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DEPARTMENT OF FASHION DESIGN AND TEXTILES EDUCATION

INVESTIGATING CHALLENGES IN PATTERN MAKING FACED BY CLOTHING AND TEXTILES STUDENTS IN TECHNICAL AND VOCATIONAL SCHOOLS IN THE VOLTA REGION OF GHANA

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DECLARATION

I, Anita Afi Nuworkpor (ID: 7201210013), hereby declare that this study was carried out and written by me, and that all sources of information have been acknowledged and that I am wholly responsible for any acts that may infringe on the research ethics policies of the university.

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Signature: ……. Date: ……

DECLARATION

I hereby certify that the work contained in the dissertation entitled "Investigating challenges in pattern making faced by clothing and textiles students in Technical and Vocational Schools within the Volta Region of Ghana", submitted by Anita Afi Nuworkpor (7201210013), for the award of the degree Master of Technology in Fashion and Textile Design to the Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development, was carried out by her, under my direct supervision and guidance. I considered that the dissertation has reached the standards and fulfilling the requirements of the rules and regulations relating to the nature of the degree.

Supervisors' Name: Ninette Afi Appiah (PhD)

Signature: ……..

Date: ……..

DEDICATION

This work is dedicated to my dear mother, Abroni Adzo Margret.

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LIST OF ABBREVIATIONS

FI	**Fashion Industry**
GDP	**Gross Domestic Product**
GTP	**Ghana Textile Printing**
ICT	**Information Communication Technology**
MMDA	**Metropolitan, Municipal and District Assemblies**
NAICS	**North American Industry Classification System**
USDL	**United States Department of Labor**

ABSTRACT

Pattern making is a critical skill in the field of clothing and textiles, forming the foundation for successful garment design and production. This study explored the challenges faced by students in pattern making in technical and vocational schools in the Volta Region of Ghana. The research employed a mixed-methods design, incorporating surveys and semi-structured interviews with fifty-five respondents which comprises a mix of both students and instructors, selected through a combination of purposive and systematic sampling methodologies. The study found that, students possess a higher level of familiarity with pattern making approaches compared to their overall expertise on the subject matter, and that a significant proportion of the students exhibit competency in pattern drafting. However, their level of competence in this area is relatively insufficient, suggesting the necessity for further efforts to enhance the students' skills and competences in pattern drafting. In addition, the study found that a considerable proportion of the students exhibited a deficiency in the technical aptitude necessary for precise pattern drafting. Based on the findings, the study recommends the establishment of a stronger collaborative partnership between industry professionals and academics in order to critically evaluate and enhance the curriculum for pattern making courses. The partnership should aim to guarantee that the curriculum encompasses a wide array of pattern making procedures, encompassing both fundamental and intricate issues that students may potentially face.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Within the domain of fashion and textiles, the process of producing garments serves as a vibrant intersection of creativity, innovation, and meticulous technicality. The core of this procedure is around the art and science of pattern making, a crucial stage that serves as a connection between the designer's conceptualization and the physical realization of a wearable garment (Jones & Brown, 2019; Armstrong, 2014). Pattern making is an essential process in garment manufacturing, involving the generation of paper or digital templates that determine the shape and structure of a garment (Bradley & Collier, 2016). It serves as a fundamental basis for ensuring the success of the manufacturing process. The complex procedure entails the conversion of design concepts and body measurements into precise patterns that guarantee accurate fit, usefulness, and attractiveness. The quality of the final garment and the overall efficiency of the production workflow are directly impacted by the success of pattern making (Forster & Irene, 2012). Nevertheless, this particular stage presents several difficulties that encompass technical, aesthetic, and operational aspects, hence affecting both conventional and contemporary pattern drawing techniques.

The history of pattern making can be traced back to ancient civilizations, during which rudimentary clothes were fashioned using fundamental geometric forms (Bakker-Edoh et al., 2018; Yan & Seock, 2019). Over the course of time, the methodologies underwent a process of development, influenced by cultural conventions, socioeconomic patterns, and technical progress. The Industrial Revolution represented

a pivotal moment in history, since it brought about the use of standardized sizing and mass production methods. Over the past few decades, the field of pattern drawing has undergone significant transformations as a result of technological advancements. The implementation of paper patterns during the 19th century facilitated a more efficient workflow and enhanced the ability to produce replicas with higher accuracy. Additionally, there exists a conventional non-scientific technique known as freehand cutting. The technique of free hand cutting is characterized by the absence of a scientific approach, as it relies on the utilization of tailor chalk or similar coloring materials to directly trace the contours of different garment components onto the fabric (Kassah et al., 2023; Azuah & Soyeh, 2022).

This process is based solely on body measurements received from the individual, without the aid of templates or paper patterns. Freehand cutting is associated with some limitations, such as the inefficient utilization of textiles resulting in significant waste, the production of poor garments, and the potential for erroneous fit. According to a Bakker-Edoh et al., (2018), the practice of freehand cutting presents a hindrance to the efficient mass manufacture of garments for commercial purposes. The utilization of computer-aided design (CAD) software has become increasingly prevalent, providing designers and manufacturers with a robust instrument to generate, alter, and edit patterns with unparalleled accuracy. The transition from manual to digital making has not only expedited the process but has also enhanced the ability to collaborate and engage in creative innovation.

Pattern drafters encounter a wide range of obstacles that span from conventional manual methods to the incorporation of sophisticated digital technologies. The existence of diverse anthropometric characteristics across individuals is a considerable obstacle in developing uniform patterns that can accommodate a broad range of consumers

(Barnard, 2002). Furthermore, the process of transitioning from two-dimensional pattern pieces to three-dimensional clothing has challenges in preserving the desired fit and proportion. The delicate equilibrium between design aesthetics and pattern structure requires careful modifications, which can be a laborious and resource-intensive process (Barnard, 2002).

Previous scholarly works have addressed different facets of the difficulties encountered in pattern drafting, but within specific contextual or disciplinary boundaries. The study conducted by Smith and colleagues (2017) emphasized the importance of obtaining precise body measurements and its influence on the accuracy of pattern drafting. In a study conducted by Jones and Brown (2019), the authors investigated the impact of cultural and geographical disparities in body forms on pattern making techniques, highlighting the importance of adopting inclusive design methodologies.

The worldwide character of the fashion industry poses obstacles in terms of bodily diversity and cultural differences. Various geographical areas display unique variations in body forms, sizes, and proportions, hence presenting a significant challenge for pattern makers in developing designs that effectively cater to a diverse range of clients (Jones & Brown, 2019). Cultural factors are influential in the process of pattern drafting, as design preferences, aesthetic sensibilities, and clothing functionality can exhibit substantial variation across different cultures.

In the intricate realm of garment production, the imperative of collaboration among many stakeholders, including designers, pattern makers, and manufacturers, cannot be overstated. The establishment of effective communication among these many responsibilities is crucial in ensuring the appropriate translation of design intent into patterns and garments. Nevertheless, instances of miscommunication or a lack of

alignment can lead to disparities between the intended design concept and the ultimate manifestation of the product (Hethorn & Ulasewicz, 2017).

The task of reconciling the need for superior clothing items with the need for streamlined manufacturing processes presents a frequently encountered obstacle. The time limitations inherent in the dynamic fashion business can exert significant pressure on pattern designers, leading them to emphasize efficiency above meticulousness, so potentially affecting the quality of pattern drawing (Lipkin, 2003). This phenomenon can give rise to problems related to proper fit, inconsistencies in aesthetics, and overall discontentment among consumers.

Notwithstanding the significance of these beneficial insights, there has been a relative lack of comprehensive exploration into the synthesis of difficulties encompassing technological details, design adaptability, cooperation bottlenecks, and financial consequences. It is imperative to confront these issues in order to maintain the fundamental role of pattern making in achieving effective garment production. This involves the transformation of imaginative ideas into garments that possess optimal fit, aesthetic appeal, and cultural appropriateness.

1.2 Statement of the Problem

The process of garment manufacture is a multifaceted activity that encompasses the entire lifecycle of clothes, commencing from the first design concept and ending in the creation of the finished product. At the core of this procedure lies pattern drafting, a fundamental practice involving the conversion of creative concepts into precise templates that provide instructions for the construction of fabric components into wearable apparel. Within the framework of Ghana's dynamic fashion sector, the practice of pattern making assumes a crucial position in guaranteeing the proper fit,

visual appeal, and overall excellence of domestically manufactured apparel (Kassah et al., 2023; Azuah and Soyeh, 2022). Nevertheless, this particular stage is characterized by a multitude of obstacles that have the ability to impede the progress and advancement of the Ghanaian garment manufacturing industry (Ababio, 2018).

Despite the growing acknowledgment of Ghana's emergence as a prominent center for African fashion, there is a notable scarcity of extensive scholarly research about the particular obstacles experienced in pattern making within the garment production process in Ghana (Obinnim, 2018; Ababio, 2018). The available body of literature offers valuable insights into the various challenges encountered in pattern making worldwide.

These challenges encompass factors such as the accuracy of body measurements (Smith et al., 2017), the influence of cultural and regional variations on body shapes (Jones & Brown, 2019), and the incorporation of technology into the process of pattern making (Hansen & Jensen, 2014). However, it is necessary to conduct a comprehensive examination of the difficulties encountered by Ghanaian pattern makers, designers, and manufacturers due to the distinctive socio-economic, cultural, and technological circumstances within the fashion industry of Ghana.

The fashion industry in Ghana exhibits a wide array of body shapes, which are shaped by cultural and geographical disparities. The task of accommodating these distinct body types while upholding design integrity presents a notable difficulty, especially considering the widespread use of conventional sizing systems that may not correspond to the body proportions of Ghanaian consumers (Agyeman, 2018; Ababio, 2018). Furthermore, the swift incorporation of digital tools, specifically computer-aided design (CAD) software, has revolutionized the procedures involved in pattern drafting.

This has presented novel prospects and obstacles, particularly with regards to technology accessibility, training, and the conservation of traditional artisanal skills (Forster & Irene, 2012). Although computer-aided design (CAD) systems offer advantages in terms of improved accuracy and more design adaptability, they also bring about some challenges pertaining to the mastery of software, the conversion of digital designs into physical garments, and the possible disruption of conventional manual skills (Lipkin, 2003; Hansen & Jensen, 2014). However, the use of these technologies presents a distinct array of obstacles, encompassing apprehensions regarding data privacy, the necessity for specialized instruction, and the assimilation of novel tools into conventional job processes.

In addition, it is worth noting that the garment production sector in Ghana faces various challenges such as resource constraints, inefficiencies in the supply chain, and restricted availability of advanced technology (Acheampong et al., 2019; Obinnim, 2018). The aforementioned problems are expected to have an effect on the process of pattern drafting, which in turn will have an affect on the overall quality, efficiency, and competitiveness of garments produced within the local industry. This study aims to investigate the unique challenges encountered by pattern makers, designers, and manufacturers during the pattern making stage of garment production in Ghana, using textile and clothing students in the Volta Region of Ghana as a case study.

1.3 Purpose of the Study

The purpose of this research study is to comprehensively investigate and analyze the challenges associated with pattern making in the garment production process. Pattern making is a critical and fundamental step in the apparel manufacturing industry, and

understanding the specific obstacles faced in this phase is essential for improving the efficiency, accuracy, and sustainability of the entire production process.

1.4 Research Objectives

This research seeks to achieve the following objectives:

1) To assess the knowledge level of clothing and textiles students on pattern making in garment production process in selected technical and vocational schools within the Volta Region.

2) To examine pattern making skills or competency in garment production process of clothing and textiles students in selected technical and vocational schools within the Volta Region.

3) To examine challenges faced by clothing and textiles students in pattern making garment production process in selected technical and vocational schools within the Volta Region of Ghana.

1.5 Research Questions

1) What is the knowledge level of clothing and textiles students on pattern making in selected technical and vocational schools within the Volta Region?

2) How skillful or competent are clothing and textiles students in pattern making in garment production process in selected technical and vocational schools within the Volta Region?

3) What is the level of challenges faced by clothing and textiles students in pattern making in selected technical and vocational schools within the Volta Region?

1.6 Significance of Study

The significance of the proposed study lies in its ability to solve crucial challenges within the textile and clothing education sector and the wider garment production industry in the Volta Region of Ghana. The findings of this study will provide essential insights that can contribute to multiple facets of education, industry practices, and policy-making, consequently generating a significant influence at both local and regional levels.

The enhancement of education and curriculum: The study's findings regarding the difficulties encountered by students in the field of textile and apparel when engaging in pattern making will offer educators and curriculum developers a deeper understanding of the practical obstacles that students are expected to confront in their professional endeavors. This knowledge has the potential to inform the creation of educational content and procedures that are more appropriate, applicable, and aligned with industry standards. By directly tackling these issues, educational institutions can enhance their ability to equip students with the necessary abilities to efficiently overcome obstacles in pattern drafting, so better preparing them for the workforce.

Industry Readiness of Graduates: The research findings have the potential to enhance the preparedness of graduates in effectively navigating the intricate dynamics of the garment production business. Through the early identification of obstacles in their education, students have the opportunity to receive focused training and counseling aimed at developing effective solutions for overcoming these challenges. This has the

potential to bolster individuals' self-assurance, aptitude for resolving complex issues, and preparedness for the professional sphere, so enhancing their odds for securing employment and advancing their careers.

Local Economic Growth and Competitiveness: The textile and garment sector in Ghana plays a substantial role in the country's economic growth and competitiveness. By examining the difficulties encountered in pattern making within the realm of education, this research can indirectly enhance the caliber of domestically manufactured clothing items. Consequently, this can potentially bolster the Volta Region's standing and competitiveness in both local and global markets. Enhanced garment quality has the potential to result in heightened consumer satisfaction, augmented demand, and potentially amplified revenue for local enterprises.

Cultural Preservation and Innovation: The intersection of cultural preservation and innovation presents a set of obstacles in the realm of pattern drafting, particularly when considering the broad range of body proportions and cultural considerations. This complex landscape provides a distinct chance to delve into novel design techniques. The findings of this study have the potential to inspire the creation of designs that not only acknowledge but also celebrate the abundant cultural diversity present in Ghana. These designs would prioritize both appropriate fit and aesthetic appeal. The convergence of culture and innovation can provide clothing items that appeal to both local and worldwide audiences, thereby playing a role in the preservation of culture and the advancement of contemporary fashion trends.

Policy Implications: The research findings have the potential to contribute valuable insights to policy deliberations and choices pertaining to the domains of education, vocational training, and the garment manufacturing sector. The study's findings can be

utilized by government bodies and regulatory organizations to develop policies that effectively connect educational outputs with industrial demands, foster innovation, and facilitate sustainable growth in the textile and clothing sector.

1.7 Limitations of the Study

This research may face several limitations, which can impact the validity and generalizability of the findings. Here are some potential limitations to consider:

1. Subjectivity: The assessment of challenges in pattern making can be subjective, as it may depend on the experiences and perspectives of the individuals involved. Bias or personal opinions of participants may influence the results.

2. Limited Scope: Focusing solely on pattern making may overlook other critical aspects of the garment production process, such as fabric selection, cutting, sewing, and quality control. These omitted factors can impact the overall understanding of challenges in garment production.

3. **Response Bias:** Participants may provide socially desirable responses, underreporting certain challenges or exaggerating others to conform to expectations, particularly if they fear repercussions or wish to present their practices in a favorable light.

1.8 Delimitation of the Study

In terms of geographic scope, this research study focus specifically on the challenges of pattern making within the context of textile and clothing students in the Kpando Technical Institute, and GRATIS Foundation at Ho, in the Volta Region of Ghana.

These two educational institutions were selected out of the seven vocational training centers offering programs in textiles and clothing within the Volta Region.

In terms of content scope, the focus of this research study will be to investigate the specific issues that arise during the pattern making phase of the garment production process. This study will explore the various hurdles encountered in pattern drafting, encompassing both technical and non-technical dimensions. These challenges encompass a range of topics, such as design correctness, fit, aesthetics, cultural factors, technological limitations, and communication obstacles.

