects using 2-point perspective; the assignment was due for
presentation in the next class, when they would also start the next project in interior
design. After the second week of the quarter, students needed to keep refining their
chair and desk designs themselves before having the drawings included in their
portfolios.

From the class observation, both class sections appeared to be on schedule
according to the course syllabus for the assignments of desk and chair designs and the
short assignment for practice in drawing circles in perspective. Though they had
different styles of instruction, both TAs were able to help the majority of the students in
the class develop their drawing skill and make progress along the two and a half week
period of these assignments. The particular differences between the class sections
during this period were that TA Andrea had her students get started on the logo design
homework one class earlier than scheduled by assigning it together with the homework
on drawing cylindrical objects, and TA Paula extended the critiques of chair and desk
designs into the fifth meeting of the class. This researcher later learned that the schedule
could be adjusted as appropriate, and this was also noted on the syllabus.

Despite some differences in the details of social interaction in the classroom
between the two class sections as indicated earlier in section 7.1, this researcher noticed
one major similarity in that both instructors appeared to concentrate their inquiry
questions into two areas. One was toward helping students with their technical problems
in drawing perspective; the other was toward the design inquiry process, which
involved the language of setting a problem/finding a solution according to different
design criteria during construction of the chairs and desks. In the critique session of the
first homework assignment, the discussion evolved more on technical problems of
drawing perspective than on the aspect of designing chairs and desks. However, discussion of the design aspect was not entirely left out, but integrated in small portions. By the third homework critique session, it was noticeable that the ratio had changed. The discussion in general then evolved around design aspects more than technical problems of drawing. Although instructors still needed to point out mistakes in students’ drawing because no one was yet making perfect perspective drawing by the end of second week, most of the drawing problems students were wrestling with in the beginning appeared to have been resolved by that time.

During one consultation with the faculty coordinator after classroom observation, he confirmed that the two areas of the critique, the perspective technique and the design aspect, identified by this researcher from her observation, were typically included in the critique of Design 199. However, the professor emphasized that the chair and desk design project was aimed more toward training the freehand perspective drawing skill than toward training design skill, though it was taught within a design project. For this reason, it was acceptable for students to produce a drawing of a chair which resembled a design from a magazine or handout in their first project. In fact, the photocopy handouts of designers’ chairs and products were examples provided with the intention that students would develop observation skill, which was expected to support the practice and development of their perspective drawing skill. The coordinator described the progress of drawing development with the grid chart, saying that the introduction should start by establishing an understanding of the practice of drawing perspective with the vanishing point method and then follow with an explanation of the grid method. After students have used the grid as an underlay for guidance in drawing
perspective lines for a certain period of time, they should have developed their drawing skills to the point that they are able to draw perspective by just setting the grid chart by the side as a reference. From this researcher’s classroom observation, after two critique sessions, or by the fourth day of class, the perspective drawing quality of the majority of students in both classes reflected a lot of improvement. This appears to correspond to the observation by the faculty coordinator that it usually takes about three to four sessions for students to be able to use the perspective grid charts to create a design with the realization that it does not have to look like a box. Since this study was designed to conduct detailed observation and interviews with only a small group of student volunteers, this researcher has no way of knowing how many students in the two class sections were able to develop their skill to the point that they could construct perspective drawing without the need to use the grid as an underlay for guidance. Nevertheless, through closely observing and interviewing student participants in my focus interviews, this researcher learned that for some of them, their drawing skill did progress along the steps mentioned by the faculty coordinator. Their skill developed to the point that they could produce well drawn freehand perspective drawings of their designs by just placing the grid chart by the side as a reference.

Based on this researcher’s class observation, examples of the activity and discussion occurring in each class section are described in the following discussion.

In the critique session on the student’s first homework assignments, the main topic of questions and problems addressed in both class sections appeared to be the technical aspects of drawing perspective using grid charts. In TA Paula’s class, there were a couple students who handed in technically correct perspective drawings at the
first presentation of their homework. There were many students who had difficulty in producing the homework but were able to identify their problems in their presentation. The problems students mentioned in class during the critique include: being able to understand 1-point perspective only or able to understand 2-point perspective only; being unable to tell the difference between the two; and having problems using the grid chart to draw perspective. The instructor helped by providing different kinds of assistance in response to those questions. For example, she pointed out that the vertical line needs to be drawn first in the grid method. Also, when drawing an object with a grid, students need to draw the horizontal edge parallel to the grid lines instead of drawing the line from a vanishing point. When the dimension falls between the grid lines, the student needs to plot the half way point inside the grid square to assist in the line drawing. Because in this class the interior grid chart was used in the demonstration, some students were unable to complete a vanishing line on top of the cube. Unlike the product design grid, there are pre-plot grid lines only on the floor and walls of the interior grid chart. In this case, the instructor suggested using drafting equipment such as adjustable triangles to assist in the line drawing. During each of the students’ presentations, the instructor appeared to examine each drawing carefully because many students had mistakes in their perspective drawing and were unable to identify those problems. Several of the most frequently pinpointed problems were that the perspective line was off or the vertical line was not perpendicular. In this first homework critique of this class, the majority of the students produced drawing assignments only in 1-point perspective drawing (maybe because the 1-point interior design grid chart was used in the demonstration). Therefore, the instructor reminded students that they needed to
draw in 2-point perspective the next time. For those who did not yet understand 1-point or 2-point perspective, the instructor said she would take the students outside to observe the perspective view from scenery in next class.

In the first homework critique of this class, the emphasis was on the technical aspect of perspective construction. There was not yet a discussion on the design aspect of students’ desks and chairs, and their designs appeared to be very simple. In the second homework critique, students were introduced to design elements such as visual concept according to design principles and design concepts to be used in refining their designs as well as title bar and page layout format to help them organize their communication. By the third homework critique, or the end of the second week, the majority of students appeared to have their earlier problems with the grid resolved and their chairs and desks no longer had the simple appearance which reflected their initial attempts to explore different shapes and forms in perspective drawing using the grid charts. The instructor led the discussion into the area of becoming critical of the design aspect of the chair and desk. When interacting with those students who had made a lot of progress in the development of both the design concept and 3-D form, the instructor was able to advance the inquiry to having students begin thinking about the color and material of the chair and desk, the target of their design, ergonomics of the seating, and manufacturing possibilities. Despite their progress, the instructor encouraged them to continue the exploration of their current concept by including additional considerations she had pinpointed in regard to the development of their design. It was also recommended that students observe examples of various chair and desk designs from handouts and magazines. A few of the technical problems pointed out by the instructor
included proportions of the chair, some perspective lines being off, the chair back
leaning forward, instability of a curve of the chair, and the importance of line drawing
being clean. During the individual critiques, many students were told to put tracing
paper over their drawings in order to further explore the concept and produce many
more alternative designs. At this point in the critique, students appeared to have a lot of
ideas and often responded verbally to the instructor’s inquiry about color, material,
concept, etc., though the instructor let them know that she preferred to see those ideas in
their drawing. Once they were on paper, she could see them and would be able to give
feedback.

This class section extended the critique of desk and chair homework for one
more class, into Tuesday of the third week. Many students who had kept up with the
assignment schedule appeared to have their designs refined and the line drawing
finalized at this class session. There was one student who went even further and
explored materials by mentioning them in relationship to cost. For this group of
students, the instructor only needed to pinpoint minor elements during individual
critiques, for example: recommending that a student add an illustration of a computer on
the computer desk she had drawn for better communication of the functionality of the
design; suggesting that the page layout should be well organized and not cluttered; and
suggesting the addition of a written explanation of design concepts on the page beside
the drawing. The instructor needed to repeat the pinpointing of elements she had already
mentioned in the last class because there were some students who had not yet specified
materials and colors for their desks and chairs, or organized their page with a title bar.
As in the last class, a lot of students talked to the instructor during and outside of
critiques about many of their new ideas that had not yet been drawn, and they were told to put those ideas on paper. Unlike the majority of the class, there were a couple of students who were unable to produce the assignments to keep up with the critique schedule. They were told to set up an appointment with the TA during her office hours to get extra help in order to catch up with the rest of the class. Overall, all students were told to keep improving their works and to feel free to obtain the instructor’s feedback on those works after this last homework critique of the chair and desk designs until the final portfolio was due at the end of the quarter.

After this last critique of chair and desk designs, TA Paula lectured about the method of drawing circles in perspective by pointing out the difference between drawing a circle in fine art and drawing a circle in perspective. According to the instructor, artists in fine art draw a circle by drawing a line in circular motion over and over to get a better circle or ellipse. Designers use a ruler to construct a support in the form of a grid box with plotted spots in certain locations, and these supports will help determine the location for constructing an ellipse on an overlay using circle and ellipse templates. In Design 199, the 3-D grid chart offered convenience in constructing the perspective grid box and plotting certain locations, which not only supported the circle or curve drawing in perspective but also helped guide the perspective construction of any cylindrical objects. In the following class when the cylinder homework was due, TA Paula demonstrated an additional technique for drawing a cylindrical object in perspective when those cylinders were stacked together. She gave drawing exercises for students to practice in class, such as converting the section view of a pen into a 2-point perspective of a pen, and practicing drawing from a cylindrical model, including a pen
and a paper model of a combination cylinder. Following the exercise, every student pinned his/her class exercise on a wall board at once, and the students went through the review with the instructor.

Afterward, instead of the regular critique, in which students took turns presenting their work in front of the class one by one, TA Paula made some adjustments by having all students set up their boards around the room at the same time to display their homework assignments, both final drawings of desks and chairs and the homework assignment on cylindrical objects. The instructor then went around the classroom to talk to each student at his/her board, checking the perspective technical aspects of the drawings of desk, chair, and cylindrical objects, and also checking page layout. TA Paula used this setup for the critique many times later on in the quarter. From this researcher’s observation, the new setup for the critique appeared to help increase peer interaction in this class section. Students appeared to show increased attention to other students’ class work as they were allowed to move from their seats, and choose either to walk around to examine other works and discuss them with their classmates at their boards, or to stop by the board where the instructor-student consultation was going on. If the instructor saw anything interesting in the individual consultation that everyone needed to pay attention to, she would call out to the whole class and point it out to them.

As mentioned earlier in section 7.1., the two class sections can be seen as having distinctly individual styles of classroom critique. From the observation in TA Andrea’s class, in this researcher’s view, the instructor added another dimension to the regular critique practice by encouraging an activity this researcher would like to refer to throughout this research study as “peer critiques.” TA Andrea mentioned this as her
intention in the interview, saying: “…besides learning how to draw, they need to learn
to critique one another; that’s important too.” This researcher would like to illustrate the
process by describing some parts of the events captured in the observation of the first to
the final homework critiques on the desk and chair design assignments as follows.

In the critique of the first homework assignment in TA Andrea’s class, the main
topic was also on the technical problems of perspective drawing, though the discussion
appeared to be integrated with design aspects more than in the other class section.
Before the critique started, the instructor explained the practice of constructive
criticism, then asked for a volunteer to be the first presenter. The rest of the students
were told to move their seats to gather closer to the presentation. When the presenter set
up his personal display board, the instructor suggested as an introductory guideline that
besides describing details of the work on the board, the student should explain the
reasons behind the work, for whom the work was intended, his/her inspiration, etc.
When the presenter finished introducing his work, the instructor led the peer critique by
inviting the rest of the class to express their ideas and share their comments on the
presenter’s work, using expressions such as, “OK, what do your guys think?” After the
class finished with their discussion, then the instructor began her critique.

In this first critique session, comments from peer critiques evolved around only
the functions and decoration of the presenter’s chair and desk designs, not on the
perspective technical drawing problems. The instructor appeared to be the only expert
who was able to pinpoint those perspective drawing problems and help correct them.
Early in the quarter, only one student participated in the peer critique and provided
comments at each presentation, but it appeared that the number of participants increased
as the class went on. I will illustrate this critique event with two examples. In one of the student presentations, the presenter proposed three chairs: a dining chair, a patio chair, and a bar stool, using the product design grid charts to explore and play with forms. When the presenter mentioned her ideas about the material for each chair, other students began to participate with questions and to exchange ideas with the presenter, such as the idea of making the patio chair from clay and using fabric and wood for the dining chair, etc. One student commented that rungs were missing from the tall bar stool and that they would assist in comfort by providing a place to step on and to rest feet and legs. After the students’ critiques, the instructor then began examining the designs and pointing out technical problems of perspective drawing. One presenter identified the difficulty she had had in the production of the assignment, for example, her desk had stack drawers on the side and she had a particular design in mind for the drawer handle but did not know how to draw it in perspective, though she had attempted to sketch it out in the homework. The instructor then provided a drawing demonstration of the requested elements. In another presentation, the presenter proposed a design of seating which adopted the idea of an art bench she had seen in an art studio class, and a design of a cantilever desk. One classmate commented that if the desk were flipped upside-down, it might be used as a TV stand. The drawings in this presentation did not display many perspective problems because the designs were very boxy. In order for the student to gain skill in perspective drawing, the instructor encouraged the presenter to try using overlay papers to explore more designs, such as adding a seat cushion and refining other parts of the chair departing from this first idea, which resembled a cubic box. The presenter asked a question on perspective, wondering how to draw a certain dimension
in 1-point perspective, and the instructor responded with a drawing demonstration to show how the 1-point perspective grid should be constructed.

The rest of the class also had interesting ideas for their first homework on desk and chair drawing, and they received compliments from the instructor for their efforts. Examples of these works include a form of a chair which was adapted from the human sitting posture, a modular desk set which had an electrical cord track built in, a recliner assembly from leaf shaped elements, a desk which adapted the a shape of a Macintosh monitor base as its stand, etc. However, in their homework drawing, everyone produced loose line drawing of the basic shapes just to get the main idea across, and the majority described the details of their design verbally. Only a few students attempted to draw those detail elements. For a couple of students who had a very plain design without many ideas to explore, the instructor suggested functional details that might be added for the students to think about and try drawing. For example, the instructor mentioned a student might think about how to solve the problem of tangled cords when developing a computer desk. No one in this class mentioned problems in understanding 1-point or 2-point perspective, though the instructor recognized from their drawings that everyone was having some types of problems with perspective and realistic drawing techniques. The problems most frequently pointed out were: the perspective line was off or missing, the perspective proportion was not right, almost every chair and desk drawing appeared paper thin without the thickness of the material, a couple of students showed material thickness but it was too thick, the scale for human figures was wrong, etc. These were mistakes the students had not been aware of at all by themselves. In this class, the instructor was often asked to draw designs students had in mind but were unable to
draw in perspective. At the end of this class, the instructor recommended that the students think about where to place a chair on the grid in order to obtain the certain view angle of the drawing which best presented the design. Another suggested practice was to try changing the scale of the grid square, i.e. from one foot to one inch.

On the critique of the second homework assignment in the following class, students’ works appeared to be improving both in their design concepts and in their perspective drawing. Their design ideas had become much more concise in detail. Many students had corrected their technical drawing problems with the help of the instructor by the last class, though their perspective drawing was not yet perfect because the students were still exploring and improving their design ideas. The number of students participating in the peer critique increased to 3-5 students in each presentation as they became comfortable in developing conversation with the presenter about the assignment during the critique. I will describe several of the student presentations as examples of the second and third homework critique sessions. It should be mentioned that my notes from observation capture only about one third of the whole conversation in each presentation. In one example, the student presenter who had designed a paddle chair or a recliner assembly from leaf shaped elements, continued to develop her first idea in this class. For the desk, she proposed a new design to replace her first idea of a simple desk with one postal leg like a dining table with a desk which combined a drafting desk and computer desk together. One classmate commented on the stability of the paddle chair because of the way its legs leaned. A second classmate critiqued the computer desk in terms of how feasible it would be to type on the keyboard because the drafting table top appeared to taper and another classmate asked a question about space for the
computer tower. After checking the technical drawing problems and helping correct them, the instructor commented that the presenter needed to try to work more on the paddle chair using the tracing paper. Another comment was that all the drawings looked paper flat with sharp corners and the student needed to explore more with adding thickness to desk and chair material. The presenter then identified her own problem, saying that she was having difficulty with drawing a curve in perspective. The instructor also recommended that the presenter enlarge the drawing of the second chair design in order to try working on details, and suggested that she should observe more examples of chair designs in magazines. The instructor commented on the computer desk that the presenter should think about the ergonomics of a leaning drafting table top which would also house a computer monitor. In another presentation, the presenter did not continue the ideas from the last session. She explored different ideas with her drawings and proposed all new concepts. The chair was developed from the shape of a hair clip, and the desk was designed to match the chair design. One classmate commented on the stability of the desks; another classmate commented that an elbow might easily get caught in the drawer when someone was working at that desk. Following the peer critique, the instructor inspected the technical drawing problems and helped correct them. The instructor commented on the design aspects, saying that the presenter had to pay attention to how the different elements connected, particularly when trying to connect details of the chair with the desk design.

In the third homework critique, students had been asked to hand in tight line drawings of two chairs and two desks with orthographic views. The difference between the last two classes and this class was that all the detail design ideas students had talked
about were now illustrated in their drawings, and the drawings appeared much more complete than in their first drawing homework, which had appeared only to be comprised of frames of the basic shapes. For the peer critique, students not only offered comments but were also able to come up with interesting design solutions for the presenter’s work. A couple students were even confident enough to pinpoint technical drawing problems in the presenter’s work. In this third homework critique, TA Andrea continued to examine each drawing closely in terms of the problems of perspective and realistic drawing techniques and helped identify these problems. Many students were told to work more on the different geometric and organic shapes of the legs of their chairs and desks, which did not appear to be in perspective. The instructor also showed increased attention to design. Details of the design appearing in the drawing would be questioned, for example, the proportion of drawer handles and the drawer, the width of a desk in relationship to ergonomics, and the intention of the line and pattern drawn on a table top surface. In commenting on the design of a secretary desk, the instructor suggested adding a panel in front of the desk to hide the legs since women prefer a desk they can sit at comfortably with privacy. One student was told to investigate the form of his desk, and to keep looking for a way to refine it.

