

Semiotics in apparel design student portfolios:
Semantic categorization and evaluation of portfolio elements

A DISSERTATION
SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL
OF THE UNIVERSITY OF MINNESOTA
BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

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June 2013

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ABSTRACT OF DISSERTATION

**SEMIOTICS IN APPAREL DESIGN STUDENT PORTFOLIOS:
SEMANTIC CATEGORIZATION AND EVALUATION OF PORTFOLIO
ELEMENTS**

The purpose of this research was to examine apparel design student portfolios for entry-level positions in the apparel industry in relation to the representation of job skills. Portfolio samples were taken from a portfolio development course taught by the researcher and separated into portfolio elements based on the types of design documentation used in the apparel industry and in an apparel design curriculum. These included technical drawings, sketches, illustrations, images of full prototype garments and detail images of prototype garments. Job skills were identified in a content analysis of online employment postings for entry-level positions in the apparel industry.

An online survey was created to collect responses from apparel design students and apparel design professionals. The relative importance of each job skill was ranked by participants as well as the level of abstractness or concreteness for each portfolio element. Participants were asked to rate the representation of job skills in twelve portfolio elements including portfolio layouts. Responses were compared across groups for differences between apparel design students and apparel design professionals in the representation of job skills. The highest represented job skill was identified for each portfolio element and used to determine the type of sign; icon, index, or symbol. An icon

is a direct representation of an object, person or idea that is easily understood by a viewer with little or no specialized training. An index is an abstracted representation of an object, person, or idea that requires some interpretation to be understood by the average viewer. Finally, a symbol is an indirect representation of an object, person, or idea that requires specialized knowledge to interpret.

Results indicated that apparel design students rank technical knowledge of fit and construction higher than apparel design professionals in relative importance, and that apparel design professionals rank sketching/flats/drawing as higher than apparel design students. Personality characteristics and interpersonal skills were seen as most abstract by both groups, and were least represented in portfolio elements. Technical knowledge of fit and construction and sketching/flats/drawing were the two job skills most represented in portfolio elements used in this study, most likely due to the outcomes of studio courses. Icons were found to be the most common type of sign used in apparel design student portfolios, and are suggested for each job skill as a means to communicate ability without the need of specialized knowledge to interpret the sign.

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CHAPTER ONE

INTRODUCTION

At the conclusion of a student's time in an art or design program there are a variety of projects and sample works that chronicle the student's progress. General practice requires the collection of these materials into a cohesive whole as a tool for representing the new graduate to their industry of choice. The portfolio, often accompanied by a résumé, is the first view a prospective employer will see regarding abilities, talents, aesthetic preferences, and work ethics. A strong, representative, and organized portfolio may also be the only means a graduating student has to gain the attention of employers.

In an ideal situation, a student is able to present their portfolio personally, touching on important points regarding skills developed, problems overcome, and design choices in regards to each project. However, given the competitiveness of entry-level jobs, and ease of sending short mini-portfolios via email, employers can often find themselves interpreting the intended message of a portfolio on their own. Although written explanations may assuage some ambiguity of each project's value, too much reliance on text could dissuade a prospective employer from engaging with the visual aspects of each project.

Background

There are abundant resources available to students as they begin collecting their works to create a portfolio, but these resources focus on the process of physically or digitally creating a portfolio (Tain, 2010; Guérin, 2005; Baron, 2010). Students are often most concerned with deciding what examples of their work should be included and how those elements should be organized. Current resources for students do give multiple examples of portfolio pages (Tain, 2010) or display various means of organization that can help students identify means of visually representing themselves (Guérin, 2005; Gaimster, 2011). However, making connections between skills learned in an academic program and displaying those skills in portfolios is often missing.

Portfolios can be used as more than only collections of works to display ability. Most often portfolios are thought of as a means to show prospective employers or clients the abilities of the designer or artist. Educational portfolios are meant to show progression and growth as a student, allowing assessment of abilities as well as creating a story of how a student has dealt with difficulties and problem solving (Blaikie, Schönau, & Steers, 2004). Educational portfolios tend to create a link between courses taken and skills learned and portfolio elements, accompanied with reflective writing from students. While these types of portfolios help to represent what a student has learned and how they have progressed, evidence is still lacking on how portfolio elements link to desired skills for employers.

Many position announcements in the apparel industry include required job skills, typical responsibilities for the position and preferred qualifications for applicants. Often these job skills are direct links courses taken in a degree program, i.e. sketching, pattern drafting, or draping. Student portfolios often include samples of projects created in classes, but information is lacking on how those projects should be represented in a portfolio to communicate proficiency in required and preferred job skills.

There are several types of portfolio elements commonly used in apparel design portfolios, including illustrations, technical drawings, and pictures of final projects. These elements are used to represent objects in real life that demonstrate given abilities and skills. Works by Max Bense (1970, 1971) use the terminology of early authors in semiotics to identify a model of representation of physical objects and concepts into signs. This includes categorizing signs into three areas: icon, index, and symbol. Identifying portfolio elements as one of these categories will allow for links between job skills in the apparel industry and type of semiotic representation.

Purpose

Message ambiguity can be resolved when the creator of a portfolio is able to explain projects and meanings in person, yet often portfolios or sample sections of portfolios are used to gain the attention of employers before meeting. The purpose of this study will be to (1) compare the perceptions of apparel design professions to apparel designs students as to what job skills are represented by portfolio elements, (2) categorize portfolio elements into semiotic categories, and (3) to find associations with the type of portfolio element and its perceived representation of specific job skills.

Research Questions

The following research questions have been identified for this study:

1. How do apparel design professionals and apparel design students rank entry-level apparel design job skills in regard to level of importance?
2. How do apparel design professionals and apparel design students view entry-level apparel design job skills in regard to being abstract or concrete in nature?
3. How do apparel design professionals and apparel design students rate portfolio elements as representative of entry-level apparel design job skills?
4. Are icons, indices, or symbols more often included in apparel design student portfolios?
5. Is there a difference between apparel design professionals and apparel design students in views of importance of job skills, whether those job skills are abstract or concrete, and how well portfolio elements represent apparel design entry-level job skills?

Objectives

To answer the previous research questions, the following objectives were identified:

1. To organize portfolio elements into semiotic categories of icon, index, or symbol.
2. To evaluate the perceived importance of apparel design job skills for entry level positions.
3. To evaluate the perception apparel design job skills as either abstract abilities or concrete skills.
4. To compare apparel design professions and apparel design students on interpretation of portfolio elements in relation to apparel design job skills.
5. To discover associations between type of semiotic category and ratings from apparel design professionals of portfolio elements to represent job skills.

Assumptions

During the data collection stage of this study the following assumptions will be made:

1. Portfolio elements can be categorized directly as semiotic signs of icons, indices, or symbols.
2. Students intend for job skills to be represented in their portfolio.

Scope

The following criteria will be used for the selection of participants in this study:

1. Apparel design student portfolios will be the result of a course project from a semester length portfolio development course, taught by the researcher.
2. Apparel industry experts will be currently working in the apparel industry and have had some involvement currently or in the past in hiring new employees.

3. The job skills identified in this study are representative of desired job skills of apparel design professional participants.

Limitations

The researcher recognizes the following limitations to the study:

1. Apparel design student portfolio samples will include works from both seniors and juniors at one mid-western university program.
2. Industry experts may represent a different market segment than where the students intend to work.

Definitions of Terms

The following definitions are given for the context of this study for clarity and consistency:

Portfolio: A collection of artwork, pictures, and design elements that visual displays a designer's or artist's abilities and skills.

Digital Portfolio: A digital version of a portfolio that can be transferred via email or placed on a website and downloaded.

Online Portfolio: An online website version of a portfolio that can be access using an Internet browser, but cannot be downloaded as a single file.

Interactive Portfolio: Any portfolio that allows for a viewer to cause visual changes within the portfolio, allowing for more engaged experience.

Portfolio element: A part of a portfolio page that in considered a single unit that can be moved and rearranged to alter a layout.

Job skill: Required and preferred abilities and skills for employment gathered through entry level apparel design job postings

Icon: A semiotic representation of a real life object that is pictographically similar to that object.

Index: A semiotic representation of a real life object that is in a small way similar to that object, but may be stylized or altered in some way.

Semantic: The relationship of a sign to the object it represents.

Symbol: A semiotic representation of a real life object that has no direct connection to the object it represents, requires training or social interaction to correctly interpret.

Sign: Generic term used to encompass all semiotic representations of icon, index, or symbol.

Abstract Ability: Something that when complete does not have a physical result, may be difficult to explain or represent, and may require varying amounts of time to complete.

Concrete Skill: Something that can be completed with observable, physical results.

CHAPTER TWO

LITERATURE REVIEW

Collection of previous work and projects into a portfolio can seem straightforward, but there is no single type of portfolio. Traditional handmade portfolios are being supplemented or replaced by digital versions, increasing the complexity of creating a portfolio, but also increasing its transferability and possible interactivity. Besides the physical differences between portfolio types, the final purpose of a portfolio can be focused on educational assessment, reflective learning, or employment seeking. Exploration of the many types and purposes of portfolios will help to identify the outcome goals of student portfolios.

Portfolio evaluation during development courses are intended to help students to improve their work and create cohesive apparel design portfolios for presentation to prospective employers. Criteria generally include organization and presentation, professionalism, and content. Nikirk (2008) outlined organization schemes and grading criteria for digital portfolios created by communication students, focusing on organization, usability and visual presentation. Often portfolio development emphasizes more on how content is presented than what is presented.

The contents of portfolios are individual and often difficult to determine general guidelines for inclusion. To better determine the types of appropriate content for employment seeking portfolios, an overview of relevant job skills will be examined. Finally, a theoretical framework of semiotic sign use and meaning will be compared to the use and presentation of employment seeking portfolios.

Portfolio Types

Portfolios are individual, personal, are fundamentally unique as they are meant to represent their creator. Many of the guides to portfolio creation are aimed at presenting modes or types of portfolios that, although geared towards similar outcomes, can vary in formatting, delivery, and complexity. Four types of portfolios have been identified as either currently used by apparel design students, or are possible for apparel design students to create with some instruction.

Traditional Portfolio

The hand-crafted portfolio encased in black leather could be considered the prototypical example of a traditional version of a portfolio. During coursework, students are often required to create presentation boards that conceptualize the idea of a design, identifies the target market, outlines specific details and unifies the visual presentation using color, shape and line (Guérin, 2005; Cassidy, 2011). Portfolio pages are generally not as large as presentation boards and encompass spreads, i.e. two pages shown at once.

Key elements that distinguish a traditional portfolio from digital or computer created portfolios are that portfolio elements; 1) can be original works rather than copies, 2) are individually adhered to pages creating surface height and texture, 3) and may

require selection of existing materials. For example, a traditional portfolio's color tone and graphical leading elements may be restricted to materials available at a craft or scrapbooking store. With improvements to printing devices and services available, traditional portfolios may include digitally created elements, but each has been individually applied to the portfolio pages.

Digital Portfolio

Tain (2010) gives several examples of digital media for portfolio presentation, including brochures, web pages, and CD-ROM. Several resources for creating portfolios show examples of digitally created portfolio elements and portfolio pages (Gaimster, 2011; Baron, 2010; Tain, 2010). However, distinctions should be made between the type of portfolio and the means of delivery. Many types of media formats have been grouped together as digital portfolios (Baron, 2010; Tain, 2010). The difficulty in group all types of electronic delivery modes and digitally created portfolios together is that the planning and execution of these types of portfolios are different. That is to say, a student creating a portfolio for use as a website will plan the organization differently than creating other types of portfolios. Lastly, to create websites and interactive portfolios requires additional software that is most likely not taught in apparel design coursework.

There is a distinction between ePortfolios and digital portfolios. Although some literature will use the terms interchangeably, many ePortfolios are created through online management software, to create a collection of works from a variety of different subjects, most of which involve writing samples (Tzeng & Chen, 2012). This form of portfolio is not a practical form for apparel design students using portfolios for entry-level positions.

An ePortfolio system can require a password log-in, file navigation, and is intended for educational assessment.

Digital portfolios are similar to traditional portfolios in that they may include digitally created and hand drawn elements, and they follow similar layouts for content organization. As opposed to traditional types, digital portfolios are, 1) created as a whole using computer software, 2) reproducible, i.e. can be printed multiple times, 3) digitally transferable, and 4) contained in a single file or folder. These distinctions for digital portfolio require some use of specialized software, such as Adobe Photoshop and Illustrator for content creation, manipulating scanned original artwork, and organization. Digital portfolios can visually appear the same as traditional portfolios, following a multiple page or spread format. Often the use of Portable Document Format (PDF) is common for distribution of digital portfolios.

Online Portfolio

Online portfolios add another level of complexity and require more specialized knowledge in computer software to create. Although several online resources exist to present a digital portfolio online, it should be noted that there is a difference between displaying or posting a digital portfolio online and having an online portfolio. An online portfolio has 1) the possibility of multiple media formats, 2) hyperlinks to allow ease of navigation, and 3) includes several individual files that are grouped together and navigated to through the use of a web browser application. These differences separate an online portfolio from a digital portfolio that is simply posted as a link or download on a website (Baron, 2010).

Learning the software required to create an online portfolio is typically outside of the structured coursework of an apparel design program. The use of template formats in free blog websites allows for students to create online portfolios without the use of website creation software such as Adobe Dreamweaver or Flash. Additionally, it should be noted that several websites exist for posting digital portfolios online or for creating small online portfolios, however, many of these are gallery style presentations that are intended to show several images rather than portfolio pages from traditional and digital portfolios. These websites include carbonmade.com, squarespace.com, and weebly.com. Most of the template style website creation providers offer free basic packages to create online portfolios with paid premium alternatives.

Interactive Portfolio

A final type of portfolio is an interactive portfolio that builds on the online portfolio. The inclusion of hyperlinks and navigation bars will allow for easy viewing of multiple pages in an online portfolio, but does not mean that the portfolio itself is interactive. An interactive portfolio may be presented online, but other means of distribution could be used that would not require the use of the Internet for viewing. Interactive portfolios can even be stand-alone applications that do not require a web browser for viewing (Baron, 2010).

With the added complexity and specialized knowledge required to create an engaging interactive portfolio it is not surprising that the format is not used often. Baron (2010) gives suggestions for organization and planning for making online portfolios more interactive, but these instructions follow a typical plan for website creation. An

interactive portfolio should 1) require the user to engage in the presentation, 2) and visually change as a user clicks, mouses-over, or taps depending of device used.

Portfolio for Different Uses

Near the end of coursework in an apparel design program, students tend to focus on the creation of a portfolio strictly for the purpose of using it during job interviews. Portfolios themselves are not however, limited to employment seeking endeavors, rather they can be used to evaluate the effectiveness of pedagogical practices (Blaikie, Schönau, & Steers, 2004), monitor student learning (Rifa-Valls, 2011), and influence student reflective learning (Paulson, Paulson, & Meyer, 1991). These uses for portfolios are similar, and only differ from employment seeking portfolios in maintaining works that show progress rather than exclusion of early projects that may not have the same quality as later work.

The use of portfolios in education arose from a need to assess students in a way that standardized testing couldn't capture (Elbow & Belanoff, 1997). Most of the focus of portfolios in education is on grades K-12, and focuses on reflective writing, sample projects and imagery of activities. These types of portfolios lost favor as the collection of so much material for each student began to become overwhelming and the qualitative and subjective process of reviewing educational portfolios couldn't be reliably rated.

There has been a large amount of emphasis placed on educational portfolios as the possibility of electronic versions of portfolios has become available. Dubinsky (2003) argued for the creation of an ePortfolio to help students become aware of their own learning processes. In some ways, this is similar to the online portfolios discussed

previously, which allows a student to post works that can be accessed by others and personally reviewed to understand their learning process and academic progress. Young (2002) identified that students are able to link educational experiences together to create a better picture of how the activities and assignments in multiple classes are related.

Portfolios in educational settings have strong potential for allowing comparison of outcomes across multiple years within a course or an entire program (Castiglione, 1990; Blaikie, Schönau, & Steers, 2004). This type of outcome assessment of school programs can help to make decisions about needed changes, or to show the strengths of the program compared to similar schools. Portfolios that apparel design students create at the end of their program are not intentionally created to show their own learning processes or the outcomes of their program. Students do, however, go through a reflective process in the selection of projects to include in an employment seeking portfolio (Tain, 2010).