1.9 Organisation of the Study

There are five chapters throughout the entire work. The study's introduction was given in Chapter one. In addition to other information, it provided the study's background, problem description, and research objectives and questions among others. The second chapter reviewed relevant literature on chosen subtopics that assisted in addressing the study objectives and providing answers to the research questions. Information about the research technique was provided in Chapter three. These included the study's demographic, sampling strategy, sample size, tools used to acquire the data, and data processing techniques. Using narratives, tables, figures, or graphs, the outcomes or findings were presented in chapter four. The key findings, conclusions, and recommendations were summarized in chapter five, which was the last chapter. All cited texts were organized alphabetically according to the APA style of referencing.

CHAPER TWO

REVIEW OF RELEVANT LITERATURE

2.1 Introduction

In the preceding chapter, the researcher established the significance and relevance of this study by providing a review on its contextual background, research challenge, objectives, and overall significance.

The review encompassed pertinent topics including pattern making and production techniques, the difficulties encountered by students studying clothing and textiles in the process of pattern-making garment production, and the potential approaches, resolutions, and interventions that can alleviate the identified challenges and improve the pattern-making process. The chapter culminates by presenting a conceptual framework that outlines the process of data collection.

2.2 Theoretical Framework

2.2.1 Activity Theory

Activity Theory, which is grounded in the principles of cultural-historical psychology, offers a theoretical framework that facilitates the comprehension of intricate dynamics among individuals, tools, groups, and the wider social environment within which activities occur. Activity Theory, originally formulated by Lev Vygotsky and subsequently expanded upon by his adherents, posits that human activity is not an isolated phenomenon, but rather takes place within a complex and interconnected system of elements (Engeström, 1999; Roth, 2004). The primary emphasis of this study is to examine how individuals actively participate in purposeful activities in order to

attain certain objectives, while also considering the impact of interactions between various components on the resulting outcomes.

The application of Activity Theory as a theoretical framework seems to be effective in examining the challenges encountered in the pattern making phase of the garment production process. In the specific research inquiry pertaining to students specializing in textile and apparel in the Volta Region of Ghana, the utilization of Activity Theory might provide valuable insights into the intricate nature of pattern making difficulties. This theoretical framework allows for a comprehensive examination of the interplay between the several elements that contribute to the execution of this particular task (Engestrom, 2000). Activity Theory encompasses various essential elements that hold significance in the examination of issues encountered in the domain of pattern design.

1. Subject: The subject of this case pertains to the students specializing in textile and clothes who actively participated in pattern making operations. The manner in which individuals tackle pattern drawing issues is influenced by their abilities, knowledge, motivations, and perspectives (Bertelsen & Bødker, 2003).

2. Object: The primary focus of the activity is the process of pattern drafting. The fundamental goal of this study is to gain an understanding of the problems that students face while attempting to develop patterns that are both precise and aesthetically beautiful.

3. Tools: Tools encompass a wide range of resources, comprising tangible instruments such as rulers and pencils, as well as intangible assets like knowledge, processes, and technology. The examination of students' utilization of tools in order to overcome hurdles, as well as the impact of tool limits on the difficulties encountered, yields significant insights (Bertelsen & Bødker, 2003).

4. Rules: Rules encompass the established norms, principles, and limitations that exert an impact on the manner in which an activity is carried out. Pattern making processes can be influenced by various factors, such as industry standards, design concepts, and educational curricula.

5. Community: The community is comprised of many individuals, including classmates, teachers, industry professionals, and other stakeholders, who offer assistance, mentorship, and opportunities for collaboration. The examination of the impact exerted by the community on pattern making difficulties and corresponding solutions can be undertaken (Bertelsen & Bødker, 2003).

6. Division of labor: The concept of division of labor encompasses the idea of how duties are allocated among those involved in a particular endeavor. In the context of a classroom environment, it is not uncommon for students to engage in collaborative endeavors such as pattern making assignments. By examining the distribution of tasks within these projects, one might uncover potential obstacles pertaining to effective teamwork and communication (Bertelsen & Bødker, 2003).

The study can employ Activity Theory as a systematic framework to analyze the interactions and conflicts among these components. The examination of students' approach to pattern making can be conducted by researchers through the analysis of their engagement with various elements such as tools, peers, teachers, and community standards. Through an examination of the ways in which these interactions influence the process of pattern making and subsequently affect the overall quality of garments, this study has the potential to provide valuable insights into areas that could benefit from enhancements in education, training, and industry standards.

2.2.2 Diffusion of Innovations Theory

The theory of Diffusion of Innovations, formulated by Everett Rogers (2003), elucidates the process through which novel ideas, technologies, or behaviors are embraced and disseminated within a given social framework, evolving gradually over a span of time. This study investigates the mechanisms by which innovations are disseminated, embraced, and assimilated within a given community or organization (Kaminski, 2011). The theory delineates many categories of adopters and elucidates the elements that exert effect on the adoption and spread of innovations. These factors encompass the properties of the innovation itself, the channels of communication utilized, the social systems in which the innovation is embedded, and the characteristics of prospective adopters (Kaminski, 2011).

Utilizing the Diffusion of Innovations Theory as a conceptual framework within a research endeavor examining the challenges encountered in pattern making during the garment production process has the potential to yield significant findings regarding the adoption of novel techniques, tools, or technologies associated with pattern making among students specializing in textile and clothing. The application of this principle can be demonstrated as follows:

The theory places emphasis on the notion that specific characteristics of an innovation have an impact on its adoption. Within the realm of pattern drafting, this study aims to examine the characteristics of novel methodologies or technologies employed in the process, including digital pattern making tools and procedures. The study aims to evaluate the impact of variables such as relative advantage, compatibility, complexity, trialability, and observability on the problems encountered by students during the process of adopting and integrating new technologies (Kaminski, 2011).

The Diffusion of Innovations Theory delineates distinct phases within the adoption process, including knowledge acquisition, persuasion, decision-making, implementation, and confirmation. This study aims to investigate the progression of textile and garment students as they navigate the many stages involved in pattern making issues. An illustrative instance involves the examination of how students learn knowledge pertaining to novel pattern making procedures, the mechanisms by which they are convinced to embrace these approaches, and the various aspects that exert effect on their decision-making process.

The theory classifies adopters into distinct groups according to their propensity to accept and adopt innovations. The aforementioned categories consist of innovators, early adopters, early majority, late majority, and laggards (Kaminski, 2011; Dingfelder & Mandell, 2011).). The study aims to examine the demographic characteristics of students who are more inclined to adopt novel pattern making methods and tools. Additionally, it seeks to explore the experiences and perceptions of these adopter categories in relation to the problems connected with these innovative approaches.

The idea emphasizes the significance of communication routes in the distribution of knowledge regarding innovations. Within the realm of pattern drafting, this study aims to examine the manner in which information on novel techniques or tools is disseminated to students specializing in textiles and clothes. This may entail an analysis of the efficacy of various communication channels, including formal education, peer interactions, online resources, and industrial partnerships (Kaminski, 2011).

The Diffusion of Innovations Theory emphasizes the impact of social systems and contextual elements on the process of adoption. This study aims to investigate the influence of several factors, such as the Ghanaian textile and apparel education system,

industry practices, cultural norms, and economic restrictions, on the difficulties encountered in the adoption of pattern making techniques. This study aims to ascertain the extent to which these characteristics contribute to or impede the successful implementation of novel pattern making techniques (Dingfelder & Mandell, 2011).

The Diffusion of Innovations Theory provides a complete theoretical framework for comprehending the adoption of novel pattern making processes, techniques, or technologies among students in the field of textile and clothing. This facilitates the examination of the difficulties that students face during different phases of adopting and integrating innovations, taking into account the characteristics of the innovations, communication methods, categories of adopters, and contextual factors. The aforementioned theoretical framework offers valuable insights into the intricate nature of using novel pattern making techniques in the garment manufacturing process.

2.3 Overview of the Garment Industry

In order to establish the contextual framework in which pattern making operates, it is important to examine the characteristics of the garment manufacturing sector. The garment industry is a component of the broader textile complex, specifically focusing on the production of soft products. According to Dickerson (1999) and Kunz and Myrna (2011), the textiles complex plays a vital role in the soft products industry, which comprises both upstream entities involved in fiber production and textile manufacturing, as well as downstream enterprises encompassing end consumers and distribution channels. Therefore, it can be observed that the garment industry, when viewed from the lens of the textile complex, functions as a consumer-oriented sector encompassing

several stages of product production, including cutting, sewing, contracting, and marketing.

The garment industry can be classified as a sector that encompasses the manufacture of sewn products, such as garments, interior decorating items (such as draperies and linens), luggage, awnings, and toys that are sewn together. The classification of the global garment manufacturing industry as NAICS 315 is outlined by the US Department of Labour (2016), as per the North America Industrial Classification System. The goal of this classification is to facilitate industrial commerce, establish standards, and enable efficient data collecting.

The garment industry comprises three sub-divisions within the North American Industry Classification System (NAICS), namely:

1. The sector of interest is the Apparel Knitting Mills, which is classified under the North American Industry Classification System (NAICS) code 3151.

2. Cut and Sew Apparel Manufacturing: NAICS 3152;

3. Apparel Accessories and Other Apparel Manufacturing: NAICS 3159.

According to the North America Industrial Classification System (NAICS), the garment industry is characterized by establishments engaged in two distinct manufacturing processes. The first process involves the procurement of fabric, followed by cutting and sewing to produce a garment. The second process entails the production of garments in establishments that initially knit fabric and subsequently cut and sew the fabric to create a garment. The Apparel Manufacturing subsector encompasses a wide array of establishments engaged in the production of complete lines of ready-to-wear apparel as well as custom apparel. This includes apparel contractors, who undertake cutting or

sewing operations on materials owned by external parties; jobbers, who perform entrepreneurial functions within the apparel manufacturing process; and tailors, who specialize in crafting custom garments for individual clients. When knitting is performed in isolation, it falls under the subsector of Textile Mills. However, when knitting is integrated with the manufacturing of finished garments, this activity is categorized within the sector of Apparel Manufacturing. According to the United States Department of Labour (2016, Para. 1),

Like other enterprises, the procedures used to actually produce a garment or series of garments via industrial means vary depending on the manufacturer and the type of garment. The procedures used to manufacture clothing are listed and discussed in general (Table 2.1). Under operations, the procedures are broken down step-by-step, followed by a description of the tasks performed and the production method, whether manual or automated.

Table 2.1: The procedures used to manufacture clothing

SN	Operation	Job description	Method
1	Design/Sketch	Production of working sketches of styles or design details with measurements	Manual/Computerized
2	Pattern Making	Production of various forms of pattern or drapes based on design/sketch, done in any size to enable sample garment to be made	Manual/Computerized
3	Sample Making	Sample of garment is produced based on specifications of buyers to	Manual

		analyze pattern fit and design and approved by buyer upon construction	
4	Production Pattern	This involves bulk production of patterns taking into consideration direct sample, specification sheet/measurement chart, actual body size measurements, ease allowances and sewing allowances	Manual/Computerized
5	Grading	This process could be part of pattern production but performed at the request of a buyer where patterns are graded into different sizes such as S, M, L, XL or XXL	Manual/Computerized
6	Marker Making	Involves the process of determining fabric yardage for each style or garment.	Manual/Computerized
7	Spreading	Involves spreading fabric on the table for cutting. Fabric is often laid in piles for cutting and laid in such a way to avoid or prevent fabric wastage	Manual/Computerized
8	Cutting	Involves cutting fabrics based on marker dimensions	Manual/Computerized
9	Sorting and Bundling	Involves the precision of sorting out cut fabrics according to sizes and grouping each size into a	Manual/Computerized

		bundle	
10	Sewing or Assembly	Involves assembling garment parts based on bundles	Manual/Semi Automated
11	Inspecting	Involves inspecting all aspects of the manufacturing process based on quality specifications	Manual
12	Pressing and Finishing	Involves ironing, pressing creases or lines, molding with heat set equipment. Sometimes this process may be performed before inspection	Manual
13	Final Inspection	Involves final review of product based on quality standards set by buyer or regulation. Specific attention is paid to sewing defects, sizing defects and garment defects	Manual
14	Packaging	Involves sorting finished garments in packages based on design and size	Manual
15	Cartooning	Involves placing packaged articles into cartons based on the specifications of the buyer	Manual
16	Shipment/Dispatch	Involves sending the final products to buyer	Manual

Source: Kiron (2016)

Almost every nation in the world has at least a basic clothing industry to supply its home market, create jobs, and generate foreign cash. Dickerson (1999) stated that historically, production capacities have changed between nations and regions through time. In the 1960s, Japan first rose to prominence as a producer, outpacing its rivals in

North America and Europe. The Asian Big Three (Hong Kong, Taiwan, and Korea), who came to dominate in the 1970s, came after Japan. The majority of South East Asian nations, including Indonesia, Thailand, the Philippines, Malaysia, China, and Sri Lanka, then rose to prominence in the 1980s. In the 1990s, East Europe remained a significant supplier to the United States even as South Asia and Latin America did. Additionally, the Mediterranean region rose to prominence among EU suppliers.

However, according to US Department of Labour (2016), the areas of Eastern Asia, South-Eastern Asia, and Asia now have the biggest trade surpluses since several of the nations in those regions have the ability to produce large quantities of textile products at competitive prices. The largest trade deficits, however, are in developed North America, developed Europe, and Asia-Pacific, despite the fact that some of these regions' nations (such as Germany, Italy, and the United States) have significant export capacities due to their superior knowledge and technology in niche goods that are typically expensive and high-value-added. Between 2010 and 2014, the average global growth rate was 7.9%, compared to 4.2% between 2013 and 2014. According to data on worldwide production, the top 15 nations together accounted for 86.5% of production, demonstrating their dominance in international trade. Global trade statistics do not include statistics on Ghana's garment exports due to the country's extremely low export of apparel-related goods.

2.4 The Concept of Pattern Making

A pattern is a template or guide that is utilized in the process of apparel production. It serves as a reference for dressmakers and tailors, aiding them in tracing and cutting various components of the garment, as well as facilitating the assembly of these components. In the present study, the concept of pattern is operationalized as the

discrete components of various sections of cut out clothing items that are then joined together. The measurement of pattern pieces is typically taken between the seam lines rather than from one edge to another. In a similar vein, the artistic components of design, including vertical lines, horizontal lines, diagonal lines, curved lines, and shape, necessitate precise measurements in order to effectively convey emotions, thoughts, sensations, and mood (Kunz, and Myrna, 2011). The process of creating a pattern involves obtaining precise measurements of an individual, which are then used to draw and cut a sheet of paper in the desired shape. This paper pattern is subsequently utilized as a template for sewing garments (Ekumankama & Igbo, 2009).

Patterns play a crucial role in the field of dressmaking due to a multitude of factors. According to Kunz, & Myrna (2011), patterns enable garments to conform to the contours of the body. The utilization of patterns in the practice of dress-making is imperative for the purpose of achieving an enhanced fit and optimizing material conservation. According to Aldrich (2006), the construction of block patterns in clothes is based on conventional measures for various demographic groups. However, these patterns can also be customized to meet an individual's unique body proportions. Individuals who encounter challenges in finding appropriately fitted attire may find the most advantageous solution in creating dresses using self-made patterns.

This is particularly relevant for those who face difficulties in obtaining ready-to-wear garments from retail stores or acquiring custom-made or made-to-measure clothing. Hence, it is imperative to establish suitable foundational templates specifically tailored for individuals with body shape concerns, which can afterwards be modified according to design elements and stylistic attributes. However, the successful execution of this task necessitates a sufficient level of proficiency in pattern making.

Pattern making is a discipline that combines artistic and scientific principles to establish a consistent sequence of events or instructions that outline the process of creating a particular item, such as a sample of cloth. Pattern making, as a form of artistic expression, involves the creation of a blueprint or schematic that outlines the pattern and structure for the construction of a garment. According to Thomas (2009), the initial stage in the process of pattern making involves the acquisition of body measurements. Another aspect closely associated with the notions in pattern making is the practice of making and pattern making.

Making is a systematic and methodical procedure for creating patterns, rooted in the principles of scientific pattern design. This approach relies on a predetermined set of body measurements as the fundamental basis for constructing a foundation or master pattern. Pattern making is primarily the process of conceptualizing and formulating the skeletal blueprint or organization for creating garments (Aldrich, 2014). The aforementioned approach pertains to a technique employed in the creation of garments, wherein the client's body measurements serve as the foundation for generating a pattern. The phrase draping is closely associated with the concept of pattern drafting. Draping is a creative technique wherein an individual constructs a pattern by skillfully manipulating a sizable rectangular piece of woven fabric around the human form, resulting in the formation of a clothing pattern that conforms to the contours of the body. The process of pattern making necessitates the acquisition of precise measurements.