For this class section, the last homework critique for chair and desk assignments was to be held on Thursday of the second week. The students were told to keep working on their chair and desk assignments after this critique because the grade could be adjusted if they showed improvement. After the critique, the instructor provided a drawing demonstration of drawing circles in perspective. The demonstration of circle drawing began with construction of a 2-D grid square, plotting certain locations on the
diagonal lines of the square, then connecting those plotted locations together using a flexible curve. For a 1-point perspective cylinder, a cube to be used as a perspective support structure was drawn first using a 1-point perspective grid chart. Certain locations on the top and bottom of the cube were plotted in order to draw circles on the two areas for the sectional surfaces of the cylinder, then the length of the cylinder was drawn by connecting vertical lines between the two circles. In the next demonstration, a 2-point perspective cylinder was built in a similar process, but the perspective support structure was a cube drawn with the 2-point perspective grid chart. During the critique of this cylinder homework assignment in the following class, the instructor not only pinpointed the mistakes of the ellipse drawing in each work but also provided additional perspective and realistic drawing techniques, for example, drawing a transparent glass by adding a line drawn inside the glass for thickness, plotting a mug handle, and drawing bottles in different locations above and below eye level in order to show that the configuration of the bottles’ curve lines would change in relationship to those locations.

In summary, one major characteristic the critique sessions of both class sections shared during the first two weeks of the quarter was a practice in which student individual presentations in front of the class allowed the rest of the students to listen to the inquiry between the instructor and the presenter, learn various details of perspective drawing by observing the instructor pinpoint mistakes in the presenter’s drawings and correcting them, observing other people’s works that suggested different shapes and forms which could be drawn with the grid chart, and learning different new techniques when the instructor responded to individual problems and requested drawing of the
specific designs the presenter had in mind. The critique sessions therefore helped expand the students’ understanding in a different way compared to individual help outside the critique, which benefited only one student in each meeting, although individual consultation was necessary for students who needed extra help to catch up with the class, were having problems with their homework assignments, or had so many questions that the short period of the presentation did not allow sufficient time. However, from the example of the two drawing class sections, it appears that the success of student participation in the regular critiques can vary. Although encouraging peer critique worked out well in one class section, the other class section had to adjust the setup of the critique in order to increase students’ attention to the critique and participation in peer discussion. In fact, the success of the classroom social discourse depends on different factors and has become a major topic of investigation in educational research, especially in terms of social and cultural aspects of classroom interaction (Erickson, 1986). But because this study is focused particularly on freehand drawing instruction, this researcher will examine the classroom social interaction only in a general overview to obtain some idea of its relationship to the drawing instruction and will not go into more specific ethnographic detail.

In the first set of surveys collected in the fourth week, after students had finished with the critiques of the first homework assignments, students were asked to select their top four choices of tools and supports from the provided list according to their significance in the production of the chair and desk designs (Appendix C). The most popular choice was a tie between perspective drawing using the vanishing points method and perspective drawing using the grid charts; second was the use of hand
sketching ideas before constructing perspective; third was a tie between participation in the classroom critiques and drafting equipment, and the fourth was perspective drawing instruction from handouts and books.

According to comparison of the survey responses for the two class sections, exactly the same number of students from both classes agreed on the vanishing point method and the perspective grid charts as the top two most important tools and supports for the chair and desk drawing assignments. In TA Andrea’s class, participation in classroom critiques also received the same number of votes as those top two drawing methods, and was in a three way tie for the most significant tools and supports with the vanishing point method and the perspective grid charts. For this class section, the follow-up ranking according to significance to the drawing production of the first assignments includes next in importance, the practice of hand sketching ideas before perspective construction, followed by a two way tie between consultation with the instructor and the drawing instruction from handouts and tools, and, finally, drafting equipment. In TA Paula’s class, the practice of hand sketching ideas before constructing perspective received the first place vote, creating a three way tie with the two drawing methods, the vanishing point method and the perspective grid method. Within this class section, the follow-up ranking included next in importance, drafting equipment, followed by examples of chair and desk designs from handouts and magazines, and, finally, a three way tie for perspective construction using a freehand technique, the transparency overlay, and perspective drawing instructions from handouts and books.
7.4. Instructional Report on the Second Assignment: Interior Design

According to the course syllabus, the interior design assignment was to begin on Tuesday of the third week of the class, and the critique of the final drawing of bedroom redesign was scheduled for Tuesday of the fifth week of class. Based on this schedule, the training for interior drawing through the project of redesigning the students’ bedrooms would take about five classes from the first day of lecture and drawing demonstration until the critique of the final line drawing of the interior redesign. Class activities as described in the syllabus appeared to be quite similar to those of the first two weeks, as they included studio critiques and student review of each other’s class assignments, lecture and demonstration, and explanation of the next homework assignment. The syllabus schedule can be described as follows.

On Tuesday of the third week, the class would begin with critiques of the homework assignment of drawings of two bottles and two of other cylindrical objects, which were due in class that day. Following the critiques, the instructor would begin the interior design lecture and give a demonstration on drawing of the floor plan and section view of a room interior and instructions on how to use an architectural scale ruler. A review of examples of logos and corporate identity was also scheduled to begin that day. For the first interior drawing homework, students would need to measure the floor plan and section views of their existing bedroom, then draw those views using the scale ½ inch = 1 foot. This assignment was due for the critique during the next class. On Thursday, the following class, students would present their homework for the critiques. Afterward, the instructor would explain the next assignment on redesigning the existing bedroom. Requirements included: the student could adjust the height but not the length
or width of the existing room, there was an unlimited budget for this interior redesign, and students were able to design furniture, lighting, storage, windows, etc. as they wished. The redesign of the existing bedroom was to be drawn in two perspective drawings displaying opposite views of the redesigned room, using 2-point perspective interior grid charts. This homework assignment was due for the next class. On Tuesday of the fourth week, the class would begin with critiques of the two perspective drawings of the bedroom interior redesign. Students would work on details of the interior drawings and complete perspective line drawings of the bedrooms using 2-point perspective. The homework assignment for the next class was to complete the perspective drawing of the redesigned bedroom. On Thursday, the students would participate in the critique session for the scheduled homework assignment. They would review each other’s work and work on finalizing the refined designs. For the next class, Tuesday of the fifth week, when the final line drawing of the bedroom redesign was due, the last critique of the interior homework was scheduled.

According to the syllabus as described above, this researcher could see that the overall instruction of this interior design drawing had one thing in common with the first assignment on desk and chair design drawing, in that both started out with basic instruction, on how to establish the first basic shape of the chair or the original room drawing for the interior project, in order to enable students to begin the process of manipulation. However, while the basic shape of the chair could be constructed right away in perspective simply by “carving the box” or sketching simple chair on the perspective support frame, which novices were able to do without looking at a chair model after watching the instructor’s demonstration, students would need to go through
a different process in the construction and manipulation of the interior perspective
drawing in this class. For interior perspective construction, the process could be easily
conceptualized when examining the first set of interior handouts, which illustrate and
give a visual description of the process. From the illustration (Figure 7.2), students
would need to begin by measuring an actual room interior and using those dimensions
to construct, first, the floor plan drawing and, second, the section views drawing. The
perspective of the existing room interior could then be constructed by transferring the
floor plan and section view drawings onto the interior design perspective grid chart and
building the three dimensional interior of the room from the floor plan up along the
room height, as illustrated in the handout (Figure 7.3). From the classroom observation,
it appeared that the drawing training created an interesting learning process for the
novices, though the training was quite a challenge for them. Later, in an examination of
the activity and discussion that occurred in each classroom, this researcher will look
into the students’ difficulties in producing interior drawing when describing the
training, which included perspective construction of an existing interior room and the
drawing manipulation process, in relationship to the social interaction in the two class
sections during the interior design project.

In one consultation with the faculty coordinator of the class, he explained some
of the reasons for using the interior grid chart in drawing training for this class instead
of the traditional interior perspective drawing training using the vanishing point
method:

…in interior design, students have to develop a floor plan and section views.

They always have a huge struggle to do perspective, and they go crazy trying to
get the perspective right [for two reasons.] First, they were not taught well and, second, they did not learn well. So, using the chart, most students find that it is much easier than developing perspective by hand. What they are trying to do is to communicate an idea from a plan to something that normal people look at, which is perspective. Most people cannot read a floor plan. Interior design students go to school for a couple of years to learn to make a floor plan and to read them, but the client cannot read one. Designers who are successful are often people who can draw in perspective.

He furthered his explanation of the benefits of the interior grid charts, saying that from his experience,

…people who use the charts gain more confidence; [their] confidence builds up sooner than for those who do not use the chart. They know it, right? They can say it is ten feet from here to that wall, it is twenty feet wide, because it is all in the chart. They know exactly what the width is in relation to the height. So the client can understand what they are looking at, and that’s communication..

In another consultation, the faculty coordinator explained an important reason for non design majors to gain interior perspective drawing skill for communication. He described the success story of a library design project where the clients, a librarian team at a North American library, were trained to read the floor plan in order for them to be able to participate with the designers throughout the design and construction process. That library turned out to be one of the best library designs in this country in terms of how well it functions. Because the librarians were able to read the detail drawings, they could pinpoint problems in the proposed design and help make changes. It made a
major difference in comparison to another library design project where the librarians had no idea how the interior would look after construction from looking at the floor plan and section view drawings and had no communication skill to participate in making changes to improve the proposed new design.

In order to demonstrate how the course plan of the interior design drawing project works in practice, this researcher would like to illustrate by examining some of the instruction practices of the two classroom sections. The discussion includes capturing some of the major concepts of practice they shared, then examining the details of activities and discussion in each class section.

In this interior design drawing assignment, both class sections appeared to follow the general instructional procedure as listed in the syllabus. They began with distribution of the interior project handouts; a demonstration of how to measure a room; a demonstration of how to use an architectural scale ruler to construct a drawing from those measurements; and an explanation of the process of constructing a floor plan, section views, and a perspective of the existing bedroom from the handouts. The interior handout was comprised of: the interior design grid charts; examples of interior drawing in floor plan view, elevation views and sectional views; illustrations of the process of construction of interior perspective from those views after transferring them onto the interior perspective grid chart; a reading on interior design guidelines; and a photocopy of an architectural scale ruler accompanied by a drawing comparing two floor plans in different scale. After students produced an interior floor plan, section views, and perspective drawings of the interior of their existing bedroom, the major focus of the critique was on checking to see that all information appeared to correspond
in all those view drawings. Dimension specification was another emphasis in every
critique session of both classes. While the furniture needed to be drawn in proportional
and accurate dimensions according to the specified ruler scale, the dimension numbers
and lines had to be drawn correctly according to the interior specification standards. The
instructors went through the same set of criteria during the critiques of students’
drawings of the redesigned bedrooms. The design criteria emphasized in both class
sections appeared to be based on functions of interior space and visual organization
according to design principles.

Although sharing the major focus of the interior design drawing training
according to the general guidelines of the syllabus, the instructional practice of each
class section appeared to differ in details of classroom activities and discussion.

In TA Paula’s class, the interior design assignment started on Thursday of the
third week of the quarter and lasted until Tuesday of the fifth week of the quarter, when
the last homework assignment on interior drawing was due. Therefore, in this class
section, the interior assignment took about four classes, with two homework assignment
critique sessions. The instructor began the assignment by having students read all of the
interior design handout as a homework assignment and giving a verbal quiz in class
about the reading material in the following class. In that class, after the quiz, the
instructor led the class into an exercise in which the whole class practiced constructing
an interior floor plan drawing of their classroom together. In the demonstration, the
instructor asked different students to volunteer in taking turns drawing each step of the
floor plan construction. The steps included: taking notes on the measurements; drawing
an enclosed outline of the room floor plan according to the measurements; drawing
dimensioning lines; writing the dimension numbers above the lines; adding wall thickness; locating and drawing all the openings in the floor plan, including the door and all windows, with the measurements, following the interior standard coding for those openings. Afterward, students practiced constructing the floor plan, drawing by themselves in class. The instructor added her own suggestions for the bedroom redesign concept, saying that she wanted to see how a small space can be maximized to serve different functions and purposes.

In the following class, when the first interior drawing homework was due, the students were to have both the drawings of their existing bedroom and drawings of their redesigned bedroom on displayed on their boards. Each set was comprised of one interior floor plan and two opposite views of the room in 2-point perspective. The student needed to produce section view drawings only for the existing bedroom drawing. In the critique of each student’s assignment, the instructor’s work included checking that the information on the floor plan and the two perspective drawings of each room corresponded with each other, and examining the dimension specifications, which many students had forgotten in their drawing. Incorrect perspective drawing of a room was one of the problems most often pinpointed in the critique. With students who were able to produce all the drawing homework as assigned, the instructor was able to focus much more on the design aspects, either to help manipulate their first idea with inquiry or making different suggestions, such as adding storage space underneath a bed, etc. It appeared that there were few signs of the design activities included in the students’ first interior drawing homework, although one student began to use cut up pictures of an audio set and decorative elements from a magazine and paste them in
combination with the line drawing so that he did not have to draw all the decorative items in the room by hand.

In the second interior design homework critique, or the last homework critique of the interior drawing project of this class section, the students who had all drawings of the existing bedroom and the redesigned bedroom constructed for the previous class came back with details for improvement of their design. Some students had made adjustments in their floor plans in terms of rearranging space, some students had worked on decorative items including materials and color using cutouts from magazines to help specify those items, and some students had worked on both. However, all students’ homework had some types of technical problems that the instructor continued to inspect closely and point out to them. These included the correspondence of detail between floor plan and perspective drawing, incorrect perspective drawing, mistakes in dimension specification, wrong scale or wrong proportion of items in the interior room, etc. Student were encouraged to continue to improve their interior design drawings and to obtain the instructor’s feedback after that day until the final portfolio due date.

In TA Andrea’s class section, the interior design drawing assignment started on Tuesday of the third week of the quarter and continued until Thursday of the fifth week of the quarter, when the final interior homework was due for the critique. Therefore, for this class section, the interior design assignment took six classes, with five homework critique sessions. The first three homework critique sessions were devoted fully to the interior design drawing assignment, and the last two extra critique sessions overlapped with the critique of the product design assignment. It is this researcher’s speculation that
the extended schedule and practices corresponded with the interior design specialization of the instructor, which enable her to be attentive to detail in the drawing training.

For this class section, the instructor introduced the interior design drawing project following the homework assignment critique of the cylindrical object drawing. The first interior drawing assignment was described with a lecture on how to measure the existing bedroom, how to use architectural scale, and how to construct a floor plan. The students needed to construct a floor plan and section view drawings of their existing bedroom by themselves as homework, which was due for the next class. As noted by the instructor, it was not required that this first drawing homework contain the fine details of interior design drawing. For the first interior design drawing homework critiques, instead of the regular setup of the critique, TA Andrea went around the room and critiqued the student’s work at their desks. In this practice, the instructor inspected each student’s work closely and pinpointed all missing details, checked the correspondence of information between the different views, and gave instructions on dimension specification. During observation, this researcher learned from the student-instructor discussion that the processes of constructing these plans and section views were not simple tasks for the novice. The students admitted having difficulty with the section view drawings. In her interview, TA Andrea discussed those difficulties and mentioned the use of visualization skill in producing these interior drawings:

Well, interiors, the problem with them is, they are really complex, the way you draw things. We start them out drawing a plan and sections; there are a lot of technical things that go along with that. Different line weights for things, dimensioning, putting new scale figures in, drawing it to scale--that’s kind of
overwhelming, I think, for them, because they just draw a chair, and, yes, it has line weight, but the chair doesn’t have as many line weights as the room does, you know. Or learning to visualize, like they can see a chair, but when they look at something they don’t really see it in the floor plan view, and they don’t understand slicing something [the room] horizontally; they don’t understand, they can’t visualize that they are looking down…They draw these things in that you’re not going to see, and it’s just hard for them to really draw things as you would see them if you could see them.

In addition to the handout and the grid chart, the one-on-one assistance provided by the instructor appeared to help the students understand and develop the ability to draw these views. In the individual meetings, the instructor spot checked and corrected the correspondence of the orientation of furniture and other items in the interiors between different view drawings and demonstrated the projection technique that can be used to construct a reference structure in order to build the floor plan furniture or decorative items in the section view drawing. The instructor provided detailed explanations to help students see how they could transfer a reality view of the room they had measured into a floor plan, then from floor plan to section view drawings. For example, the floor plan view was described as the view we see when looking down at the room, which has been sliced horizontally at 5 feet above the floor. From such a spot, any elements that get cut, such as walls, windows, door, sliding closet door, etc., need to be drawn accordingly, in sections. In this beginning drawing class, the instructor provided such information for the students by correcting those window and door sections in the students’ drawings with reference to interior standards of specification.
Different line weights were introduced for referencing the distance between such a location and the viewer’s eyes. For example, in a floor plan, the thickest line is the line representing the interior wall. At the end of this class, the instructor demonstrated how to draw interior perspective from a floor plan by projecting upward using the 2-point interior perspective grid charts and explained the homework assignment on drawing perspective views of the two opposite corners of the room.

The second interior homework critique of this class section was devoted to interior perspective construction. The perspective drawings of students’ existing bedroom and the redesigned bedroom were due during the critique. For each room, students needed to produce perspective drawings of the two opposite corners of the room in 2-point perspective. The instructor resumed the class’s regular critique setup with peer critique again in this class, and the students appeared to make interesting comments both on decorative ideas and on the technical aspects of the drawings. Their comments included recommendations for storage space in different designs and locations to solve the problem of too much clutter in the room, moving the TV inside a closet, observing that windows and a door were missing from a perspective drawing, that a cabinet was floating off the floor in a perspective drawing, the bed was too high, etc.