Job Skills Representation

Portfolios for seeking employment are presented in interviews to demonstrate an applicants abilities and aesthetic style. This is also a chance to give evidence from previous projects and employments that an applicant possesses the skills and abilities that the employer has posted in job announcements. Companies seeking new employees will often explicitly advertise the qualifications they are looking for in new hires, outlining job responsibilities and typical tasks. Students creating portfolios at the end of their coursework should review the types of job skills employers are looking for to ensure that their portfolio represents these desired skills (Baron, 2010; Tain, 2010).

Much of the literature involving portfolios focuses on educational portfolios, writing samples or curriculum assessment (Taras, 2002; Rifá-Valls, 2011; Ziegler & Montplaisir, 2012). Specific programs that have used portfolios for assessment of learning include nursing, biology and physical sciences (Fitzsimons & Pacquaino, 1994; Prince, 1994; Ziegler & Montplaisir, 2012). Another area of focus in regards to portfolios and employment is directed at teacher performance (Campbell, Melenyser, Nettles, & Wyman, 2000; Stecher, 2004). Apparel design student portfolios are generally not used as a means of evaluating student learning outcomes, program effectiveness, or the students' instructors. Portfolios created by apparel design students are focused on presentation of abilities to prospective employers. However, assuming that apparel design courses are organized to teach students abilities they will use in their future careers, educational portfolio assessment should represent job skills desired by the industry.

Portfolio assessment will tend as well to focus on reflection, allowing the student to view previous work and contemplate the change in understanding or knowledge (Campbell et al, 2004). This is often accomplished through reflective writing samples that are included in the educational portfolio (Paulson, Paulson & Meyer, 1991). Samples of reflective writing may be useful in assessment of apparel design program outcomes, but are typically not of interest to employers reviewing apparel design portfolios.

Employers are more likely interesting in current ability rather than educational growth. Presentation of the change in knowledge or a student's growth in understanding

in a given topic is not relevant to employment seeking portfolios. Jarvis, Holford, and Griffen (1998) state that students need to realize what they have learned and demonstrate it. For apparel design students this may change to realizing what they can do and demonstrate it.

Theoretical Framework

The success of non-verbal communication requires a mutual understanding between both the sender and the receiver of a message of what the contents of the message means. There are several theories of communication that help to explain the process of non-verbal human interaction (Griffin, 2003). Student portfolios contain several components that are used to represent the production of apparel such as technical drawings that indicate to manufacturers how an article of clothing would be constructed. However, the use of student portfolios is not intended to communicate with factories, but rather to demonstrate skills and abilities to prospective employers.

The messages intended by students in portfolios are an additional layer of meaning added on top of the original purpose of portfolio elements. For example, a student portfolio may include an illustration, technical drawings, fabric swatches and an expanded color story. These elements, viewed as a means of communication, represent how the clothing is fit on the body, how the clothing would be constructed, what the clothing's material and optional visual variations. However, placing these elements into a portfolio and changing the receiver of the message alters the context and the meanings. These portfolio elements can now represent skills learned in the classroom such as clothing construction, color theory, and the use of principles of design.

Semiotics

The field of semiotics has a long history of working with the meanings and interpretations of signs (Nöth, 2000). The use of signs to represent objects, ideas, and feelings has been a part of the human experience since the beginnings of non-verbal communication. Many signs used in society can be understood with little or no direct instruction, whereas others require specialized training or social interaction to extract meaning. Additionally, there is the complication that signs can shift in meaning across different cultures or across time.

In the early 20th century, Charles Sanders Peirce worked with categorizing and understanding semiotic signs (Nöth, 2000). His works set a foundation for semiotic schools of thought and helped to define much of the terminology used in the study of signs. Each sign is made up of three parts, the representamen (sign itself), the object the sign represents, and the interpretant or meaning. Each of these parts then has three categories, creating three trichotomies. The second of Peirce's trichotomies, the relation of the sign to the object, is most relevant for understanding student portfolios. This identifies the relationship of the object to the sign as an icon, index, or symbol.

Works by Max Bense, which build on the definitions that Peirce outlined can help related the sign to the object it represents and the meaning that it holds.

Max Bense

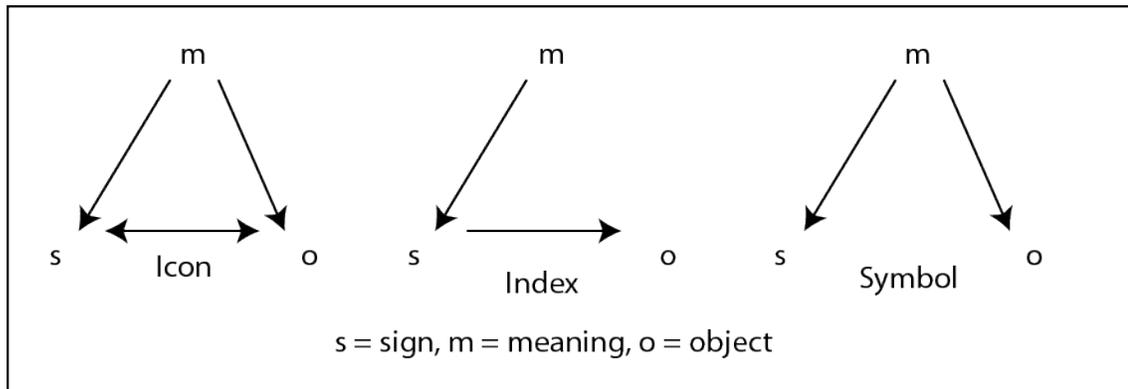
In 1971, Max Bense published a work entitled Zeichen und Design (trans. Signs and Design), which coupled with his 1970 work Semiotik: Allgemeine Theorie der Zeichen (trans. Semiotics: General theory of signs) evaluated design outcomes based on semiotic principles. Bense was a German philosopher and writer that examined the connections between natural sciences and the humanities. A portion of his works revolved around design, incorporating both mathematical principles and semiotic interpretations of meanings in signs. Bense (1971) used much of the same terminology as previous semiotic researchers building on the collection of principles and models to show semiotic ideas in designed objects.

Within the works of Peirce (Nöth, 2000) there are three categories of semiotic signs: icon, index, and symbol. Peirce used these terms as part of his classification of sign types and semantic representation, in other words, the relationship of a sign to the object. Bense (1971) built on this idea of how a sign directly or indirectly represents an object in the physical world. The relationship of the sign to the object it represents is considered a semantic study within semiotics (Nadin, 1990).

Icons are easily understood as the object because of visual similarities and often direct proportional relationships. For example, an icon could be a realistic painting or drawing or a photograph. Indices are signs that still maintain some direct form or shape to the represented object, but often have been simplified or altered in proportion and scale. A stick figure drawing of a person would be categorized as an index. Symbols require some indirect understanding and interpretation to make the connection to between the sign and the actual object. Text can be seen as a symbol as the words referring to an

object do not share the form or shape of the object. Figure 2.1 represents the direct or indirect relationships the type of sign can have with the meaning and real life object it represents.

Figure 2.1



Model of the relationship between a sign, the object, and meaning (Bense, 1971).

The type of semiotic sign is only one corner of a triad to explain how signs are used and understood. The three sides are the sign, the real life object that the sign represents, and the social meaning or understanding of the sign. Using this triad, a simple example of a pedestrian crossing sign can be examined. The pedestrian crossing sign itself is the sign, viewed by drivers as they come near a crosswalk. The real life object the sign represents would be people crossing the road at that time. The meaning or social understanding of the sign is that there may be pedestrians in the road currently and drivers should be cautious.

The difficulty in using semantic categorization as described by Bense (1971) in apparel design student portfolios is that there are two levels of meaning for each of the portfolio elements. A portfolio element can be interpreted as a representation of a physical object, whereas at the same time the portfolio element can be interpreted as a

representation of competence at a skill or ability. It is the intention of this study to take the later view, interpreting the model of Max Bense (1971) to view signs in portfolios as representations of skills and abilities and the meanings of the sign as how well the given skill or ability is represented.

By identifying apparel design entry-level design skills, and that the meaning of a sign is how well the skill is represented, then the best signs can be identified as the missing variable. Signs seen as best representing a job skill can be further categorized as icon, index, or symbol giving justification to recommendations for creating portfolios and portfolio elements that include socially understood representations of apparel design entry-level job skills.

Summary

There are several types of portfolios that can be created by apparel design students at the end of their studies, showing how they have learned or what they have learned. Additionally, apparel design students have a range of choices for presenting their portfolio, from traditionally created spreads with individual elements adhered to a page or a fully interactive online portfolio using multiple media types. Given the computer software typically taught in apparel design programs and used in the apparel industry, the use of digital portfolios appears most common.

Employers are often very clear about the job skills required in employment postings. However, the connections between what apparel design students should choose to present in their portfolio and what job skills employers seek are unclear. The use of semiotic theory to identify the semantics of signs used in student apparel design

portfolios can help to establish these links. Inclusion of the categorization of signs as icon, index, or symbol can clarify how students can represent skills and abilities learned in coursework to future employers.

CHAPTER THREE

METHODS AND PROCEDURES

This study explored the interpretations in the meanings represented by apparel design student portfolios. The objective of this study was to examine elements of apparel design portfolios into semiotic categories: icons, indices, and symbols. In addition, this study attempted to discover characteristics of signs in apparel design portfolios that were rated by industry experts to represent essential job skills better than others. Comparisons between apparel design professionals and apparel design students were shown by type of job skills represented by elements in student portfolios, how well a sign represents those job skills, and whether those job skills are concrete or abstract in nature. Lastly, this study examined the relationships between type of semiotic category, icon, index, or symbol, and abstract abilities or concrete skills.

Job Skill Identification

A review of job skills listed by employers in the apparel industry was conducted to identify the types of job skills that portfolio elements should represent. Two employment seeking websites that focus on apparel industry jobs were queried (www.stylecareers.com and www.wwd.com). Employment postings were used to identify job skills, using the following requirements: 1) job postings were current as of November,

2012; 2) job postings were for entry-level positions requiring 0-2 years of work experience, and 3) job postings included explicit listing of required and preferred skills and abilities. Searches for job postings included technical and aesthetic design positions.

Descriptions of responsibilities listed as part of job postings were also evaluated for the job skills that they represented. For example, maintaining and organizing swatch libraries and quality control testing categorized as part of proficiency in textile knowledge and manufacturing respectively. Requirements and qualifications for advertised positions that reflected personality characteristics were also included.

64 entry-level position announcements were found for a variety of areas in the apparel industry. Specific areas included men's, women's, and children's wear, sportswear, outerwear, wovens, knits, and a range of specific product categories, i.e. skirts, tops, denim. Within the posting, 386 instances of 21 keywords were identified for job skills and 62 instances of 21 keywords were identified for job categories. Keywords related to job skills were used for this study, and all keywords are listed in appendix A.

Themes

This search revealed 21 keywords relating to entry-level job skills and abilities across the apparel design industry. These skills were grouped into broad themes that either grouped several keywords into a more generalizable category or combined small subsets of keywords based on close relationship. For example, keywords of Team Player and Communication Skills were grouped into Interpersonal Skills.

The following seven themes were identified for job skills for entry-level apparel design positions:

1. Computer Knowledge (CAD)
2. General Computer Knowledge (Word/Excel)
3. Personality Characteristics
4. Interpersonal Skills
5. Technical Knowledge of Fit and Construction
6. Sketching/Flats/Drawing
7. Fabric Knowledge

The above job skills themes were used as a basis for evaluation of apparel design student portfolios. This can help to establish empirical links between the types of portfolio elements students should include in their portfolios in order to represent desired skills and abilities employers desire. However, some of the listed job skills themes are more easily represented in portfolios than others, varying in the degree of whether the job skill has physical outcomes. Abstract abilities, such as those related to personality, may be more difficult to explicitly represent in portfolios than the ability to create garment specifications for production. Further analysis was needed to determine if employers and students view these job skills as either abstract or concrete in nature.

Participant Selection

Participants in this study were 26 apparel design industry professionals and 44 apparel design students enrolled in a four-year apparel design program. After receiving approval from the Institutional Review Board, prospective apparel design professional participants identified through researcher and advisor industry contacts were recruited by email invitations with a link to the survey website. Apparel design students were

recruited through email invitations from department lists and through course instructors (see appendix B). No compensation was provided for participation. All parts of the research instrument were online and available for two months.

Research Instrument

Participants were asked to rank the seven themes in job skills identified in the literature review from active entry-level job postings in the apparel design industry in order of importance for apparel design graduates. These job skills themes include: (1) Computer Knowledge using CAD, (2) General Computer Knowledge (Microsoft Word/Excel), (3) Personality Characteristics, (4) Interpersonal Skills, (5) Technical Knowledge of Fit and Construction, (6) Sketching/Flats/Drawing, (7) Fabric Knowledge. Using a seven point Likert scale, the participants were also asked to determine if these job skills are abstract or concrete abilities.

Students in a semester long portfolio course were asked to allow the use of sample work for the research instrument. Three samples of portfolios, two pages each, from student portfolios were used as the content for industry professional and student rating. Three elements in each spread and the general layout were used for the instrument. Parts of portfolios were purposely selected to present a variety of traditional hand drawn and computer generated elements.

The researcher chose examples of several types of outcomes from apparel design curriculum. These included the following:

1. computer created technical drawings,
2. computer created illustrations,

3. hand drawn sketches,
4. images of completed garments ,
5. images of details of finished garments.

Each of the identified elements were outlined in the full portfolio spreads and duplicated in a larger format. Participants were asked to use a seven point Likert scale (1 = poorly, 7 = very well) as well as a null responds (0 = not at all), to identify if a job skill is represented by the portfolio element and to determine how well the element represented the job skill. A printed version of the online survey can be found in appendix C.

Participants were given the option of giving comments as open-ended responses in the online survey. These statements were used as a means of comparison to quantitative results, but the low number of comments from participants could not be analyzed qualitatively in results.

Data Collection

Three sample spreads of apparel design student portfolios were presented as an online survey for convenience. Each participant was asked to complete basic demographic information, including age, sex, job classification (professional or student), years of experience in their job, and whether they routinely interact with portfolios. For professionals, interaction with portfolios included experience interviewing new employees and viewing portfolios. For students, interaction with portfolios asked if participants have taken a course in portfolio development.

One of the three elements in the portfolio spread was highlighted and marked with a colored outline, and participants were asked to indicate on a seven point Likert scale (1 = not at all, 7 = very well) how well each job skill is represented by that element. A total of seven Likert scales per design element will be presented.

Data Analysis

This study collected quantitative responses from participants and open-ended comments at the end of the online survey. Quantitative responses from participants were examined using Statistical Package for the Social Sciences (SPSS) software. Frequencies were run on the complete data set, identifying which skills were most commonly matched with outlined portfolio elements by professionals and by students. These descriptive statistics will also rank skills seen as most important by apparel design students and apparel design professionals. Mann-Whitney U nonparametric comparisons were used to compare the means of the two groups in the ratings of skills as abstract or concrete, rankings of importance of skills, and how well each portfolio element represents job skills. The Mann-Whitney U test was used in place of the standard t-test because of the larger response rate from apparel design students than apparel design professionals.

The highest rated job skill within each portfolio element as rated by professionals was selected as the basis for identification of icon, index, or symbol. Three independent raters were used to identify the type of sign each portfolio element represented as icon, index, or symbol. Each rater had a varying level of experience in design and different areas of expertise. Three portfolio elements were rated as representing two separate job skills, therefore identification of sign type was done twice for primary and secondary

meanings. The following definitions were given to the raters for identification of sign type.

1. Icon - Direct, pictorial representation of the outcome of the skill; example, Fit and construction skills are represented because it is an image of a constructed garment.
2. Index - Indirect, but logically understandable representation of the skill; example, Fabric knowledge is represented because the image of the garment is constructed with fabric.
3. Symbol - Indirect representation of the skill that requires expertise or understanding of the field or process to interpret; example, General computer knowledge is represented because the image of the garment has been scanned and placed in the document.

Raters had a high level of agreement with an interrater reliability of 0.87. Reliability was measured as the number agreements divided by the total number of agreements plus the number of disagreements (Touliatos & Compton, 1988).