The establishment of precise measurements serves as the fundamental basis for fostering creativity within the realm of pattern drafting. The act of obtaining precise measurements is considered to be the fundamental basis upon which the practice of pattern creating through making is established (Aldrich, 2014). According to Thomas

(2009), the initial stage in pattern making is the process of obtaining precise body measurements. It was suggested by the individual that, during the process of pattern drawing, it is advisable for the individual to solely don regular undergarments when taking measurements. Nevertheless, Thomas (2009) did not provide a comprehensive explanation of the specific procedures involved in garment construction through pattern making in the context of apparel production, nor did they elucidate the impact of these stages on the fit of the apparel.

According to Okorie (2000), the possession of imagination and a comprehensive understanding of dimensions are considered essential attributes for garment designers. In the field of pattern drafting, designers of garments must possess a comprehensive understanding of the fundamental aspects and concepts of design as they pertain to the realm of art. The precision of measures is contingent upon fundamental principles of design, including proportion, balance, rhythm, emphasis, and harmony. The effective communication of emotions, ideas, sensations, and mood through the art aspects of design, including vertical lines, horizontal lines, diagonal lines, curved lines, and shape, necessitates precise measurements.

According to Aldrich (2014), the incorporation of pattern forms into pattern making is a significant aspect of garment production. Making patterns typically depend on fundamental patterns. The fundamental template for men's attire, comprising a shirt and trousers, encompasses several measures in order to attain a personalized and tailored fit. The required measurements for shirt patterns encompass the following dimensions: neck circumference, neckband circumference, shoulder width, chest circumference, centre front length, centre back length, back width, waist circumference, arm length, arm circumference, and sleeve length.

Previous research has established that consumers place a higher level of importance on the fit of clothing items (Dove, 2016; Shailong & Igbo, 2009). Furthermore, it has been found that the process of pattern making and cutting plays a significant role in achieving proper fit for customers (Foster & Ampong, 2012). This suggests that the efficacy of any flat pattern making approach is contingent upon the precision of the measurements acquired and the fidelity with which they are transcribed into the pattern. According to Musheno (1980), the fundamental template for men's attire, comprising a shirt and trousers, involves a series of measures in order to attain a personalized and well-fitting garment.

The required measurements for shirt patterns encompass the following dimensions: neck circumference, neckband width, shoulder width, chest circumference, centre front length, centre back length, back width, waist circumference, arm length, arm circumference, and sleeve length. The essential measurements for pants encompass the waist, seat (hip), high hip, thigh, knee, out-seam (side lengths), inseam, and hemline. According to Aldrich (2006), it is recommended to utilize normal body measurements for designing dresses tailored to men of average stature, often around 5 feet 10 inches or 178 centimeters in height. The process of creating tailored clothing commences with precise measurements. The aforementioned statement suggests that the efficacy of a flat pattern making technique is contingent upon the precision of the measurements acquired and the subsequent translation of those measurements onto the pattern.

According to the research conducted by Joseph-Armstrong (2010), the utilization of patterns in the process of apparel creation serves to enhance the aesthetic appeal and improve the overall fit of the garments. In order to obtain precise measurements for men's patterns, it is recommended that the individual being measured assumes a natural stance and avoids the presence of mirrors. Mirrors, despite promoting the notion of an

ideal physique characterized by an upright posture and tense muscles, can lead to improper fitting of the garment when the individual assumes a normal stance (Thomas, 2009). According to Thomas (2009), it is recommended for females to adopt an erect posture, standing straight with feet together while maintaining a comfortable demeanor.

Individuals who encounter challenges in finding appropriately fitted attire may find the most advantageous solution in creating dresses using self-made patterns. This is due to the potential problem they may face in acquiring ready-to-wear garments from retail stores or obtaining custom-made or made-to-measure clothing. Hence, it is imperative to establish suitable foundational templates specifically tailored for individuals facing issues with their physique, which can afterwards be modified in accordance with design elements and stylistic attributes. However, the successful execution of this task necessitates a sufficient level of proficiency in pattern drafting. The subsequent portion, thus, delves into the proficiency of pattern drafting.

2.5 Pattern Making Techniques

2.5.1 Pattern Making

According to Joseph-Armstrong (2010), pattern making is a method of patternmaking that relies on measurements derived from a form or model in order to construct fundamental foundation patterns, as well as design patterns. Based on this concept, making can be characterized as an engineering methodology that relies on the precision of body measurements and the accuracy of making instructions to achieve success. According to Adu-Gyamfi (as stated in Forster & Ampong, 2012), precise measurements play a significant role in the process of pattern and garment cutting. In the absence of precise measurements, garment cutters will lack the necessary data to

accurately tailor clothing. According to Joseph-Armstrong (2010, p. 38), there exist two distinct methodologies for creating a pattern. The first approach involves exclusively utilizing direct measurements obtained from the individual's body, while the second approach involves relying on calculated measurements and proportions derived from one or two primary measurements, often taken from the bust, occasionally cross-validated by height.

The preference for the first strategy (direct measuring) over the second approach (standard measurement) in dressmaking is attributed to the less standardized shapes of clothing resulting from fashion trends. The rationale behind this claim is that standard measures are derived from statistical measurements obtained from a representative sample of a particular community. The aforementioned measurements are acquired through manual means utilizing tape measures, and their precision is predominantly contingent upon the proficiency of the individual responsible for collecting the data. The use of body scanning technology yields multidimensional data that possess the capacity to offer more dependable standard measures for the establishment of standard size categories and fitting patterns (Aldrich, 2014; Ashdown, 2007). This suggests that standard measures may not be entirely reliable in the context of writing.

In the process of creating a foundational block, it is necessary to possess a comprehensive understanding of body shapes attained through figure analysis, as well as the ability to effectively translate precise body measurements onto the pattern piece. The examination of the human body provides valuable insights to the dressmaker regarding the optimal placement of the bust point and the appropriate amount of excess fabric to include in the making of the basic block, so ensuring an ideal and precise fit. According to Joseph-Armstrong (2010), the hang, balance, and fit of clothing are influenced by the unique characteristics of particular body types. However, it is

important to emphasize that achieving perfection in the design of the garment is more crucial than conforming to a certain body shape (p. 26). In order to initiate the procedure of obtaining body measurements, it is necessary for the individual undergoing measurement to don either a leotard or underwear, assume a barefoot stance, and maintain an upright posture.

2.5.2 Flat Pattern Making

Flat pattern making is a fundamental technique utilized in the realm of garment production, which enables designers and pattern makers to convert their design conceptions into accurate templates on two-dimensional surfaces. The origins of flat pattern making can be traced back to ancient cultures, wherein clothes were fashioned by manipulating basic geometric shapes. The advent of the Industrial Revolution signified a pivotal moment characterized by the establishment of standardized sizing practices and the introduction of commercially available paper patterns. According to Mori and Wakita (2014), these advancements in fashion design have facilitated a democratization of the field, allowing anybody, including both experts and home sewers, to produce clothing that possess a consistent fit and style.

The procedure encompasses various essential stages, ranging from acquiring measurements to manipulating pattern blocks. Precise measurement acquisition is an essential preliminary phase in the flat pattern design procedure. Measurements play a fundamental role in the process of flat pattern drafting, as they provide the essential foundation for the creation of pattern blocks that facilitate the transformation of design conceptions into physical clothing. According to Armstrong (2014), accurate measurements are essential in order to create patterns that are customized to suit the unique body proportions of individuals. Measurements encompass various body

dimensions such as bust circumference, waist circumference, hip circumference, shoulder breadth, and arm length, among others. The conventional techniques of measurement entail the utilization of a tape measure to directly assess various anatomical dimensions. Subsequently, these measurements are documented and employed in the process of pattern making. The meticulous consideration of measurement techniques is necessary in order to prevent inaccuracies. The act of draping fabric on a dress form or directly on a model facilitates the process of obtaining measurements while simultaneously making necessary adjustments to ensure proper fit. According to Hume (2018), this particular method offers tactile input and can be utilized to detect and address potential fit problems.

Flat pattern making is widely recognized as the most expeditious and effective technique employed in the creation of design patterns, which play a crucial role in ensuring the uniformity of dimensions and proper fitting of clothing manufactured on a large scale. According to Armstrong (2014), the practice of flat patternmaking distinguishes itself from other methods by its reliance on pre-existing patterns (known as working patterns) that are manipulated utilizing techniques such as slashing or pivotal/transfer methods. The slash-spread and overlap technique entails the manipulation of a basic pattern through cutting and tape.

This process allows for the repositioning of darts, the overlapping of pattern pieces to increase fabric volume, or the overlapping for a more tailored fit. The outcome is the creation of a novel design. The aforementioned technique exhibits greater versatility and facilitates a wide range of dart manipulations that are comparatively more challenging to execute using the alternative pivot method. The primary emphasis of employing this technique for manipulating darts is in the pivotal location of the dart(s)

under consideration. This phenomenon occurs due to the fact that in the act of slashing, the cuts terminate at the pivot point, rather than penetrating through it.

2.5.3 Modifying/Reverse Engineering

Reverse engineering, often known as garment deconstruction or a knock-off, is a term used to describe the process of analyzing and understanding the design and construction of a product, typically a garment (Pritchard, 2013). Through this particular procedure, patterns are derived from a pre-existing garment. The garment is disassembled, subjected to analysis, and subsequently utilized to create the pattern components. The dressmaker has the agency to exercise discretion in augmenting or subtracting specific elements from the initial design. The essential objective is to attain the appropriate silhouette.

According to Pritchard (2013), the importance of selecting an acceptable current pattern or clothing with a comparable silhouette in order to change a pattern or an existing garment for a new design. Furthermore, she asserted that this particular technique may not necessitate an extensive repertoire of pattern cutting abilities. Instead, it relies on a comprehensive comprehension of garment construction and a familiarity with crucial measurement places on the human body. It is important to note that the fundamental concepts essential for achieving a well-fitting garment remain applicable within the context of this technique.

2.5.4 Draping

Draping, as a technique employed in the three-dimensional (3D) patternmaking process, has been recognized as one of the earliest methods utilized for pattern generation (Lindqvist, 2013). According to Pritchard's (2013) study, the process of draping, also

known as toiling, necessitates the utilization of a dressmaker's stand or mannequin. The term "toiling" originates from the French word "toile," which refers to cotton or linen fabric. Over time, it has acquired usage within the fashion industry to signify a prototype or trial garment. The conventional method of draping involves the manipulation of cloth through molding, cutting, and pinning onto a mannequin or an individual in order to create a garment. The style lines and construction details of the drape are meticulously delineated and afterwards eliminated. Fabric pieces containing the aforementioned construction and style features are then produced. These fabric pieces are subsequently placed in a flat position over pattern paper and meticulously replicated. The finalization of the pattern involves the inclusion of directional indicators, such as grain lines, notches, buttonholes, accurate seam and hem allowances, as well as facings.

According to Pritchard (2013), in her exposition of this methodology, it is imperative that the fabric employed for draping on the form possesses comparable attributes to the fabric intended for the final artwork. The author further asserts that fabric types such as cotton muslin or calico are frequently employed in this method because to their cost-effectiveness and versatility in terms of weight. The utilization of draping techniques proves to be particularly advantageous in the creation of complex garment designs or when working with unconventional textiles. According to Lindqvist (2013), this technique can be characterized as an aesthetic approach. It appears that success in utilizing this technique requires creativity, a discerning eye for balance and proportion, and an understanding of fabric properties.

2.5.5 Darts

Darts refer to triangular fabric folds that are strategically sewn in order to manage fullness or reduce surplus fabric, so shaping a garment to conform to the curves of the body (Baker, 2007; Fischer, 2009; Jeffreys, 2006). Darts play a crucial role in achieving proper garment fit as they facilitate the smooth adaptation of two-dimensional fabric pieces to conform to the contours of three-dimensional human bodies. Darts are employed in the process of fabric manipulation to get a customized fit that conforms to the contours of the human body. In certain instances, darts are employed in a decorative manner to establish a design line through the sewing of the dart from end to end or by stitching it to a critical location, such as the bust point, in order to get a tailored fit for the body. These features are commonly observed in the regions of the torso, specifically the bust, waist, and hips, which are known for their distinctive contours. Hence, it is of utmost significance to exercise precision while ascertaining the dimensions, length, and configuration of darts, as well as during the processes of marking, stitching, and pressing such darts.

According to Hollen and Kundel (1992), the size of a dart is influenced by the angle at its tip. They argue that as the body curvature increases, the corresponding dart must also be larger in order to get a proper fit. As the magnitude of the angle increases, the size of the protrusion caused by the dart also increases. It is imperative for dressmakers to acknowledge that the size of darts is not contingent upon their length, but rather, it is determined by the dart intake. To clarify, it should be noted that short darts do not inherently correspond to diminutive darts. Regarding the measurement of dart length, it is imperative that darts possess sufficient length to extend up to the bust circle. Furthermore, it is permissible to elongate darts to reach the bust point, so compensating

for a portion of the customary allowance for ease. Increasing the length of the dart up to the bust point results in a closer fit of the garment.

Darts can be marked using several methods, such as employing dressmaker's tracing paper and wheel, tailor's tacks, chalk or soap slivers, marking pencils or pens, pins, or small snips (Baker, 2007). The choice of procedure employed is contingent upon the specific fabric type and the proficiency level of the dressmaker. In addition to considering the fabric type and the dressmaker's expertise, it is crucial to assess the marking method employed on a fabric scrap to ascertain its washability without causing any harm to the cloth. To achieve uniform dart length on both sides, it is advisable to designate the termination point of the dart using either a pin or cross markings. Among the three techniques used for marking darts, the pin marking method proves to be time-efficient, as long as it is compatible with the cloth being worked on.

2.5.6 Flat Pattern Making

The practice of paper pattern making holds a significant position as a time-honored and fundamental technique within the realm of fashion design and the manufacturing of garments (Joseph-Armstrong, 2010). The practice of paper pattern manufacturing can be traced back to ancient times, where fundamental geometric shapes were employed as templates for the production of garments. During the 19th century, the introduction of standardized paper patterns had a transformative impact on both domestic sewing practices and the manufacture of garments by professionals (Joseph-Armstrong, 2010). The aforementioned patterns facilitated the reliable reproduction of designs, hence playing a significant role in the emergence and popularity of ready-to-wear fashion.

The process of paper pattern manufacturing entails the creation of paper templates that function as instructional guides for the precise cutting and assembly of fabric

components. The successful execution of this procedure necessitates precision, meticulousness, and a comprehensive comprehension of the fundamental principles of garment creation (Joseph-Armstrong, 2010). Pattern designers employ several techniques, such as flat pattern making, to create patterns. This process involves converting measurements and calculations into pattern components (Jones & Brown, 2019). As to the findings of Fletcher (2014), the process of creating a draft involves the utilization of muslin fabric, which is carefully tailored to provide a comfortable and well-fitting prototype for either a standardized mannequin or an individual. The indicated modifications have been made on the initial draft of the paper. The process of creating patterns using the flat pattern making approach is considered straightforward due to the reliance on pre-existing templates. The challenging aspect is in the creation of templates, which can be accomplished either by manual methods or by utilizing pattern-making tools. According to Fletcher (2014), the process of creating these items may appear straightforward, although it is challenging due to the necessity of including several human body dimensions and doing extensive test fittings. The aforementioned patterns should possess a high level of accuracy, as subsequent patterns are derived from them. In the flat method, the pattern maker proceeds by tracing the fundamental blocks and performing the required adjustments, including appropriate stitching and other allowances, for each individual component (Joseph-Armstrong, 2010).

The pattern includes small markings on the outer edge of the seam allowance, referred to as "notches," which serve the purpose of ensuring proper alignment and matching during the sewing process. All of these activities generate a "working pattern." After the completion of the test fit, the operational pattern transitions into what is known as the "production of pattern." The acquisition of skills such as grading and pattern

manipulation enables the ability to achieve variations in size and make alterations to designs.