Like other critiques of this class section, the instructor was in fact the only expert in the drawing technical aspects, and the problems most frequently pinpointed by the instructor were related to the furniture and other items in the room. They were either not drawn to scale or the perspective lines were off. Some examples of comments on the design aspect include: manage the clutter in the room, move the bed because there is not
enough space to walk around, move the chest of drawers to get symmetrical alignment with other furniture, look for examples of door panel design in magazines. One of many important techniques addressed by the instructor was, when drawing a furnished room in perspective, draw things that are closest to you first and the other items will be drawn as hidden behind the front items. TA Andrea emphasized that when working on interior design, students need to utilize all drawing views together, and sketch ideas out in floor plan and section views first before constructing the perspective. The instructor also addressed this concern in the interview, saying:

...because they [the students] try to take it right away into perspective. And yes, you do that, but with an interior that we design, it’s not just how you see things in perspective, I mean, you make a floor plan so that you can get an idea about circulation… You have to design, like with interior, you have to design in plan, in elevations, in section, in perspective all at the same time…

In the third interior design drawing homework critique, the instructor wanted to see crisp and clean drawing with improvement in creative design. In the second critique, students had been in the beginning phase of developing their ideas; their furniture as well as the space arrangement in the room were still in sketches. In this third homework critique, the majority of students had cleaned up the clutter and kept only basic furniture in their redesigned bedroom. Students who had handed in their homework in the previous class had their technical drawing problems corrected by this time. Some students had attempted to explore the design beyond drawing a clean, well-organized room. Those attempts included trying to design and draw a room with a high ceiling; trying to design a Japanese style interior. One student tried to design a ceiling but
admitted having problems drawing it, and another tried using cutouts of furniture and decorative items from magazines to specify her interior décor. The instructor was still checking for any technical drawing problems in the students’ drawings, including perspective problems, scale and proportion, and dimensioning, and gave perspective drawing tips. Those tips included: selecting a good viewing angle which has few items obstructing the view or drawing forefront objects as transparent items so that the drawing will better illustrate the interior space student design, and plotting vanishing points in addition to using the grid. There was increased attention to other details such as circulation space between pieces of furniture and the alignment of furniture according to design principles.

In the last two homework critiques of the interior design drawing assignment, which overlapped with the critiques of the product design drawing assignment, students kept on exploring design possibilities and checking circulation, and gave attention to drawing such details such as a vanity set, different types of door swing, curtains, mirrors, etc.

For this class section, aside from the individual critiques on the first homework assignment, the rest of the critique sessions were in the regular setup with peer critiques as the class had practiced from the beginning. Because there were many details in interior design that the instructor needed to point out to the students, I asked TA Andrea during the interview about the students’ improvement in their interior drawing training and the technique of pointing out these details for students. The instructor replied:

They do improve. I think it takes, for some of them, the ones that really try, it takes the first critique, and you point out things that they don’t think about, and
then they start thinking about it, and then their drawing gets a lot better….They [the students] don’t think about the way things line up, and that’s why I gave them that one handout that was for harmony and materials, and I’d bring it up to them. OK, well, a lot of them draw doors, and [I say] “How does this door open?” “Well, you pull it open.” “Well, where’s the doorknob?” Just little things like that. There’s no lighting, or that kind of thing, or we talk about the heights of things, and maybe having a uniform height, finding out door height, finding out window height, and that kind of thing. And once you clean out these little things, ‘Oh, that bed seems really close to the door, you wouldn’t be able to open it,’ and they are like, ‘Oh!’ They just draw something, and they don’t think about proportion and if it would actually work. But once you mention it to them, then they look at it…

In the second set of surveys collected at the end of the ninth week of the course, students were asked to select from the listing four choices of tools and supports they considered the most beneficial to the construction of their interior design projects (Appendix D). From the responses of the combined two classes, the top two in rank include: first place is the grid chart for perspective construction, and second place is the practice of hand sketching ideas before constructing perspective. Third place is a three way tie between the vanishing point method for perspective construction, drafting equipment, and participation in classroom critiques. Fourth place is a tie between consultation with the instructor and examples of interior design and decorative items, including furniture from handouts and magazines.
When examining the survey responses from each class section individually, the top four ranking of tools and supports according to their benefit for the interior design project appears to be slightly different from the combined data. For the responses from TA Andrea’s class, the top four ranking is: first place, the grid charts for perspective construction; second place, the participation in classroom critiques; third place, the use of hand sketching ideas before perspective construction; and fourth place, drafting equipment. In the responses from TA Paula’s class, the top two in rank are: first place, the grid charts for perspective construction, and, second place, a tie between perspective construction using the vanishing point(s) and the use of hand sketching ideas before perspective construction. Third place is a five way tie between perspective construction using the freehand technique; drafting equipment; perspective drawing instruction from handouts and books; examples of interior design and decorative items, including furniture from handouts and magazines; and consultation with the instructor. Fourth place is a tie between use of the copy machine and use of computerized tools such as printer, scanner, CAD program, etc.
Figure 7.2: Drawing floor plan and section views of an existing interior room.
Figure 7.3: Constructing perspective view of a room interior.
7.5. Instructional Report on the Third Assignment: Product Redesign and Rendering

According to the course syllabus, the assignment on redesigning a product of choice would take about four classes. It would start from Thursday of the fourth week, when students would be given the first assignment, to bring to class a picture of a product they wanted to redesign, until Tuesday of the sixth week, when the finished line drawing of the redesigned product was due for the critique. Therefore, the product design drawing assignment would take four classes with three homework critique sessions. Following the last product design homework critiques, on the same day, the instructor would demonstrate the marker rendering technique and explain the rendering homework assignment. The rendering exercise would take only two classes from the demonstration to the review of students’ rendering homework assignments in the following class.

Activities in class during these assignments mentioned in the syllabus include: critique and review of others’ class work, lecture and demonstration of processes involved in the product redesign project, and explanation of the homework assignment. According to the syllabus, each class was scheduled for a combination of these three activities. On Thursday of the fourth week, students would be given the assignment to bring to class pictures of a product they wanted to redesign. In the following class, Tuesday of the fifth week, after the critique and review of the final line drawing of the interior design homework, the critique session would continue into the next project on redesigning a selected product based on the photocopies or photographs the students had brought to class. In accordance with the syllabus, the instructor explained that the
redesign process would start with sketching ideas, then improving functions and aesthetics. The homework assignment, which was due for the next class, included developing two perspective drawings with orthographic views of two new designs. The drawings needed to be line drawings without shading. The following class on Thursday started with a critique and review of each student’s homework assignment with the aim of refining the line drawing of the product. The homework assignment which was due for the next class was to complete a finished line drawing of the product. On Tuesday of the sixth week the last homework critique scheduled for the product design project, the class began with critique and review of the homework assignments on finished line drawing of the redesigned product. After the critique, the instructor demonstrated marker rendering techniques by specifying a light source coming from the left and shade lying to the right of an object. Then, students viewed some examples of marker rendered drawing and practiced rendering basic shapes in class. For the rendering homework assignment, which was due for the next class, students were to select one chair design and one desk design from their earlier project and render a line drawing of both designs with markers and prismacolor pencils, using only two colors. On Thursday of the sixth week, the marker rendered drawing homework was due for the critique and review session. Therefore, the rendering exercise took two classes, one class for demonstration and the following class for critiques of the homework. The graphic design project was scheduled to overlap with the rendering assignment so that, after the marker rendering demonstration, the instructor was also scheduled to explain about graphic design, including logos and resumes. In addition to the rendering homework,
students were to bring examples of good logos and bad logos, three examples each, for
discussion in the following class.

According to the classroom observation, both class sections went through the
course plan as scheduled, and the class discussion and activities were conducted in a
similar fashion. It is this researcher’s observation that, in spite of some similarity
between this assignment and the first two drawing assignments, in that the students
needed to produce drawings to explore alternative ideas, the training process for product
design drawing appeared to be different in detail. Unlike the interior design drawing
assignment, in which the beginning phase concentrated on the drawing process to
establish the illustration of the existing design in different interior views, the beginning
phase of the product design drawing was devoted to instructor-student discussion on
criteria for selecting the product and specific problems concerning the products students
wanted to redesign. A photograph or photocopy of the existing product a student wanted
to redesign was used in this early phase of discussion. Then the students started drawing
the products and continued by exploring many options to solve such problems as had
been identified earlier. In the process, the students produced many drawings illustrating
their ideas for solving those problems, using them to communicate and discuss their
ideas with the instructor and peers in order to obtain feedback. For the final critique of
the product design drawing assignment, the students produced final line drawings of
their concluding ideas constructed from their participation in those discussions. The
emphasis on problem solving in design was also addressed by the faculty coordinator
when he discussed the difficulty of using traditional freehand drawing without use of
with the grid chart in design drawing saying:
...They struggle with making the drawing rather than making a problem-solution, and that is what design is about, solving problems. Drawing is for communicating your answer. That’s where a conflict comes in. Some people believe that you should learn to draw naturally, do it freehand naturally. It is my observation that it takes students 3-4 years of practicing drawing freehand all the time without using a chart, and three years later they draw like sophomores…

He added that, by using the grid charts, students were enabled to produce quality perspective drawing quickly and accurately while working on the problem-solution practice of the design process at the same time. In the process, they were trained in the ability to communicate and to be a designer, not to be the greatest drawer.

After the critique of the final line drawings of the product design drawing assignment, the instructors demonstrated the marker rendering process. Similar training was conducted in both class sections. Using a photocopy of the finished line drawing of a chair, the instructor set up a brick in front of the photocopy in order to obtain a lighting-shadow reference, then began marker rendering on the line drawing of the chair. The training was quite different from traditional practice, in which the student observes a chair model and produces an exact copy image in line drawing complete with lighting and shadow.

Because the discussion and activities of the two class sections were quite similar in this product design drawing assignment and marker rendering exercise, I will describe some of the discussion from both class sections in order to better illustrate the conversations that made up the critiques.
In the first homework critique of the product design assignment, the discussion started with students showing pictures of the products they wanted to work on redesigning. Students of both class sections appeared to be asked a similar set of questions by their instructors: what is wrong with the product, why does it need to be redesigned, what do you wish to change to make it better, etc. Some students already had rough ideas about what they wanted to improve in the selected product and some did not. For example, in TA Paula’s class, one student was thinking about redesigning a cell phone button for use by the elderly, while another wanted to redesign a car but had no specific idea yet about what needed to be redesigned. After going through the process of inquiry with the instructor, the student later changed from the car to another product with which he had more experience and was able to develop various ideas to redesign it. In TA Andrea’s class, one student wanted to redesign a desk lamp, and he was guided in the inquiry to think about expanding his idea beyond designing a new lamp shade. Another student wanted to redesign the shape of a coffee mug, and he too was guided to expand his investigation into functional problems of the mug. In this project, students from both class sections received feedback not only from the instructor but also from peers. It appeared that everyone had personal experiences and suggestions to share when discussing products and tools that we use in everyday living.

For the second homework critique of the product design assignment, students produced the first set of drawings of the redesigned product in perspective and orthographic views. The instructors appeared to guide the inquiry and discussion into two areas: how to correct the perspective problems in these drawings and how to improve the first ideas the students proposed. For example, in TA Paula’s class, a
student who proposed a redesign of an electric hot pot got help from the instructor to pinpoint problems in her perspective drawing, i.e., the round base of the container needed to be drawn using a curve, not a straight line at the bottom. Her first design itself looked too similar to the existing design, and the instructor helped expand her idea with inquiry such as: why would a customer choose to buy this design over the one already in the market in terms of its functions and its appearance, who is the target of this item, etc. In TA Andrea’s class, one student proposed a wall mounted printer. It was pointed out that his orthographic drawing needed improvement. For the design, he was questioned about whether he had thought about the inconvenience it would be to the user to have to drill a hole in the wall to install the printer and how his redesign idea would accommodate a user who moved his/her desk a lot. Another student proposed a design of a small coffee maker which could also make hot water for two cups of tea or instant soup. The instructor complimented her effort in developing such an idea but commented on its aesthetics, which looked awkward. The student then admitted that she had problems drawing ellipses and could not convey the shape she wished in her drawing, which at present looked like an attempt to combine different forms together. One student proposed an interesting idea of redesigning a toaster by relocating the toaster slots; however, he had only drawn the toaster slots without finishing the whole toaster in his first drawing. In fact, it appeared in the observation that producing the drawings in the product design project had become quite a challenging job for many students. As recorded in my observation notes, TA Andrea outlined the process of this assignment in a way which was intended to assist the students according to their needs: they should pick a product to which they could add a little to in terms of a new idea
and/or redesign; take a picture of the product; trace it; and redesign it. The instructor made some comments in her interview about the difference between the desk and chair drawing exercise and the product design drawing exercise:

It [the first assignment] lasts a long time. It was trying to break them into the idea of doing critiques and that you need to keep working on one thing, and, also, it’s more fun to them because that’s the first assignment and that’s where they’re trying to learn all their skills. So we start them on something simple because a lot of their chairs are very orthogonal, and straight lines, whereas when you get into products, a lot of the projects are ergonomic, and curved, and these are things I’m trying to teach them to draw.

She added another reason for choosing the desk and chair drawing practice as the first assignment rather than the product design drawing practice, saying “It’s an easier way to break them in than, you know, go out and redesign this toaster, with all these curves and that kind of thing. It’s a little easier to say, just come up with something from your imagination, like this chair.”

For the critique of the third homework assignment on product design drawing, the students needed to produce a tight line drawing of the refined product redesign idea in perspective and in orthographic view. Students who had handed in their first idea sketches the previous time now showed improvement in most of their technical drawing problems. For this group of students, the drawings conveyed much more clearly both ideas and details in drawing, and the instructors appeared to direct their questions toward improving the design idea. For example, a student who had redesigned an electric hot pot now had her problems in perspective drawing corrected. She also
proposed a new design concept of improving the pouring function of the hot pot by redesigning the hot pot handle and pouring spout in order to support the motion of pouring a hot liquid by turning the hand to the side, though her drawing showed that she was still developing this new idea. Critical comments she received included such ideas as: the form of the new handle did not match the form of the pot, the ideas of material and color needed to be clarified, etc. For another student, who had completed the drawing production for her final idea of a redesigned sweeper, the instructor asked questions about expanding design details and pointed out any additional design information which needed to be explained in the drawing plate. For example, in looking at the final drawing of this sweeper design, the instructor questioned whether the sweeper handle was designed so that it could be twisted. The student who wanted to redesign a coffee mug had come up with a redesign of the mug cover, though the instructor commented that there were other functions he might need to continue to explore, such as how the hand could be protected from heat when someone was holding the mug. Students of both classes were encouraged to continue improving their product design drawings and to obtain feedback from the instructor after this last homework critique of the project until the final portfolio was due at the end of the quarter.

Scheduled after the critique was the demonstration of the marker rendering technique to add realistic effects to the drawing. As this researcher pointed out earlier, the process of learning the practice of rendering lighting and shadow shading in design drawing appeared to be quite different from the traditional realistic drawing training process. In the rendering training process of the class Design 199, students do not have to draw an exact copy of a chair model complete with shading in order to produce a
drawing of a chair with rendering and to learn about lighting and shadow in drawing. In fact, it is this researcher’s opinion that, because designers draw in order to show an illustration of a product that has not yet come into existence, students therefore need to develop the ability to do marker rendering on a line drawing of this new product without using any model. In Design 199, the instructors from both class sections lectured about lighting and shadow in drawing using a brick and distinguishing the different shades of light and amounts of contrast appearing on the three surfaces of the brick. Then, by placing a brick in front of the line drawing of a chair to obtain a reference for the shades of light and shadow, the instructors began to demonstrate the rendering by transferring those shades and contrasts that appeared on the three surfaces of the brick onto the line drawing of the new chair design. The other technique used to assist in rendering in this class was use of the phrase “parallel remains parallel.” The phrase was intended to be used as guidance for rendering practice suggesting that, for example, if the light source is located on the upper left hand side, two parallel areas such as the surfaces of chair legs that face to the left would be rendered in the same shade of light or using the same shade of gray marker, though TA Paula commented in her interview that such guidance might not be helpful in producing shades of light on an object in very fine detail as close to reality as a typical fine artist would expect in his/her drawing. TA Andrea also explained in her interview that, because of the short training time for this rendering exercise, one practice outside class that she recommends to students is to take a photo of something and draw a replication of it. She explained the aim of this practice: “Because if I have a picture of that, I can study it, then I’m going to see, ‘Oh, well, the reflections or the shadows go this way,’ and just practically
you are learning how to *imagine* where shadows would be. In that case, it’s just observation.”

On the second set of surveys distributed at the end of the ninth week of the course, students were asked to identify from the listing four choices of tools and supports that they considered the most beneficial to the construction of their product redesign project (Appendix D). According to responses from the combined two class sections, the first place is the grid charts for perspective construction, the second place is the use of hand sketching ideas before perspective construction, the third place is participation in the classroom critiques, and the fourth place is a tie between the drafting equipment and consultation with instructor.

The top four ranking of the tools and supports beneficial to the product redesign project for each class section is slightly different compared to the combined data. According to the survey responses from TA Andrea’s class, the first place is a tie between the grid chart for perspective construction and the use of hand sketching of the idea before perspective construction begins, and the second place is a tie between participation in classroom critiques and consultation with the instructor. Third place is the drafting machine, and fourth place is a tie between perspective construction using the freehand technique and the copy machine. According to the survey responses from TA Paula’s class, the first place is the grid charts for perspective construction, the second place is the use of hand sketching ideas before perspective construction, the third place is examples of various designs of the product in marketing from handouts and magazines, and the fourth place is a four way tie between perspective construction
using the vanishing point method, perspective construction using the freehand technique, drafting equipment, and reference photographs.
CHAPTER 8

STUDIES OF EIGHT STUDENTS FROM THE DRAWING CLASS

As described in chapter 6, the second research proposition is interested in investigating the way students with different backgrounds and levels of drawing skill developed their perspective drawing skill in this class, Design 199, and what the instructional strategies and tools utilized in this class meant in their training. In this chapter, by telling a story of each student based on observation, interviews, and instructor comments, this researcher attempts to understand how each student participant who volunteered for the focus interview developed his/her drawing skill in this class. It is hoped that with such an understanding, the learning patterns can be characterized into different themes that describe the students’ learning of drawing skills in terms of communication practices in the drawing classroom.

From an examination of the different data sources in section 7.1, the content and drawing practices of the two class sections of Design 199 appeared to meet the different overlapping needs of the students, and the training evolved with a group of students that had various levels of skill and different backgrounds in freehand drawing as well. In the first survey, students were asked to identify their perspective drawing skill prior to taking the class by checking the choices provided. According to the responses, the
majority of the students, twelve out of twenty-one, had some knowledge of perspective drawing and considered their ability to produce perspective drawing to be at a beginning level. Three students in this first survey said they had no perspective drawing skill at all prior to taking the class, while three other students were aware of perspective theory but had never had a chance to develop the skill. There were only three out of the twenty-one students in the first survey who considered themselves skilled in perspective drawing and who said they could readily produce perspective drawing but were taking the class with the goal of developing their design skill.