CHAPTER FOUR

RESULTS

This chapter presents the results of the online survey used in the research study that was made available online for approximately two months. Demographic information is presented first, with separation between apparel design student and apparel design professional. Each of the twelve portfolio elements used in the study are presented separately, identifying student and professional responses, statistical differences in means between groups, and the identification of each portfolio element as icon, index or symbol. At the end of this chapter the open ended responses of participants are displayed, and will be discussed in chapter five.

Demographics

Forty-four apparel design students and 26 apparel design professionals participated in the survey. Of those participants, 27 apparel design students and 12 apparel design professionals completed all parts of the survey. Although this gave an approximate 60% completion rate, enough participants completed the study to use non-parametric data analysis for the valid responses. Of the 70 participants that began the

research instrument, 65 were female (41 apparel design students, and 24 apparel design professionals) and five were male (3 apparel design students, and 2 apparel design professionals). Apparel design students included sophomores (n=10, juniors (n=11), seniors (n=16), and graduate student or other (n=7). Forty-two percent of students indicated that they had previously taken a course that included portfolio development.

Apparel design professionals were asked how many years they had worked in the apparel industry, with two indicating 0-2 years, none indicating 2-5 years, and 16 indicating 5 or more years of experience. Six apparel design professionals did not respond to the number of years of experience. Ninety-one percent of professionals designated that they had previously participated in interviewing prospective employees. Professionals were also asked what types of portfolios their company preferred to receive. Digital portfolios were the most common (70%), followed by traditional portfolios (65%), and online portfolios (52%). 9% of professional respondents did not know which types their company preferred.

Both students and professionals in apparel design were asked which types of portfolios they currently have, or plan to create in the near future. Students responded that 39.1% plan to make traditional portfolios, 67.4% plan to create digital portfolios, and 69.6% will make online portfolios. Professionals responded more consistently in that 41.7% plan to make or have traditional portfolios, 41.7% for digital portfolios, and 41.7% for online portfolios (n=19, 5 professionals did not respond). Most participants indicated more than one portfolio type.

Job Skills

Participants were asked to rank each of the seven identified job skills from most to least important. The data were split by group, either apparel design student or apparel design professional, to derive means for each group. Average rankings were used to identify a group ranking for each of the job skills. Table 4.1 displays mean rankings for each of the job skills by occupation. These rankings were scored as 1= most important, 7= least important. Mann Whitney-U comparison of means was used as a non-parametric test for significant differences. Rankings of technical knowledge of fit and construction and sketching/flats/drawing were both found to be significantly different between groups, (p=0.012, and p=0.022 respectively).

Table 4.1
Job skill rankings of apparel design professionals and apparel design students.

Job Skill	Student Mean	Professional Mean	Rank		Sig. Diff. of Ave. ratings
			Student	Professional	
Computer Knowledge (CAD)	3.58	3.00	2	1	
General Computer Knowledge (Word/Excel)	4.63	4.94	6	7	
Personality Characteristics	3.87	4.38	4	4	
Interpersonal Skills	3.66	3.13	3	3	
Technical Knowledge of Fit and Construction	3.08	4.63	1	5	Yes, p=0.012
Sketching/Flats/Drawing	4.47	3.13	5	2	Yes, p=0.022
Fabric Knowledge	4.71	4.81	7	6	

Student, n=38; professional, n=16, 1=highest/most important, 7=lowest/least important

Table 4.2
Ratings of job skills as concrete or abstract.

Job Skill	Student	Professional	Sig. Diff. of Ave. ratings
Computer Knowledge (CAD)	4.85	6.41	Yes, $p < 0.001$
General Computer Knowledge (Word/Excel)	5.51	6.18	
Personality Characteristics	4.22	3.18	
Interpersonal Skills	4.07	3.41	
Technical Knowledge of Fit and Construction	5.37	5.76	
Sketching/Flats/Drawing	5.83	6.06	
Fabric Knowledge	5.41	5.53	

Student, $n=41$, professional $n=17$, Likert scale, 1=abstract, 7=concrete.

Job Skills as Abstract/Concrete

Participants were asked to rate how concrete or abstract they found each job skill on a seven point Likert scale (1=abstract, 7=concrete). The data were again split by occupation to show means per group. Average ratings of both student and professional responses are shown in table 4.2. Only computer knowledge (CAD) showed a significant difference between apparel design students and apparel design professionals ($p < 0.001$). Apparel design professionals view computer knowledge (CAD) as more concrete than apparel design students.

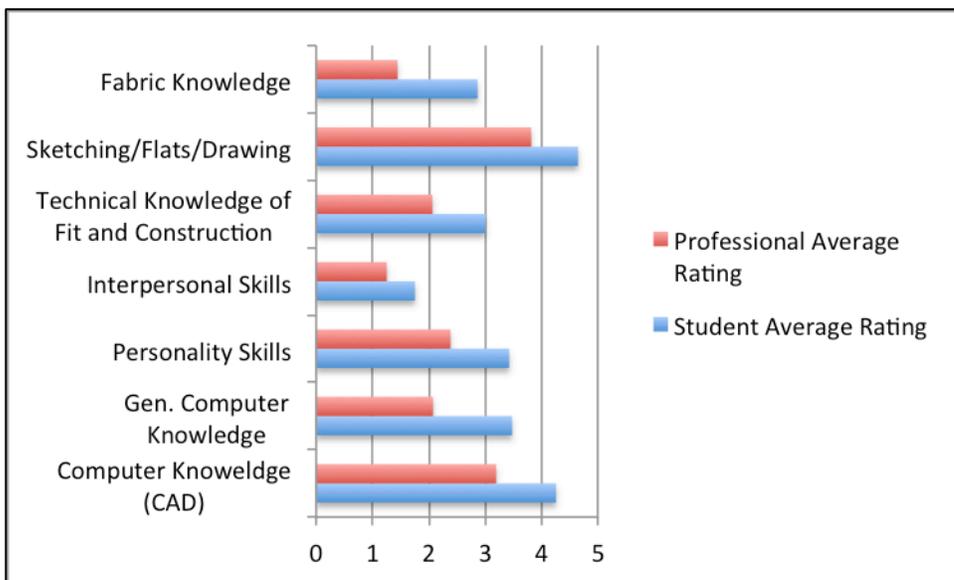
Representation of Portfolio 1, Element 1

Figure 4.1 displays the first portfolio element used in the research instrument. This portfolio element was selected as an example of computer illustration. Participants were asked to rate how well each of the identified job skills were represented by this portfolio element. Participant responses are displayed in figure 4.2.

Figure 4.1 Portfolio 1, Element 1. Hand drawn fashion illustrations.



Figure 4.2 Participant responses for portfolio 1, element 1.



Mann-Whitney U non-parametric comparison of means was used to compare the responses from each group. For this portfolio element the representation of three job skills was significantly different: computer knowledge (CAD) ($p=0.048$), general computer knowledge (Word/Excel) ($p=0.036$), and fabric knowledge ($p=0.016$). Apparel design student responses were higher across the representation of all job skills for portfolio 1, element 1.

The job skill rated as most represented in this portfolio element by apparel design professionals was sketching/flats/drawing. Comparison of means using a paired samples t-test was done within the apparel design professionals group to insure that the rating of the highest represented job skill was significantly different than the ratings of any other job skill. All ratings of the representation of job skills were significantly different except for computer knowledge (CAD) ($p=0.295$). This indicated that both of these job skills were represented in the portfolio element. Sketching/flats/drawing was then labeled as the primary represented job skill, and computer knowledge (CAD) was labeled as the secondary represented job skill.

Independent raters viewed the portfolio element and the represented job skill in order to indicate the type of sign. For the primary represented job skill (sketching/flats/drawing) all three raters labeled the sign as an icon. For the secondary represented job skill (computer knowledge (CAD)), raters disagreed about the type of sign. Icon, index and symbol were each indicated by one rater as the type of sign for this portfolio element when representing computer knowledge (CAD). Discussion of the implications for the rater disagreement will be presented in the following chapter.

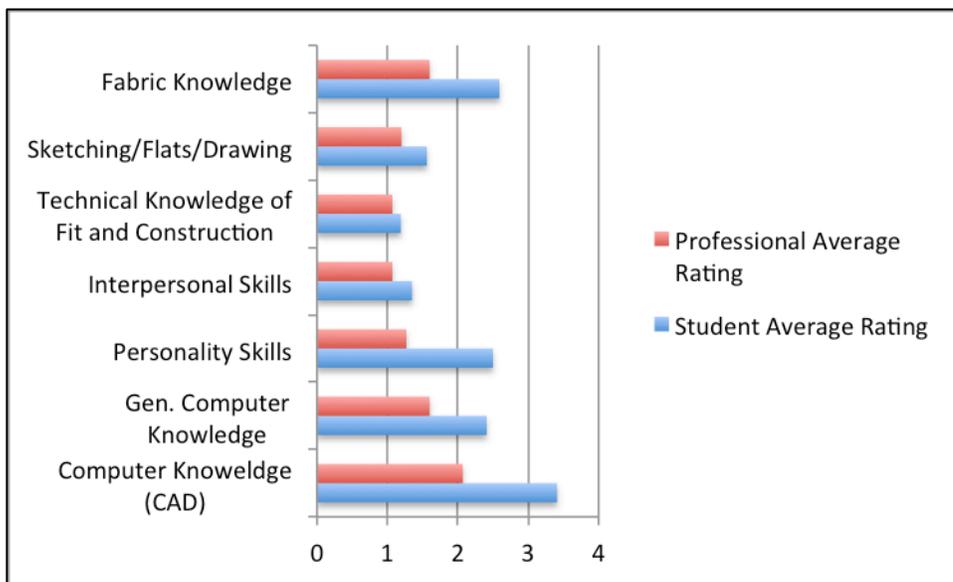
Representation of Portfolio 1, Element 2

Figure 4.3 displays the second portfolio element used in the research instrument. This portfolio element was selected as an example of color or fabric swatches. Participants were asked to rate how well each of the identified job skills were represented by this portfolio element. Participant responses are displayed in figure 4.4.

Figure 4.3 Portfolio 1, Element 2. Color/Fabric swatch samples.



Figure 4.4 Participant responses for portfolio 1, element 2.



Apparel design student and apparel design professional responses were compared using Mann-Whitney U as a non-parametric test. Student average rating of the

representation of each job skill was higher than professional ratings. A significant difference between groups was evident in computer knowledge (CAD) ($p=0.021$).

The job skill rated as most represented by this portfolio element was computer knowledge (CAD). However, paired samples t-tests of the apparel design professionals responses indicated that the ratings for fabric knowledge ($p=0.334$) and general computer knowledge (Word/Excel) ($p=0.204$) were not significantly different from the rating of computer knowledge (CAD). Therefore, the primary job skill represented by this portfolio element was determined to be computer knowledge (CAD), with a secondary job skill of fabric knowledge and a tertiary job skill representation of general computer knowledge (Word/Excel). Raters were in agreement of the type of sign as an icon for this portfolio element when representing computer knowledge (CAD). However, disagreement between the portfolio as a symbol (2 raters), and index (1 rater) was found for both the secondary and tertiary job skill representation. Disagreements and their implications will be discussed in the following chapter.

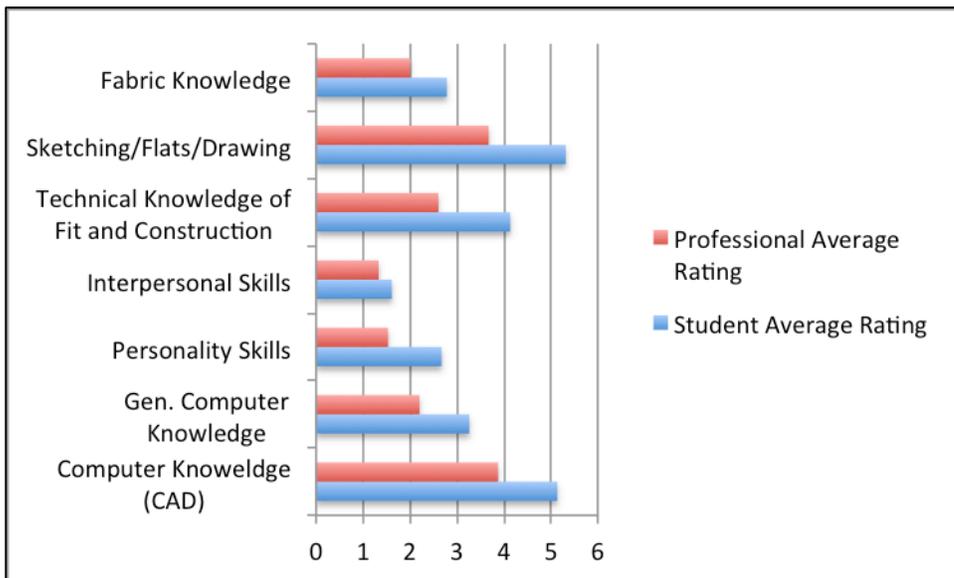
Representation of Portfolio 1, Element 3

Portfolio 1, element 3 was selected for use in the research instrument as an example of a computer created technical drawing. Participants were asked to rate how well each job skill was represented by this portfolio element. Figure 4.5 displays the portfolio element as used in the research instrument, and figure 4.6 shows participant responses.

Figure 4.5 Portfolio 1, Element 3. Computer created technical drawings.



Figure 4.6 Participant responses for portfolio 1, element 3.



Mann-Whitney U non-parametric comparison of means was used to compare the responses from each group. For this portfolio element the representation of three job skills was significantly different: computer knowledge (CAD) ($p=0.008$), technical knowledge of fit and construction ($p=0.009$), and sketching/flats/drawing ($p=0.005$). Apparel design student responses were higher across the representation of all job skills for portfolio 1, element 3 than the responses from apparel design professionals.

The highest rated job skill by apparel design professionals for this portfolio element was computer knowledge (CAD). Paired samples t-tests were run to compare the ratings by professionals of the other job skill representations in portfolio 1, element 3. All comparisons were found to be significantly different except for sketching/flats/drawing ($p=0.638$). Computer knowledge (CAD) was therefor labeled as the primary job skill represented by portfolio 1, element 3, and sketching/flats/drawing was labeled as the secondary job skill. The primary job skill was viewed as an icon by two of the independent raters, while the remaining rater viewed the portfolio element as an index for type of sign. The secondary job skill was unanimously viewed as an icon.

Representation of Portfolio 1 Layout

To include a broader context for the portfolio elements, the layout of the portfolio page spread was also rated by participants for their opinions of the representation of job skills. Figure 4.7 displays the layout for portfolio 1, and figure 4.8 shows participant ratings.

Figure 4.7 Portfolio 1 layout.