In the context of modern fashion, flat pattern manufacturing continues to hold significance despite the rapid progress of technology. According to Fletcher (2014), the process of paper pattern making is considered a fundamental talent that is imparted in fashion design school. This particular skill equips students with a comprehensive comprehension of the underlying principles governing the construction of garments. The procedure is highly regarded for its manual dexterity and skill, which corresponds to the growing preference for handcrafted and artisanal goods within the fashion sector. Furthermore, paper patterns play a crucial role as prototypes, enabling designers to visually conceptualize their designs in tangible form prior to commencing the production process (Barnfield & Torr, 2006).

2.5.7 Computerised Pattern Making

The integration of computer technology has become pervasive across all facets of our professional lives. The initial implementation of Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) systems was observed in the cutting room throughout the 1970s. In recent times, there has been a notable decrease in the cost of computers. Nevertheless, it is worth noting that pattern making and grading software continues to be a substantial financial commitment (Joseph-Armstrong, 2010). The process of generating a flat pattern through computer-aided design (CAD) is a highly accessible and sophisticated design methodology, particularly after achieving proficiency with the specific CAD system being utilized. A significant number of emerging design entrepreneurs employ computer technology as a means to alleviate the workload associated with the development of novel design aesthetics (Joseph-

Armstrong, 2010). The industry also engages in the digitisation of manual patterns for the purpose of production.

The pattern creator operates through the utilization of a life-sized, sensitive surface and a computer-linked stylus. Designers employ a diverse range of geometric designs derived from different shapes and lines in order to generate patterns. Modifications can be readily implemented on the display if deemed essential, while accurate patterns are prepared for further tasks such as grading and marker creation. Computers possess use in generating repeated patterns. Certain pattern makers employ the method of initially making their patterns on rigid paper, subsequently utilizing a scanner to convert these physical patterns into a digital version. Subsequently, the alterations to the pattern are implemented directly on the screen. The primary technological components encompass 'pattern design systems' and 'pattern generation systems' (Joseph-Armstrong, 2010). Pattern design systems have the capacity to enhance the efficiency of pattern making procedures and enhance the precision of the outcomes. A proficient production pattern maker with expertise in utilizing pattern design technologies effectively draws the block digitally and constructs garment patterns by assembling all the currently utilized block patterns. The pattern generating system is responsible for automatically creating patterns by utilizing the pattern design system and its various components.

Numerous corporations employ computer-aided design (CAD) systems for the purpose of generating patterns. Computer-aided design (CAD) finds extensive application in various fashion design procedures, encompassing the generation of design sketches, apparel design, pattern creation and grading, draping, virtual visualization, the development of garment specification sheets, storyboards, fabric printing, and technical drawings (Joseph-Armstrong, 2010). In general, computer-aided design (CAD) offers

time-saving benefits throughout the design process, facilitates the generation of novel design concepts, enables comprehensive visualization of all design elements, supports the development of prototypes, and aids in the refinement of new designs prior to production. There are various computer-aided design (CAD) software packages, with notable options being those developed by Lectra packages, Gerber Technologies, Tukatech, and Optitex, which are widely regarded as the most superior choices.

2.6 Knowledge Level of Pattern Making

The acquisition of pattern making knowledge and abilities is of paramount importance in enabling students to effectively translate their design concepts into precise and accurate patterns. Numerous studies have underscored the need of comprehensive pattern making education within technical and vocational curricula (Fletcher, 2014). According to Adigwe and Omoregie (2016), possessing a thorough understanding of pattern making is crucial in order to create garments that are well-constructed and satisfy the required standards of quality.

Numerous scholarly investigations have brought attention to the difficulties encountered by students specializing in apparel and textiles when engaging in the practice of pattern drafting. The issues encompass several aspects, such as comprehending pattern symbols, performing mathematical calculations, converting design conceptions into patterns, and assuring appropriate fit (Asare & Acquaye, 2015). According to Alhassan and Razak (2019), an additional set of obstacles includes a dearth of practical experience and restricted availability of teaching materials.

The quality of garments is significantly impacted by a comprehensive comprehension of pattern drafting. According to Kandilov et al. (2019), those who possess a greater

understanding of pattern making demonstrate enhanced abilities in generating patterns that yield clothes with optimal fit. Conversely, a lack of proficiency in pattern making might result in garments that do not fit properly and have degraded quality.

The acquisition of pattern making knowledge among students in technical and vocational schools is greatly influenced by the curriculum and teaching techniques employed. The significance of a meticulously designed curriculum that effectively integrates theoretical knowledge and practical application is underscored in a study conducted by Bui (2017). According to Issa (2020), the utilization of interactive workshops and experiential learning can significantly improve students' comprehension of intricate pattern making principles.

The incorporation of technology within the realm of pattern making education has demonstrated considerable potential in augmenting students' understanding and proficiency. According to Teixeira and Veloso (2018), the utilization of computer-aided design (CAD) software and digital tools can enhance the process of seeing and manipulating patterns, hence assisting students in comprehending pattern transformations and modifications.

The knowledge of pattern making among students is influenced by cultural and regional circumstances. According to Nartey (2017), the acquisition of skills and techniques by students is influenced by cultural preferences, traditional garment designs, and local aesthetics. The comprehension of local design preferences and cultural components holds significant importance in the realm of pattern making education within certain geographical areas.

The existing body of research highlights the importance of comprehensive pattern making education for students specializing in clothes and textiles within technical and

vocational schools. Students' knowledge levels are affected by various challenges, including mathematical calculations, ensuring proper fit, and limited access to resources. The enhancement of students' pattern making knowledge is contingent upon the implementation of effective curriculum design, instructional techniques, and technological integration. The acquisition of skills and practices by pupils is further influenced by the cultural and regional background. It is imperative to consider these variables in order to ensure that students possess the necessary skills and knowledge to make meaningful contributions to the garment production process.

2.7 Pattern Making Skills

Pattern making is an essential skill within the clothing and textiles curriculum, serving as a crucial link between design concepts and the practical realization of garments. Proficiency in pattern making is an essential requirement for students aspiring to enter the fashion business, as it guarantees the precise transformation of creative concepts into garments that are both visually appealing and properly fitted (Fletcher, 2014). Pattern making encompasses a fusion of technical proficiency, meticulous mathematical calculations, and creative interpretation. The acquisition and proficiency of several approaches are necessary for students in order to generate designs that satisfy both aesthetic and utilitarian criteria. As per the findings of Müller and Hildebrandt (2017), the proficiency of students in pattern making include their capacity to generate fundamental blocks, alter patterns to accommodate diverse body forms, and adjust designs to suit different fabric types.

Once again, there are numerous obstacles that impede the progress of apparel and textiles students in acquiring pattern making skills. The presence of limited resources,

insufficient equipment, and obsolete curricula has the potential to impede the opportunity for practical application and the development of refined skills (Hartmann, 2019). Furthermore, the quality of pattern making education may be influenced by the presence of diverse teaching approaches and a shortage of experienced instructors (Dinler & Özgen, 2018).

The incorporation of technology into the process of pattern making has become progressively indispensable. According to Demirdöğen and Sari (2020), the utilization of computer-aided design (CAD) software in educational settings provides students with the ability to digitally see and alter patterns, hence enhancing the efficiency of the design process and facilitating prompt modifications. The utilization of computer-aided design (CAD) tools provides students with essential competencies that align with the requirements of contemporary industries.

The development of pattern making skills is contingent upon the implementation of a meticulously crafted program. Dinler and Özgen (2018) highlight the significance of a curriculum that achieves a harmonious integration of theoretical knowledge and practical application. This approach enables students to develop a comprehensive understanding of both the mathematical foundations and the artistic elements involved in pattern drafting. According to Hartmann (2019), it is imperative for the curriculum to incorporate industry trends in order to educate students with the necessary abilities that are in line with the prevailing fashion expectations.

The integration of cultural significance into pattern drawing education holds significant importance, particularly within a region characterized by diversity such as the Volta Region. According to Müller and Hildebrandt (2017), having a comprehension of the cultural significance associated with specific garment styles and design aspects

empowers students to develop designs that effectively connect with their local populations.

By actively participating in internships, workshops, and partnerships, students gain valuable practical knowledge about the challenges and opportunities associated with pattern making in the industry. According to Demirdöğen and Sari (2020), the acquisition of industry knowledge and experience has a positive impact on the development of students' problem-solving abilities and fosters their capacity to adapt to a wide range of design demands.

The cultivation of adept pattern drawing abilities among students specializing in clothes and textiles is vital in order to uphold the caliber and competitiveness of the fashion industry. In order to equip students with the essential skills in pattern drafting, it is imperative to address many challenges pertaining to resources, curriculum design, instructional approaches, and industrial applicability. The incorporation of technology, consideration of cultural context, and fostering industry collaboration can enhance the comprehensive growth of students' pattern making abilities, thereby equipping them with the necessary tools to thrive in the ever-evolving realm of fashion design.

2.8 Challenges in the Pattern-Making Garment Production Process

2.8.1 The challenges of poor infrastructure and safe business environment

The presence of inadequate infrastructure presents considerable obstacles in the pattern-making garment production process, hence affecting operational efficiency, product quality, and overall market competitiveness. The pattern-making process may be impeded by facilities that are limited in scope or antiquated in nature. The presence of limited space, suboptimal lighting conditions, and obsolete equipment hinders the

efficiency of workflow and undermines the precision of pattern making (Jones & Vlachos, 2014). One example of a limitation is the constraint of limited workstations, which hinders pattern makers from effectively spreading and manipulating huge pattern components. According to Rae and Grace (2018), the production timeline and pattern making timelines are adversely impacted by delays in materials delivery, unreliable transportation, and power outages. These disruptions have a negative impact on meeting deadlines and capitalizing on commercial opportunities.

Once again, the limited availability of technology poses a hindrance to contemporary pattern making methodologies. The absence of computers, digital design tools, and CAD systems imposes limitations on the possibility for efficient, precise, and scalable pattern development (Rae & Grace, 2018). In certain garment production facilities, the unavailability of contemporary digital equipment necessitates pattern makers to depend on conventional manual techniques. The aforementioned factor hinders the efficiency of the pattern making procedure and constrains the integration of novel methodologies. The limited availability of technology hinders the implementation of digital pattern making techniques, hence impeding the efficiency of the production process. The aforementioned issue pertains to the inadequacy of training facilities and resources available for pattern makers, which, in conjunction with other variables, poses obstacles to the development of skills and the transmission of information. The field of pattern drawing necessitates a specific set of skills and knowledge, and a scarcity of well-rounded training programs exacerbates the dearth of proficient practitioners (Zhang & Hines, 2014). The existence of this gap has a significant impact on the quality and efficiency of pattern production.

In addition, inadequate infrastructure hampers the progress of innovation in the field of pattern drafting. The limited availability of resources for experimentation and

adaptation to emerging design trends constrains the capacity to develop innovative patterns (Jones & Vlachos, 2014). This significantly limits the fashion industry's ability to provide consumers with innovative and attractive designs. The lack of sufficient access to high-quality pattern-making tools such as rulers, curves, and markers negatively impacts the precision and productivity of the process. Pattern designers may employ improvised tools, leading to patterns that lack precision and encounter fit-related problems. The presence of inadequate resources for the purpose of checking and validating patterns might result in errors that are only identified at a later stage in the manufacturing process. Consequently, this can lead to the need for rework and the generation of waste (Zhang & Hines, 2014). Inadequate infrastructure can rise to concealed expenses. The presence of substandard facilities and technology can result in inefficiencies, which in turn can have negative consequences such as higher production costs, diminished profit margins, and decreased competitiveness within the market (Jones & Vlachos, 2014).

In general, inadequate infrastructure has wide-ranging consequences for the process of pattern-making in garment manufacture. The aforementioned factors, namely efficiency, innovation, quality, and cost-effectiveness, are influenced by this phenomenon. To effectively tackle these problems, it is imperative to allocate resources towards enhancing infrastructure, adopting advanced technologies, providing comprehensive training programs, and optimizing supply chain operations (Fletcher, 2014). These expenditures are crucial for establishing a favorable environment that promotes precise, efficient, and competitive pattern manufacturing.

2.8.2 The Challenge of Availability and Affordability Pattern-Making Garment Production

The accessibility and cost-effectiveness of resources are crucial factors in the pattern-making garment production process. The aforementioned problems pertain to the availability of proficient workforce, high-quality resources, appropriate tools, and advanced technology necessary for efficient pattern making and production processes. The presence of proficient pattern makers, seamstresses, and technologists is necessary in order to ensure the production of clothing of superior quality. Nevertheless, it is important to note that in specific areas, there may be a deficiency of proficient workforce, which can result in setbacks, inadequate workmanship, and escalated expenses in the production process (Torstensson & Hellström, 2016).

In areas characterized by elevated labor costs, the task of manufacturing clothing that adhere to affordability standards presents a formidable challenge. The pursuit of sustainable materials may face challenges due to their comparatively elevated costs. The task of reconciling cost-effectiveness with environmentally responsible methods presents difficulties, especially for designers who are committed to making ethical decisions (Torstensson & Hellström, 2016). Designers and manufacturers operating on a small scale encounter challenges when it comes to procuring materials at rates that are competitive in the market. The presence of limited quantities frequently results in increased prices per unit, hence influencing the ultimate affordability of clothes (Yan & Seock, 2019). The process of pattern making necessitates a significant investment of time and specialized knowledge, hence augmenting the overall expenses associated with production (Yan & Seock, 2019).

The outcome of clothes is influenced by the availability of high-quality fabrics and materials. The lack of sufficient access to suitable fabrics might impede the creative

decision-making process of designers and result in less than optimal outcomes (Pallari & Newton, 2018). The accessibility of particular textiles or embellishments necessary for a design may be limited due to many variables, including seasonal variations, geographical constraints, or challenges in procurement (Pallari & Newton, 2018). The global supply chain can be disrupted by several factors like as natural catastrophes, political instability, or trade restrictions, which in turn can have an impact on the availability of materials and components necessary for the production of garments (Rissanen & McQuillan, 2018).

In the realm of pattern-making garment production, the presence of obstacles related to availability and pricing serves to highlight the intricate relationship between many factors such as resources, skill sets, technology, and creative ambitions. Successfully addressing these difficulties necessitates the integration of innovative approaches, collaborative efforts, and strategic decision-making in order to facilitate the efficient allocation of resources and the development of garments that possess technical proficiency while remaining financially viable.

2.8.3 The Challenge of Pattern Measurements

The precision and analysis of measurements are crucial factors in the pattern-making phase of garment manufacturing. The accuracy of measurements has a direct impact on the suitability of the final garment. According to Aldrich (2008), the presence of inaccurate measurements might result in the production of ill-fitting clothing, which in turn leads to discontent among consumers. In addition, measurements may exhibit variability as a result of factors such as inconsistent use of measuring procedures, variations in tape tension, or faults in the measurement process.

The significance of precise measurements in the context of commercial garment production was highlighted by the findings of Iloeje's research in 1995. Iloeje (1995) conducted an empirical study aimed at determining the mean body measures of female adolescent students, with the intention of utilizing this data for the development of block designs tailored to their specific needs. The study included a sample of 600 female adolescents who were selected randomly from a pool of 55 junior secondary schools for females in Enugu State. The researcher conducted measurements on 18 anatomical regions utilizing a fiber-steel measuring tape. Following a thorough statistical examination of the collected data, it was determined that there exists no statistically significant disparity in the average body measurements of female adolescents between the ages of 12 and 14, specifically in terms of bust, waist, hip, and back waist length.

The human body possesses a three-dimensional structure characterized by intricate curves, slopes, and contours. Accurately measuring each body part, while taking into account inherent variances, is a significant problem (Shin, 2016). For example, the process of measuring bust, waist, and hip circumferences necessitates the navigation of convex and concave curves. The lack of uniformity in the utilization of measurement language and reference points across various brands, countries, and cultures results in perplexity and misapprehension. The lack of uniformity in this aspect is a hindrance to the process of standardization and the precision of pattern making (Bradley & Collier, 2016).

Once more, it should be noted that clothes featuring elaborate design aspects, including but not limited to asymmetrical shapes, draping, or cut-outs, necessitate meticulous measurements in order to accurately execute the pattern making process. According to Hume (2018), the presence of inaccurate measurements can potentially result in the

production of deformed clothing. The process of selecting appropriate models for measurements is of utmost importance. In order to ensure that pattern alterations effectively accommodate the desired fit and comfort of the intended consumer base, it is crucial for fit models to closely resemble the target population (Shin, 2016).