Freehand sketching and fine art/still life drawing were two types of training the majority of students (17 and 16 students) in the survey had experience in prior to taking Design 199. Some students had training in engineering and mechanical drawing (14 students), and others had training in computer graphics (10 students), woodworking (9 students), and cartooning (6 students). It is noticeable that the majority of students had received training in freehand sketching and fine art/still life drawing before college. There were 7 students who had fine art/still life drawing training before college, 5 students who had been trained both before and in college during past quarters, 2 students who had been trained before college and in college in past quarters, and were taking another drawing course together with Design 199 in that same quarter. There were only 2 students who had received fine art/still life drawing training entirely at the college level. These number are similar to those for freehand sketching training prior to taking the class Design 199. It should be noted that an almost identical group of students checked both freehand sketching and fine art/still life drawing training in the survey form. However, this researcher did not follow up on whether they interpreted
fine art/still life drawing and freehand sketching as the same type of drawing production, or whether there might be other explanations to this similarity. Unlike the students with freehand sketching and fine art/still life drawing training, the majority of students who had a background in engineering and mechanical drawing as well as in computer graphics had received their training in college. There were two students who indicated in the survey that they had taken the mechanical drawing course together with Design 199 during that Spring Quarter. There was only one student in the survey who had experienced none of these types of training before taking Design 199.

The differences in students’ prior drawing skill was also apparent to this researcher during classroom observation. In contrast to the impersonal responses in the survey, I had a chance to get to know each individual student and watch the students draw and participate in class. In TA Andrea’s class, those who considered their background experience and level of drawing skill more advanced than that of the majority of the class included two new design students who had recently been accepted into the design program and one future applicant who had already had one year’s experience as a freshman in the design program of other college. Though they were quite confident and comfortable in producing the drawing assignments, these students did not exhibit a skill in perspective drawing that was far ahead of the rest of the class. A number of students appeared to be able to make quick progress using the grid charts and caught up with this group in terms of perspective drawing ability within a few weeks. This observation also appeared in the study by Anderson (1997), who said that the students’ drawing ability appeared to be equalized after the first couple of weeks of 3-D grid drawing exercises. Though TA Andrea mentioned in her interview that often in
this class students who had already been accepted into the program appeared to lack enthusiasm in their attempts to produce quality drawing assignments compared to those who were trying to get into the program and worked much harder attempting to produce the best possible portfolio to be used for entry into the program, from my observation in TA Andrea’s class, the experienced students appeared to be quite beneficial to the drawing training and the overall social exchange of the class. For instance, during the critique sessions, they often led the peer critique with interesting examples, such as proposing distinctive concepts in the student designs. They were also comfortable in breaking the silence during the critique with questions and comments when other students were not yet familiar with the process of participation in the design critique.

From my observation in TA Paula’s class, the difference in students’ prior perspective drawing ability was apparent in the students’ first drawing exercise in class when they were told to produce perspective drawings before the instructor began her instruction. In this class, the students who exhibited a drawing skill level above that of the majority of the class included: three design students who had recently been accepted into the program, four future applicants, and one senior art major. In fact, two of the four future applicants volunteered to participate in my focus interview. Therefore, I learned that they had attended design programs in other schools for a year or two before trying to enter the design program here at OSU. As in the other class section, there were students who started out with little skill but later exhibited the ability to catch up with the more experienced students within a few weeks. It was noticeable to this researcher during classroom observation that those students who had background experience in design and drawing were beneficial to the training of this class as they set examples in
drawing and presentation techniques for the rest of the class when presenting their work. However, despite the fact that there were a number of students with prior experience in design and drawing, few students participated in the discussion during the critiques. In this class section, a lot of the students social exchange occurred during one on one discussion with the instructor and among their peers outside the critique sessions. A student participant in my focus interviews who came from this class mentioned that discussion with an experienced peer was of benefit to his drawing development.

8.1. Report on Eight Subunits of this Study

As described in the second research proposition, this researcher will review each student as one subunit in the following investigation of how students with different backgrounds and levels of drawing skill developed their perspective drawing skill in this class. The first four participants are students from TA Paula’s class. Three of them were recommended to me by the instructor as having an interesting and different style of skill development. When asked about her technique for helping students gradually increase their drawing and design skill, TA Paula indicated in her interview that she changed her strategy according to the needs of each individual student. Therefore, in the discussion of each student from this class section, this researcher will also examine the drawing teaching strategy as a continuation of the investigation of instruction in the last chapter. The rest of the participants from TA Andrea’s class are students that the instructor viewed as making progress in her class in interesting and different ways.
8.1.1. Report of the first subunit of the study, a story about Mike

Mike was a sophomore student from mechanical engineering, who was taking the class due to his interest in switching majors into the design program and hoped to develop a portfolio to be used for entry into the program. This student had extensive mechanical drawing experience and perspective drawing experience using the vanishing point method prior to taking this class. However, both the instructor and the student himself appeared to be frustrated with his progress during the freehand drawing training of this class from the beginning.

TA Paula explained in the interview that she got quite frustrated working with Mike. Though she saw design potential in his work, such as in his concept of an alligator chair, which he proposed as a child’s chair, he appeared to have problems using freehand drawing to communicate his ideas. The instructor pointed out, for example, that the quality of his drawing was not clean and that he had no dexterity in his skill, as could be observed in the way he pressed the pencil too hard and was unable to move the pencil well during drawing. Therefore, the instructor introduced to him and this class a drawing exercise she often used in fine art drawing class to help students soften their pencil movement. Though she complimented him, saying that he appeared to have ability in design, it was only when he used the computer, not for his freehand skill.

Inquiry during the critique was another area which both instructor and student admitted was a source of frustration. TA Paula had to work very hard in providing inquiry to try to help Mike understand the concepts of design elements, such as those involved with lines, forms, texture, alignment, etc. From the observation, it appeared
that Mike did not pick up the point of inquiry in the beginning, but his last project in graphic design toward the end of the quarter finally showed some improvement resulting from the inquiry. During the interview, the instructor explained that her purpose in asking one question after the other was to understand what was in his mind so that she could help him. The instructor told me that, for Mike, she needed to use strategies different from the inquiry she used with the other students. During my observation of one of her critique sessions with Mike, the instructor not only asked questions but also demonstrated how to manipulate the drawing according to each question. The instructor mentioned this practice in the interview:

…that’s why I ask him questions one after the other, to help him … because if he shows something I can manipulate, something on paper so I can ask, “Which one looks better? If I move this one here.” I don’t know if you remember that I always put a white paper over different parts of the design and said, “Look at this work by itself; what do you think about this line? what do you think about contrast…?” And I kept asking one question after the other because I think the studio critique is one of the most important things.

Continuing her description of her inquiry strategy with Mike, she said,

…That’s why I keep asking him, “Do you think you need this? do you think you need that?” and there he needs to change the quality, he needs to move that. These are things he needs to be asking himself when he is designing. Besides asking himself, I think he also needs to ask for opinions and to see if another person thinks it is good…

The instructor added another reason for using “why” questions with Mike:
…Yes, I think they should be clear with the thing they are doing. They should be clear about what really comes first in their design. Sometimes they are not. It is so with Mike. He thinks, you know, maybe this looks good, but he doesn’t know why. So I ask him, “Do you think this one looks better? If so, why. For this one, you think we should move it? Why?” Because it is very important that they understand the elements of design. Why is it important about the line? Why is it so important about the contrast. Why do you think we should place this in the middle because of the alignment? You have to understand why it is good to repeat certain patterns and why sometimes we don’t need to repeat certain patterns, because it’s going to look cloudy or busier. So those are things that they really need to understand when they are designing. So that’s why I think these have helped him a lot, all these questions. I mean, I know sometimes the students, they don’t like it…

She added, “I need to ask questions because I don’t think that when a student says ‘yes,’ ‘OK,’ it means they get it…. So, I need to ask them again.”

From my observation, Mike’s drawing skill and design skill showed some improvement after the inquiry event when the instructor demonstrated those manipulations accompanying her inquiry late in the quarter, though I do not recall whether he received only verbal inquiry in the beginning. From my observation notes and according to the instructor, he completed only partial homework assignments most of the time and did not meet with the instructor to get extra help early in the quarter. By the second half of the quarter, he had attempted to complete all the drawing assignments for the final portfolio, and the instructor appeared to be able to help him more in his
progress. Once the instructor was able to see the drawings on plate, she was able to demonstrate how to manipulate them using the inquiry, though the student admitted in the first interview during the first half of the quarter that he felt intimidated by the inquiry. Mike also mentioned that he benefited from discussion with classmates such as Dan, one of the student participants in this focus interview group who had prior design drawing skill.

8.1.2. The second subunit of the study- a story about June

June was a senior from the Textile and Merchandizing Department, who had taken this class since it was offered as an alternative to one of the requirements in her major. The student was graduating that quarter, and Design 199 was the only class she was taking; therefore, she had plenty of time to contribute to this class. It was quite interesting to this researcher that she was the only student participant who replied that she did not have any background training in perspective drawing at all. However, during the first interview, this researcher looked through the drawings she had produced for the first drawing assignment given in class prior to the instruction and noticed that she was able to draw a cube in perspective. When I asked her about the drawing, she replied that she had drawn the cube “just as it is.” In the same exercise, when the grid charts were given to the students without instruction following the freehand drawing, June tried to use them to produce a cube the way she had drawn it previously, but admitted it confused her quite a bit, as she did not know that she was not supposed to move the tracing paper around. Therefore, trying to understand how she developed her skill in this class was quite a puzzle for this researcher in the beginning.
In the interview, June explained to me that she was quite frustrated trying to produce the first assignment because she was unable to understand 1-point and 2-point perspective. In that quarter, students had only one day to produce the first homework assignment which was given on Tuesday and due on Thursday during the critique. So June admitted that she had gone to get help from a friend, a graduate student in the Art Department, who helped her by explaining both the perspective concept in the vanishing points method and how to use the grid perspective. From listening to her explanation, this researcher began to develop the understanding that, in fact, what June meant by “not understanding 1-point and 2-point perspective” was in fact that she did not understand that these are “coding,” or terms designers use to specify the perspective drawing support structure by its viewing angle. Moreover, she had never had any experience using such structures to produce a drawing, even though she understood that when producing a cube in realistic drawing, the part which is further back needs to be drawn smaller. This researcher should remark that June is an international student from Japan and her art education prior to her college in the US may be different from that of the rest of the class in terms of both curriculum and technical drawing experience.

With a peer outside class providing tutoring and coaching, June was able to complete her first homework assignment. From my classroom observation, June was one of only two students in the first homework critique of her class section who handed in a technically correct perspective drawing, and the instructor did not have to provide any technical help for her drawing. In fact, I noticed from the observation that June also was one of the students who completed homework assignments and had them ready by every critique session, although her perspective drawing in later assignments was not as
perfect as in the first one and she received a lot of technical help from the instructor. This was due to the fact that the level of difficulty increased in later assignments and she attempted to challenge herself by producing all of her designs in organic form, which is not simple to produce in freehand perspective. June credited the 3-D grid chart as the most essential tool for her understanding and her ability to produce freehand perspective drawing.

In watching June develop her skill in class, this researcher realized that the ability to complete the homework drawing assignments and have them on the display board for every critique session allowed her to keep up with the critiques and enabled her to make progress along the schedule of the course. From my observation, June always came back with a drawing which was improved with some adjustments after each critique. Therefore, the instructor was able to move the inquiry into design aspects, providing additional criteria for her to be using to manipulate her drawing in each class. For example, after she had explored and successfully produced a drawing of a chair resembling an organic S form, the instructor started an inquiry into the function of the chair, whether it would be stable enough to sit on, and the ergonomic and comfort issues. In the next class, after June had made some adjustments to that chair, the instructor began to ask questions to lead her to think about marketing issues, target users, manufacturing possibilities, etc. It appeared to this researcher that this process only helped student improve their skill if they worked hard on manipulating and exploring the ideas in their drawing in each and every class. Though June had the advantage of having a tutor outside class to assist her with her technical drawing problems, other students were able to benefit from outside class tutoring too by getting
extra help from the instructor during her office hours. A couple of students in my focus interviews revealed that they had made good progress by getting that kind of help from the instructor.

TA Paula explained that June appeared to have graphic background skill. Describing her work, she said:

…She really knows how to apply the concept …and she starts to involve it with color. The composition, the positioning of her paper is very neat, I mean, she’s neat too. You can tell that she has gained this information and all these concepts, how to manipulate the color, how to manipulate lines…

TA Paula further said that she used another inquiry strategy with June. With Mike, she asked him questions of “why.” For June, she said, “Show me.” From observation, the instructor appeared to have a discussion with June, but without having to question her or demonstrate how to manipulate the drawing along the lines of the inquiry in the critique since she already had reasons for why she had adjusted her design in that way. In order for June to continue to explore her ideas using drawing, the instructor asked her to produce different choices after they had discussed what those other choices might be, and the students often argued to support her first idea against other possibilities. TA Paula explained this approach saying, “…because she could see it. You see, sometimes students need to see it by themselves.” From a conversation with her during the interview, this researcher realized that June had gained skill in using a visual medium for communication from the training in her major. For example, she was the first student in the class section to add a color scheme index alongside the drawing of her chair. June told me that this was the practice she used when recommending
furniture textile material and color to clients. Her skill in visual observation was apparent in a textile report for which she had researched different historical techniques used in sewing and draping fabric for decorative purposes. (June brought the report to class to show the instructor the type of report binding she planned for her portfolio)

8.1.3. The third subunit of the study, a story about Dan

Dan had his background education in the design program, but he did switch majors during his junior year and later graduated with a non design major degree. This student was considered one of those who had some background in drawing training and a level of drawing skill above that of the majority of the students in the class. He took Design 199 because he planned to reapply for entry into the design program again so that he could get a design degree and switch his career to design, which he preferred to his current job. Dan was working full time and going to school part time; Design 199 was the only class he was taking that quarter. Dan explained that he had been a student in interior design during his past education but he planned to apply to product design this time. This researcher was quite curious about why he was taking this class because the perspective training might be too basic for him. The student explained that in fact he needed to develop his freehand perspective drawing skill because during his year in design school he had actually struggled with the problem of being unable to draw well, but somehow managed to get by.

In the interview, Dan revealed that he did not like to use the grid chart and the overlay, and he attempted to do all assignments in freehand using only opaque paper. He had the impression that all the experienced designers he met demonstrated the
ability to produce their ideas using freehand drawing fluidly without using any support tools, and he hoped to be able to develop his drawing ability to reach such a level.

In examining the drawing he produced for each assignment in class, this researcher noticed that his prior drawing skill level allowed Dan to be able to produce freehand perspective and to complete each assignment easily without using the chart or going through the process according to the course plan. Therefore, I asked TA Paula for her comments, as I wondered how the student would benefit from this class. In an informal conversation after class, the instructor pointed out that, although Dan appeared to produce many perspective drawings to show his ideas and those drawings were technically correct, those drawings were lacking in variety; they were all similar with very few adjustments. After this conversation with the instructor, this researcher went through the observation notes again and realized that the instructor had recommended to Dan in many critique sessions that he should try using an overlay paper to explore and manipulate his design ideas in drawing. During the interview with TA Paula, the instructor pointed out that Dan had been in design school before and his skill was apparent in his drawing; however, another area she thought he needed was rendering. The student missed two classes that quarter and both were rendering classes. Moreover, he had used computer rendering for his rendering homework assignments, which was not allowed for that project. In the rendering exercise, the instructor mentioned that her intention was to see whether the students were able to capture and produce lighting shades and their transition by freehand rendering. According to the instructor, by using pencil and prisma color, “you are able to think, you are able to manipulate in a certain way.” The computer rendering only produced the final work for the students; therefore,
they did not have to go through such a process. One thing this researcher noticed in Dan’s drawing early in the quarter was that Dan did not draw a human figure with his design drawing as required in each project. When asked about this, Dan replied that it was not easy to draw a figure well in the right proportions.

From the classroom observation, Dan appeared to be beneficial to the class as he set an example by always presenting completed homework which was done in another level of drawing skill and presentation technique compared to the rest of the class. During the critique, he always proposed interesting design concepts in his drawings and introduced interesting criteria for reviewing the design. His classmates learned about design drawing from discussion with him; for example, Mike had mentioned in his interview that his discussions with Dan were helpful to him. The class also learned by watching and listening to the instructor critique Dan’s drawing because there were many details in his drawings that the instructor was able to point to and talk about. For example, in one class meeting late in the quarter, the faculty coordinator made a visit to the critique. His comments about Dan’s work included the observations that the way he had placed the color pattern behind the chair and desk drawing was not helpful for presentation purposes because viewers could not see the detail design of the desk and chair well. Another comment was that Dan’s perspective drawing appeared to be done from a low viewing angle and the design was not as presentable as it should be. He said that the student needed to use the grid chart so that the perspective drawing would better present the design.
8.1.4. The fourth subunit of the study- a story about Pam

Pam was a transfer student from another university. She had done the design fundamental classes during her freshman year prior to coming to this university and was interested in applying for entry as a visual communication major of the design program here. That quarter, she was taking a full load of classes along with Design 199 because she was in the process of applying for her major, and there were other disciplines she was interested in applying to besides design. Therefore, she had to take a number of classes to support those application processes.

According to TA Paula, Pam appeared to have background skill in both freehand drawing and computer skill quite similar to June’s, though the instructor commented that she had to work with Pam a lot in the graphics area because it appeared that she still needed to practice how to manage graphic elements along lines of visual concepts in the principles of design and elements of design, for example, how to manipulate and organize certain elements in her design through the use of contrast and the use of alignment.