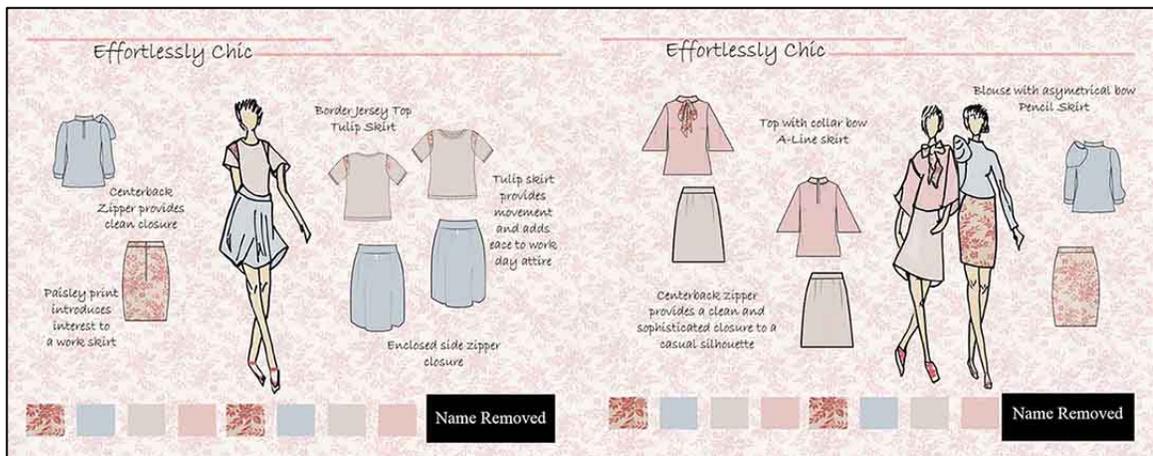
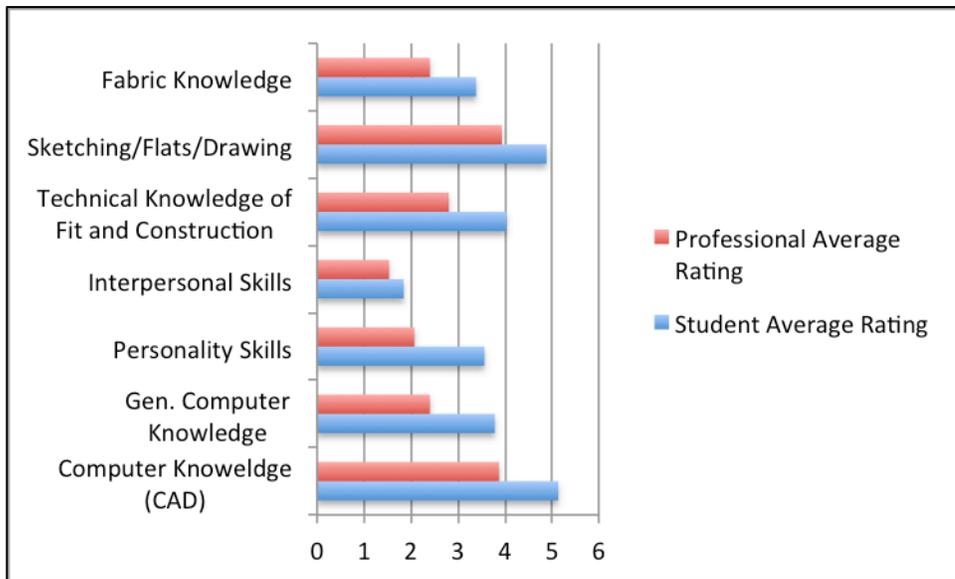


Figure 4.8 Participant responses for portfolio 1 layout.



Mann-Whitney U non-parametric comparison of means was used to compare apparel design student and professional responses. Although apparel design students

gave higher ratings for the representation of each job skill, only computer knowledge (CAD) ($p=0.005$), general computer knowledge (Word/Excel) ($p=0.039$), personality skills ($p=0.025$), and technical knowledge of fit and construction ($p=0.034$) were significant. The highest represented job skill as reported by apparel design professionals was sketching/flats/drawing.

Comparisons were made between the highest represented job skill and each of the others as indicated by apparel design professionals to discover secondary or tertiary meanings. Computer knowledge (CAD) was the only job skill with a rating that was not significantly different from the highest rated job skill. Therefore, sketching/flats/drawing was labeled as the primary meaning for portfolio 1 layout, and computer knowledge (CAD) was labeled as the secondary meaning.

Independent raters agreed that portfolio 1 layout was an icon representation of sketching/flats/drawing. However, 2 raters viewed the secondary meaning of computer knowledge (CAD) as an icon, whereas the third rater indicated that they viewed portfolio 1 layout as an index of computer knowledge (CAD). Disagreements between raters and possible reasons for the disagreements are discussed in chapter five.

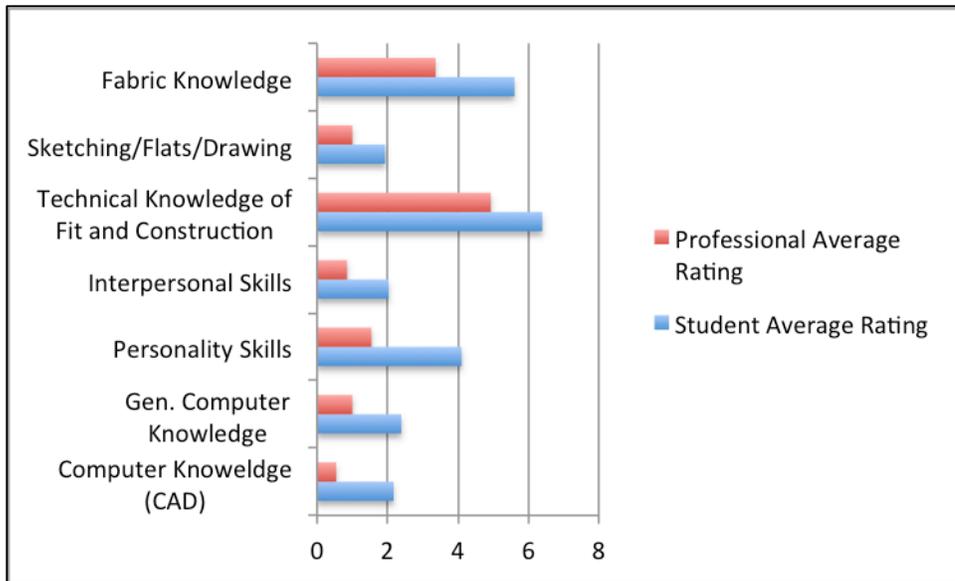
Representation of Portfolio 2, Element 1

Portfolio 2, element 1 was selected for inclusion in the study as an example of a typical finished garment image. Participants rated this portfolio element for how well it represented each of the seven job skills. Figure 4.9 displays the image used in the online survey, and figure 4.10 displays the mean responses for each group.

Figure 4.9 Portfolio 2, Element 1. Full image of completed garment.



Figure 4.10 Participant responses for portfolio 2, element 1



Non-parametric Mann-Whitney U comparison of means was used to determine differences between groups. Apparel design student responses were higher than apparel design professional responses across all job skills, and over half the tests showed significant differences. Job skills showing significant differences were: computer knowledge (CAD) ($p=0.048$), personality skills ($p<0.001$), technical knowledge of fit and construction ($p<0.001$), and fabric knowledge ($p<0.001$).

The job skill with the highest rated representation in the apparel design professionals group was technical knowledge of fit and construction. Comparisons between professional responses were completed using paired samples t-tests to determine if any job skill representation was not significantly different than the highest rated. All ratings of the representations of job skills compared to the rating for technical knowledge of fit and construction were significant, identifying technical knowledge of fit and construction as the meaning of the portfolio element as a sign. Independent raters

determined this portfolio element to be an icon (2 raters) and a symbol (1 rater).

Disagreement regarding the type of sign is discussed in chapter 5.

Representation of Portfolio 2, Element 2

Along with images of entire garments, detail images of specific portions of a garment are typically included in portfolios to display a complex area or some part of the garment that is hidden from view in the full image. Portfolio 2, element was selected as an example for the research instrument of a detail image. Figure 4.11 shows the image used in the online survey and figure 4.12 displays the participant responses in regards to job skill representation in the image.

Figure 4.11 Portfolio 2, Element 2. Image of details of final garment.

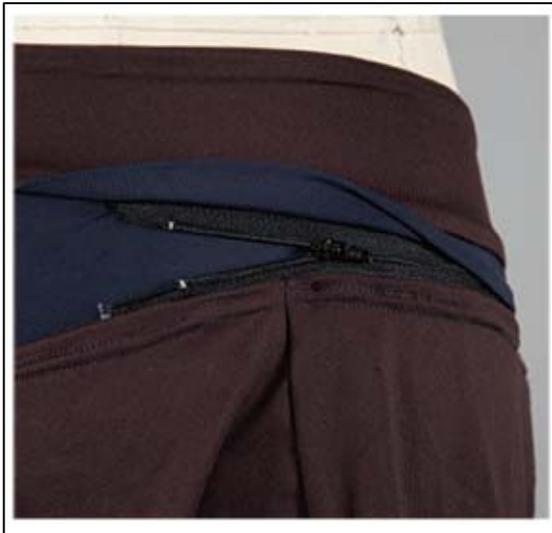
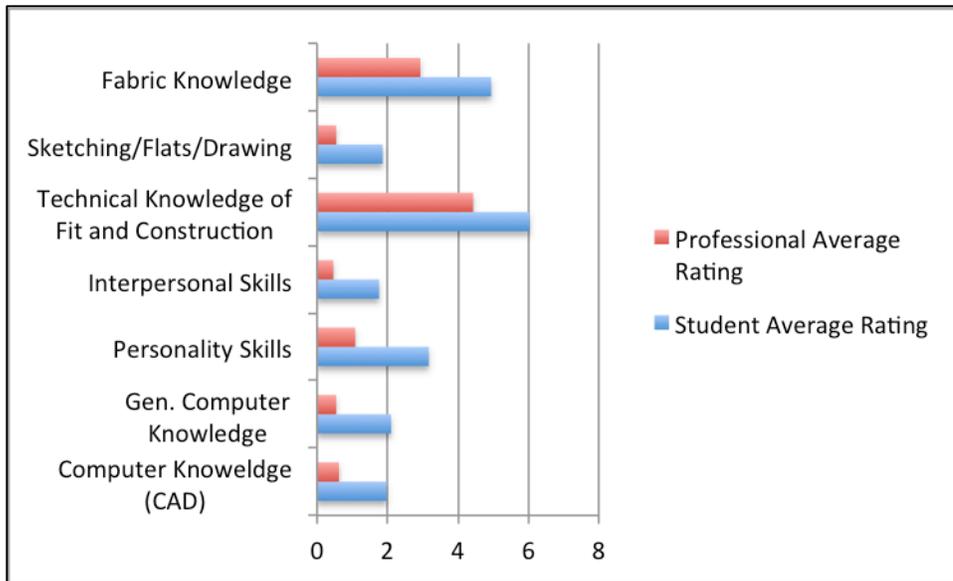


Figure 4.12 Participant responses for portfolio 2, element 2



Apparel design students rated each job skill as represented higher in the portfolio element than did apparel design professionals. Mann-Whitney U comparison of means was used as a non-parametric test to determine differences between the group means. Personality skills ($p=0.002$), technical knowledge of fit and construction ($p<0.001$), and fabric knowledge ($p=0.003$) were all significantly different. Apparel design professionals rated technical knowledge of fit and construction as the highest represented job skill. Paired samples t-tests were used to determine if the ratings of the other job skills were significantly different than technical knowledge of fit and construction. All comparisons were found to be significant, identifying technical knowledge of fit and construction as the best represented job skill. Independent raters agreed that portfolio 2, element 2 was an icon of this job skill.

Representation of Portfolio 2, Element 3

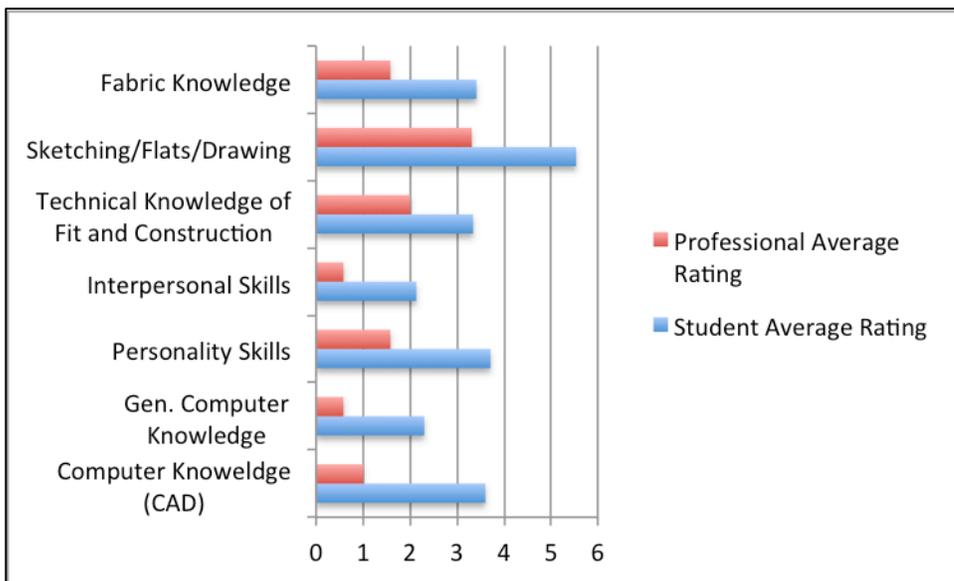
Figure 4.13 displays the portfolio 2, element 3 used in the research instrument. This portfolio element was selected as an example of a technical drawing create by hand.

Participants were asked to rate how well each of the identified job skills were represented by this portfolio element. Participant responses are displayed in figure 4.14.

Figure 4.13 Portfolio 2, Element 3. Hand drawn technical drawings.



Figure 4.14 Participant responses for portfolio 2, element 3



Mann-Whitney U non-parametric tests were used to compare the mean response of each job skill between groups. All comparisons were significant, except for interpersonal skills ($p=0.077$). Apparel design student responses were consistently higher than apparel design professional responses for this portfolio element. Apparel design professionals rated sketching/flats/drawing as the most represented skill for portfolio 2, element 3. Paired samples t-tests showed that all other ratings for job skills by professionals were significant, identifying this portfolio element as best representing sketching/flats/drawing. All independent raters viewed this sign as an icon representation of sketching/flats/drawing.

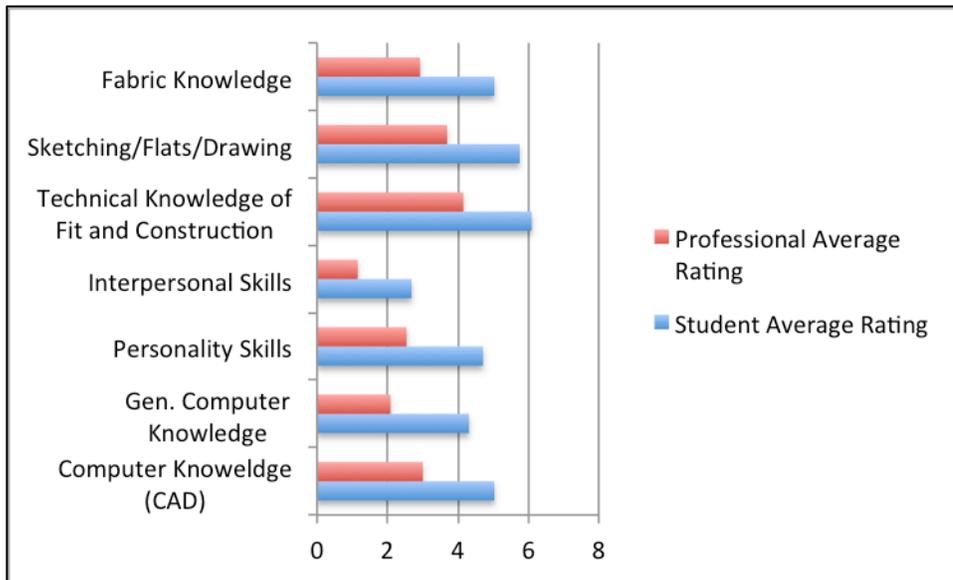
Representation of Portfolio 2 Layout

The layout of portfolio 2 was used as a whole as an additional portfolio element to include a broader context for the individual elements. Figure 4.15 displays portfolio 2 layout, and figure 4.16 shows participant responses from the online survey.

Figure 4.15 Portfolio 2 layout



Figure 4.16 Participant responses for portfolio 2 layout



Apparel design student responses were higher across all job skills than apparel design professionals. Mann-Whitney U comparisons of means was used for non-parametric data, showing that apparel design students and apparel design professionals responses were significantly different for the representation all job skills in portfolio 2 layout.

Apparel design professionals rated technical knowledge of fit and construction as the most represented job skill in portfolio 2 layout. Paired samples t-tests showed that there was not a significant difference between technical knowledge of fit and construction and sketching/flats/drawing in apparel design professional responses ($p=0.190$). This identified technical knowledge of fit and construction as the primary job skill represented by portfolio 2 layout, and sketching/flats/drawing as the secondary job skill represented by portfolio 2 layout.

Independent raters identified portfolio 2 layout as an icon for technical knowledge of fit and construction. Sketching/flats/drawing was also viewed as an icon representation by independent raters.