Manual measurements are dependent on human interaction and interpretation, which might provide possible sources of mistake. The utilization of 3D body scanning and digital measurement techniques presents promising opportunities for enhancing precision and establishing uniformity (Bradley & Collier, 2016). It is imperative for patterns to be designed in a manner that can effectively suit a wide spectrum of body shapes and sizes. The process of pattern making has distinct obstacles when it comes to measuring persons who have non-standard body proportions, such as those who are categorized as plus-size or tiny (Aldrich, 2008).

In contemporary times, the utilization of 3D body scanning and virtual fitting technology presents the possibility of capturing measures with precision and effectiveness. According to Shin (2016), these technologies facilitate the creation of a thorough depiction of the human body, enabling accurate modifications and customisation of patterns. The utilization of 3D body scanning technology facilitates the acquisition of precise measurements and shape data, hence mitigating the potential for human mistake. According to Aicher (2019), designers can acquire precise measurements by conducting scans of persons while they are wearing undergarments, thereby eliminating the potential impact of clothing layers.

In general, precise measurements serve as the fundamental basis for achieving effective pattern making and garment manufacturing. The presence of difficulties pertaining to the precision of measurements, the extent of variability, and the process of

interpretation significantly affect the appropriateness of fit, the level of consumer pleasure, and the reputation of a brand. The incorporation of technical innovations, such as 3D body scanning, presents promising opportunities for resolving measuring difficulties and improving the accuracy and effectiveness of pattern making procedures.

2.8.4 The Challenge of Colour Separation in Designs

The process of color separation, which is an essential component of garment design, presents many difficulties within the pattern-making and garment production stages. The successful incorporation of numerous colors or prints in a design necessitates meticulous color separation to guarantee proper alignment and cohesiveness. According to Nayak et al. (2019), the creation of harmonious designs involving complex patterns, such as plaids, stripes, and elaborate prints, necessitates careful attention to meticulous pattern matching. When adjusting designs to accommodate various garment sizes, the process of color separation gets complex. Expertise is necessary to maintain pattern consistency and ensure precise color arrangement (Liu et al., 2016).

The concept of color is intricately connected to aesthetics and has the potential to influence our emotional and psychological states. Textile businesses are continuously refining dyeing and applied design techniques to meet the insatiable decorative inclination of individuals (Musheno, 1980). Empirical evidence suggests that blue and green hues evoke a sense of tranquility and serenity, whilst vibrant colors like red and yellow elicit feelings of joy and excitement. Conversely, individuals may see black and grey shades as gloomy and disheartening. However, it is important to acknowledge that individuals' emotions and preferences have the potential to undergo transformations over time. Hence, the task at hand involves undertaking ongoing research to ascertain

the evolving preferences in individuals' fashion inclinations. As an example, it was customary for individuals to wear black attire as a symbol of sorrow in the past, although contemporary Christians tend to favor white garments for this purpose. Despite individuals' emotional connection to variations in color, Vulker and Cooper (1987) proposed that darker hues have a tendency to create an illusion of lower physical size, whilst brighter shades can provide the impression of larger stature.

2.8.5 The Challenge of Choice of Texture of Fabrics -

The influence of texture on the perception of size has been observed. Therefore, a significant issue arises in the process of choosing textiles with certain textures that effectively cater to the preferences and fashion requirements of prospective consumers of mass-produced apparel (Fletcher, 2014). The temperature and seasonal variations may have a role in influencing the choice of fabric textures, such as rough and thick materials or shiny and lustrous fabrics, for clothing selection. This phenomenon occurs due to the perception that rough and thick textures create a visually bulkier impression, while bright and lustrous textiles reflect more light and thus offer the illusion of a larger appearance than the actual size of the individual. Moreover, it is crucial to note that failure to wear appropriate clothing materials in accordance with prevailing weather conditions may increase an individual's susceptibility to pneumonia or heat rashes (Ezema, 2001). When engaging in large-scale garment production, manufacturers must take into account these issues (Fletcher, 2014).

2.8.6 The Challenge of Figure and Styles

The concept of figure type refers to the various shapes observed in individuals or the visual depiction of a person (Spenser, 1998). Adult body types are classified based on their height and proportions. In their study, Olaitan and Mbah (1991) conducted an

analysis of figure types, classifying them into four distinct categories: short and slender, short and plump, tall and slender, and tall and chubby. However, Anyakoha and Eluwa (1999) present a more extensive examination as they identify seven distinct categories of figures that are readily identifiable among women. In addition, she proceeded to provide suggestions regarding the appropriate styles of clothing to select as well as those to refrain from choosing. According to her, the figure kinds encompass those who possess proportionate tall and slim physiques, short and chubby body structures, flat chests, enormous busts, short necks, long necks, and large hips. The most optimal figure kind is the one that exhibits proportionality. An individual whose body does not conform to the expected or proportional figure can be characterized as having a figure-related issue. According to Anyakoha and Eluwa (1999), the issues pertaining to body figure encompass flat chest, huge breast, short neck, long neck, and large hips.

Certain individuals, particularly women, may encounter challenges when attempting to choose clothing items from the market as a result of their unique body shape concerns. Hence, it is imperative for the apparel business to not only incorporate provisions for modifications in their designer outfits but also offer guidance to tailors responsible for executing these alterations.

2.9 Strategies to Enhance Pattern-Making Production Process

2.9.1 Improved Training and Education:

According to Ng and Wong (2017), offering extensive instruction in advanced pattern manipulation techniques and technology use to pattern makers and designers enables them to effectively address intricate fit and design difficulties. Comprehensive educational and training programs offer pattern makers and designers a profound

comprehension of pattern manipulation techniques, principles of garment production, and industry-recognized best practices. Professionals who possess a mastery of these talents are capable of properly addressing intricate fit difficulties and producing garments that exhibit optimal fit. Furthermore, it enables pattern developers to utilize sophisticated modification techniques, like slicing and spreading, pivoting darts, and contouring seams. This particular skill set allows them to tailor patterns to accommodate unique body shapes and sizes while maintaining the integrity of the design.

Once again, training provides learners with exposure to the most up-to-date digital tools and software utilized in the field of pattern designing. According to Ng and Wong (2017), possessing expertise in these technologies enables designers to effectively utilize digital solutions for precise pattern generation, virtual fitting, and design visualization. Education plays a crucial role in equipping individuals with the necessary skills to effectively detect and address fit difficulties and various challenges encountered in the process of pattern drafting. Individuals cultivate their critical thinking abilities in order to examine trends, foresee possible issues, and formulate effective resolutions to uphold the standard of garment quality. This tool assists professionals in comprehending anthropometric differences and the intricacies of body forms and sizes. The comprehension of this concept enables the adaptation of patterns to better suit various client demographics, resulting in a more efficient resolution of fit-related issues (Sarkar et al., 2019).

Education places a strong emphasis on the significance of collaboration and proficient communication among designers, pattern makers, and manufacturers. Enhanced communication plays a crucial role in effectively conveying design intent to precisely produce patterns, hence diminishing errors and mitigating fit-related concerns (Hume,

2018). Education plays a crucial role in imparting knowledge to professionals on the importance of quality control at every stage of the pattern making process. According to Aldrich (2008), individuals acquire the ability to recognize faults, inconsistencies, and deviations at an early stage of the process, hence averting the progression of these flaws to the finished garment. Moreover, training programs frequently incorporate comprehensive knowledge pertaining to contemporary developments in pattern design, technological advancements, and production methodologies. This knowledge is essential for professionals to remain up-to-date and be able to adjust to changing industry practices and consumer preferences.

2.9.2 Collaborative Workflows

Collaboration fosters a culture of transparent communication among designers, pattern makers, and manufacturers. Effective communication plays a crucial role in effectively conveying design intent, fit specifications, and technical details, hence minimizing the likelihood of misunderstandings and errors (Hume, 2018). Collaborative workflows facilitate a close collaboration between designers and pattern makers, enabling the translation of sophisticated design concepts into accurate patterns. The alignment of design aesthetics and technical components of pattern making is crucial in order to preserve the desired visual appeal while effectively addressing the practical considerations involved (Sarkar et al., 2019).

Once more, the partnership between designers and pattern makers plays a crucial role in attaining uniform clothing fit across various sizes. Pattern makers possess the ability to offer valuable information regarding the influence of design aspects on fit, hence empowering designers to make well-informed choices regarding design modifications (Sarkar et al., 2019). Efficient resolution of challenges encountered in pattern drawing

can be facilitated through collaborative efforts. When confronted with fit or technological challenges, pattern makers and designers might collaborate to devise innovative resolutions that uphold the integrity of the design. Collaborative workflows facilitate the use of an iterative methodology in the process of pattern making. Designers and pattern makers have the opportunity to engage in iterative processes of reviewing and testing patterns, thereby enhancing their quality through the incorporation of feedback, fitting sessions, and prototype testing (Sarkar et al., 2019).

In addition, teamwork facilitates the incorporation of technology into the processes of pattern drafting. Collaboration between pattern makers and designers on digital platforms enables the real-time modification and visualization of alterations, hence enhancing the precision and effectiveness of pattern generation processes. Collaborative workflows play a crucial role in enabling the timely identification of potential difficulties (Sarkar et al., 2019).

By including multiple stakeholders in the process, it becomes possible to identify and resolve potential issues related to fit, construction, or design before they become more serious. Efficient collaboration minimizes lead time through the optimization of communication and decision-making procedures. Rapid feedback loops among stakeholders facilitate expedited pattern development and production deadlines. In general, the implementation of collaborative workflows is important in order to effectively tackle the various issues encountered in the field of pattern making (Sarkar et al., 2019). By facilitating collaboration among designers, pattern makers, and other relevant stakeholders, these workflows effectively synchronize fit, design, and technical elements, leading to precise patterns, enhanced garment quality, and heightened production efficiency. The establishment of a productive collaborative environment facilitates the integration of diverse skills, including creative thinking,

technical competency, and effective problem-solving, resulting in favorable outcomes in the field of pattern drawing.

2.9.3 Adoption of Advanced Alteration Techniques

The utilization of sophisticated modification techniques is of utmost importance in effectively addressing the difficulties that arise in the process of pattern drawing. These techniques provide designers and pattern makers with the ability to modify designs in order to accommodate a wide variety of body shapes and sizes, all while upholding design aesthetics and obtaining an ideal fit. Aldrich (2008) asserts that the utilization of advanced alteration techniques, such as cutting and spreading, enables meticulous modifications to be made in targeted regions of a pattern.

According to Aldrich (2008), the process of customization allows for the adjustment of patterns to accommodate the unique body shapes and proportions of individuals, hence reducing the occurrence of fit-related problems. Making precise patterns for complicated designs featuring distinctive seam lines, drape, or asymmetry can provide a significant challenge. According to Hume (2018), the utilization of advanced alteration techniques provides pattern makers with the ability to effectively change darts, seam lines, and style components in order to accommodate the intricacies of garment design while ensuring a suitable fit.

Once again, the occurrence of fit concerns might be attributed to variations in body sizes and proportions. The utilization of alteration approaches empowers pattern creators to make adjustments to patterns in crucial regions, including the shoulder width, bust, waist, and hips, with the aim of attaining a fit that is both precise and pleasant (Aldrich, 2008). Advanced alteration techniques offer designers the capacity to enhance design aesthetics while maintaining optimal fit. For example, the use of

pleats, gathers, or tucks can enhance the aesthetic appeal of a garment, while also ensuring that these modifications are in harmony with the overall design concept (Hume, 2018). Muslin iterations or test garments are commonly employed in the evaluation of fit prior to the finalization of patterns. By utilizing modern modification techniques, pattern designers are able to make very accurate adjustments at an early stage of the process, hence minimizing the need for multiple iterations of muslin and resulting in significant time and resource savings (Aldrich, 2008).

2.9.4 Comprehensive Quality Control

The implementation of comprehensive quality control systems is of utmost importance in addressing the various difficulties involved with pattern drafting. The process of quality control entails conducting comprehensive testing of the pattern on fit models or dress forms. Fit concerns are effectively resolved by making necessary modifications to darts, seams, and other components of the pattern, hence assuring optimal fit across various sizes and body types. Quality control checks are implemented to assure the appropriate translation of design components, including style lines, seams, and detailing, from the initial design concept to the pattern (Ekumankama & Igbo, 2009). This serves to mitigate any inconsistencies that may arise between the initial design concept and the ultimate execution of the pattern.

Once more, it is essential to conduct quality control checks to ensure the appropriate representation of sophisticated garment constructions, such as draping or pleating, within the pattern. Any inconsistencies or difficulties in the construction process are promptly addressed at an early stage. Furthermore, it examines sustainable practices through an evaluation of pattern layout efficiency in order to reduce fabric waste. The design of the pattern arrangement has been developed with the aim of minimizing

material usage and fostering sustainable production practices. The implementation of comprehensive quality control measures plays a crucial role in the early detection of faults and issues during the pattern making process. The implementation of this proactive technique serves to mitigate the occurrence of expensive errors and guarantees that the pattern is prepared for production.

Comprehensive quality control procedures offer a structured framework for effectively addressing issues encountered in the process of pattern design. Quality control plays a vital role in ensuring the correctness, consistency, and alignment of patterns with design intent through a rigorous evaluation of fit, design accuracy, construction details, and other essential factors. Consequently, this results in the creation of apparel that exhibits optimal fit, embodies the intended aesthetic preferences, and adheres to the most stringent benchmarks of quality and production efficacy.

2.9.5 Use of Digital Pattern Making

Computer-aided design (CAD) software has revolutionized the field of pattern making by enabling digital pattern making, which presents novel approaches to address the diverse obstacles found in traditional pattern making techniques. This technology facilitates the precise adaptation of patterns to align with specific body measurements. According to Ng & Wong (2017), the utilization of customized designs that cater to individual body shapes can effectively mitigate fit concerns and improve the accuracy of the results. CAD software, such as the one used in the fashion industry, enables designers to visually represent clothing on virtual avatars, facilitating the process of fitting and modifying patterns in a simulated environment in real time. According to Huang et al. (2018), this particular functionality facilitates the identification of fit

difficulties, design discrepancies, and stylistic variances prior to the commencement of physical production.

Moreover, the utilization of digital pattern making techniques diminishes the necessity for creating several physical prototypes. According to Nayak et al. (2019), designers have the ability to digitally make incremental alterations to patterns, enabling them to conduct rapid testing and optimization prior to engaging in physical production. Digital technologies enable the execution of elaborate design manipulations, including but not limited to color separation, grading, and the creation of complex seam lines. According to Aicher (2019), the utilization of digital making plays a crucial role in preserving the integrity of design across diverse design components.

Furthermore, it facilitates smooth collaboration among designers, pattern makers, and manufacturers. According to Ng and Wong (2017), the utilization of real-time sharing of digital patterns and feedback has the potential to boost communication, leading to a reduction in errors and an improvement in efficiency. The utilization of digital pattern making has emerged as a robust solution for addressing the various issues encountered in traditional pattern making. This technology has several benefits, including improved customization of fit, the ability to visualize and make alterations in real-time, simplification of complex design processes, and the facilitation of effective communication among stakeholders. Through the utilization of computer-aided design (CAD) software, the fashion industry may effectively address enduring challenges and produce garments that exhibit precise fit, design accuracy, and expedited production schedules (Sarkar et al., 2019).

2.10 Conceptual Framework

Figure 2.1 shows the conceptual framework that guides the study. In figure 2.1, the factors that challenges of pattern making as well as the strategies to enhance pattern making among students of clothing and fashion are derived from the techniques of pattern making. Also, the arrows in between the challenges of pattern making and the strategies to enhance pattern making are an indication that the two influences one another. Together the application of the strategies to enhance pattern making to overcome the challenges of pattern making will determine the knowledge and competencies that student of clothing and fashion will acquire in pattern drafting.

Figure 2.1 show details of the conceptual framework.