In the interview with the student, Pam said she did not have any problems with using the grid to produce perspective drawing. She had started out by using product design grid chart no. 4 which already had a line drawing of a chair contained in the grid. This way, she could begin manipulating the basic chair right away without having to draw the basic shape of a chair first. Most of her designs were in organic form, and she benefited from the grid structures to help plot those designs. Pam showed me some of the idea sketches she had done before placing those designs on the grid, and it was apparent that she already had freehand drawing skill. As the quarter went on, Pam
appeared to concentrate on working more and more with her idea sketches, and, in fact, the quality of her freehand sketching later improved almost to resemble her final line drawing. This researcher sat by her in one class during the product design project critique session and asked her why she had decided not to present her work during the critique even though her work looked more complete than that of many students who had presented their work that day. The student replied that it was because her plate was not yet complete and she had not finished placing all the ideas and information she had developed there yet. It appears to this researcher that, for students who already have some background in design and drawing, the drawing projects in this class become a lot more like design projects to help them efficiently integrate thought (speech) with their production skill, and somehow her thought (speech) had become so productive that later in the course her drawing or production skill was not fast enough to accommodate her thoughts.

When asked about the benefits of communication with peers inside and outside of class, Pam explained that she often got feedback and comments on her work from family members, especially her mom. But the instructor appeared to be the greatest influence on her work because, as she said, the instructor pointed out to her many things she had never noticed by herself and helped her “see more.”

8.1.5. The fifth subunit of the study- a story about Kim

Kim was a freshman and was taking Design 199 in order to build her portfolio for applying to make design her major. In that quarter, the student explained, she had taken a full course load. Together with this class, she was also taking other drawing classes, including a drawing class offered in the Fine Arts Department and an
engineering drawing class offered in the Engineering Department. Besides the Design Department, Kim was also interested in applying to the School of Architecture. She had some perspective drawing as well as engineering drafting background at the high school level. Kim was one of the students this researcher mentioned earlier who received the benefit of consulting with the instructor during her office hours from the beginning of the quarter, and this enabled her to improve her drawing skill along the schedule of the course.

In the interview with TA Andrea, the instructor observed that Kim was one of the students who was progressing well in her class. According to the instructor, the student appeared to have come to class with little background skill in perspective drawing and had become really frustrated and intimidated in the beginning. Kim came to her office during office hours to get help early in the quarter. In the consultation, the instructor went over the first demonstration she had done in class of how to use the grid, then let the student repeat the process with her. Describing the meeting with the student about the chair drawing, the instructor said:

This was the first one with the chair design. She had a medieval type chair with arches on it, and, you know, once she sat down, she was like, “Should I draw a line here?” and I’m like, “Well, think about this,” and once we went through this, then she got it, and now her drawing quality is great, she doesn’t have issues. But I think she’s one of the ones that has the best drawing ability, in that she gets her angles correct.

The instructor mentioned that in the class, there were students who sometimes just panicked and asked her questions, or just left things out. But those who wanted to
do well, like Kim, really wanted to know how to draw certain things and sought extra help from the instructor because they were trying to get into the department so they were taking the class seriously.

8.1.6. The sixth subunit of the study- a story about Claire

Claire was a freshman majoring in communication. She had taken Design 199 for elective credits. She had some background drawing training from the high school level.

In an interview, TA Andrea said that Claire was one of her better students. The instructor said that, despite the fact that the student was taking the class as an elective, she was taking the assignments seriously. According to the instructor, Claire always asked questions, so she learned more as the instructor responded with demonstrations. Another important factor was that, though she started out with little drawing ability, the student wanted to do well and tried very hard. TA Andrea complimented Claire highly for her improvement in the interior design drawing project, in which she was able to make significant advancement after the first homework critique session on interior design drawing,

… Claire’s really made advancement from her first interior…drastic improvement in the second [critique] because I had talked about things she didn’t have, like uniform concepts, and pointed them out to her, and she worked really hard and she came back and she had a great designs. But you’ve just got to make them aware.

From my classroom observation, Claire made interesting progress beginning in her first project in chair and desk drawing. She was one of the few students who
brought in her first homework drawing of a chair along with a concept. In her chair concept, she adapted the posture of a human sitting into a form for her chair design. Although her first homework reflected her limited skill in perspective drawing, she got help from the instructor to correct her technical mistakes. Then she came back with another idea of a form of chair adapted from a hair clip, which was more difficult to draw that the first one, but she somehow managed to sketch out the form. Later, in my interview with Claire, she brought in her sketch book to show me different ideas of chairs she was trying to explore by sketching them out in freehand perspective with color. It was quite impressive to this researcher how quickly she improved from her chair drawing in the first homework assignment.

From the conversation with her during the interview, this researcher also noticed an interesting practice Claire developed from attending this class. In the last chapter, I described how successful the practice of peer critique appeared to be in this class section, and Claire indicated that such participation was very beneficial to her design and drawing. By the third project of perspective drawing of a product design drawing, Claire described her drawing production process by saying that she started out with a very rough idea without any concrete direction by producing loose line drawings and brought them to class in order to obtain feedback and different ideas from the instructor and classmates. Then she would gather those ideas and suggestions and use them to further develop and extend her idea for redesigning the product. In other words, the student built her idea sketch with the help of her peers. This researcher found the practice to be quite interesting because typically a designer begins to gather ideas and
builds them into an identifiable form for him/herself before taking them out to receive feedback.

As this researcher indicated earlier in Chapter 7, there were some students whose development appeared to follow the order as described by the faculty coordinator. Claire was one of the students in that group. In one classroom observation, I watched Claire working on finishing up perspective lines for the details of her interior design drawing for the fourth homework critique of the interior design drawing and realized that she could produce the drawing well without using the grid chart and the overlay. She explained that she could now produce perspective drawing by just placing the grid by the side as a reference.

8.1.7. The seventh subunit of the study- a story about Vicki

Vicki took Design 199 in order to develop her portfolio for application into the design program. The class was the only course she took that quarter because Vicki was working full time and going to school as a part time student. A couple of years previously, she had spent one year as a freshman in the design program of another university. Moreover, she had already enrolled in the class Design 199 once in Autumn 2002, but had had to drop the class late in the quarter due to a health problem. Therefore, Vicki not only had some background skill in design and drawing, but also had experience with drawing training using the grid chart in the class Design 199 prior to taking the class again in Spring 2003. TA Andrea commented about Vicki during the interview, saying:

No, I didn’t see what she did the first time, but I think where she started from to where she is now, I think she needed a lot of improvement. She might just have
a more natural knack for doing graphics, than maybe doing interiors, but she
tried really hard. She calls, she comes to office hours, so she puts in a lot of
effort. This is what I mean. You can’t expect them to know everything when
they come into the program. That’s why they’re trying to come in, to learn to do
these things…

From the classroom observation, Vicki appeared to have no problem in
understanding perspective concepts and how to use the grid chart. However, she used
the chart in her own way. Unlike other students, Vicki made many photocopies of the
grid charts, then produced drawings of her idea sketches right on those grid charts
without using overlay paper. The student explained that this was because it was difficult
for her to see the complex grid lines underneath the overlay paper. It is this researcher’s
observation that many of her designs, such as the chair and desk drawing that appeared
in the final portfolio, were in fact similar to her first idea. By using the grid charts,
Vicki could work on exploring the drawing of different shapes and forms graphically
herself without the need for the instructor to guide her in that area. However, those
graphic lines and forms needed to be turned into objects in space by using drawing
techniques to produce realistic 3-D effects. It appears from my observation notes that
the instructor provided help to Vicki, for the most part, in terms of technical drawing
problems such as a missing detail perspective line, realistic effects such as thickness of
material, stability of the chair when someone sits on it, etc. It is this researcher’s
opinion that Vicki began her drawings with graphic lines and forms, then tried to
rework them into 3-D objects. Therefore, the student later utilized drawing to work on
solving the problem of making her chair stable, and it appears as if she attempted to
work with a mock up model of the chair, but using perspective drawing on paper, which is quite challenging to do.

During the critique sessions, Vicki appeared to be quite helpful in that she was comfortable in speaking up and leading the discussions, even at the beginning of the quarter, at the time when the majority of students were not yet familiar with participation in the critique process. This researcher views Vicki as an integral factor in helping establish the peer critique in this class section. With her prior experience, she was able to point to details in the drawing and give interesting as well as humorous comments on her classmates’ works, therefore helping to develop a pleasant discussion among them.

8.1.8. The eighth subunit of the study- a story about Brian

Brian was the only student in the focus interviews who had recently been accepted into the design program at this university. The student explained that he had perspective drawing training in his early years and had no problem understanding and producing the drawing. This student participant had only one interview session with this researcher because he was not interested in participating in the second interview.

TA Andrea commented in her interview that Brian was already skilled in perspective drawing, but observed that those students who have already been accepted into the program often appear to lack enthusiasm about doing good work in this class compared to those who are trying to get into the program. The instructor felt that this attitude somehow holds them back from benefits they might have overlooked.

From the classroom observation, it appeared that each of the homework critique sessions became a critique of Brian’s design development more than his drawing
development. Brian came to class with his first idea in a sketch, then consistently made improvements in his design in each critique session. In the critiques, the instructor’s comments on his works were focused toward function and aesthetics. In this researcher’s view, Brian’s work on his drawing took an opposite direction compared to Vicki’s. For example, in the drawing assignment of the chair and desk designs, Brian proposed the design of a chair for a guitar player. He first drew simple blocks just to explore the function and ergonomics of the seating and a foot rest. After he received the instructor’s comments on its form, that the chair looked similar to a trash can with a foot paddle, he started to adjust the graphic form and worked on the aesthetics of the chair. He was one of the students who used the computer in the rendering assignment, which was not acceptable for that assignment. Nevertheless, his work and the design concepts he presented in each class helped provide examples for those who were still developing their skill both in drawing and in design.

In this researcher’s opinion, Brian is another student who helped make the peer critique in this class possible. In class, he was comfortable speaking up to make comments and helped point out different functional elements and factors that novices who were still developing their observation skills had not yet noticed. His comments were made in a friendly manner similar to Vicki’s, and somehow his classmates appeared to feel at ease joining in and adding their comments too.
CHAPTER 9

SUMMARY, IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSION

In a qualitative research study, the story told may be viewed and interpreted in different ways. In this research study, the researcher has attempted to view the story according to the interpretation process as described in the research methodology, in Chapter 6. The event of the 3-D grid drawing instruction, including social interactions and the participants’ use of tools, will be read along the lines suggested by former research studies guided by the zone of proximal development theory, particularly in the areas of scaffolding and the cognitive apprenticeship concept. Thus, the paradigm of the practice of drawing for communication observed in the practice of the class Design 199 has been expanded according to the propositions for investigating the instructional strategy and the concept of drawing for communication, and will be described and discussed in the following sections.

9.1. Interpretation of the Instructional Strategy of Drawing for Communication

In the first research proposition, this researcher proposed from document analysis of successful drawing manuals from different disciplines that the freehand drawing instruction using the 3-D grid appeared to be parallel to the immersive
approach of the second language teaching and learning strategy. In particular, the way
the 3-D grid enables the novice to begin his/her first drawing practice without having to
go through traditional training such as that of Edwards (1976/1989) to separate
symbolic meaning from an object in order to develop skill in producing a well drawn
image of such an object first, then learning to integrate the drawing production skill
with speech later. In the other words, as students develop their freehand drawing skill, it
will be integrated with analytic and descriptive speech from the beginning.

Because drawing is different in many ways when compared to language skill,
investigations in the research phase sought to better illustrate the drawing instructional
strategy by incorporating the means of training generated in the classroom
communication and social interaction.

Conducting the study with two class sections of Design 199, in which this
instructional method is implemented, this researcher had an opportunity to observe the
whole process of perspective drawing instruction, the student development, and the
social interaction of the class. To illustrate the drawing instructional strategy, this
researcher would like to begin by providing a description of the social events of the
class, and this description will be followed by an interpretation of the drawing
instructional strategy.

Social communication events of the class Design 199

From an overview of the class concepts, description and requirements, it was
noticeable to this researcher that this drawing class is conducted differently from a
drawing class with a typical format. In the traditional class, most of the class time is
devoted to studio drawing by having the students working on their own drawings in
class with occasional consultation with the instructor and a couple of scheduled meetings to review all student works together. From the syllabus schedule and classroom observation of Design 199, it appears that most of the class time of Design 199 is devoted to critique sessions, which this researcher will regard as the main social communication event of the class. The main event is accompanied by other necessary events, including lectures and demonstrations, in which the instructor provides information with modeling and a tutoring process and the students listen and/or do some practice exercises in class. Another is the individual consultation or tutoring which occurs in the portion of time left in each class after these two events, and also outside of class time. For the most part, the students practice freehand drawing skill by producing homework assignments outside the classroom.

The social events and classroom activities as well as the three major drawing assignments indicate the intention for the learning to occur in a real situation similar to that of a designer studio, where the knowledge and skill developed in this class will ultimately be used. It is apparent to this researcher that the faculty coordinator “situated” all drawing assignments so that they closely resembled drawing practice in a design studio, which would be characterized by the three social events. Although the critique session in this Design 199 drawing class appeared to resemble the design studio critique, this researcher views the practice as a ‘mocked up design studio critique’ because the critique of student work in this class has as its primary aim the development of freehand drawing skill and the greater part of the critique is devoted to helping students with their technical drawing needs. The drawing training is situated in a format with the appearance of design studio practice in order to provide the
prerequisite design training for those who will be entering the program and to enable non majors to communicate with designers using the drawing skill developed within situations approximating design studio transactions.

In this overview of the class, this researcher would like to describe the critique session, or the main communication event, as an integral part of this class in which students learn and develop their skill by communicating with others, and the time spent on homework is when the student develops his/her skill by communicating with him/herself. From observation and the interviews with the instructors, this researcher concluded that, after some practice in class following the lecture and demonstration, students are expected to produce most of their work outside the classroom at home and to be prepared to present their homework, which is due in each critique session. In the presentation, students are expected to develop a discussion with the instructor and peers as they talk about their work as well as problems that occurred in the production of their homework. Both instructors kept reminding the students that each homework assignment would usually take more time than they had expected. In fact, it was important for the progress of the students that they had the assignment on a presentation board for every critique because, as determined from the classroom observation and instructors’ interviews, the skill development depended a lot on the amount of work a student produced and put on the board so that the instructor could establish sufficient inquiry and discussion with the students. After the critique, the students needed to take those questions from the inquiry and ideas from the discussion home and use them to question and discuss with themselves as they developing their drawings for the next presentation.
The critique session, or the main communication event in this class, can be well described and well marked by the requirement of using a display panel. On the first day of class, students were given instructions on how to construct their own individual display panels to be used for displaying their drawings at each critique event. Their drawings, on 8 ½ x 11 paper, needed to be mounted on the panel before class time, and the panel needed to be ready in front of the class for the critique. On the syllabus schedule, the event is marked as “critique: designs on panels at beginning of class.” As an introduction of the first homework critique, the instructor explained the practice of constructive criticism as a guideline for the exchange of comments and the social manners expected in the classroom critique event.

**Seven methods in the drawing instructional strategy**

In the class Design 199, the training to develop perspective drawing skill for non art majors and incoming design students, using means of communication characteristic of design studio transactions, can be captured and characterized as seven tutor’s tasks. The drawing instructional strategy can be seen as comprised of two major areas of tutor tasks. The first area of tasks is to acquaint students with scaffolding tools for supporting drawing production and terminology for communication and social exchange. The purpose of these tasks is to enable novices to participate in the main social event of the class or studio critique from the beginning of the training using the drawing production skill they are developing. The second area of tutor’s tasks is to provide drawing training through the design studio inquiry and social exchange while moderating the critique event. The novices are expected to establish the designer’s situated perspective drawing skill as they go through the process. The seven tutorial tasks described in relationship to
drawing skill development and the communication process are discussed in the following sections.

9.1.1. Acquainting students with terminology and practices of drawing supporting tools and the dialogue used in the transaction events of the class

On the first day of class, the instructor went through the syllabus, particularly by pointing out the requirements. In contrast to those of other drawing classes, the requirements indicated in the syllabus emphasized both the student drawing outcome and class participation. This researcher could see that the syllabus provided guidelines not only for the content of drawing exercises required for each assignment but also the presentation schedule for each meeting.

The technical terms 1-point and 2-point perspective drawing were explained to the students using the vanishing point method. Then the 3-D grid charts or primary tools used for perspective drawing in this class were introduced in relationship to the vanishing point concept through verbal explanation and a drawing demonstration. The terms 1-point and 2-point grid perspective refer to the two different structures of the perspective drawing support frame built by using the 1-point and 2-point vanishing point methods; the structures offer two orientations for the object being drawn according to two different viewing angles. The use of scale figures and dimensioning techniques was another emphasis from the beginning of the class. In fact, this researcher noticed that most of the trained designers including, for example, the faculty coordinator and TA Andrea, always identified the design they were working on and talked about it with dimensions. Therefore, this researcher would like to regard the scale figure and dimensioning techniques as a spatial dimensioning code. Thus, students were
introduced not only to the drawing support tools, but also to two sets of codes: 1-point
/2-point perspective and the spatial dimensioning code. Students needed to understand
and be able to implement the codes in their drawings in order to participate in the
designer conversation.

9.1.2. Modeling the skill of drawing a basic image of an object from visualization

On the first day of class, the instructor provided a drawing demonstration of
drawing using the grid chart. Unlike traditional practices, students in this class were to
draw a visualized image of a chair without using any chair model and without having to
practice separating the symbolic meaning of a chair in order to produce a well drawn
image. Instead, the production of a perspective image of a chair from the student’s
visualization was made possible by use of the 3-D grid chart to provide a scaffolding
structure at the production level. The chart also supported the ability to draw a
visualized image spatially with dimensions in perspective. Based on a conversation with
the faculty coordinator, this researcher would identify use of the 3-D grid chart with a
familiar instructional technique, a scaffolding/fading process. The need for the 3-D grid
chart as an underlay was expected to fade out as students increased their perspective
drawing skill and became capable of producing the drawing independently from the
drawing support structure.