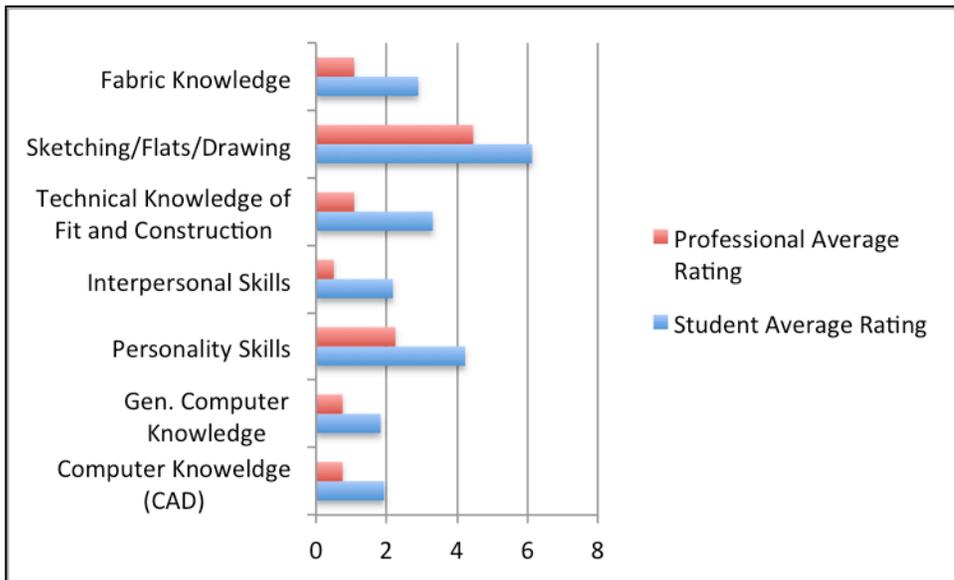
Representation of Portfolio 3, Element 1

Portfolio 3, element 1 was chosen as an example of hand drawn sketches. Figure 4.17 shows the portfolio element as used in the online survey, and figure 4.18 displays participant responses for rating each job skill representation.

Figure 4.17 Portfolio 3, Element 1. Hand drawn sketches.



Figure 4.18 Participant responses for portfolio 3, element 1



Mann-Whitney U non-parametric comparison of means was used to compare apparel design student and apparel design professional responses. Personality skills ($p=0.015$), technical knowledge of fit and construction ($p=0.005$), sketching/flats/drawing ($p<0.001$), and fabric knowledge ($p=0.012$) were all found to be significantly different. As with other portfolio elements, student responses were higher than professional responses.

Sketching/flats/drawing was rated by apparel design professionals as the most represented job skill in portfolio 3, element 1. Paired samples t-tests were used to compare responses of all job skills to the most highly rated. All comparisons were significant, identifying sketching/flats/drawing as the best representation for portfolio 3, element 1. Independent raters agreed that type of sign for this portfolio element was an icon.

Representation of Portfolio 3, Element 2

Portfolio 3, element 2 was selected for inclusion in the research instrument as a combination of ideation sketching and technical drawings made by hand. Figure 4.19 displays portfolio 3, element 2 and figure 4.20 shows participant responses for the representation of each job skill in this portfolio element.

Figure 4.19 Portfolio 3, Element 2

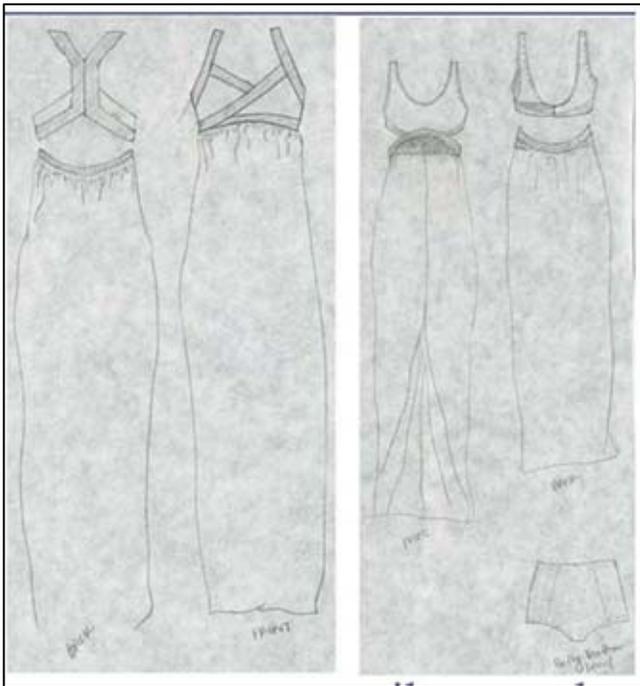
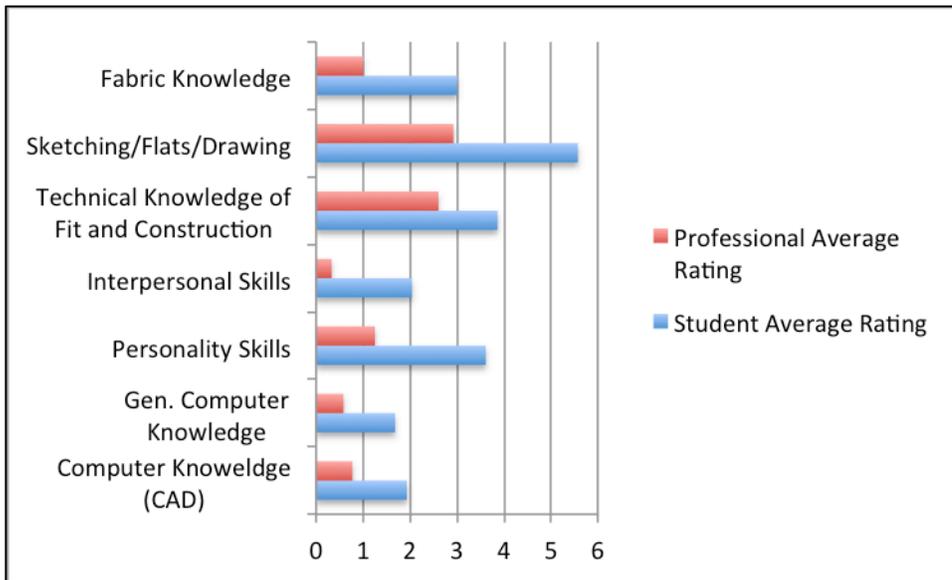


Figure 4.20 Participant responses for portfolio 3, element 2



Apparel design students rated the representation of each job skill higher than apparel design professionals for portfolio 3, element 2. Mann-Whitney U non-parametric comparison of means was used to compare the responses of each group. Personality skills ($p=0.002$), sketching/flats/drawing ($p<0.001$), and fabric knowledge ($p=0.023$) were all found to be significant differences.

Sketching/flats/drawing was rated as the highest represented job skill in portfolio 3, element 2. Paired samples t-tests were used to compare responses to the remaining job skill representation against sketching/flats/drawing within the apparel design professional group. Technical knowledge of fit and construction was the only job skill that was not significantly different from sketching/flats/drawing ($p=0.555$). This identified sketching/flats/drawing as the primary job skill represented by portfolio 3, element 2, and technical knowledge of fit and construction was identified as the secondary skill represented.

Independent raters scored the primary job skill of sketching/flats/drawing as an icon. The secondary job skill represented was viewed as a symbol for type of sign.

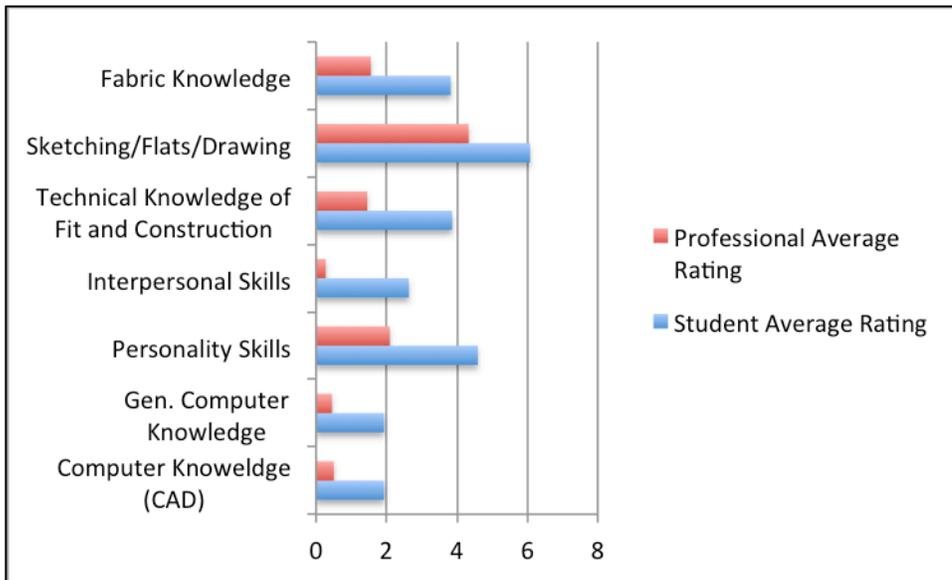
Representation of Portfolio 3, Element 3

Portfolio 3, element 3 was selected for use in the research instrument as an example of a hand drawn illustration of a fashion garment. Apparel design students and apparel design professionals were asked in the online survey to rate this portfolio element for how well it represented the seven identified job skills. Figure 4.21 shows the image of portfolio 3, element 3, and figure 4.22 displays participant mean responses.

Figure 4.21 Portfolio 3, Element 3. Hand drawn illustrations.



Figure 4.22 Participant responses for portfolio 3, element 3



This portfolio element was rated higher by apparel design students than apparel design professionals for representing each of the job skills. Mann-Whitney U comparison of means was used as a non-parametric test to compare the group means of student and professional. Computer knowledge (CAD) and general computer knowledge (Word/Excel) were the only two job skills without significant differences ($p=0.258$ and $p=0.190$ respectively). Sketching/flats/drawing was identified as the highest represented job skill in portfolio 3, element 3.

Paired samples t-tests were used to compare each of the job skill ratings against sketching/flats/drawing within the apparel design professional group. All comparisons showed significant differences, identifying sketching/flats/drawing as the best represented job skill for this portfolio element. Independent raters were unanimous in viewing portfolio 3, element 3 as an icon of sketching/flats/drawing.

Representation of Portfolio 3 Layout

The layout of portfolio 3 was used in the research instrument as a simple portfolio element to give a broader context to selected samples that would be presented in a portfolio. Figure 4.23 displays portfolio 3 layout and figure 4.24 shows participant mean responses for each of the identified job skills.

Figure 4.23 Portfolio 3 Layout

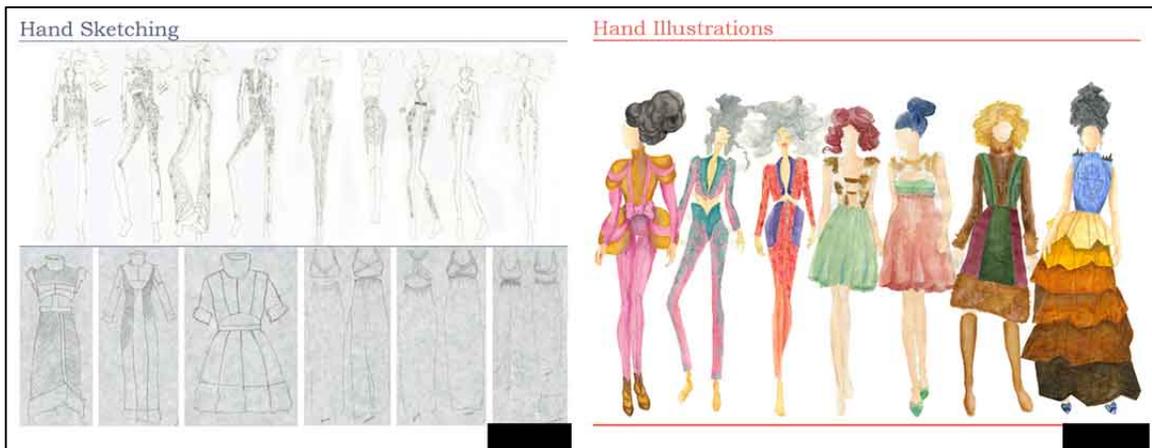
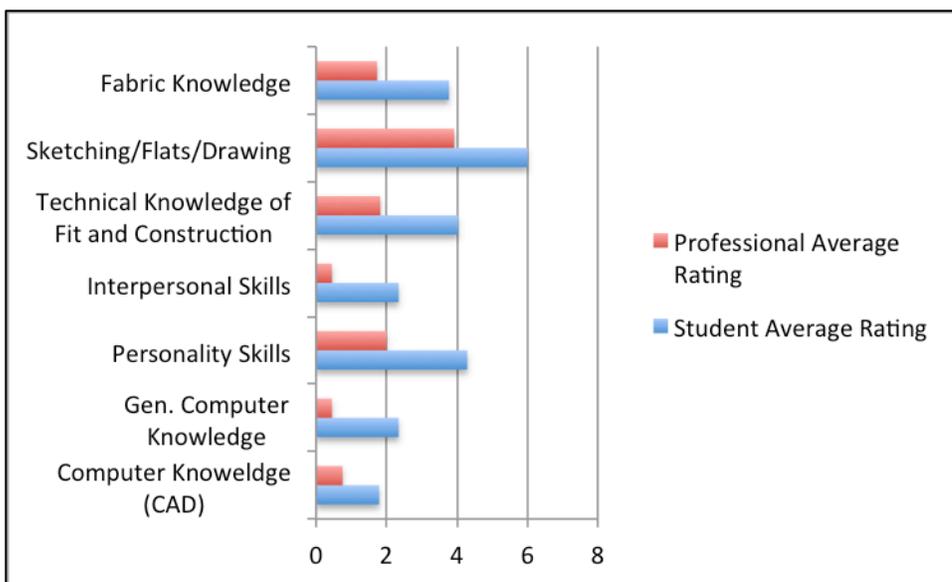


Figure 4.24 Participant responses for portfolio 3 layout.



As with all other portfolio elements, apparel design students rated the representation of each job skill higher than did apparel design professionals. Mann-Whitney U non-parametric comparison of means was used to determine differences in the ratings between groups. The ratings for each job skill were significantly different, except computer knowledge (CAD) ($p=0.457$). Apparel design professionals identified Sketching/flats/drawing as the most highly rated job skill.

Paired t-tests were used to compare the responses of apparel design professionals between job skills. All comparisons were found to be significant, identifying sketching/flats/drawing as the best meaning for portfolio 3 layout. Independent raters agreed that this layout was an icon for sketching/flats/drawing.

Open-ended Responses

Participants were given the option comment to the survey regarding portfolios. Five apparel design students and five apparel design professionals responded with short comments. Responses are presented verbatim below and discussed in chapter 5.

Professional comments

Designers need to understand their niche market [sic] and who they are designing for. They need to find the balance of inspiring yet workable in business if they are choosing to work for a more commercial enterprise.

I would like to see more technical information and fabric information. A great designer would keep those things in mind and know how all aspects work together to achieve a great garment.

quality not quantity, show your thought process/brainstorming/concepting [sic]

I would evaluate their word skills base [sic] on the misspellings in the text. Also, construction skills can be evaluated as to whether or not all the seams are in place in the flats--zippers without seams or kimono sleeves are questionable as to how much a student knows about construction

They should have parts that are really focused on technical flats as that will be their primary job coming out of college. When I look at portfolios, it's great to see their creativity, but my biggest concern is that they can create detailed flats that I can use in my tech packs. It helps if they have something that shows they know how to spec a garment as well.

Student comments

I support a mix of sketches, flats & photos of built garments.

They should be clean and crisp, and each project should follow the same format. Every project within the portfolio should show "follow-through" starting from mood board to preliminary sketches to finished product.

As a student applying for entry-level jobs, I have been told by employers they are looking for the entire brainstorm process, from concept to finished product, and to include drawings and brainstorms in my portfolio.

It is equally important to include information/images that pertain to the type of job position you are interviewing for such as technical versus creative. Both types of positions might have different looking portfolios that highlight different strengths.

Portfolios are difficult to assemble! It's difficult, as a student, to know what employers want.