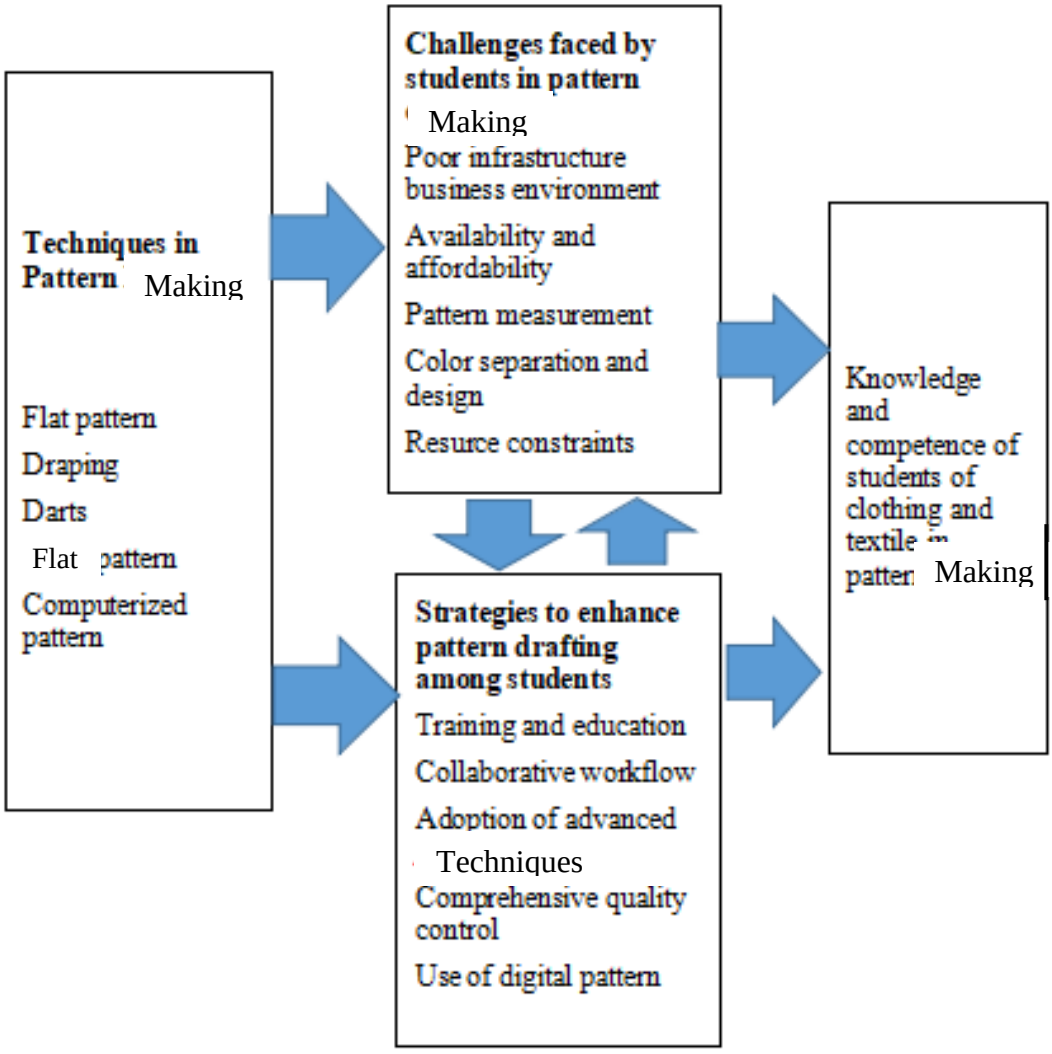


Figure 2. 1: Conceptual framework of the study

Source: Authors' Construct, 2023.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

Research methodology refers to the systematic approach employed in the establishment of a study, which facilitates the acquisition and analysis of material in a structured manner (Polit & Beck, 2012). This chapter provides an overview of the research methodology, encompassing various aspects such as the research paradigm, research approach, research design, study setting, study population, data collection, data management, data collection process, data analysis, validity and reliability, ethical considerations, and dissemination of findings.

3.2 Research Design

A research design refers to a systematic framework that outlines the specific procedures to be undertaken in order to address research inquiries and evaluate hypotheses, ultimately leading to the desired outcomes of the study (Vogt et al., 2012). The research design plays a crucial role in determining the quality and academic suitability of a study, since it outlines the necessary steps and methodologies required to accomplish the study's objectives. While it is crucial to utilize the appropriate data analysis tool, it is of more significance to employ the appropriate study design and data gathering methods (Vogt et al., 2012).

The research employed a descriptive design for its methodology. According to Bordens and Abbott (1996), this particular design involves the systematic collection of data with the purpose of testing hypotheses or addressing a specific inquiry pertaining to the

present condition of the subject under investigation. According to Bordens and Abbott (1996), the utilization of a descriptive design in research allows the researcher to uncover significant yet concealed patterns within the subject of investigation. Leedy and Ormrod (2010) have classified descriptive research design into four main categories: observation studies, correlational research, developmental designs, and survey research. This research uses the survey descriptive study. Descriptive survey research is a methodological approach within the realm of descriptive research that integrates both quantitative and qualitative data in order to yield pertinent and precise information (Neuman, 2007). This decision facilitated the researcher in collecting data that effectively addressed the various dimensions of the research questions. The utilization of several design approaches offers the advantage of capitalizing on the strengths and mitigating the limitations of individual designs, so facilitating the acquisition of comprehensive data that effectively addresses research inquiries.

In order to provide a rationale for incorporating surveys as a component of my research methodology, the researcher sought to gather information from study participants regarding their knowledge pertaining to the challenges encountered in the pattern making phase of garment manufacture. The collection of responses to inquiries of this nature can only be accomplished through the administration of a survey. According to Leedy and Ormrod (2010), a survey is a research method that entails gathering information on one or more groups of individuals by posing questions and recording the responses provided by respondents during interviews. The authors posited that inquiries could pertain to the attributes, viewpoints, dispositions, or prior encounters of the collectives. The primary objective is to acquire knowledge about a substantial population through the process of surveying a representative subset.

3.3 Study population

According to Sileyew (2019), a study population represents the broader group or category from which a sample is drawn to gather data and make inferences. It serves as the foundation for defining the scope and boundaries of a research study. The characteristics of the research population are integral to the study's objectives and research questions, as they guide the selection of a representative sample that can yield meaningful and generalize results.

Cooper and Schindler (2014) makes a distinction between accessible population, target population and sample population. The accessible population is the entire group that is accessible to the researcher (also see Gravetter & Forzano, 2018). According to the authors, while it may not be feasible to study the entire accessible population, this group represents the universe from which the sample is drawn. The target population is a subset of the accessible population and consists of individuals or groups that are the primary interest of the study. It represents the specific demographic, geographic, or categorical criteria that the researcher aims to investigate. In many cases, the target population is a more narrowly defined group within the accessible population. The sample population is the group from which data is actually collected in the study. It is typically a smaller, manageable subset of the target population. . Simply said, it is made up of all components, individuals, things, or objects whose properties are being investigated (Saunders et al., 2012). The sample population should ideally be representative of the target population to allow for valid inferences.

For the purpose of this study, the target population will typically include the following groups:

3.4.1 Clothing and Textiles Students

This group consists of students currently enrolled in technical and vocational schools within the Volta Region who are pursuing programs related to clothing and textiles. These students are directly involved in pattern making courses and activities.

3.4.2 *Instructors, Educators and School Administrators*

The researcher identified twenty eight **(**28) teachers, twenty five (25) instructors, and educators who teach pattern making or related subjects in technical and vocational schools. Their insights and experiences can provide valuable perspectives on the challenges students face and potential solutions. In addition, two (2) administrative staff and school leaders who oversee the curriculum, resources, and facilities related to clothing and textiles education. Their input can shed light on institutional factors that impact pattern making education.

By targeting these groups, the study can gather a diverse range of perspectives and insights to comprehensively explore the challenges faced by clothing and textiles students in pattern making within the Volta Region of Ghana's technical and vocational schools.

3.5 Sources of Data

The primary data served as the primary source of information utilized. The collection of primary data was conducted by the administration of survey questionnaires. The researchers' intention was to develop and implement surveys or questionnaires to collect data from the specific population as outlined in the target population section of this chapter. This approach facilitated the collection of data directly from the true respondents, regarding pattern making and production techniques. It has also shed light

on the challenges encountered in the pattern-making garment production process, as well as the potential strategies, solutions, and interventions to address these challenges and improve the pattern-making process. Once again, the research involved conducting in-depth interviews with key informants or participants. This methodology offered valuable qualitative perspectives on the topic being examined.

3.6 Sampling

3.6.1 Sample Size Determination

The determination of sample size for a study from a given population lacks definitive guidelines. There exist two methodologies that can be employed to address the issue of sample size. The researcher may initiate the process by formulating assumptions and thereafter determining the appropriate sample size through the utilization of various statistical methodologies. Furthermore, the researcher has the option to utilize the "rule of thumb" technique as suggested by Neuman (2007). As stated by Kothari (2005), the adequacy of the estimate's correctness cannot be only ensured by the sample size. The researcher emphasized the need of assessing the features of the research sample and considering the element of homogeneity. Sandelowski (1995) asserts that in qualitative research, sample sizes should strike a balance between being sufficiently significant to facilitate the generation of "novel and intricately detailed knowledge" pertaining to the subject under inquiry, while still being manageable enough to allow for an exhaustive, case-oriented exploration of the qualitative data. Based on the findings of Green and Thorogood (2013), a substantial number of qualitative researchers engaged in interview-based studies with a well-defined research focus see a limited generation of novel insights following the completion of approximately twenty 20 interviews. The aforementioned statement supports the previous stance of Morse (2015), who advocates

for qualitative researchers to select a smaller number of participants while considering factors such as homogeneity and representation (Creswell, 2018).

The sample population in the present study exhibits comparable occupational features. The probability of encountering redundant information increases significantly as the sample size employed in the research expands. This phenomenon often leads to the saturation of data. According to Nwana (1981), it is said that different sample sizes are appropriate depending on the size of the population. For populations consisting of a few hundred individuals, a sample size of 40% or more is sufficient. In the case of populations with many hundreds of individuals, a sample size of 20% is adequate. Similarly, for populations consisting of a few thousand individuals, a sample size of 10% is deemed appropriate. Finally, for populations consisting of several thousand individuals, a sample size of 5% or less is considered sufficient. Given the aforementioned circumstances, the researcher opted to select a sample population consisting of fifty five (55) individuals. The demography of the sample consist of twenty eight (28) educators, twenty five (25) instructors and two (2) administrators.

A sample of fifty-five (55) was used because that is number that was administered the questionnaires.

3.6.2 Sampling Procedure

The research employed a combination of purposive and systematic sampling methodologies. Purposive sampling is a method of participant selection that entails choosing individuals based on specific attributes that are pertinent to the study inquiry. This study employed purposive sampling to select the instructors and course facilitators in the schools. Specifically, the student respondents constituted 76% (42 individuals) of the entire study population, whiles the tutors/instructor population constituted 24%

(13 individuals) of the entire respondents. This methodology guaranteed the inclusion of individuals who have a wealth of knowledge about the dynamics of pattern drafting.

The utilization of simple random sampling was implemented in this study to ensure that each student had an equal chance of being selected. A list of all the students in the textile and design class was requested and numbers assigned to each name. The numbers were picked randomly. Individuals numbers that were picked were considered as respondents of the study. Again, this approach guaranteed that every individual in the class had an equal opportunity to be included in the sample.

Again, simple random sampling was employed in selecting Kpando Technical Institute, and GRATIS Foundation, as the study institutions, out of the seven educational institutions in the Volta region, offering various vocational training programmes.

3.6 Data Collection Instruments

The research utilized a variety of data collection methods, including surveys, interviews, and focus group discussions, in order to gain information from the respondents. The utilization of these research instruments within the study facilitated the researcher in conducting a comparative analysis of the primary data acquired from the chosen participants, hence enabling the formulation of conclusions and suggestions. Surveys are a valuable tool for gathering quantitative data, whereas interviews and focus group discussions are effective in providing qualitative insights. The collection of quantitative data from clothing and textiles students, and instructors involved the utilization of semi-structured questionnaires. The interviews examined the challenges encountered in pattern drafting, individuals' perspectives on the curriculum, and recommendations for enhancing it. The survey instrument comprised five distinct

components. The initial portion centered on the demographic characteristics of the participants. The subsequent part centered attention on the knowledge of the respondents of the pattern making and production procedures that were employed. The subsequent part addressed the level of skills and competency of the students vis a viz pattern drafting. The third section examined challenges faced by clothing and textiles students in pattern making garment production process in selected technical and vocational schools within the Volta Region of Ghana.

Furthermore, it is worth noting that distinct focus group discussions were organized with students and tutors in order to foster an environment conducive to open dialogue regarding common obstacles and experiences. For each school, one focus group was organized with 11 participants.

The interviews encompassed many perspectives, opinions, and recommendations, with the purpose of facilitating the identification of issues associated with pattern making in the realm of garment manufacture. Each individual interview with the participants was given a time duration ranging from 10 to 12 minutes. Data was gathered within a span of three weeks. This research exclusively considered and utilized material derived from sources that have been verified, studied, and reviewed by the researcher.

3.7 Validity of the Research Instruments

The concept of validity refers to the extent to which the results of data analysis accurately represent the phenomenon being investigated (Omona, 2013). Validity is the term used in this study to describe the degree to which the instruments successfully accomplished their intended objectives. The assessment of the instruments' validity was conducted by my dissertation advisors and other lecturers within the department. They

engaged in a critical evaluation of the items within the instruments and provided expert guidance to assist in the modification and refinement of the questionnaires.

3.8 Data Analysis and Processing

To ensure that the data collected are accurate, consistent with other information gathered, uniformly entered, and well-arranged, the raw data were closely examined to look for errors and omissions. The information gathered were then coded by labeling responses with numbers or other symbols in order to group them into finite number of categories or classes.

Based on the data gathered, thematic analysis, a flexible and content-sensitive tool (Harwood & Garry, 2003) was used to generate categories, themes, and explanations that were derived from phrases, behaviors, patterns, and incidents. This helped in analyzing the research objectives.

The quantitative data obtained from the questionnaire survey were subjected to analysis using descriptive statistics, namely frequencies and percentages. This analytical approach was employed to provide a comprehensive overview of the obstacles encountered by students in pattern drafting. The qualitative and quantitative data were juxtaposed and synthesized in order to establish a holistic comprehension of the challenges at hand. The utilization of triangulation in data sources has the potential to augment the study's validity and reliability.

In order to assure the accuracy, consistency, uniformity, and organization of the obtained data, a thorough examination of the raw data was conducted to identify any potential errors or omissions. The collected data subsequently coded, wherein

responses were assigned numerical or symbolic labels to facilitate their classification into a limited set of categories or classes.

3.9 Ethical Considerations

This research duly prioritized a number of ethical considerations which included among others;

Ensuring Confidentiality: The researcher provided a guarantee to the respondents and interviewees on the extensive measures used to handle the data generated with the highest level of anonymity and confidentiality. In order to provide further assurance, the researcher employed and used alphabetical letters as a means of representing the identities of the research participants.

Academic integrity: The researcher demonstrated a thorough understanding of the established protocols for citing information obtained from an author, emphasizing the need of properly crediting the source. It is crucial to recognize that any failure to do so is a violation of academic honesty, which may carry legal consequences.

Declaration of Inaccurate Information: The study abstained from asserting inaccurate information or information that lacks verifiability.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF DATA

4.1 Introduction

This chapter presents the outcomes and analysis of the data obtained during the administration of the questionnaire to the respondents. It details what occurred at each stage of the data collection procedure, as well as the data collected. In the study, graphs and tables were used to provide a quick visual impression and understanding of the qualitative data.

4.2 Background Characteristics of Respondents

In this section, the demographic characteristics of the study's respondents are provided and examined. The section also provides helpful data that complements the findings and enables a more thorough study of policy.

4.2.1 Respondents' Gender

The study was structured to elicit information on the gender of the respondents. Figure 4.1 show the details.