9.1.3. Modeling the combined skill of cumulative editing and spatial editing of the basic
image drawn from visualization

The faculty coordinator emphasized the use of a translucent overlay paper
accompanied by the grid chart. To help the students understand the purposes of these
materials, the instructor provided a demonstration of manipulating a basic image drawn
from visualization by drawing over the basic image using a translucent overlay paper. This researcher’s explanation of this drawing practice is that the grid chart provides scaffolding at the drawing production level to enable the students to draw with integrated symbolic meaning, and to enable them to draw spatially when making changes to the chair image as well. The translucent overlay paper offers the advantage of being able to edit the drawing while accumulating evidence of past adjustments, for the purpose of increasing the variety of redesign ideas. It appeared to this researcher that, in the drawing manipulation process, the instructor demonstrated a technique of exploration which the student could implement to produce drawings and see other design possibilities in incremental numbers. Moreover, in the first set of handouts, photocopies of different designers’ chairs were included so that students could observe and be influenced by other design possibilities. These influences were expected to increase productivity in the drawing exploration.

In both demonstrations, the instructor implemented modeling strategy using drawing production support tools to help students realize that it is not difficult to draw and edit perspective drawing and to produce different designs of the chair as well as using these tools. It is also hoped that the drawing skill will increase as the students have more practice due to their interest in exploring the production of different design possibilities.

9.1.4. Cultivating skill in cumulative editing of the drawing along two different discourses

In the main communication event of the class, the critique of the chair and desk homework assignments, the two main areas of discussion in the critique appeared to be
the technical perspective drawing problems students had in their drawings, and the
design ideas students had for their chair and desk designs. For the technical drawing
problems, the instructor would pinpoint the problems for students and provide
additional instruction about how to correct their mistakes. In this discourse topic, this
researcher could see that the instructor’s words would shift the students’ attention from
seeing the chair into seeing the lines and perspective angle as they tried to detect and
correct the drawing mistakes pointed out to them, for example, the perspective lines
were off, the back desk legs looked too short, etc. The grid chart therefore provided a
reference for perspective line and angle in checking for and correcting those drawing
mistakes. Moreover, some students had to give attention to the construction of an
additional grid for drawing details such as a desk drawer handle, etc. In the other
discourse topic, the instructor would talk about a drawing by shifting the students’
attention from inspecting perspective lines and angles to seeing the designs and
functions of the chairs and desks. This discourse topic included such comments as: the
chair does not look stable, the chair seat needs a cushion for comfort, a desk drawer
handle might not function well because its shape or the scale is wrong, etc. While the
design was being adjusted, the grid chart appeared to provide scaffolding support at the
production level so that students could concentrate on correcting the designs of their
desks and chairs in terms of such criteria as function and aesthetics. In the process of
developing the design, students were expected to utilize the comments and questions
obtained from interpersonal conversation with the instructor in communicating with
themselves as they adjusted the design.
The instructors also provided a drawing demonstration in the next assignment, which was the practice exercise on drawing circles in perspective. During the homework assignment critiques, technical drawing problems were pinpointed and corrected, and additional realistic drawing techniques were modeled, though the technical drawing aspect was the focus of the discussion in this drawing exercise. In this exercise, the grid chart appeared to provide a perspective structure used to support location plotting because all drawing lines were curved and only plotted spots were needed to guide the curve construction.

The instructional methods identified during these drawing assignments can be described as modeling, coaching, and scaffolding. Particularly in the chair and desk assignment, the method appeared to support both the development of drawing production skill and the communication process with the assistance from the use of the grid chart for scaffolding at the production level. According to research studies in instructional strategy, those three methods are recognized in many disciplines as being helpful in student development by means of observation and guided practice. In terms of drawing training, particularly in this class Design 199, this researcher noticed that these methods and tools were quite significant for the students’ development by means of visual observation and guided drawing practice to help students see, visualize, and, particularly, to discuss and manipulate visual information with others interactively, because the design drawing training in this class does not focus on observation drawing. From classroom observation and as stated in the focus interviews, many students agreed that their awareness of visual detail information developed in this class was derived from what the instructor and peers pinpointed, discussed, and helped them “see”
9.1.5. Modeling and coaching skill in drawing converted view images from visualization

In the lecture/demonstration event at the beginning of the interior design project, students learned to develop an interior floor plan and elevation view drawn from the scene of a room they had actually observed, then to construct perspective drawings of the interior room from those views. This researcher would like to point out that, unlike the first assignment, in which students only drew an image of a chair as they visualized it using a 3-D grid perspective, in this assignment students needed to convert the actual view of the room they had observed into a floor plan view in their visualization, then draw the floor plan from their visualization. From class observation of the lecture and demonstration event, in order to enable students to draw the floor plan, the instructors demonstrated how to transfer the scene of an interior room to dimensions and use the dimensions to construct the floor plan. A set of 2-D square grid charts for the interior floor plan and elevation view were provided to support construction of those views using measurements taken from the actual room. To assist in the drawing construction, the instructor provided verbal description to help students visualize the floor plan view from the observed view of the room. Following the completion of those views, the perspective drawing of the interior room was to be constructed by assembling the floor plan and elevations together on an interior perspective grid chart.

According to the syllabus and based on classroom observation in TA Andrea’s section, one class meeting was scheduled specifically to help students develop skill in constructing those view drawings and utilizing them in building perspective drawing, in order to ensure that they gained such skill before moving into the critique of interior
redesign of a room. The discussion on the student homework assignment was focused on the technical aspects of the drawing. In the class, the instructor spot checked the correspondence of information appearing in every view including floor plan, elevation, and perspective, then made students aware of their mistakes and provided additional drawing projection techniques for making corrections. This researcher developed a deeper understanding of this drawing training from the focus interview with TA Andrea, as she addressed the importance of utilizing all those views together when designing the interior of a room. In the classroom observation, this researcher noticed that students who picked up this drawing skill appeared to be able to “see interior perspective in a combined view.” For example, in the following class during the peer critique, some students were able to point out that windows were missing from the perspective view as they checked the floor plan and elevation when viewing the perspective drawing of a classmate.

According to observation and the interviews, students utilized the interior perspective grid chart as a drawing support to help them produce their early idea sketches in perspective right away. In this researcher’s opinion, the interior perspective grid charts were of benefit to students as they provided scaffolding support at the drawing production level and allowed students to concentrate on developing their first idea sketches by drawing along with speech (thought) and inquiry. Although the process of drawing different views of an interior room in order to construct a perspective view is itself an important practice, it can be seen not only as scaffolding for drawing the redesigned interior to make the redesign task easier but also as a way to make the communication process more efficient as the students explain their redesign idea both
for themselves and to others using different view drawings of the redesigned room. The benefit can be seen in particular when the redesign is done along lines of the comments of different discourse topics, a process which this researcher will explain in the following section.

9.1.6. Cultivating skill in cumulative editing of interior perspective drawing using combined views, and along lines of three different discourses

In the main communication event, the critique of the interior redesign homework, the three main areas of discussion appeared to be the drawing technical problems, the design and function of space, and the graphical organization of interior decoration according to design principles (handouts). For the drawing technical problems, the instructor provided coaching by identifying mistakes and helping students correct them. In this discourse, because of the use of different views in the drawings of the interior room, the instructor’s words would shift the students attention to different details within and between each view. In the perspective view, the instructor’s comments pointed out such details as: wrong perspective angles, missing perspective line, furniture floating above the floor, a wrong scale figure, and use of the right scale for furniture in the room. In the floor plan and elevation view, the students’ attention was shifted to a check of the correspondence of spatial locations of items within and between each view, then a check of line weight by acknowledging the spatial location of items in each view. In the process, the instructor sometimes provided verbal scaffolding by describing the visualized views to assist students when they needed to shift their visualization accordingly between those views to perform the tasks. For
dimension and detail specification, the instructor also provided coaching by helping identify mistakes and helping correct them.

In the next topic, the functional use of space, the instructor’s comments shifted the attention of students from inspecting technical details to seeing the functional use of space according to circulation, ergonomics, and economic aspects, in relationship to the movable and non movable items in the room. During discussion of these design aspects, student needed all views in their drawings to assist in their redesign because the perspective drawing alone might not be sufficient to enable them to see and acknowledge the spatial dimensions of interior space, for example, whether a door cannot be fully opened because the bed is placed too close to the door. The instructor provided coaching by verbally making the students aware of the functional aspects of interior space and helping them adjust the design. The grid charts were used to provide dimensional scaffolding on the perspective drawing as well as other views to help in the task of spatial editing including checking measurements of space and making adjustments easier.

In another topic, aspects of design, the instructor shifted the students’ attention from exploring three dimensional space to seeing the alignment, balance, contrast, etc. of placement of items in the room according to visual concepts of design principles. A handout about those visual concepts was provided as a reference so that students could work on the redesign task themselves after receiving coaching.

Though many tools designed to assist in interior redesign drawing production were used in this class, the need for the instructor to provide coaching was not decreased. According to TA Andrea’s interview, some students will often get involved
in working only on the technical and visual aspects of the redesign drawing; therefore, they draw a technically correct interior perspective drawing with a redesign which ‘looks cool’ but is not a functional space. Therefore, coaching is needed throughout the assignment to make students aware of problems by inquiry and verbal description and to help them visualize usage problems caused by a nonfunctional space and decoration, then to suggest the appropriate adjustment. This researcher observed that, because there are many details in interior design that students need to work on in each discourse topic, it is not easy for the novices to make the shift between the two and the three discourse topic. Although the grid chart helps provide scaffolding at the drawing production level to allow students to seek solutions to their problems through inquiry and make adjustments to their designs along each discourse topic, instructor coaching appears to be needed throughout the learning phase of this assignment to provide comments on different topics and help make the shift between topics possible.

9.1.7. Cultivating skill in the spatial editing of the perspective image of a product along lines of a set of problems and knowledge students formulate themselves through inquiry

This drawing assignment began differently compared to the earlier exercises. Instead of concentrating on construction of basic shapes, the students were guided by the instructor inquiry to examine the picture of a product and discuss the product they wanted to redesign. Students were instructed to draw the basic shape of the product by simply tracing an outline from the photocopy of the product. Unlike the first project of chair and desk redesign, in which all students dealt with products with the same function, in this project the instructor provided inquiry for students to enable them independently to identify problems and construct knowledge to be used in redesigning
the product of their choice. The instructor’s inquiry included such questions as: what is wrong with the product, why does it need to be redesigned, what do you wish to change to make it better, etc.

In the main communication event, the critique of the product redesign drawing, the area of discussion between the instructor and each student appeared to be focused on the perspective technical drawing problems, on the design aspects of the redesigned product, and on the criteria each student formulated to be used in the redesign, such as the functional criteria and consumer aesthetics criteria. As in the other homework assignment critiques, the instructor started with discussion on the perspective technical drawing problems in the drawing of the redesigned product. In this product redesign drawing project, it appeared that freehand production of perspective drawing was not a simple task for students because the majority of the products and tools were in complex shapes with lots of curves. Those drawing difficulties required drawing assistance from the instructor. The grid charts provided perspective reference for checking on plotted locations during the consultation on technical drawing aspects. The majority of students revealed that it was helpful to sketch their redesign idea out on regular paper before constructing it on the 3-D grid chart. Following the perspective technique discussion, the instructor then began discussing the redesign ideas students proposed according to the functional criteria and other design criteria they had formulated. In this discussion, the instructor’s comments on the functional design criteria included such suggestions as: do more investigation on how a user holds a mug containing hot liquid, the new design idea for printer function appeared to be more complicated or inconvenient for users than existing products, etc. With those comments, students were guided to switch
from seeing shape and line in terms of technical drawing inspection to seeing the adjustments of shape and form of the redesigned product in relation to the desired functions of the product. In the following discussion on consumer aesthetics, student were guided to switch from analyzing the correspondence between the product form and its function to examining the appearance of the redesign by the instructor’s comments in reference to basic visual concepts in design principles as well as marketing criteria students had proposed. It should be emphasized that in the critique of design aspects, the instructor not only commented on the redesigned product but also on the problems and criteria students had formulated to guide their designs. Many students were given suggestions and/or given inquiry in order to help them reformulate or further develop the problem and design criteria they had proposed in the first homework critique. The instructor’s comments included such observations as: why would the user choose to buy your design over others, the new functional criteria are not distinguishable from those of products already on the market, etc.

Besides these aspects of the critique, the instructor also checked the layout of the drawing plate. In the comments of this discourse topic, students were guided to see the product redesign drawing as one of the graphic elements of the drawing plate along with title bar, dimensions, and additional written description. Students were encouraged to organize and manage these graphic elements on the page for clear and efficient communication.

For the marker rendering assignment, the instructor modeled the task verbally by describing the process during the drawing demonstration. Since there was no model used in the drawing process, in order to support the visualization of the shades of light
and shadow, the instructor set up a brick in front of the drawing paper in order to observe the shades of light on each surface and implement them in the drawing rendering. Another rendering scaffolding was the phrase ‘parallel remains parallel’ to guide in the use of similar shading on parallel areas.

Discussion of the drawing instructional strategy of the class Design 199

So far in the exploration of the drawing instructional strategy of the class Design 199, this researcher has approached the classroom practice by characterizing the strategy of instruction as parallel to the immersive practice used in teaching English as a second language. The investigation in the research phase has allowed this researcher to further examine the drawing instructional strategy and thus to provide a description in terms of the components and techniques utilized in this strategy. In the interpretation of the drawing instructional strategy of the class Design 199, this researcher would like to identify the components as comprised of three social engagement events, seven tutor’s tasks this researcher has defined by organizing the social transactions of design input by the tutors as their tasks in cultivating the designer drawing skills, and various drawing production/instructional support tools. These tools include the typical instructional tools of verbal inquiry, syllabus, and handouts, as well as the 3-D grid chart, which is a unique drawing support tool provided in this class. All of the components aim to enable the learners to produce drawings of their idea and to engage in the designers’ social transactions in this class.

There are many unique elements of practice in this drawing instruction, and this researcher would like to refer to them as techniques. For example, verbal tools were found to be utilized in interesting and different ways in the drawing transactions. Tutors
had to moderate the social events, provide support and encouragement, provide modeling and coaching for drawing skill establishment, and provide problem solving inquiry as well. Other interesting uses of verbal tools include assisting students to develop visualization skills with verbal descriptions and providing a marker rendering scaffolding tool with the phrase ‘parallel remains parallel’.

In examining the social transactions of this design drawing class, this researcher identified the functions of the 3-D grid perspective and the ways they are transformed. Typical inquiry along different criteria the tutor used in the critiques of this class, such as drawing techniques and design criteria including function and visual concepts, appeared to cause the drawing tools to have different functions, and this researcher would like to characterize this as focus shift inquiry. For example, the 3-grid charts were found to be used: as a reference for perspective technical drawing correction in drawing technical discussion and as a drawing scaffolding support at the production level during the transactions that occurred in creating and refining the designs of products and room interiors under the discourse topics of function and the visual concepts of design.

Moreover, a unique element of the drawing support tools of the class this researcher would like to mention is their multifunctional character. Besides supporting the drawing production, the drawing tools together with the drawing process made apparent the concept of a particular task in classroom transactions. For example, the use of the 3-D grid chart together with overlay paper appeared to make the productive process of creating a design and refining it during the critique visible to the students.
The use of interior grid charts together with the process of drawing sectional views and perspective from the floor plan of an interior room made the practice ‘read plan’ visible.

In addition, in examining the drawing instruction, this researcher captured seven tutor’s tasks and described them together with the essential skills the tutors introduced for producing drawing integrated/interacting with different kinds of speech production related to the context and social event of the design critique. According to the nature of the skills as described, this researcher would like to characterize those seven essential skills as designer situated drawing skills. The designer situated drawing skills generated from this entry level design drawing training include: familiarity with coding and dialogue used in interpersonal transactions concerning design as well as drawing production support tools; skill in drawing a basic image of an object from visualization; the combined skill of cumulative editing and spatial editing of the basic image; skill in cumulative editing of the drawing along two different discourse topics; skill in drawing a converted view image from visualization; skill in cumulative editing of an interior perspective drawing using combined views and along the lines of three different discourses; and skill in the spatial editing of the perspective image of a product along lines of a set of problems and knowledge formulated by the student him/herself through inquiry.
9.2. The Concept of Drawing for Communication

According to the conceptual framework as described in chapter three and chapter six, the concept of drawing for communication generated in the drawing acquisition process of novices would involve skill development, the communication process, and cognitive development. Apparently, the drawing instructional strategy as described in section 9.1. is focused particularly for those who need to establish the drawing skill. The concept of drawing for communication, described in terms of the novice’s learning patterns according to the instruction of the Design 199 drawing class, would be comprised of the establishment of seven designer’s drawing skills in relation to social interaction with an instructor in the three communication events as indicated in the drawing instructional strategy.

The intent of the second investigation was to elaborate the concept of drawing for communication by looking at different learning patterns that it was anticipated would be found in the drawing classroom. As discussed earlier, the different backgrounds and skill levels among novices, and the interactions between novices and experienced students in this class could contribute to different meanings of the training practice. It was anticipated that the concept of drawing for communication described according to the learning patterns of different individuals would include a variety of learning patterns, which comprise drawing skill development in relation to social communication. Each theme represents a learning pattern which will lead to another concept of drawing for communication, as well as another drawing instructional strategy. Moreover, it was anticipated that the investigation would reveal other elements in drawing skill development and social interaction that are significant to the process of
drawing for communication besides those specified in the drawing instructional strategy and course plan.

As indicated in the methodology chapter, by investigating the development process of students who had different drawing backgrounds and skill levels when they entered the class Design 199, this researcher will attempt to derive some concept of drawing for communication from the understanding of how each student participant developed his/her drawing skill through/during participation in the communication of the class. In the following characterization of the concept of communication, this researcher will describe eight themes derived from the observation and understanding of student drawing learning through the communication practices of the drawing classroom, then discuss different ways of describing the concept of drawing for communication in this drawing class.

Themes as characterized from student drawing learning through communication practices

Theme one. For the student who has background understanding in the vanishing point concept and method of perspective drawing, engineering drafting skill, and Computer-aided Design, but has no background training in fine art freehand observation drawing, design training, or graphic visual concepts according to design principles, the concept of drawing training through communication includes: developing skill in dexterity, establishing freehand perspective drawing skill and skill in manipulating design drawing along different lines of design criteria discourse, and individual coaching.
These factors are derived from the drawing development of Mike. They point to two areas the student needed to develop in order to improve his drawing skill and participate in the communication events of the class. For developing freehand drawing skill, dexterity is the most fundamental element, and the student needs to be trained in this skill. Similarly, a student of second language verbal communication needs to have oral training including training in phonetics and conversation practice with a speech coach. Skill in manipulating the design drawing according to inquiry related to each of the design criteria, i.e., graphics and visual concepts, ergonomics, function, etc., is necessary for participation in the design studio critique because the communication and exchange involves inquiry and discussion of different design criteria for the purpose of manipulating and developing the designs. Mike appeared to benefit also from individual coaching in which TA Paula implemented a selective set of questions to support his skill development.