CHAPTER FIVE

DISCUSSION

This chapter discusses the results of the study and implications related to selection of elements to include in apparel design student portfolios. In addition, the discussion addresses the broader context of apparel design pedagogy that may lead to the observed results. Differences in demographics and portfolio types will be discussed, followed by the differences observed in the ratings of job skills and their perceived level of abstractness or concreteness. The results of the apparel design student and apparel design professional ratings of the representation of portfolio element will be discussed as a single whole, as the results trended towards similar results.

The highest rated job skill represented will be discussed, including the identification of icon, index, or symbol. Distinctions between the type of sign will be discussed covering implications for use of semiotic analysis for portfolio development. Rater disagreement in regards to the type of sign will be discussed separately in relation to theoretical foundations (Bense, 1971). Finally, the research questions for this study are restated and addressed from the results.

Demographics

The first portion of the research instrument posed questions related to experience with portfolios and the types of portfolios expected for entry-level apparel design positions. One of the catalysts for this study was that portfolios are often required to convey a message about the person creating a portfolio without that person present for explanations of the content. Both groups were asked about the types of portfolios they currently have or plan to create, and professionals were asked about the types of portfolios their company accepts. Apparel design students appear to be moving towards digital and online portfolios, whereas the responses of apparel design professionals were evenly distributed across the three types of portfolio. This would suggest that students want to create portfolios on the computer with the intent of sharing their work through email or the Internet.

Apparel design professionals indicated that their companies are more likely to accept or prefer traditionally created paper portfolios. However, professionals did not indicate a preferred type of portfolio for themselves, giving equal responses to each type of portfolio that they currently use. Apparel design students seem to be favoring digital and online portfolios, which may create issues when companies would prefer to see traditional paper portfolios. It is likely that digital portfolios have the capability to be printed and displayed during interviews as if they had been created by hand.

The type of portfolio is dependent more on specific company needs and student preference, but apparel design students should be aware that they may need to create multiple versions of their portfolio to be prepared for sending or displaying their work.

However, the preference for traditionally created portfolios may stem from the difficulty of presenting digital or online portfolios without technology. Digital and online portfolios may be best for sharing examples of previous work asynchronously and across distance, but traditionally created portfolios may still be best for face-to-face interviews.

Job Skills Ratings

Participants rated each of the job skills identified in the literature review in two categories: level of perceived importance and whether each job skill was abstract or concrete. Each category will be discussed separately along with implications for representation in portfolios and general apparel design education.

In response to the research question “How do apparel design professionals and apparel design students rank entry-level design job skills in regards to level of importance?”, the results indicate that apparel design students and apparel design professionals ranked most job skills similarly in level of importance. The significant differences between ratings of technical knowledge of fit and construction and sketching/flats/drawing are noteworthy. Apparel design students ranked technical knowledge of fit and construction as the most important job skill, whereas apparel design professionals ranked the same skill as fifth of the seven skills shown in the survey. This addresses the first part of research question five, in that there is some difference between apparel design students and apparel design professionals in views of importance of job skills. Given that students spend a large portion of their undergraduate studies in studio coursework that involves apparel construction, patternmaking, and prototyping designs it is understandable that this skill appears to be emphasized in the curriculum.

The relative lower ranking of technical knowledge of fit and construction leads to the assumption that apparel design professionals do not view this skill as relevant to entry-level design positions. Decisions regarding fit and manufacturing of a final design are most likely made by apparel designers with more experience. Additionally, professionals that responded to the survey may be more involved in the aesthetic considerations of apparel design rather than the technical construction.

Sketching/flats/drawing was ranked by apparel design students as the fifth highest job skill in terms of importance, whereas apparel design professionals ranked the same job skill as the second most important. The difference in rankings may be accounted to the need to transfer and communicate ideas in the professional environment more than in the educational environment. Typically, an apparel design student is given the topic and requirements of a project, but the follow-through from ideation to prototype construction is done entirely by the student. In this scenario, the need to communicate the design ideas through sketches or technical drawings is not a requirement. Whereas in the apparel industry it more common for prototypes and the production of final saleable items are created by people other than the originator of the idea. Additionally, it may be the case in larger apparel design companies that an entry level design position does not include the responsibilities of fit and patternmaking, but rather those tasks are given to employees with more experience. Further, apparel design students generally only complete one technical drawing per project, whereas an entry-level professional would be expected to create several variations of technical drawings for each possible design.

Within the research instrument working definitions of abstract and concrete were given to participants. These were stated as follows:

Abstract – Something that when complete does not have a physical result, may be difficult to explain or represent, and may require varying amounts of time to complete.

Concrete - Something that can be completed with observable, physical results.

In response to the research question “How do apparel design professionals and apparel design students view entry-level apparel design job skills in regards to being abstract or concrete in nature?”, the results show that ratings of the level of abstractness or concreteness of job skills both apparel design students’ and apparel design professionals’ responses were similar. Computer knowledge (CAD) was the only job skill that showed a significant difference in rating, with apparel design professionals identifying computer knowledge (CAD) as being more concrete. These results address the second part of research question five, that there was only one significant difference in the views of apparel design students and apparel design professionals in regards to level of abstractness or concreteness in entry-level apparel design job skills. Apparel design professionals would be expected to have more experience with computer aided design software; therefore they would have more experience in viewing the outcomes of such work. Apparel design students may view computer knowledge (CAD) as more abstract because the job skill is less defined for them and envisioning the results may be more difficult.

Increasing familiarity with computer aided design for students, especially focusing on the results of using computer software, may increase the level of perceived concreteness. In early learning stages of apparel design, much of the tasks are completed by hand. These tasks include sketching, creating technical drawings, and pattern drafting. As those skills are mastered the tasks are transferred to computerized versions of similar processes. Many apparel design students may view computer knowledge (CAD) as the process of working with computer aided software, whereas apparel design professional may view computer knowledge (CAD) as viewable results of the software and not the intangible tasks of working with computer aided design software.

Two of the job skills identified in employment postings online received scores that indicate that they are more abstract than the other job skills. Personality characteristics and interpersonal skills were both rated more abstract on the seven point Likert scale by both groups. Interestingly, each of the other job skills were rated as slightly less abstract by professionals than students. Personality characteristics and interpersonal skills were both rated as more abstract by professionals than by students. Apparel design professionals may also be more familiar with the task of working in teams that requires a higher level of familiarity with co-workers personality characteristics and interpersonal skills. This may have led to apparel design professionals rating these two job skills as more abstract, as they may view the task of identifying these skills as difficult group work.

The results show that skills rated as more concrete were more often seen as represented in the portfolio elements. Those that were rated as more abstract were not

rated as represented as the primary or secondary meaning in any portfolio element. The definition given to participants indicated that abstract skills are difficult to represent, and personality characteristics and interpersonal skills were identified as more abstract and less represented in all portfolio elements. These job skills are not trivial however, and should be included in some way in apparel design student portfolios. Both groups ranked interpersonal skills as the third most important job skill, and personality characteristics as the fourth most important. Given that these job skills are listed in employment postings and ranked higher than basic apparel skills such as fabric knowledge, these skills should be included in portfolios.

Further research will be needed to identify means of representing personality characteristics and interpersonal skills in portfolios, as well as means to instruct students to display these skills during interviews. More experience with interview practice and giving presentations may allow for students to be comfortable enough in front of small groups to allow personality characteristics to show. Although some small amount of personality characteristics and interpersonal skills are represented in portfolio elements, it may be that these job skills can best be represented in person rather than through visual means.

Difference Between Groups

In response to the research question “How do apparel design professionals and apparel design students rate portfolio elements as representative of entry-level apparel design job skills?”, apparel design students consistently rated the representation of job skills higher than apparel design professionals. All 84 possible job skill and portfolio

element combinations were higher, and 49 of those differences were significant (see Appendix D). The results show that in most cases there is a difference between the ratings of the representation of entry-level apparel design job skills, which addresses the final part of research question five. This indicates that apparel design students have a higher opinion of how their skills are represented in portfolios. That is not to say that apparel design student opinions are inflated unreasonably, or that apparel design professionals are too critical of student work. The difference between responses could be due to a different frame of reference and experience.

Kruger and Dunning (1999, 2002) argued that unskilled individuals will rank themselves as higher than average, whereas highly skilled individuals rank themselves above average but lower than their actual scores. The authors argued that the miscalibration between actual and perceived scores resulted from poor metacognitive skills in regards to a given topic. That is, an incompetent individual is unable to realize their incompetence due to their lack of understanding. The Better-Than-Average (BTA) effect has been shown in psychological literature (Krueger & Mueleer, 2002; Guenther & Alicke, 2010) to effect how an individual will predict they perform without awareness of group norms.

The BTA posits that an individual, with no information regarding the performance of peers, will believe himself or herself better than average. The effect is related to social comparison theory (Festinger, 1954), which states that individuals compare themselves to peers to orientate themselves in society in regards to abilities and skills. Once information is provided that allows for social comparison, it is expected that the BTA

effect will disappear. However, the BTA effect and social comparison theory describe the comparison of ability and skills, not the perceived representation of meaning in signs.

Rating of the representation of job skills in portfolio elements can be seen as a metacognitive skill, the ability to understand the process to create each portfolio element. Kruger and Dunning (1999, 2002) argue that it is the lack of metacognitive skill that causes large miscalibration in perceived performance in the unskilled. Typically, the improvement of metacognitive ability comes with improvement of skills, in that to become aware of what is good or bad in a given category, one must become good at that thing. However, for students in an apparel design program, their restricted social comparison network may be the cause of misperception in how well job skills are represented in portfolio elements.

Apparel design students complete their major coursework typically with a core group of peers, moving as a group from one course to the next. Throughout this time they are exposed to each other's work as a frame of reference, with perhaps other work from students a year ahead or behind in the program. They have built their frame of reference for what type of work and what level of quality is good or bad based on what they have seen. The results of this study suggest that apparel design professionals come from a different frame of reference. There is a higher expectation from the professional's viewpoint.

If the responses of apparel design students and apparel design professionals are to be more similar, then apparel design students require more exposure to professional quality design documentation. This level of quality will vary from company to company,

depending on multiple variables including but not limited to location of production for final product, the company's internal design cycle, and the product category.

Highest Rated Job Skill

Each portfolio element had one job skill that was rated as having the highest representation by apparel design professionals. Comparisons were made within the professionals group to insure that the highest rated job skill was significantly different than the other job skill ratings within the same portfolio element. In cases where a significant difference was not found, the portfolio element was labeled as having a secondary meaning, and in one case a tertiary meaning.

It is of importance to note that although portfolio elements used in the study were selected purposefully to include a variety of portfolio elements, not all jobs skills were selected as the primary meaning of a portfolio element. That is to say, sketching/flats/drawing was best represented as the primary meaning in seven of the twelve portfolio elements. However, interpersonal skills and personality skills were not rated as the primary or secondary meaning in any of the portfolio elements. That is not to say that these job skills were not seen in any of the portfolio elements, but rather they were lowly rated as represented in each portfolio element. This is expected in that personality characteristics and interpersonal skills were rated as most abstract of the seven identified job skills.

With interpersonal skills and personality characteristics rated most abstract and not seen as the dominant meaning in any portfolio element, the ratings of these two job skills were compared between individual portfolio elements and portfolio layouts.

Interpersonal skills and personality characteristics were generally rated slightly higher in portfolio layouts than portfolio elements, and some significant differences were found (see appendix E). However, due to the inconsistency of whether a layout or portfolio element was rated higher, the results can not conclude that the overall layout of a portfolio page represents either interpersonal skills or personality characteristics better than individual portfolio elements.

Therefore, the study suggests that methods for representing all job skills for specific job postings should be developed. The research instrument however, was only able to represent sketching/flats/drawing, computer knowledge (CAD), and technical knowledge of fit and construction as primary meanings. Semiotic theory (Bense, 1971) is discussed in the following section to discover means of representing all job skills in apparel design student portfolios.

Icon, Index and Symbol

This study has explored the relationship between the signs in portfolios and their meaning, that is the semantics of the signs, or their relationship to their meaning. There are three areas that define the relationship of the sign to its meaning; the sign itself, the object the sign refers to, the meaning interpreted by the viewer. In the case of this study there has been a slight abstraction to the object portion of this equation. The object represented in many of the portfolio elements from the research study has been of an apparel garment, either as a finished prototype or as a drawing. However, the context of the study has asked participants to identify the object as an intangible set of skills, not a physical object.

The basic principles outlined by Bense (1971) still apply in that the physicality of the object represented is never specified. Within the study there are signs in the form of portfolio elements, job skills that take the place of the object, and meanings interpreted from apparel design students and apparel design professionals. Given that participants have identified which meaning and object each of the signs represent, the missing piece is the relationship of the meaning and object to the sign. That is, whether each sign is an icon, index, or symbol.

The following definitions were used by independent raters for identifying the type of sign:

Icon - Direct, pictorial representation of the outcome of the skill

Index - Indirect, but logically understandable representation of the skill

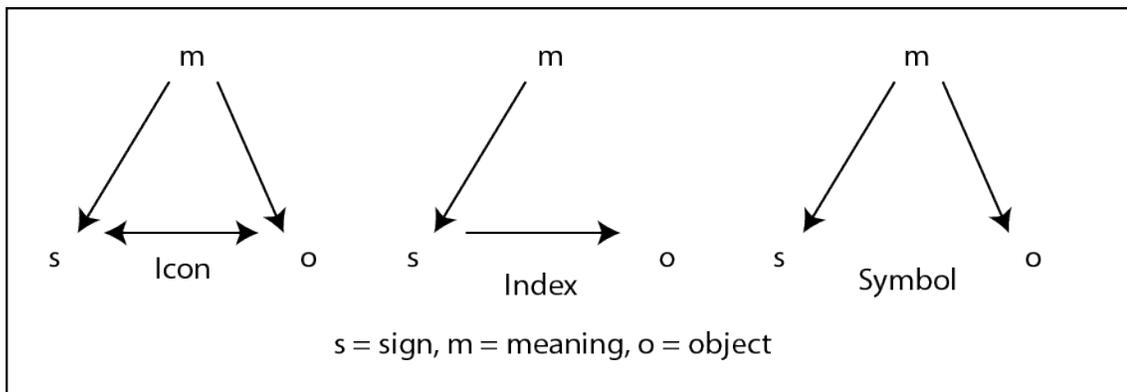
Symbol - Indirect representation of the skill that requires expertise or understanding of the field or process to interpret.

Of the twelve portfolio elements nine were identified as icons in their primary or only meaning. The remaining portfolio elements were either areas of disagreement or the portfolio element was identified as a symbol. These results show that icons are the most common sign type in apparel design student portfolios, addressing the research question, “Are icons, indices, or symbols more often included in apparel design student portfolios?” Six portfolio elements included secondary meanings, two of which were unanimously viewed as icons, one was seen as a symbol, and remain three were areas of disagreement. The solitary portfolio element that included a tertiary meaning was also an area of rater disagreement. Overall, interrater reliability was 84%, which was obtained through

dividing the total number of agreements by the total number of agreements plus the total number of disagreements (Touliatos & Compton, 1988).

The relatively high number of portfolio elements rated as icons indicates that direct, easily identifiable meanings are the most dominant in portfolios. Some portfolio elements were not labeled as icons, such as portfolio 1, element 2 (see figure 4.2), which was identified as a symbol. Icons, indices, and symbols differ in the relationship of three elements: the meaning, the object represented, and the sign itself. Figure 5.1 shows the directional relationships for these three elements for each sign type.

Figure 5.1



Model of the relationship between a sign, the object, and meaning (Bense, 1971).

Portfolio 1, element 2 was identified as a symbol for representation of computer knowledge (CAD) as its primary meaning (see Figure 4.3). Using the diagram above we can describe this portfolio element as the meaning (some level of skill in CAD), is directly linked to the sign (portfolio 1, element 2) and directly linked to the object (computer knowledge (CAD)). However, there is no link between the sign itself and the object, in that specialized knowledge was needed to understand the meaning of the sign and how the meaning relates to the object. That is to say, without understanding that this

portfolio element required computer knowledge (CAD) to create then it would not be known how the portfolio element was created or that CAD was used at all.

For comparison, portfolio 3, element 1 (see figure 4.17) was rated as an icon for sketching/flats/drawing. This element's meaning (some skill in sketching/flats/drawing) is directly linked to the sign (portfolio 3, element 1) and directly linked to the object (sketching/flats/drawing). In this case however, the sign and the object are directly related and easily identifiable without specialized knowledge. To clarify, the viewer of portfolio 3, element 1 does not need to know how to draw, or how much skill is required to create the portfolio element to understand that it is created through sketching/flats/drawing.