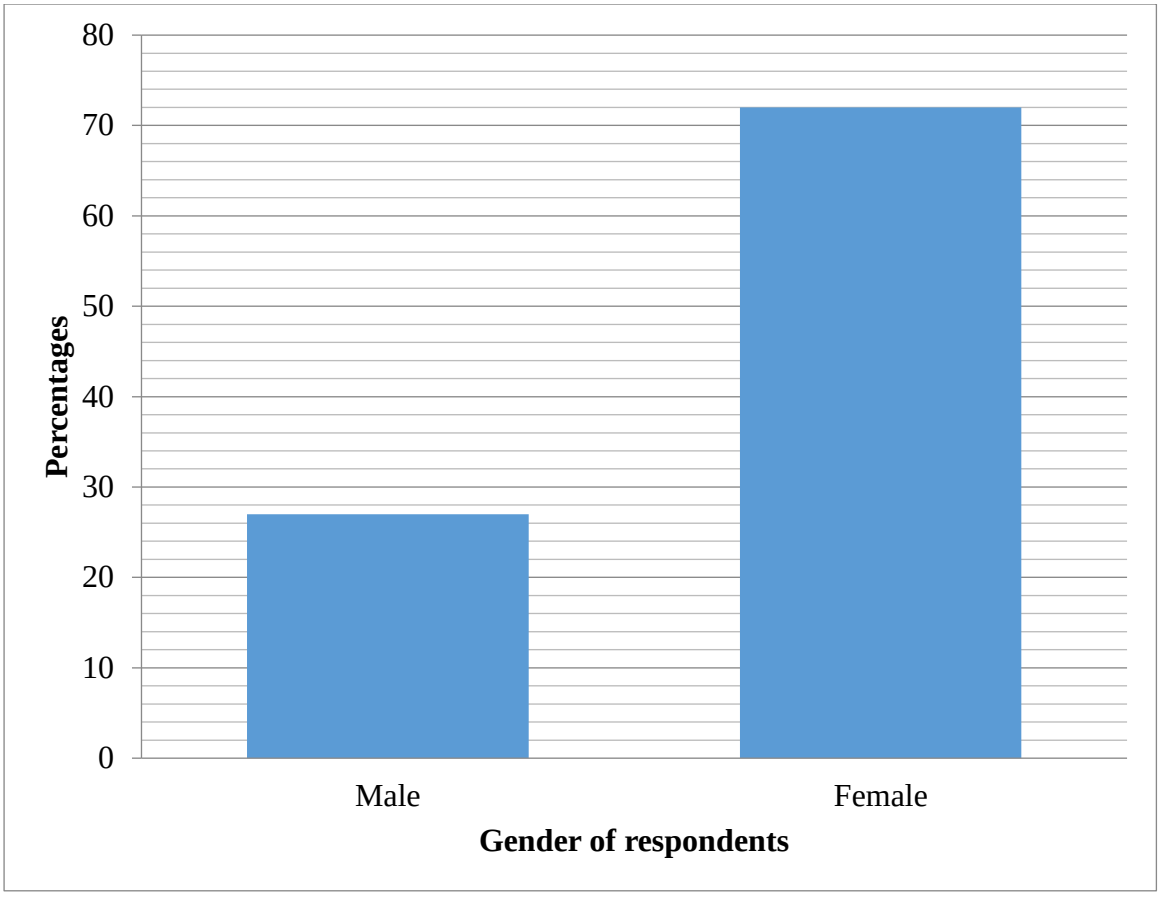


Figure 4. 1: Gender of Respondents

Source: Field Survey, 2023.

According to the data presented in Figure 4.1, the male respondents include a total of 15 individuals, accounting for 27% of the entire research sample. On the other hand, the female respondents amount to 40 individuals, representing 73% of the overall respondents. The respondents in this study include of both male and female pattern making designers. They were recruited by diverse approaches, which were explained in detail in the preceding chapter. The number of female respondents exceeds that of male respondents, as previous research has indicated that females tend to exhibit a higher level of fashion consciousness compared to males (Amankwa et al., 2012). The number of female respondents exceeds that of male respondents by a margin of 46 percent. A comprehensive understanding of the gender composition in the field of

pattern making is important in order to produce clothing that are inclusive, properly fitted, and suitable for the market. According to Ng and Wong (2017), the use of this practice guarantees that the fashion industry maintains an awareness of the various body shapes, tastes, and cultural influences, hence advocating for gender equality and cultivating a more inclusive approach to the processes of design and manufacturing.

4.2.2 Age of respondents

The research proceeded to identify the age status of the respondents. Figure 4.2 shows the results.

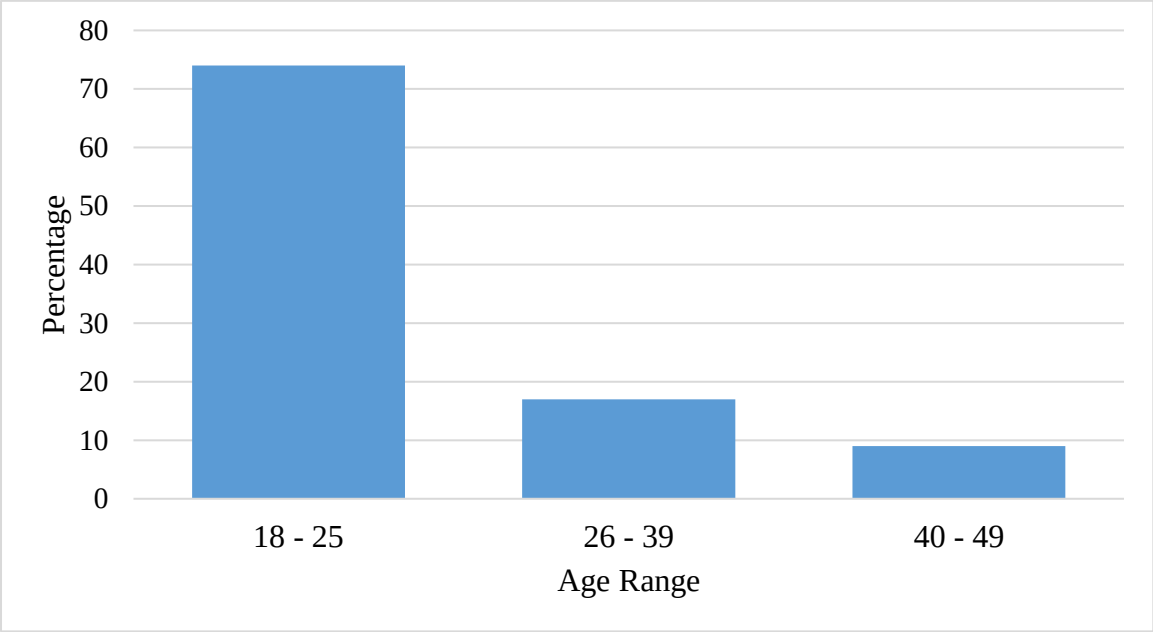


Figure 4. 2: Age of Respondents

Source: Field Survey, 2023.

According to the survey findings in Figure 4.2, a majority of the participants, specifically 74% (41 individuals), fell within the age range of 18 to 25. A smaller proportion, comprising 17% (9 individuals), belonged to the age group of 26 to 39. The remaining 9% (5 individuals) were categorized as being between the ages of 40 and 49. It may be noted that a considerable proportion of respondents fall between the age range

of 18 to 25 years. This phenomenon may be attributed to the nature of study institutions as educational establishments that cultivate apprentices, hence resulting in a significant proportion of responders being individuals in the process of self-mastery. A comprehensive grasp of historical knowledge is crucial for comprehending the multifaceted requirements and obstacles encountered by students in the field of pattern design. Educational institutions can improve learning outcomes and successfully handle problems by tailoring interventions and methods, taking into account age-related disparities in experiences, technological competency, and learning preferences (Blackwell et al., 2017).

4.2.3 Educational Status of Respondents

The study further sought to know the current educational status of the respondents. Table 4.1 shows the detail.

Table 4. 5: Educational Level of Respondents

Highest Qualification	Frequency	Percentage (%)
No Formal Education	N/A	N/A
Basic School	N/A	N/A
SHS, Diploma, HND	43	78
First Degree	7	13
Masters	5	9
Total	55	100

Source: Field Survey, 2023.

Based on the data shown in Table 4.1, it can be observed that there is a lack of respondents belonging to the categories of 'No Formal Education' and 'Basic School'. However, a total of 43 participants, accounting for 78% of the total respondents in the research, reported their current stage of schooling at the Senior High School (SHS). Out of the total respondents, seven individuals, constituting 13% of the sample, were classified under the first degree category. Conversely, only five respondents, accounting for 9% of the whole sample, fell into the Masters degree group in the field of education. The data presented in Table 4.1 clearly indicates that all of the participants possess a certain level of formal education, which serves as a foundation for acquiring fundamental arithmetic skills, comprehending patterns, and mastering the processes involved in pattern design.

4.2.4 Occupational Distribution of Respondents

The study probed the occupation of the respondents. Figure 4.3 show the results.

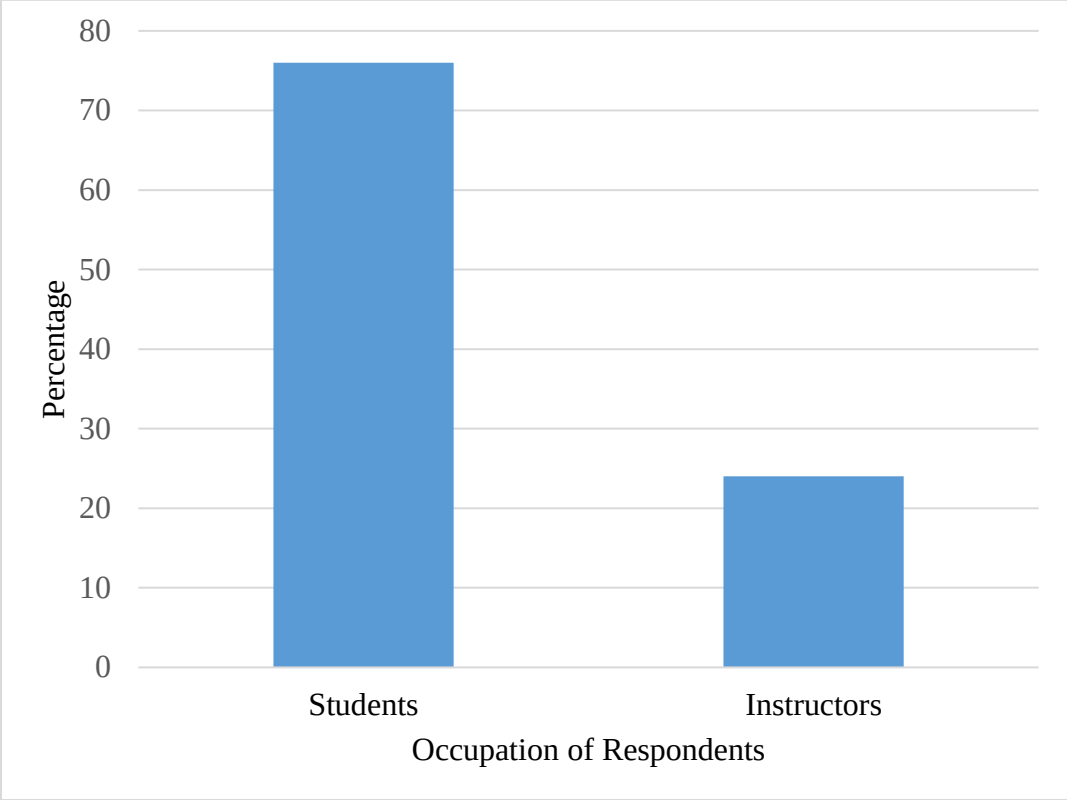


Figure 4. 3: Occupational Distribution of Respondents

Source: Field Survey, 2023.

According to the information presented in Figure 4.3, the proportion of respondents classified as students accounts for 76% of the overall sample. An additional 24% of individuals can be classified as instructors and administrators. The sample of instructors include both male and female individuals who are engaged in teaching pattern making or other disciplines relevant to this field within the chosen educational institutions. The incorporation of their opinions ensured a full representation of teachers' viewpoints. Understanding the occupational composition of the participants is essential as it enables

the researcher and the research process to gain insight into the respondents' viewpoints and their understanding of the research inquiries.

4.2.5 Class of students

The study inquire the class or grade of the student respondents. Figure 4.4 shows the details.

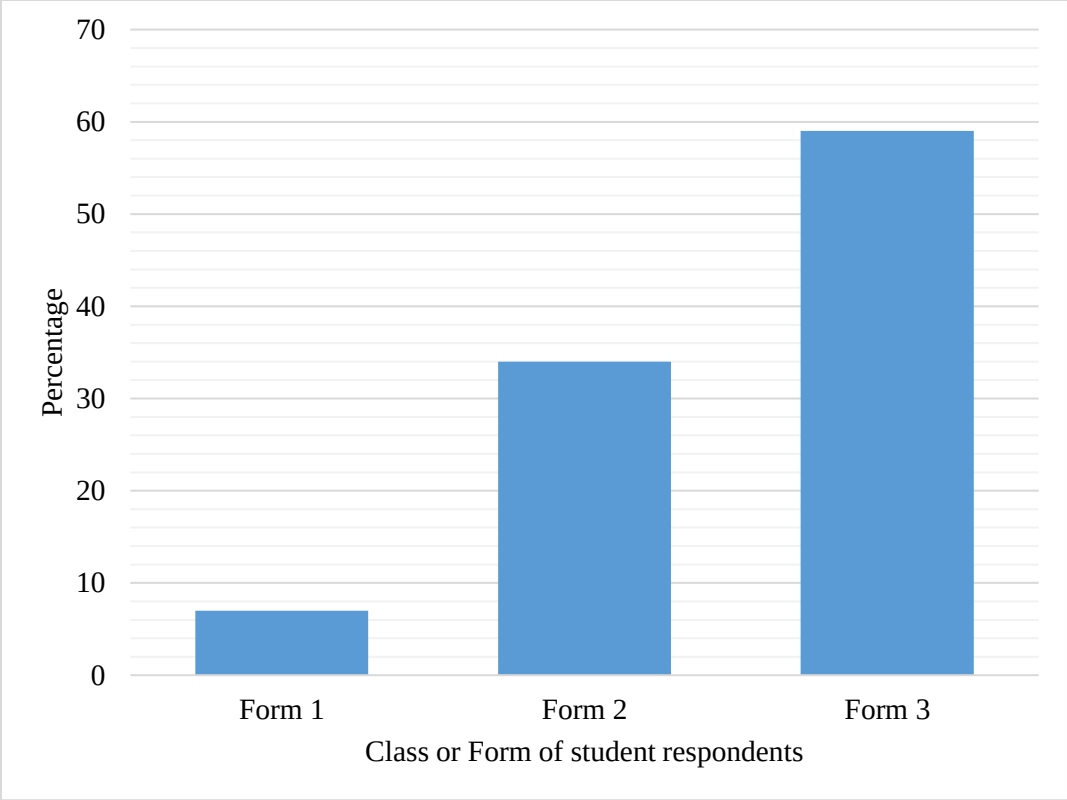


Figure 4. 4: Form of Student Respondents

Source: Field Survey, 2023.

According to the data presented in Figure 4.4, a substantial majority (59%) of the student participants are enrolled in form 3. According to the data, 34% of the students are enrolled in Form 2, whilst just 7% of the students are enrolled in Form 1. There is a clear indication that the number of respondents in form three is significantly higher than the number of respondents in the other two forms. The study include individuals

who have completed substantial portions of the course curriculum and possess a considerable amount of knowledge in the subject matter, including pattern making. In the realm of research studies, possessing knowledge regarding the class or grade of students has significance as it offers crucial contextual information and facilitates a deeper understanding of the participants' academic progression, developmental status, and educational encounters. The provided context facilitates the interpretation of the research findings within the relevant educational framework. Different grade levels adhere to distinct curricula and academic topics. The comprehension of the grade level allows researchers to customize their inquiries and evaluations in accordance with the academic backgrounds and expertise of the participants.

4.3 Knowledge Level of Pattern Making

The objective of this component of the study was to examine the respondents' degree of knowledge regarding pattern drafting. The present study commenced an inquiry of the pattern making approaches that are instructed within the clothes and textiles curriculum of educational institutions.

4.3.1 Pattern Making Techniques in School Curriculum

Table 4.2 presents an overview of the many pattern making processes that are included in the clothing and textile curricula offered by educational institutions. The results are presented in Table 4.2.

Table 4. 6: Pattern making Techniques Taught in Curriculum

Pattern Technique	Number of students	Percentage
Freehand cutting method	51	93
Commercial pattern	47	85
Draping	45	82
Digital pattern	48	87
Flat pattern	55	100
Total	55	100

Source: Field Survey, 2023.