**Theme two.** For a student who has dexterity skill, visual observation skill, visual graphics and communication skill, some understanding of realistic drawing, experience with Computer-aided Design, and drawing manipulation skill but has no understanding or background training in the vanishing point perspective concepts, engineering drafting skill or fine arts freehand realistic drawing, developing the concept of drawing training through communication will include: developing an understanding of the designer’s codes for perspective drawing and spatial dimension, establishing freehand perspective drawing skill with perspective support structures, practice in formulating knowledge and integrating drawing with the information, and using peer tutoring.
It was learning in these areas that enabled June to improve rapidly in both her
drawing skill and her communication skill in the design critiques. June had some
realistic drawing skill as in drawing basic shapes such as a cube but had never been
aware of the techniques of perspective drawing. After gaining an understanding of the
perspective drawing support structure and how to implement the structure in producing
drawing, the student was able to explore and manipulate the design drawing herself
along lines of inquiry from the instructor. The student benefited from peer tutoring
outside class which helped her get ready for each critique discussion, and this appeared
to help her progress steadily because the instructor was able to provide suggestions and
further inquiry once there were drawings on the panel to discuss. June had skill in visual
observation and in using a visual medium for communication as she had obtained these
skills from the training in her major. She implemented those skills in communicating
about her design drawing in this class, for example, in her use of color scheme index.
The student also had the ability to search for and formulate knowledge, and to integrate
such information in her design drawing

Theme three. For a student who has dexterity skill and some skill in freehand
sketching, visual observation skill, and some understanding of the vanishing point
perspective concept but has no perspective drawing skill, developing the concept of
drawing training through communication includes: being an efficient listener, using
inquiry and interpersonal discussion to establish freehand perspective drawing skill and
to construct design ideas in drawing, practicing observation but not copying, using
design concepts, and interacting with peers to develop idea sketches.
These were distinctive factors in the progress of Claire in both her drawing skill and her ability to communicate in the critique. The student was very proficient in picking up suggestions and questions from the inquiry and interpersonal discussion, including details the instructor made her aware of and used them to communicate with herself in constructing her drawings. With such an ability, a student who had very little perspective drawing skill initially was able to develop the drawing skill quickly with the grid after one instruction of modeling and coaching. The student also progressed well in developing her design skill, since the inquiry in turn also became beneficial to her ability in communicating about her designs both in her drawings and in her verbal explanation. From the first drawing assignment, Claire used the term ‘concept’ when integrating the different shapes of other objects into her idea, for example, the ‘concept’ of her chair design. Also, this researcher would like to use the term “observe but not copy” to describe Claire’s work. Some examples from her work include: adapting the form of a human figure in sitting position as the form of her chair, and integrating the form of a hair clip into her chair design. Also, in the focus interview about her interior design drawing, the student explained that she observed interior design space and decoration in different media and integrated the ideas in her interior redesign in an interesting way.

Theme four. For a student who has some understanding of the vanishing point perspective concept, some training in fine arts observation drawing and engineering drafting, but has no skill in freehand perspective drawing construction, developing the concept of drawing training through communication would include: establishing
freehand perspective drawing skill and utilizing instructor tutoring and the tools provided for support at the drawing production level.

These factors were significant in Kim’s progress in developing drawing and communication ability in the drawing class. Kim also had little skill in perspective drawing but improved rapidly due to her consultation with the instructor during office hours. The student sought help as early as the first assignment and, therefore, gained a good basic drawing skill, which helped her progress as the assignments increased in difficulty. The student already had training in engineering drafting and fine arts observation drawing; therefore, she had already developed her visual observation skill and knew what she wanted to draw but had problems with perspective technique, though the student said that it was her discussion with the instructor that helped her gain her design skill, the technique of using both the grid and vanishing point, and the technique of drawing many decorative items in perspective. With technical support from both the instructor’s tutoring and the drawing tools, the student was able to communicate about her designs both with herself and with others.

**Theme five.** For a student who is already quite skilled in perspective drawing and also has some design skill, developing the concept of drawing training through communication includes: utilizing the drawing training process of this class to help improve certain skills in his/her design practice and refining the quality of his perspective drawing to make it more presentable, utilizing interpersonal conversation to develop different design criteria, and helping provide peer tutoring.

These are benefits that Dan gained from and offered to this drawing class. Dan was a student participant who already had both the skill to produce well-drawn
perspective and understanding of the overall task of design due to his three years of experience in the design program during his undergraduate years. It appeared that, instead of the development of perspective drawing skill, it was the drawing process in this class that could help him improve the other elements of design skill he needed, such as, for example, training in the ability to sketch with spatial dimensions by using the grid so that he could see the measurements in perspective and the ability to produce a much greater variety of ideas by using an overlay with the grid. The use of the grid in perspective drawing training helped him adjust his drawing to obtain a better viewing angle and made his design drawing more presentable. Dan states that he often talked with people outside design to obtain feedback on his designs and used their comments to develop criteria to redesign his work. Because of his drawing and design experience, classmates such as Mike indicated that they benefited from Dan’s comments.

**Theme six.** For a student who already has background training in design fundamentals, visual observation skill, an understanding of perspective concepts and some skill in perspective drawing, developing the concept of drawing training through communication would include: utilizing the drawing training and tools of this class to support productivity with new ideas and to refine the existing perspective drawing skill, and discussion with the instructor help the student ‘see more.’

These were benefits Pam gained from this drawing class. Pam already had a background both in drawing skill and in design fundamentals. The process of drawing training in this class appeared to contribute to improving the skill she already had. For example, the grid enabled her to use freehand drawing to explore many more shapes and forms than in her past designs; therefore, she was able to increase her production of
new ideas for the designs. The student also credited discussion with the instructor with helping her ‘see more.’

Theme seven. For a student who understands perspective concepts, is skilled in using the 3-D grid for drawing in this class, has a background education in design fundamentals and has background skill in graphics, the development through the concept of drawing training through communication includes: utilizing the drawing tools to support the spatial manipulation of his/her designs, improving perspective drawing skill in the areas of drawing and communicating spatially, helping establish the peer critique as an experienced peer leading in the peer critique, drawing classmates to participate in the critique through his/her humor and friendly comments.

These are benefits Vicki gained from and offered to the drawing class. Vicki was taking this class for the second time and also had prior experience in other fundamental design classes. The student had skill in graphics and benefited from use of the drawing tools introduced in this class to help support the spatial manipulation of her designs and to help develop her skill in drawing and in communicating her design spatially. Vicki was comfortable in making comments during critiques and appeared to help establish peer discussion during the critique.

Theme eight. For a student who already has both design and perspective drawing skill, development through the concept of drawing training through communication includes: utilizing the drawing assignments as design projects to help improve his/her design skill and refine his/her perspective drawing skill, helping establish the peer critique as an experienced peer by providing comments and leading discussion in problem solving, his/her better observation skill will help others see.
These are benefits Brian gained from and offered to the drawing class. Brian already had skill in both perspective drawing and communication in design. He had recently been accepted into the design program at this university. His homework presentations helped by serving as examples for the rest of the class as he brought in interesting design concepts as well as different approaches to solving his design problems. Those elements helped set up interesting problem solving discussions with the instructor and allowed others to learn from observation. Like Vicki, Brian helped lead the class discussion during the critique with friendly comments on classmates’ works.

Discussion of the concept of drawing for communication

As mentioned earlier, the concept of drawing for communication generated from the learning patterns of students establishing their perspective drawing skill in the Design 199 classroom would involve description of their skill development during the social communication process of the class. In this drawing classroom, there appears to be two ways to illustrate these learning patterns. One is to illustrate the learning patterns of the novice along lines of the drawing instructional strategy according to the course plan. Viewed in this way, the concept of drawing for communication described in terms of such learning patterns would be comprised of the establishment of seven drawing skills in relation to the communication process with the instructor in the three main social event of the classroom. Another approach is to illustrate the learning patterns of individual students in the drawing class. Thus, the concept of drawing for communication will be derived from the learning patterns of eight selected student participants.
From the second investigation, in which different themes are developed by characterizing the students’ drawing skill development in the communication process, it appears that the concepts of drawing for communication derived from individual students’ learning patterns are not only different in detail for the novices and experienced students as individuals but are also different for the group of novices and the group of experienced students. The first four themes represent learning patterns of those students who need to establish drawing skill. The concepts of drawing for communication derived from each novice’s learning patterns differ due to the fact that there are certain different elements in the drawing skill training that each novice specifically needs to acquire in relation to the particular social communication process of the class, in order to establish and improve his/her drawing skill for communication. The concepts of drawing for communication also appear to be different when derived from selected students who have already had some drawing experience. Instead of focusing on establishing the drawing skill, the concept of drawing for communication for experienced students appears to involve a process of improving different elements in their existing drawing skill, as well as a process of improving other skills, such as design skill, through the drawing training of this class.

In this investigation and theme development, interesting types of skill training and social instructional strategies besides those practices specified in the drawing instructional strategy according to the course plan, were found to be implemented in the drawing class sections. The additional skill training necessary for drawing for communication found through the drawing classroom observation and interviews include development of skill in dexterity, skill in being an efficient listener, skill in
observing but not copying, etc. Interesting social instructional strategies found to be implemented in the drawing classroom include such practices as: peer critique, peer assisted idea sketches, etc.

9.3. Implications

9.3.1. Discussion of the drawing skill training in relation to cognitive development

The influence of Vygotsky’s concept can be easily identified in recent sociocultural cognitive theories and instructional practices including cognitive apprenticeship techniques (Efland, 2002). In the development of the instructional approach, craft apprenticeship suggested the paradigm of situated modeling, coaching and fading (Collins, Brown, & Newman, 1989). The term situated nature of cognition was introduced during the construction of such cognitive apprenticeship techniques (Efland). Unlike the decontextualized learning of traditional classroom practice, situated cognition recognizes learning through activity, in the real situation of practice, and through interaction with other people (Brown, Collins, & Duguid, 1989).

The cognitive apprenticeship technique described by Collins et. al. is the most frequently cited instructional strategy along the lines of this concept. There are six methods in the strategy, and they are described in three groups. The first group is comprised of the modeling, coaching, and scaffolding processes. The second group consists of articulation and reflection. The third group can be described as exploration.

In order to examine the relationship between drawing skill development in the training of the drawing class and cognitive development, this researcher would like to identify the tutor’s tasks and instructional tools along lines of the three groups of the
cognitive apprenticeship methods. When examining the drawing training of the class Design 199, it is quite interesting to this researcher that all six methods of cognitive development could be identified in each of the critique sessions from the beginning of the drawing training.

Starting from the first homework critique, students who gained an understanding of the use of the 3-D grid were able to produce the perspective drawing of a chair in a quality that was sufficient to convey their ideas, which allowed the students to be capable of bringing up topics such as the design inspiration or function of the chair in discussions with the instructor and classmates right at the beginning of the class. This event is regarded as a process involving intersubjectivity and is recognized in this social instructional strategy as the point where the cognitive process begins. Without use of the 3-D grid scaffolding in the drawing production, novices might need a longer period of training in the perspective drawing skill to reach the point where they could produce a chair design drawing integrating their creative ideas and establish interpersonal conversation about their design.

Although the drawing was not perfect in the first two homework assignments and the instructor needed to provide drawing technical assistance, most of the drawings portrayed the students’ ideas well enough for the instructor to proceed also with inquiry on design problems of the chair. Therefore, the first group of cognitive training methods, modeling, coaching and scaffolding, was found to be exercised by the instructor to assist students in problem solving of perspective technical drawing problems, as well as in problem solving of chair design issues, by giving advice and correctional feedback.
The internal thinking process and the visualization process become apparent to the student through such tutor’s tasks as verbal modeling, in which the instructor verbalizes the perspective construction technique of the chair, and through the use of scaffolding tools such as the 3-D grid with an overlay, which makes the processes of cumulative editing drawing and spatial dimensional drawing visible to students. The practice of constructing a floor plan and elevation view drawing from an actual view, then using the drawings of those views to construct an interior perspective drawing, is considered by this researcher to be another scaffolding tool which helps make the process of visualizing an interior perspective view apparent to students. Through such training strategies, students were enabled to acquire perspective drawing skill as well as cognitive and metacognitive knowledge, and therefore formed an overall picture of the task. These are goals of the first group of training methods of the cognitive apprenticeship technique.

The second grouping of cognitive apprenticeship methods, articulation and reflection, can also be captured in the main social event of the class, or during the homework critique sessions, from the first project of the desk and chair design drawing assignments. During the critique sessions of the class Design 199, the instructor often provided inquiry to lead students to respond verbally or though drawing production of a redesigned chair, which made the student problem solving process apparent to others. Examples of typical questions in the instructor inquiry in this class were: what do you see, why do you think we should move this over there, etc. Besides being questioned, students themselves could make their cognitive process, or internal thinking and visualization, apparent to others through verbalization and drawing. The other practice
that helped make the problem solving process of the students visible was giving students the role of critics in the peer critique during the critique sessions of Design 199. While the term articulation refers to the way students make their problem solving process visible to others, the term reflection refers to the teacher’s technique which results in students’ participation in the above process. In this cognitive development process, students are provided opportunities to study their own problem solving processes and obtain strategic knowledge in two ways: by comparing their own concepts with those of the professor and peers, or through internal conceptualization of the task (Bruijn, 1995).

The critique session is also an event through which the students can achieve cognitive development through the process of exploration, which comprises the final group of cognitive apprenticeship methods. According to this method, the instructor would expect students to be able to formulate problems and knowledge and solve their own problems independently and, in addition, to demonstrate an expert problem solving ability. In the course plan, this method was implemented by the instructor in the last assignment of perspective drawing of the product redesign project. However, because there were students with various background levels of design and drawing skill attending the class Design 199, some experienced students appeared to have such skill and to utilize it from the beginning of the drawing class. Therefore, the rest of the class had the opportunity to observe as those students formulated and reformulated their design problems and criteria to find solutions from the first drawing project. According to research study in this area, the students’ ability in independent inquiry allowed the instructor to fade away from the problem-solving process (Bruijn, 1995).
In summary, according to this researcher’s observation, social interaction in the critique session including peer critiques, the integration of experienced students in class, use of the 3-D grid, and an instructor who is experienced in both drawing coaching and moderating the critique, the main social event of the class, are factors that this researcher sees as integral for learning and cognitive development along lines of the cognitive apprenticeship concept to occur as described in this drawing classroom.

9.3.2. Contribution of the drawing instructional method to traditional drawing training

The instructional strategy is intended to complement traditional methods as well as contribute toward developing drawing instruction using other kinds of tools. In describing the drawing instructional strategy in section 9.1, this researcher also identified seven steps of the perspective drawing training which is situated in the design studio culture in order to provide drawing skill training within the context of drawing practice in conjunction with design transactions. In addition to training incoming design students, the drawing instruction is expected to benefit those non majors who seek to develop freehand drawing skill in order to communicate with designers, builders or manufacturers, and, in particular, with themselves in order to be able to create products and tools the way they want. It is hoped that the knowledge elaborated in the interpretation of the drawing training practices characterized in this research study will also be of benefit in the development of drawing instruction using other kinds of tools, such as computerized training. With the social strategy approach to the interpretation of drawing training, such training can be implemented for various construction technological tools, either for self-taught individual learners or for web based participatory group learners.
Besides the skill training, the benefit of the training in relationship to cognitive development was elaborated by this researcher in section 9.3.1. From such an examination, it appears to this researcher that this drawing training could complement traditional methods in various ways. For example, the supporting tools used in this training, such as the 3-D grid chart accompanied with overlay, could assist those who are in training with traditional methods to expand the dimensions of their drawing skill. For those who have already learned to draw well with traditional methods, the process of the 3-D drawing training could make it possible for them to expand their skill into another transaction mode of drawing which supports the ability to design and to communicate with designers, and contribute to improved cognitive, investigative, and communicative ability.

9.3.3. The implications of the drawing training in art education

At the beginning of this dissertation and with reference to an art education scholar, this researcher mentioned the decline of interest in freehand realistic drawing training among art teachers of the past century due to influences from different ideologies of the time. It is hoped that the training of freehand perspective drawing skill constructed within the means of drawing practice in designer studio transactions might draw some attention from art educators due to the benefit of the drawing training in terms of both communication skill and cognitive development, as elaborated earlier by this researcher.

In addition to the implementation of the drawing concept and its instructional strategy in art studio education, this research methodology may be implemented for further exploration of the concept of drawing for communication in order to
complement the study of drawing production in visual art education. For example, by implementing the methodology in the study of drawing training situated in other authentic practices, the process is anticipated to contribute to the proliferation of knowledge in communication and cognition based on development of drawing production skill. Such exploration and findings could complement the mainstream knowledge which derives meaning from visual communication practices situated in visual art communication activities such as the practice of looking and identification in discourse.

9.3.4. Implications of the drawing for communication instructional strategy for general education

In order to better describe the implications of the concept of drawing for communication and its instructional strategy, I would like to refer back to the significance of instruction of drawing for communication addressed in chapter 1 of this dissertation. The idea of investigating/constructing freehand realistic drawing for adults to enable them to draw from thought and to communicate their own ideas has caught the attention of many researchers partly due to the observation from design critics that designers possess a dominant position in aesthetic and spatial design practice because of their ability to communicate with quality drawing skill (Robbins, 1994; Boys, 1996). It is in fact one of several efforts in the design movement to shift the client-based practice from a perspective in which the designer attempts to understand the needs of the client and then provide an aesthetic spatial design, to a perspective of making designer’s communication skills accessible to the clients. These skills enable clients who are professional adults from non art and design majors to engage in designer transactions,
and to communicate fully and exchange their interesting ideas with designers so that
designer and client work on the creative task together, or the clients become designers
themselves. It has been anticipated that through this practice, clients would gain not
only products and tools designed to best suit their needs, but also knowledge and skill in
a new domain.