Six portfolio elements had secondary meanings, and one included a tertiary meaning. The distinction between those had more than one associated meaning lays in the mixture of job skills. Examining portfolio 1, element 1 (see figure 4.1) both sketching/flats/drawing and computer knowledge (CAD) were rated as represented job skills. The figures in portfolio 1, element one blend the irregular line quality and imperfections often seen in hand drawn illustrations and the dark, consistent line width found in computer generated images. Portfolio 1, element 1 was created by hand drawing the figures, scanning the image for use in a software image manipulation program, then traced and colored using software tools.

Similarly, portfolio 3, element 2 (see figure 4.20) represented sketching/flats/drawing as the primary job skill and technical knowledge of fit and construction as a secondary represented job skill. This image is hand drawn and scanned

for inclusion in the portfolio sample, but little or no corrections or manipulations have taken place. In this case, the secondary meaning is derived from the form and style of the sketches, as they resemble technical drawings used to communication style and silhouette lines for apparel design companies.

The two portfolio layouts that included secondary meanings were comprised of portfolio elements that were labeled as representing each of the job skills found in the portfolio. That is to say, portfolio 1 layout was rated as representing sketching/flats/drawing and computer knowledge (CAD), both of which were seen as primary skills in the portfolio elements that made up the layout. Portfolio layouts will represent the job skills identified in the elements that comprise it. As evidence, portfolio 3 layout was labeled as representing sketching/drawing/flats without a secondary job skill represented. Each of the three elements used in the research instrument that comprise portfolio 3 were identified as icons of sketching/flats/drawing. There was no portfolio element that represented as a primary meaning of any other job skill; therefor, the portfolio layout is a representation of sketching/flats/drawing.

The placement of portfolio elements in each of the layouts used in the research instrument is also of note. Those items rated as icons were often central in the portfolio layout or created a focal point due to color, size or spacing. However, portfolio 1, element 2 (see figure 4.3) was placed on the bottom portion of the page. This portfolio element could easily be overlooked, and given that its representation of computer knowledge (CAD), fabric knowledge, and general computer knowledge (Word/Excel) was symbolic, it is possible that this element would be misinterpreted or disregarded. In

the case of portfolio 1 layout, other elements included representation of computer knowledge (CAD), but no other element included fabric knowledge or general computer knowledge (Word/Excel). It is suggested that portfolio elements that are the only representation of a job skill in the layout be emphasized or described through text to clarify its representation.

To increase the representation of job skills in portfolio layouts it is suggested that apparel design students include a variety of elements that represent different job skills in each portfolio spread. Portfolio elements can represent multiple job skills simultaneously, so it is suggested that students include elements that include at least two job skills. This could be accomplished through correction and manipulation of hand drawn illustrations in computer software, stylizing sketching in formats recognizable to prospective employers as technical drawings, or inclusion of process steps that display garment construction with patterning and manipulation of fabric.

Raters for the type of sign, whether icon, index, or symbol, were in disagreement in regards to some portfolio elements. Rater disagreement can be caused by different levels of experience and expertise in relation to the object represented in the sign. Raters for this study included the researcher as a graduate student, a tenured associate professor, and a tenured full professor. Each of these raters came from different backgrounds that could have influenced their perception of prerequisite knowledge to interpret each of the signs.

Using the pedestrian crossing sign example previously explored in the literature review, there is a certain level of expected knowledge to interpret the sign. However, if a

person who had never seen a striped pedestrian crossing zone in a street viewed the sign, they could interpret it as an uneven sidewalk warning. Cultural understanding and experience will create the link between sign and object. Rater disagreement for this study can most likely be attributed to different levels of experience with the variety of portfolio elements and how much specialized knowledge was required to connect the meaning to the object.

For apparel design student portfolios it is expected that the majority of works would be icons, as students would have less experience than professionals. An apparel design professional's portfolio might include more works that were symbolic of job skills, such as sales figures and teamwork experience. Their higher level of expertise would lead them to interpret the meaning of all signs more readily. To avoid miscommunication, and increase clear demonstration of abilities, it is suggested that apparel design portfolios focus on icon signs that directly represent job skills and require the least possible specialized knowledge.

Participant Comments

Only ten total participants responded with comments at the end of the online survey, five from each apparel design students and apparel design professionals. Apparel design students responded with comments that focus on the content of the portfolio, showing examples of the process of designing and steps leading up to prototype construction. Apparel design professionals' comments discussed similar topics related to content, but emphasizing the relevancy of elements in portfolios to the type of specialization. That is to say that apparel design professionals wish to see specific

examples related to the type of job. For example, a student applying for a technical design position should focus on technical drawings and fit related content for their portfolio. However, there is a difficulty in creating a single portfolio that addresses each type of job for which a student may submit their portfolio.

Comments from both apparel design students and apparel design professionals suggest the creation of modular portfolios that can be adjusted and modified quickly depending on the type of specialization. In regards to apparel design curriculum, this also suggests the creation of specializations within an apparel design program to build deeper knowledge in specific areas in the apparel design process.

CHAPTER SIX

CONCLUSION

This research study has explored apparel design student portfolios in relation to job skills and semiotic analysis of portfolio elements. Employment postings for apparel design entry-level apparel design positions are increasingly found online and often require the submission of examples of previous work. The purpose of this research was to examine how well portfolio elements represent job skills identified in advertised employment postings for entry-level apparel design positions. The study also addressed the semiotic type of sign of portfolio elements with the intent of discovering the type of signs used in apparel design student portfolios and which type of sign best represents job skills to employers.

The design of the study included three components. First, the content analysis and thematic grouping of keywords in online employment postings for entry-level apparel design positions was completed and used to identify important job skills required. Second, an online survey was developed to rate the representation of each job skill to sample portfolio elements. Third, each portfolio element was labeled with the most highly represented job skill from the online survey and independent raters identified each portfolio element as an icon, index, or symbol.

The quantitative results from the online survey were analyzed using Statistical Package for the Social Science (SPSS). Comparisons were made between apparel design student and apparel design professional responses in the importance of job skills, the abstractness or concreteness of each job skill, and the perceived representation of each job skill in twelve portfolio elements.

Significance

The results of the study showed several statistical significant results between apparel design students' and apparel design professionals' responses to job skills and their representation in portfolio elements. Apparel design students viewed technical knowledge of fit and construction as more important relative to other job skills, whereas apparel design professionals placed sketching/flats/drawing as relatively more important for entry-level designers. This may be a result of the emphasis on patternmaking and construction in educational settings, whereas the apparel industry may focus more on the development of design documentation in the form of technical drawings and sketches.

Job skills were also rated for their level of abstractness and concreteness to help identify those skills that are more easily represented in portfolios. Both groups rated personality characteristics and interpersonal skills most abstract, and a significant difference was found between apparel design students and apparel design professionals in computer knowledge (CAD). This would indicate that apparel design professionals view the outcome of computer knowledge (CAD) as more concrete and more easily represented. This may be due to a higher level of experience with computer software and the outcomes of using CAD.

Both groups rated the representation of each of the seven job skills in each of twelve portfolio elements. Apparel design students rated the representation of job skills consistently higher than apparel design professionals, with over half of the comparisons reaching significance (see Appendix A). Apparel design professionals highest rated job skill in each portfolio element was identified as the meaning of the portfolio element. In several cases there was not a significant difference between the ratings of job skills within a portfolio element by apparel design professionals. In these cases a primary and secondary meaning was attached to the portfolio element. The most common job skills represented in the portfolio samples used in this study were sketching/flats/drawing, technical knowledge of fit and construction, and computer knowledge (CAD). Personality characteristics and interpersonal skills were not found to be primary or secondary meanings in any of the portfolio elements.

Independent raters identified the type of sign in relation to the meaning attached to the portfolio elements by the apparel design professional responses. Icons were the most common type of sign in the portfolio samples used in this study. There was some disagreement between raters in the type of sign, most likely explained by the experience of each rater in regards to the represented job skill.

Implications

Apparel design students can benefit from this study in the development and selection of portfolio elements to include when interviewing for entry-level positions. Apparel design education curriculum can also benefit from this study in the development of course projects that provide evidence of job skills that are abstract and currently less

represented in apparel design student portfolios. Demonstration of job skills such as fabric knowledge and general computer knowledge can be emphasized in apparel design courses by including portions of design project requirements that result in visible results of activity in these areas. For example, comparison of characteristics for a variety of fabric possibilities in a design project could be presented in an excel spreadsheet and included in presentation boards or portfolio spreads to show competence in fabric knowledge and displaying the information using general computer knowledge.

This study indicates that an increased emphasis on computer knowledge (CAD) and sketching/flats/drawing is needed for entry-level apparel design portfolios. Job skills vary in their level of abstractness and concreteness, indicating that not all job skills are easily represented in portfolios. Abstract skills, such as personality characteristics and interpersonal skills are less likely to be represented in portfolio elements and means of representing these better needs to be found. Interpersonal skills involve specific abilities in teamwork and communication (see Appendix B), which could be represented in portfolios through documentation of team projects. Showing images of working in teams may have a perceived meaning that the applicant works well in teams, or at the least that the applicant has experience working with others.

Apparel design students rate the representation of jobs skills in portfolio elements more highly than apparel design professionals. Given that apparel design students are generally not exposed to industry quality work, there is a different frame of reference for interpreting meanings. The most often represented job skills in portfolio elements in the current study were technical knowledge of fit and construction and

sketching/flats/drawing. Given that apparel design studio courses focus on ideation sketching, patternmaking and prototype construction, it is probable that these job skills are more evident in apparel design student portfolios as there are more outcomes related to these job skills. To represent more job skills in apparel design student portfolios, outcomes from course projects that represent these job skills need to be developed.

To reach this goal of representing more job skills in apparel design student portfolios is to identify those job skills needing representation within course work. Although the job skill of technical knowledge of fit and construction is addressed in apparel design courses, and represented in portfolio elements in this study, it is comprised of several keywords or tasks found in job postings. One of those tasks included in technical knowledge of fit and construction is patternmaking (see Appendix A), which is part of the apparel design courses, but results in very little documentable outcomes included in portfolios. Sample images of the process of patternmaking through pictures of paper patterns or screen captures of computer-aided pattern drafting may increase the representation of technical knowledge of fit and construction.

However, if apparel design student portfolios were also viewed as educational portfolios, then they could show evidence of the progress of the student as well as the outcomes of the curriculum (Blaikie, Schönau, & Steers, 2004). In this way, adjustments can be made to programs to better create documentation of job skills desired by the apparel industry. Job skills identified in this study as concrete are better represented in portfolio samples used for this research, but abstract skills can be better represented by identifying where in the apparel design program they should be taught and how to create

projects that document the student progress in these job skills. This could include possibilities such as determining that interpersonal skills should be taught during the freshman and sophomore years of an apparel design program and creating evidence of the outcomes. This could include writing samples or teamwork samples, but could also include video of student presentations within digital and online portfolios.

Independent raters identified the majority of portfolio elements as icons with some minor disagreements for the type of sign. The prevalent use of icons in the sample portfolios indicate that the use of direct representation of job skills, without the need of specialized knowledge about processes to create it, are the most effective type of portfolio element to include in apparel design student portfolios. For example, an apparel design student that wants to represent computer knowledge (CAD) will show better representation of that skill through the use of an icon. The creation of technical drawings in a CAD program may show this skill, but only to those viewers who have some understanding of CAD programs and knowledge of how the technical drawing was made. A more direct representation would be an image of the computer screen as the student is working on the technical drawing, a snapshot of the process of creating the technical drawing.

Limitations

This study contains some limitations that should be taken into account when interpreting or applying the results. Portfolio samples were taken from final projects in a single portfolio development course at a major mid-western university. Portfolio elements were selected purposefully to represent the types of images and artwork

generally included in apparel design student portfolios. The portfolio samples and the job skills identified for the research was intended to be general, not directed at a specific specialization or product category within the apparel industry. Job skills were identified through an online search of employment postings, which will change over time and as the apparel industry changes.

Additionally, participants were asked to rate the representation of job skills in each portfolio element, but some misinterpretation from participants may have resulted in rating of portfolio element quality, or the ability in each job skill. Although future research may show a correlation between perceived ability in each job skill and how well each job skill is represented, the current study assumed participants rated the representation of job skills. Each of these limitations can be addressed in future research

Future Research

This study presents several opportunities for future research in the area of portfolio development and presentation. Further exploration of job specializations within the apparel industry is needed, focusing on technical design, aesthetic design, textile design, and many other niche categories of job specialization. Job postings often include specific product categories as well, indicating that future research can isolate idiosyncrasies of niche markets for portfolio development.

Portfolios are a means of communication, which includes a sender of a message and a receiver. This study examined the interpreted meanings of portfolio elements for representation of job skills. Future research can focus on the intended message from the creator of the portfolio, specifically in the areas that were found to be less represented in

the current study. That includes the representation of personality characteristics and interpersonal skills, which were not represented strongly enough in portfolio elements of this study to be considered primary or secondary meanings.

Within apparel design curriculum, future research can examine the effect of exposure to industry quality design documentation and artwork on the perception of apparel design students. The current study found apparel design students to rate the representation of job skills higher than apparel design professionals. Exposure to industry quality technical drawings, prototypes, and sketching may influence perception by students of these types of documentation and set quality goals for their own work.

Lastly, apparel design curriculum research can examine types of projects that can create outcomes that are portfolio ready and represent multiple job skills in each portfolio element. Increasing the number of meanings in portfolio elements and the strength of the representation of job skills can reduce time in communication within less portfolio elements.

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APPENDICES

Appendix A: Job skills and job categories keywords

Job skills themes and subcategories

Job Skill	Sub Category	Number of repetitions in job postings	
Computer Knowledge (CAD		85	
	Adobe Suite		63
	CAD		22
General Computer Knowledge		50	
	MS Word		18
	MS Excel		32
Personality Characteristics		98	
	Organized		29
	Deadline orientated		15
	Detail orientated		11
	Flexible		10
	Multitasker		10
	Motivated		9
	Creative		6
	Problem solver		3
	Hard worker		2
	Time manager		2
	Critical thinker		1
Interpersonal Skills		54	
	Team Player		24
	Communication skills		30
Technical Knowledge of Fit and Construction		53	
	Construction		27
	Fit		14
	Patternmaking		12
Sketching/Flats/Drawing		26	
	Sketching		13
	Drawing		8
	Technical Flats		3
	Illustration		2
Fabric Knowledge		20	

Job category themes and subcategories

Job Category	Sub Category	Number of repetitions in job postings	
Market Segment		20	
	Women's		10
	Men's		3
	Girl's		3
	Boy's		1
	Junior's		1
	Children's		1
Job Type		17	
	Technical/Specifications		13
	Product Development		1
	CAD		1
	Color/Print		1
	Textile		1
Product Category		13	
	Knits		4
	Sportswear		2
	Outerwear		2
	Intimates		2
	Wovens		2
	Activewear		1
Product Type		12	
	Denim		5
	Sweater		5
	Tops		1
	Skirts		1

Appendix B: Recruitment emails for online survey

Email script for request to use portfolios

Greetings,

I am currently working on a research project involving the evaluation of apparel design student portfolios in relation to job skills and qualifications. Since you have already completed a course in portfolio development, I would like to ask permission to use samples of the portfolio projects you submitted in the spring as examples for this research project. Your work will have all identifying marks removed, including your name, email address, mailing address, or logos that you may have included on project pages. The samples will only be used in an online survey for apparel design professionals and students to answer a few questions about job skills and abilities represented in the sample.

There is no compensation available for allowing your sample portfolio projects to be used, however a summary of general results will be made available to you at the completion of the study.

If you would be willing to allow the use of your portfolio projects, please respond with a mailing address or other means of contact so that a consent form and signature can be collected.

Thank you for helping,
Chad Sowers

Email script for request to participate in survey

Greetings,

My name is Chad Sowers a graduate student at the University of Minnesota working on a doctoral dissertation involving portfolios. I have put together a survey that will help to identify how job skills and abilities are represented in apparel design portfolios and would appreciate your participation. Please click the following link to be directed to the survey, it is estimated to take 15-20 minutes.

<https://www.surveymonkey.com/s/appareldesignstudentportfolios>

If you would like a summary of results to this study when it is completed, please reply to this email.

Thank you for your participation,
Chad Sowers

Appendix C: Print copy of online survey

Apparel Design Student Portfolios

You are invited to be in a research study of apparel designs student portfolios. To participate, you must be between the ages of 18 and 65.

This study is being conducted by Chad Sowers, Department of Design, Housing, and Apparel, University of Minnesota in part for the completion of his dissertation research. If you have questions, he can be contacted at sowe0025@umn.edu

The purpose of this study is to evaluate apparel design student portfolios and how well they represent job skills. You may devote as much or as little of your time as you wish. You may choose not to respond to any question, and discontinue participation at any point.

By participating in the evaluation, you give your consent for the information gathered to be used in research projects and publications.

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Apparel Design Student Portfolios

1. I am

Female

Male

2. I am an:

Apparel Design Student

Apparel Design Professional

Apparel Design Student Portfolios

3. If you are a student, what year are you in your program?

- Freshman
- Sophomore
- Junior
- Senior
- Other/Graduate Student

4. If you are a student, have you taken a course in portfolio development?

- Yes
- No

Apparel Design Student Portfolios

5. If you are a professional, how many years of experience do you have in the industry?

- 0-2
 2-5
 5+

6. If you are a professional, have you participated in interviewing prospective employees?

- Yes
 No

7. If you are a professional, what type of portfolio does your company require or prefer for job applicants? (Choose all that apply)

- Traditional, cut and paste paper portfolio
 Digital, printable portfolio
 Online web portfolio
 Don't know

Apparel Design Student Portfolios

8. What type of portfolio do you currently have, or if you are a student which are you planning on creating? (Choose all that apply)

- Traditional, cut and paste paper portfolio
- Digital, printable portfolio
- Online web portfolio

Apparel Design Student Portfolios

10. Please rank the following job skills and abilities in order of importance for entry level positions as 1 = Most important, 8 = Least important:

***note* Choices will reorder after each selection**

<input type="text"/>	Computer Knowledge (CAD)
<input type="text"/>	General Computer Knowledge (Word/Excel)
<input type="text"/>	Personality Characteristics
<input type="text"/>	Interpersonal Skills
<input type="text"/>	Technical Knowledge of Fit and Construction
<input type="text"/>	Sketching/Flats/Drawing
<input type="text"/>	Fabric Knowledge

Apparel Design Student Portfolios

In the following questions you will view sample student portfolios. Some of these images may be larger than your browser window and may require you to scroll to view all portions.

Apparel Design Student Portfolios

Detail



Apparel Design Student Portfolios

Detail



Apparel Design Student Portfolios

Detail

jersey top

Tulip Skirt



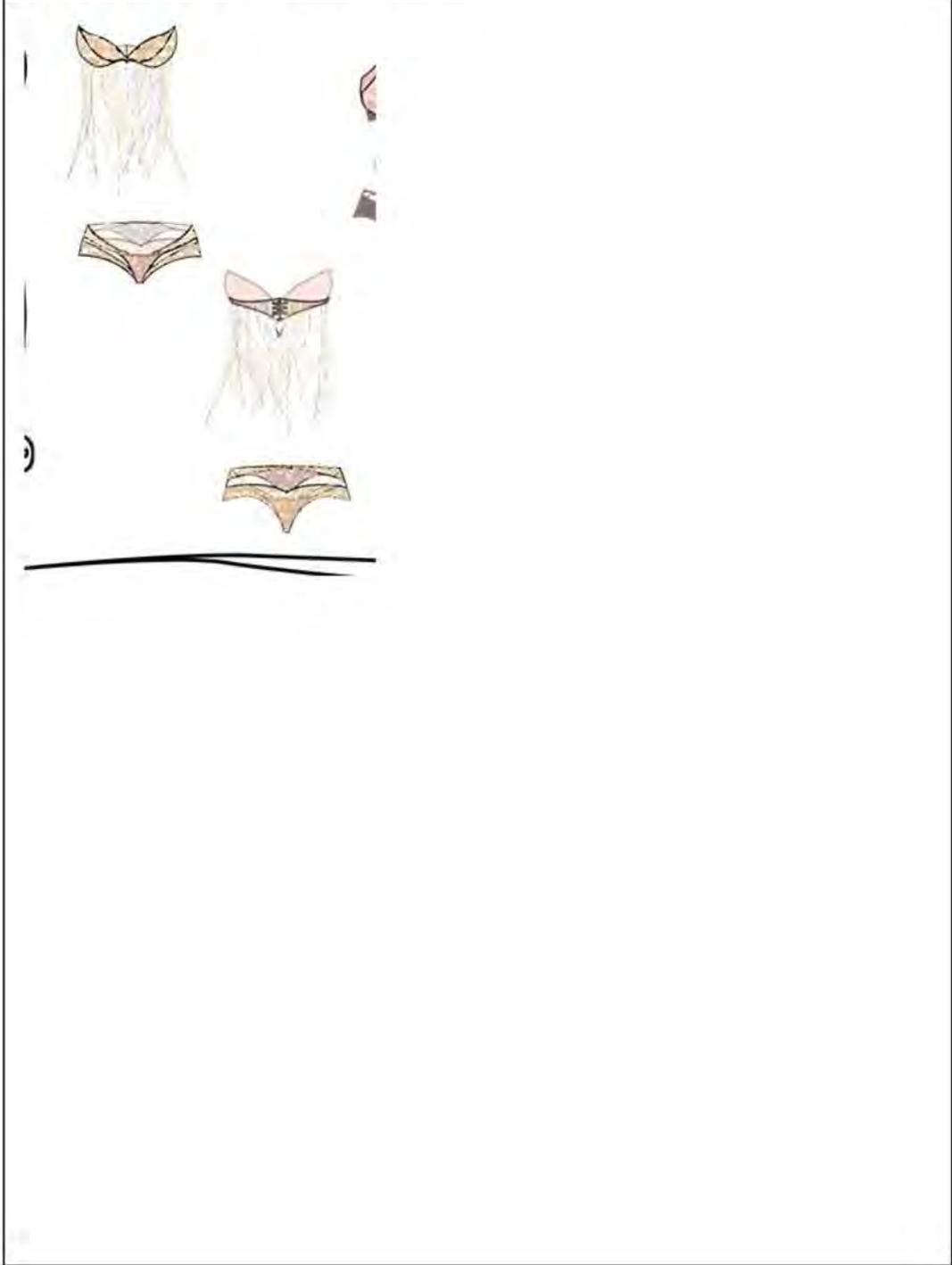
Apparel Design Student Portfolios



Apparel Design Student Portfolios



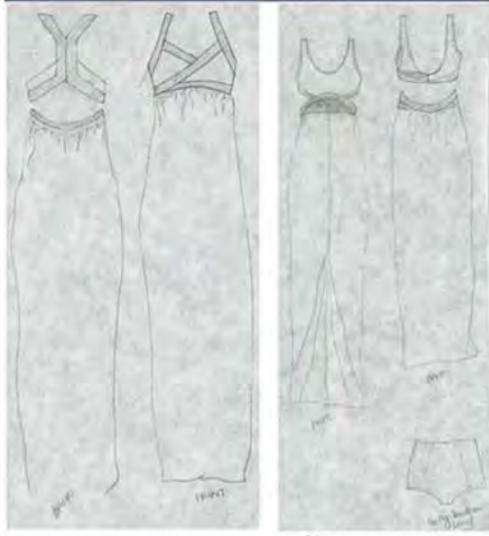
Apparel Design Student Portfolios



Apparel Design Student Portfolios



Apparel Design Student Portfolios



Apparel Design Student Portfolios



Apparel Design Student Portfolios

23. Do you have any additional comments about apparel design student portfolios?

Apparel Design Student Portfolios

Thank you for completing this survey on Apparel Design Student Portfolios.

Your feedback is appreciated.

Appendix D: Statistical comparisons of apparel design professional and apparel design
student ratings of portfolio element representation

Apparel Design Student and Apparel Design Professional Mean Responses and Significant Differences.

Portfolio Element and Job Skill	Student Mean Response	Professional Mean Response	Sig.
Portfolio 1, Element 1			
Computer Knowledge (CAD)	4.25	3.19	0.048*
General Computer Knowledge (Word/Excel)	3.47	2.07	0.036*
Personality Skills	3.42	2.38	0.134
Interpersonal Skills	1.75	1.25	0.322
Technical Knowledge of Fit and Construction	3	2.06	0.108
Sketching/Flats/Drawing	4.64	3.81	0.124
Fabric Knowledge	2.86	1.44	0.016*
Portfolio 1, Element 2			
Computer Knowledge (CAD)	3.41	2.07	0.021*
General Computer Knowledge (Word/Excel)	2.41	1.6	0.282
Personality Skills	2.5	1.27	0.05*
Interpersonal Skills	1.35	1.07	0.716
Technical Knowledge of Fit and Construction	1.19	1.07	0.86
Sketching/Flats/Drawing	1.56	1.2	0.53
Portfolio 1, Element 2			
Fabric Knowledge	2.59	1.6	0.06
Computer Knowledge (CAD)	5.13	3.87	0.008*
General Computer Knowledge (Word/Excel)	3.26	2.2	0.165
Personality Skills	2.67	1.53	0.103
Interpersonal Skills	1.61	1.33	0.745
Technical Knowledge of Fit and Construction	4.13	2.6	0.009*
Sketching/Flats/Drawing	5.31	3.67	0.005*
Fabric Knowledge	2.78	2	0.249
Portfolio 1, Layout			
Computer Knowledge (CAD)	5.13	3.87	0.005*
General Computer Knowledge (Word/Excel)	3.78	2.4	0.039*
Personality Skills	3.56	2.07	0.025*
Interpersonal Skills	1.84	1.53	0.572
Technical Knowledge of Fit and Construction	4.03	2.8	0.034*
Sketching/Flats/Drawing	4.88	3.93	0.054

Portfolio Element and Job Skill	Student Mean Response	Professional Mean Response	Sig.
Fabric Knowledge	3.38	2.4	0.136
Portfolio 2, Element 1			
Computer Knowledge (CAD)	2.17	0.54	0.048*
General Computer Knowledge (Word/Excel)	2.39	1	0.079
Personality Skills	4.1	1.54	0.001*
Interpersonal Skills	2.03	0.85	0.143
Technical Knowledge of Fit and Construction	6.39	4.93	0.001*
Sketching/Flats/Drawing	1.93	1	0.276
Fabric Knowledge	5.6	3.36	0.001*
Portfolio 2, Element 2			
Computer Knowledge (CAD)	1.97	0.62	0.151
General Computer Knowledge (Word/Excel)	2.1	0.54	0.058
Personality Skills	3.17	1.08	0.002*
Interpersonal Skills	1.76	0.46	0.06
Technical Knowledge of Fit and Construction	6.03	4.43	0.001*
Sketching/Flats/Drawing	1.86	0.54	0.087
Fabric Knowledge	4.94	2.93	0.003*
Portfolio 2, Element 3			
Computer Knowledge (CAD)	3.6	1	0.004*
General Computer Knowledge (Word/Excel)	2.3	0.58	0.034*
Personality Skills	3.71	1.58	0.004*
Interpersonal Skills	2.13	0.58	0.077
Technical Knowledge of Fit and Construction	3.34	2	0.049*
Sketching/Flats/Drawing	5.53	3.31	0.001*
Fabric Knowledge	3.41	1.58	0.02*
Portfolio 2, Layout			
Computer Knowledge (CAD)	5.03	3	0.001*
General Computer Knowledge (Word/Excel)	4.31	2.08	0.001*
Personality Skills	4.71	2.54	0.003*
Interpersonal Skills	2.68	1.15	0.043*
Technical Knowledge of Fit and Construction	6.09	4.15	0.001*
Sketching/Flats/Drawing	5.75	3.69	0.001*
Fabric Knowledge	5.03	2.92	0.001*

Portfolio Element and Job Skill	Student Mean Response	Professional Mean Response	Sig.
Portfolio 3, Element 1			
Computer Knowledge (CAD)	1.93	0.75	0.227
General Computer Knowledge (Word/Excel)	1.83	0.75	0.238
Personality Skills	4.23	2.25	0.015*
Interpersonal Skills	2.18	0.5	0.069
Technical Knowledge of Fit and Construction	3.31	1.08	0.005*
Sketching/Flats/Drawing	6.13	4.46	0.001*
Fabric Knowledge	2.9	1.08	0.012*
Portfolio 3, Element 2			
Computer Knowledge (CAD)	1.93	0.77	0.446
General Computer Knowledge (Word/Excel)	1.68	0.58	0.422
Personality Skills	3.61	1.25	0.002*
Interpersonal Skills	2.04	0.33	0.079
Technical Knowledge of Fit and Construction	3.86	2.6	0.051
Sketching/Flats/Drawing	5.57	2.92	0.001*
Fabric Knowledge	3	1	0.023*
Portfolio 3, Element 3			
Computer Knowledge (CAD)	1.93	0.5	0.258
General Computer Knowledge (Word/Excel)	1.93	0.45	0.19
Personality Skills	4.59	2.09	0.004*
Interpersonal Skills	2.63	0.27	0.016*
Technical Knowledge of Fit and Construction	3.86	1.45	0.003*
Sketching/Flats/Drawing	6.07	4.33	0.001*
Fabric Knowledge	3.82	1.55	0.007*
Portfolio 3, Layout			
Computer Knowledge (CAD)	1.79	0.75	0.457
General Computer Knowledge (Word/Excel)	2.34	0.45	0.013*
Personality Skills	4.29	2	0.006*
Interpersonal Skills	2.34	0.45	0.038*
Technical Knowledge of Fit and Construction	4.03	1.82	0.002*
Sketching/Flats/Drawing	6	3.92	0.001*
Fabric Knowledge	3.77	1.73	0.011*

*Significant at the 0.005 level.

Appendix E: Statistical comparison of individual portfolio elements and overall layout
for interpersonal skills and personality characteristics

Apparel design professional responses for personality characteristics

Portfolio and Element	Portfolio Layout Mean	Portfolio Element Mean	Sig.
Portfolio 1	2.07		
Element 1		2.27	0.567
Element 2		1.27	0.022*
Element 3		1.53	0.027*
Portfolio 2	2.50		
Element 1		1.67	0.064
Element 2		1.17	0.054
Element 3		1.58	0.050*
Portfolio 3	2.00		
Element 1		2.09	0.588
Element 2		1.18	0.068
Element 3		2.09	0.341

*sig. at the 0.05 level

Apparel design professional responses for interpersonal skills

Portfolio and Element	Portfolio Layout Mean	Portfolio Element Mean	Sig.
Portfolio 1	1.53		
Element 1		1.33	0.271
Element 2		1.07	0.131
Element 3		1.33	0.082
Portfolio 2	1.00		
Element 1		0.92	0.339
Element 2		0.50	0.256
Element 3		0.58	0.358
Portfolio 3	0.45		
Element 1		0.18	0.341
Element 2		0.18	0.341
Element 3		0.27	0.553

*sig. at the 0.05 level

Apparel design student responses for personality characteristics

Portfolio and Element	Portfolio Layout Mean	Portfolio Element Mean	Sig.
Portfolio 1	3.53		
Element 1		3.34	0.421
Element 2		2.5	0.001*
Element 3		2.67	0.007*
Portfolio 2	4.71		
Element 1		4.21	0.114
Element 2		3.29	0.001*
Element 3		3.83	0.001*
Portfolio 3	4.22		
Element 1		4.37	0.581
Element 2		3.73	0.063
Element 3		4.58	0.057

*sig. at the 0.05 level

Apparel design student responses for interpersonal skills

Portfolio and Element	Portfolio Layout Mean	Portfolio Element Mean	Sig.
Portfolio 1	1.84		
Element 1		1.56	0.194
Element 2		1.35	0.002*
Element 3		1.61	0.374
Portfolio 2	2.62		
Element 1		2.03	0.057
Element 2		1.76	0.006*
Element 3		2.13	0.129
Portfolio 3	2.30		
Element 1		2.19	0.862
Element 2		2.11	0.345
Element 3		2.63	0.026*

*sig. at the 0.05 level