Based on such a background, this researcher would like to direct the discussion
of the implications of the concept of drawing for communication and its instructional
strategy, not toward the question of how learners transfer their existing knowledge in
learning the new skill and knowledge in the situation of a new subject domain, but
toward the question of what support the instructor of the new subject domain provide so
that adult learners from other disciplines can engage in the social transactions of the
new subject area. With appropriate communication support provided in such social
engagement, adult learners can share, exchange and further explore possible directions
of their ideas and existing knowledge in the transactions of the new domain. The adult
learners are thus enabled to participate fully in a process of knowledge co-construction
that yields the outcomes which best suit their needs.

From the research phase of the study, the unique communication supports
described in the interpretation of the instructional strategy of drawing for
communication and foreseen by this researcher to offer potential benefit to the educator
include: the immersive nature of the instructional strategy; the instructional
components, which include social events, tutor’s tasks, and new discourse production
support tools; and techniques for utilizing these tools in multiple functions. Although
constructed for designer situated drawing skill development, it is anticipated that the
components and techniques of this instructional strategy will benefit adult learners by enabling them to participate in the transactions of the new subject domain and to develop new ideas or explore existing ideas in the process. With the unique elements of the strategy, learners will become acquainted with social events, coding, new discourse production skills and appropriate support tools, visual representation of the tasks, and visualization skills necessary in the transactions. These supports can make it simpler for adult learners to use new discourse skills to interact with/integrate their existing knowledge or create new ideas in the transaction process of the new domain. The different concepts of drawing for communication generated from the eight different case studies serve as examples which show that adult learners come to a new learning situation with well established practices in a particular social transaction, and thus, the communication supports provided by the instructor may have different meanings for different students or additional supports may be needed in order for each learner to successfully adjust to the transactions in the new social domain.

9.4. Recommendations

Because this research study has been conducted as an attempt to understand and describe the overall picture of the training, broad based data sources were gathered and a selective portion of the information emphasized by participants was captured and characterized. In the process, this researcher had a chance to distinguish concepts as well as social exchanges and see different issues that appeared to be of interest for detailed investigation in future research study.
The first concerns the studio critique. This researcher realized from the investigation of this design drawing training that the studio critique was the most significant instruction activity in this training, an event in which students learned to develop their drawing skill and cognition through participation in the conversation of the event. It is interesting that each instructor taught drawing skill and moderated the event differently because each had her own teaching techniques and unique drawing background experience to offer. A future study might look into the classroom instructional practice of experienced teachers to capture interesting elements of the technique of social instructional strategy such as the inquiry and conversation each teacher utilizes successfully in teaching design and drawing through the communication process with a group of students with a variety of background skills.

The peer critique is an event that would be quite interesting as the topic of a detailed investigation on the social and communicative exchange involved. As noted in the discussion of the research outcome, peer socialization during the critique appears to be quite an important factor for enabling students to gain both quick development and enjoyment of learning at the same time. However, it was apparent to this researcher while conducting this study that it is not easy to host such a social group activity that should result in success in learning a certain skill in every class. A future research study might look for a successful peer critique event as the basis for a detailed investigation. Any successful social instruction strategy identified by such a study would be anticipated by this researcher to benefit both the traditional studio critique practice where the instructor leads the critique and drawing training using technology to support group learning through social exchange such as web based training.
Inquiry is the main technique found to be implemented in the studio critique, and it is, in fact, a powerful tool to help students develop their drawing skill, communication skill, and cognition during the critique event. However, according to the interview with the TA and from this researcher’s experience in design instruction, a student does not always have a good experience in learning with the technique. In these design drawing classes, inquiry techniques similar to those used in the design studio critique were also utilized by the instructors. They include such strategies as inquiry to help a student explore different design ideas by commenting on and criticizing his/her proposed idea. One student participant from a non art and design major revealed in the research interview that he felt intimidated by the need to participate in the critique of the drawing class. In fact, the faculty coordinator also addressed the issue of students’ feelings in the social interaction of the studio critique, saying that the issue deserved more attention and recommending that there should be future study to look into the issue.

9.5. Conclusion

Although there are different realistic drawing techniques available for today’s learners, the drawing technique proposed in this research study allows learners to gain drawing skill through the social communication of a design drawing classroom which resembles the communication in a design studio classroom setting.

In the early part of this research study, different successful realistic drawing techniques from famous art teachers as well as from design education were examined through document analysis. Those drawing strategies were characterized into three
groups according to their approaches to the event of separation/integration between speech and drawing production in drawing skill acquisition. The drawing instruction technique using the 3-D grid perspective has been identified as a drawing instructional method that supports both the construction of a well-drawn image and integration of thought and speech at the same time. The drawing method is seen by this researcher as parallel to the immersive teaching and learning of English as a second language. In the traditional approach, a student needs to begin the drawing training by practice in withholding symbolic meaning of the object being drawn in order to produce a quality replica drawing image from such a model. In contrast to the traditional approach, the 3-D grid perspective can be identified as a scaffolding tool which provides assistance at the production level; using it, novices are enabled to produce drawing integrated with speech from the beginning of the training.

However, drawing skill differs in many ways from language skill. In the research phase of this study, the embedded single-case study research was designed and two investigations were conducted in order that the researcher might better describe the paradigm of the practice of drawing for communication from the perspective of the meanings generated within the social communication and exchange of the drawing class. The first research proposition involved development of the instructional strategy along lines of the social cognitive paradigm. The investigation was intended to provide a view of the drawing instruction from the instructor’s perspective. The second research proposition involved developing a concept of drawing for communication. The investigation was intended to provide an explanation of the drawing concept through illustration of the students’ development in this drawing class.
From the first investigation, the drawing instructional strategy is characterized as comprised of two major groups of tutor’s tasks. The first is to acquaint the student with tools that provide drawing scaffolding at the production level and terminology for communication exchange. Their purposes are to enable novices to use drawing to participate in the main social communication event of the class, which is the studio critique, and to develop a designer’s situated drawing skill from such participation. The second is to moderate the critique event while providing drawing training through design studio inquiry and social exchange. The seven main tasks of the tutor in those two strategies have been characterized. In the discussion on the cognitive development issue, those instructional tools and practices that benefit both drawing skill development and the communication process have been shown to have a relationship to cognitive development.

Seven designer situated drawing skills are also identified in the description of the tutor’s tasks. Due to this strategy of drawing skill training, the designer situated drawing skills introduced in this entry level design drawing class are described as skills useful in producing drawing integrated/interacting with different kinds of speech production related to the context and social event of design transactions.

The second research proposition involved examining the concept of drawing for communication. From the conceptual framework developed in this research, the concept of drawing for communication generated in this drawing classroom is described in two ways. First, the concept is described based on novice learning patterns according to the design of the drawing instruction along the course plan. Second, the concept is described based on learning patterns of individual students who attended the drawing
class. The latter allows this researcher to propose a method of proliferation of the concepts of drawing for communication as well as to give examples of such expansion of the concept by describing the learning patterns of student volunteers from the drawing class. Eight themes have been characterized based on the drawing development of eight student volunteers with different drawing backgrounds and skill levels. The investigation also revealed other interesting elements of drawing skill development and social instruction strategy implemented in the drawing class in addition to those specified in the course plan. Those elements include development of skill in dexterity, skill as an efficient listener, skill in the peer critique, etc.

In addition to the relationship between the instructional strategy and cognitive development, other implications of the study include the potential for: implementing the strategy in developing drawing training using other kinds of tools such as computerized training, utilizing the training to complement traditional drawing training, providing additional drawing training strategies for art studio education, providing additional knowledge of drawing production in visual art study, and offering different approach to instructional strategy for general education. Three recommended areas for future research study include conducting comprehensive study on an expert’s teaching of drawing through the design studio critique, on the successful peer critique in this kind of drawing training, and on the issue of students’ feelings in relation to experiences that occur as a result of the design inquiry and critique.
APPENDIX A

INTERVIEW QUESTIONS FOR TEACHER
Interview questions for the teacher

1. What is your background in training and in practice of art and design? Have you ever taught a drawing class before? If so, what type? How long have you been teaching the drawing class Design 199?

2. At the beginning of the class, what appear to be the most common problems among those students when they first learn to draw perspective using 3D grid charts and translucent paper? How do you assist them to overcome their perspective drawing problems?

3. As the class progresses through different drawing assignments, according to the syllabus, please describe your strategies for helping students gradually increase their drawing and design skills step-by-step in each of the drawing assignments. Please show some of your students' works as you help me understand how these skills have developed as students go through the drawing assignments for the class Design 199.
   - Have you ever changed your teaching strategy during the course of the quarter?
   - If so, how?

4. What techniques of communicating design ideas and preparing drawings of those designs for class presentation have been presented to students (e.g., items such as title bars, dimensioning, etc.)? Are there any teaching strategies involved when you address those techniques? If there are, have you changed such teaching strategies throughout the course of the quarter?

5. Could you share some thoughts on the differences between teaching fine art drawing versus teaching design drawing?
APPENDIX B

INTERVIEW QUESTIONS FOR STUDENT
Interview questions for students

1. Did you have any drawing training and/or other visual art skills before this class?

2. Did you have any specific class or training in perspective drawing before coming to this class?
   - If you did, how was it taught?
   - If you do not have any training, did you learn perspective drawing on your own?
   - If the answer is “yes”, how did you do it?

3. In the first drawing exercise in class:
   - Could you describe what went through your mind during the drawing’s production?
   - What were the challenging/difficult aspects in constructing this perspective drawing according to the assignment?

4. For homework assignment on desk and chair drawings:
   - Could you describe what went through your mind during the drawing’s production?
   - What was your choice of drawing tools and methods?
   - What were the challenging/difficult aspects in constructing this perspective drawing according to the assignment, and how did you go about solving it?
   - For this assignment, please describe your design process and other thoughts you attempted to communicate. Were there any problems in communicating this information?

5. Among three different conversation events, could you please describe:
   - How does consultation with the instructor influence your design and your presentation in class?
   - How does participation in classroom critiques influence your design and your presentation in class?
   - And if you work on the drawing assignment with classmates or friends, how does this influence your design and your presentation in class?
APPENDIX C

QUESTIONNAIRE NO. 1 RESULTS
1. What were your reasons for taking this course? (Check all that apply)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisite (for non-design major)</td>
<td></td>
</tr>
<tr>
<td>Pre-requisite for Industrial Design</td>
<td></td>
</tr>
<tr>
<td>Pre-requisite for Interior Design</td>
<td></td>
</tr>
<tr>
<td>Pre-requisite for Visual Communication</td>
<td></td>
</tr>
<tr>
<td>Developing portfolio for application in Industrial Design</td>
<td></td>
</tr>
<tr>
<td>Developing portfolio for application in Interior Design</td>
<td></td>
</tr>
<tr>
<td>Pre-requisite &amp; developing portfolio for application in Industrial Design</td>
<td></td>
</tr>
<tr>
<td>Pre-requisite &amp; developing portfolio for application in Visual Comm.</td>
<td></td>
</tr>
<tr>
<td>Elective credits</td>
<td></td>
</tr>
<tr>
<td>Elective credits and other</td>
<td></td>
</tr>
<tr>
<td>Other (alternative course in Textile &amp; Merchandising)</td>
<td></td>
</tr>
<tr>
<td>Want to develop perspective drawing skill</td>
<td></td>
</tr>
</tbody>
</table>

2. Please describe your perspective drawing skill prior to taking this class:

<table>
<thead>
<tr>
<th>Skill Description</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Aware of perspective drawing but never had a chance to develop the skill</td>
<td></td>
</tr>
<tr>
<td>Have some knowledge of perspective can produce drawing at beginner level</td>
<td></td>
</tr>
<tr>
<td>Can readily draw perspective but want to develop design skill</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

3. According to the following listing, which types of training have you done, and when? (Check all that apply)

<table>
<thead>
<tr>
<th>Type of training</th>
<th>Before college</th>
<th>Before college and in college past quarter</th>
<th>In college past quarter</th>
<th>Before college &amp; In college past quarter and this quarter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine art still life drawing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Engineering/mechanical drawing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Woodworking/metallurgy shop</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Pencil/pastel sketching</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Cartooning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>2D/3D computer graphic/animation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>None of the above</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

4. For assignment on desk and chair drawing, please check the four items which you consider most beneficial to the construction of your own designs from the following listing of methods and tools: (☐ check more than four choice, ☑ check less than four choices)

<table>
<thead>
<tr>
<th>Method/Tool</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perspective construction using one and two vanishing points</td>
<td></td>
</tr>
<tr>
<td>Perspective construction using 3-D grid charts</td>
<td></td>
</tr>
<tr>
<td>Perspective construction using freehand techniques</td>
<td></td>
</tr>
<tr>
<td>Transparency overlay</td>
<td></td>
</tr>
<tr>
<td>Hand sketching ideas before perspective construction begins</td>
<td></td>
</tr>
<tr>
<td>Drafting equipment</td>
<td></td>
</tr>
<tr>
<td>Copy machine</td>
<td></td>
</tr>
<tr>
<td>Perspective drawing instructions from handouts and books</td>
<td></td>
</tr>
<tr>
<td>Examples of desk/chair designs from handouts and magazines</td>
<td></td>
</tr>
<tr>
<td>Computerized tools, i.e. printer, scanner, CAD programs, etc.</td>
<td></td>
</tr>
<tr>
<td>Consulting the instructor</td>
<td></td>
</tr>
<tr>
<td>Working on drawing assignments with classmates or friends</td>
<td></td>
</tr>
<tr>
<td>Participating in the classroom critiques</td>
<td></td>
</tr>
<tr>
<td>Other (other peoples work)</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX D

QUESTIONNAIRE NO. 2 RESULTS
1. What were your reasons for taking this course? (Check all that apply)

- Pre-requisite (for non define major)
- Pre-requisite for Industrial Design
- Pre-requisite for Interior Design
- Pre-requisite for Visual Communication
- Developing portfolio for application in design (non define major)
- Developing portfolio for application in Industrial Design
- Developing portfolio for application in Interior Design
- Developing portfolio for application in Visual Communication
- Pre-requisite & developing portfolio for application in Interior Design
- Pre-requisite & developing portfolio for application in Visual Comm.
- Pre-requisite & developing portfolio for application in Industrial & Visual Comm.
- Elective credits
- Elective credits and other
- Other (e.g., to fulfill requirement in my major)
- Want to develop perspective drawing skill

2. Please describe your perspective drawing skill and your design skill prior to taking this class:

My perspective drawing skill BEFORE:

- Quite confident, can draw anything
- Haven't tried drawing
- Beginner level perspective drawing

None

- Beginner level design skill
- Have some confidence on my design skill above beginner
- Quite confident in develop & communicate design using drawing

My design skill BEFORE:

None

3. Please describe your perspective drawing skill and your design skill as of today:

My perspective drawing skill NOW:

- Very confident, able to draw anything
- Have gained a lot of confidence

None

- Beginner level design skill
- Have gained some confidence on my design skill improve from beginner level
- Have gained a lot of confidence in developing & communicating using drawing
- Very confident in developing & communicating through drawing production

My design skill NOW:
For assignment on redesigning your bedroom, please check the four items which you consider most beneficial to the construction of your interior design from the following listing of methods and tools: (check more than four choices)

<table>
<thead>
<tr>
<th>Method/Tool</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perspective construction using one and two vanishing points</td>
<td></td>
</tr>
<tr>
<td>Perspective construction using 3-D grid charts</td>
<td></td>
</tr>
<tr>
<td>Perspective construction using freehand techniques</td>
<td></td>
</tr>
<tr>
<td>Transparency overlay</td>
<td></td>
</tr>
<tr>
<td>Hand sketching ideas before perspective construction begins</td>
<td></td>
</tr>
<tr>
<td>Drafting equipment</td>
<td></td>
</tr>
<tr>
<td>Copy machine</td>
<td></td>
</tr>
<tr>
<td>Reference photographs</td>
<td></td>
</tr>
<tr>
<td>Perspective drawing instructions from handouts and books</td>
<td></td>
</tr>
<tr>
<td>Examples of interior designs, furniture, and decorative items from handouts and magazines</td>
<td></td>
</tr>
<tr>
<td>Computerized tools, i.e. printer, scanner, CAD program, etc.</td>
<td></td>
</tr>
<tr>
<td>Consulting the instructor</td>
<td></td>
</tr>
<tr>
<td>Working on drawing assignments with classmates or friends</td>
<td></td>
</tr>
<tr>
<td>Participating in the classroom critiques</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

For an assignment on redesigning a product of your choice, please check the four items which you consider most beneficial to the construction of your product designs from the following listing of methods and tools: (check more than four choices)

<table>
<thead>
<tr>
<th>Method/Tool</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perspective construction using one and two vanishing points</td>
<td></td>
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<tr>
<td>Perspective construction using 3-D grid charts</td>
<td></td>
</tr>
<tr>
<td>Perspective construction using freehand techniques</td>
<td></td>
</tr>
<tr>
<td>Transparency overlay</td>
<td></td>
</tr>
<tr>
<td>Hand sketching ideas before perspective construction begins</td>
<td></td>
</tr>
<tr>
<td>Drafting equipment</td>
<td></td>
</tr>
<tr>
<td>Copy machine</td>
<td></td>
</tr>
<tr>
<td>Reference photographs</td>
<td></td>
</tr>
<tr>
<td>Perspective drawing instructions from handouts and books</td>
<td></td>
</tr>
<tr>
<td>Examples of various designs of the product in marketing from handouts and magazines</td>
<td></td>
</tr>
<tr>
<td>Computerized tools, i.e. printer, scanner, CAD program, etc.</td>
<td></td>
</tr>
<tr>
<td>Consulting the instructor</td>
<td></td>
</tr>
<tr>
<td>Working on drawing assignments with classmates or friends</td>
<td></td>
</tr>
<tr>
<td>Participating in the classroom critiques</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX F

EXAMPLES OF INTERIOR DESIGN PERSPECTIVE GRID CHARTS
One-point perspective interior design

Two-point perspective interior design
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