The data shown in Table 4.2 illustrates the level of familiarity among respondents with the pattern making procedures that are taught in the school curriculum. Based on the data, it is evident that the flat pattern approach received the highest score, as all respondents (100%) affirmed its recognition and inclusion in the apparel and textile design curriculum. Subsequently, the subsequent techniques were employed: Freehand cutting method (93%), Digital pattern (87%), commercial pattern (85%), and Draping (82%). The findings indicate that respondents demonstrated a lack of awareness or limited understanding of several strategies, such as collar and neckline, sleeve and sleeve cap, and skirt and pants, as seen by their low scores. The data presented indicates that a notable number of the participants have verified the presence of the primary pattern making methods that are crucial in the manufacturing of garments.

4.3.2 Knowledge of Pattern Making

The study proceeded to investigate the knowledge level of the respondents concerning pattern making. The same variables used in table 4.2 were used for the purpose of the analysis. Table 4.3 shows the detail responses.

Table 4. 7: Knowledge of Pattern Making

Pattern making	Responses				Total
	High extent	Moderate extent	Low extent	No extent	
Knowledge of pattern making	26	52	22	N/A	100
Knowledge of freehand cutting method	32	44	23	N/A	100
Knowledge of commercial pattern method	18	32	50	N/A	100
Knowledge of draping method	34	41	25	N/A	100
Knowledge of flat pattern making	56	21	23	N/A	100
Total	166	190	144	N/A	500

Source: Field Survey, 2023.

The data in Table 4.3 presents a mix of responses on the extent of knowledge of pattern making. Figure 4.5 further sheds light on the general level of knowledge of pattern making.

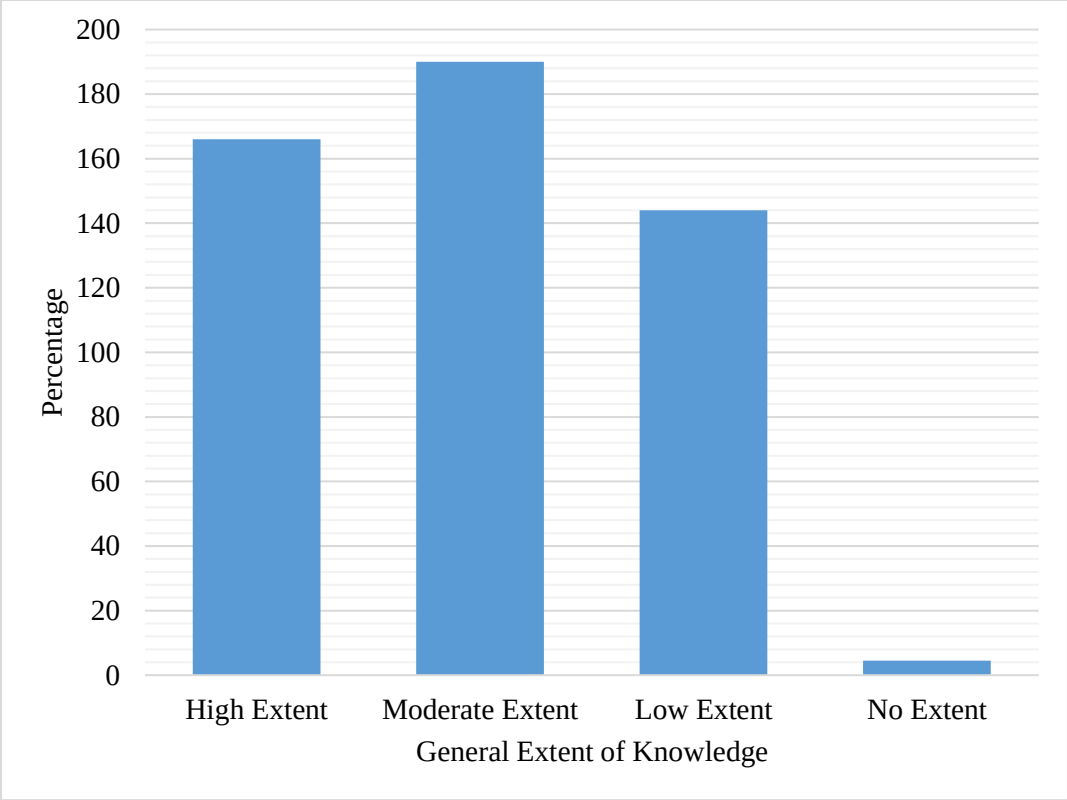


Figure 4. 5: General level of knowledge of pattern making

Source: Field Survey, 2023.

The data in figure 4.5 shows that generally, the respondents level of knowledge about pattern making is moderate. This is followed by high extent, low extent and no extent. An understanding of the general level of knowledge of pattern making is essential most especially in helping in planning for interventions to build the capacities of respondents.

4.3.3 Competency in pattern making

The study proceeded to identify the competency in pattern drafting. This was solely directed to the student respondents. Figure 4.6 show the results.

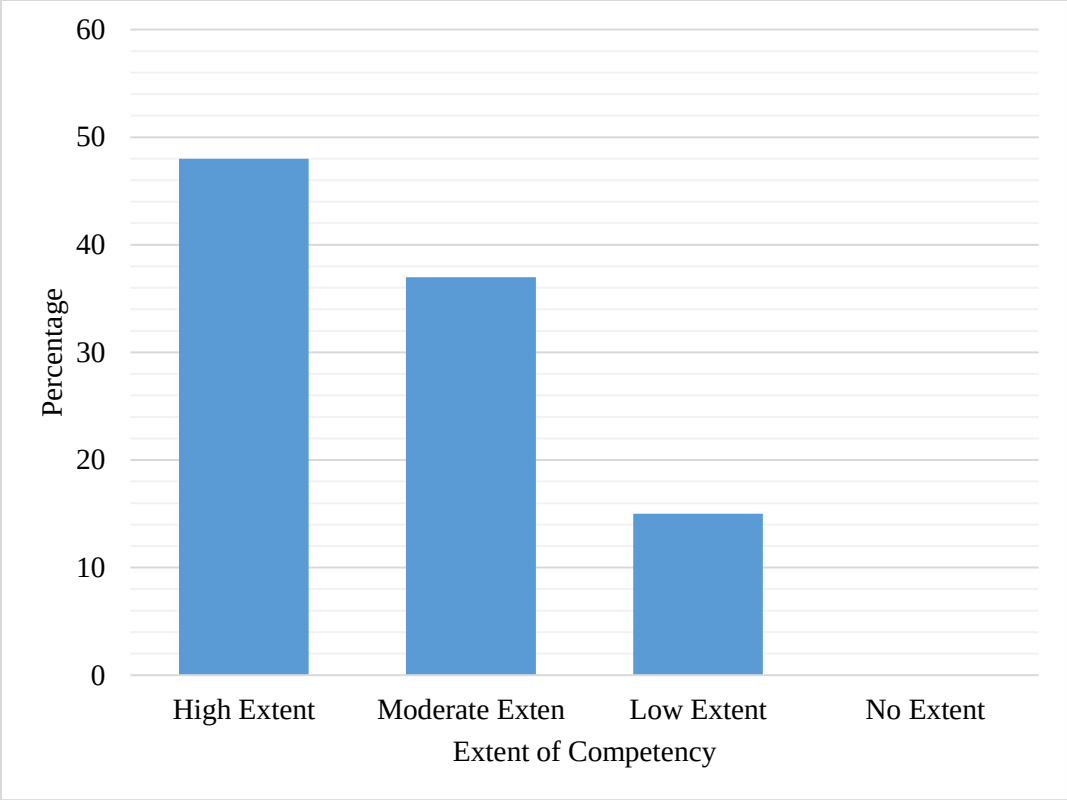


Figure 4. 6: Competency in Pattern Making

Source: Field Survey 2023.

The data presented in Figure 4.6 illustrates the respondents' self-reported levels of competency in the field of pattern drafting. The data reveals that a significant proportion (48%) of the participants expressed a higher level of skill in pattern making, whereas 37% reported a moderate level of competency. A total of 15% of the participants indicated that their competency in pattern making is comparatively inadequate. The data obtained from the respondents suggests that a substantial majority of participants possess a certain degree of competency in the field of pattern drafting. This further implies that the participants exhibit a wide-ranging and sophisticated repertoire of competencies, expertise, and proficiencies pertaining to the generation, manipulation, and modification of patterns for the manufacturing of garments. According to the respondents, a pattern maker who possesses a high level of competence is capable of

showcasing skill in many techniques, possesses a comprehensive understanding of garment construction principles, and is able to proficiently convert creative thoughts into precise and appropriately fitted patterns.

4.3.4 Competency in freehand cutting

The study proceeded to identify respondents level of competency in freehand cutting. Figure 4.7 shows the results.

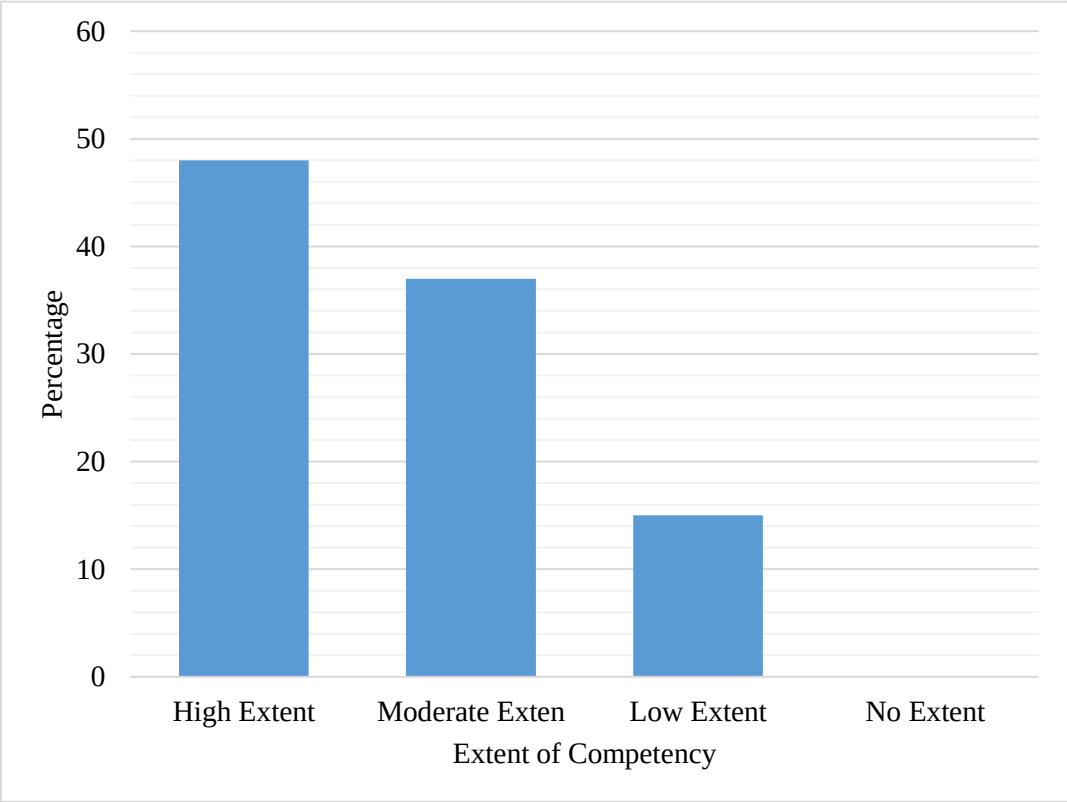


Figure 4. 7: Extent of Competency in Freehand Cutting

Source: Field Survey, 2023.

The data presented in Figure 4.7 indicates that a considerable number of the participants exhibit a greater level of competency in freehand cutting. While a significant proportion of respondents, specifically 52% and 42%, demonstrate high and moderate levels of competency in freehand cutting, it is noteworthy that only a minimal 6% of participants

reported a lesser extent of ability in this skill. The implications of the findings indicate that a substantial proportion of the participants has the ability to generate clothing patterns independently, without the need for pre-existing templates, measuring tools, or prescribed dimensions. In contrast, the pattern maker utilizes their specialized knowledge, extensive practical background, and discerning sense of proportions to precisely manipulate and contour fabric components, drawing inspiration from a design concept or a broad conception of the intended garment form. During a focused conversation, a subgroup of participants highlights the utilization of the freehand cutting technique, which enables them to directly control the cloth on a dress form. This approach fosters a hands-on and intuitive creative process. It has been observed by others that the utilization of freehand cutting is motivated by the practice of draping fabric on a dress form. This technique aids in the visualization of the garment's fit and drape on an actual human body, hence resulting in a more precise portrayal of the final aesthetic.

Once more, it is worth mentioning that a subset of the individuals included in the study observe that although freehand cutting allows for artistic liberty and a tactile approach to creating patterns, it may not possess the same level of accuracy as conventional pattern making techniques, particularly when dealing with designs that are more rigid or detailed in nature. Additionally, the authors observe that this technique is particularly well-suited for designers and pattern makers who prioritize artistic expression and a hands-on, investigative approach in their trade.

4.3.5 Competency in Flat Pattern Making

The study proceeded to identify the competency of the respondents in flat pattern drafting. Figure 4.8 shows the results.

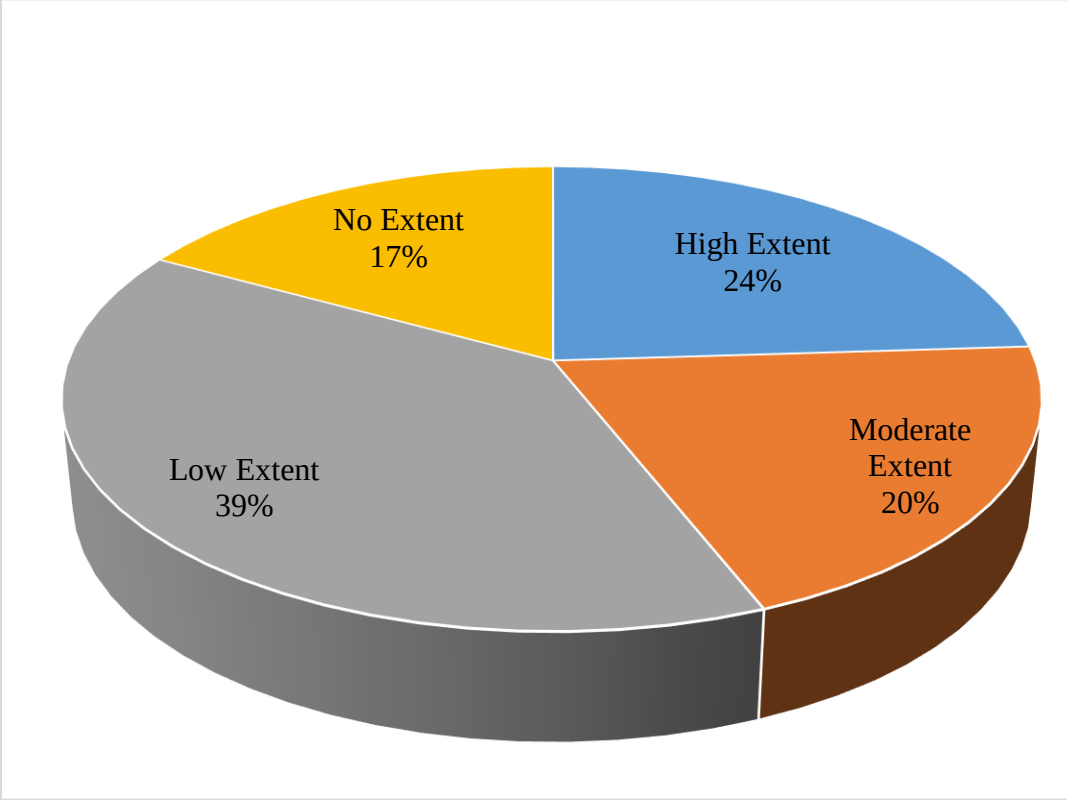


Figure 4. 8: Extent of Competency in Flat Pattern Making.

Source: Field Survey, 2023.

According to the data presented in Figure 4.8, a notable percentage of the participants (56%) exhibit little competency in flat pattern drafting, while the remaining respondents (44%) demonstrate varying degrees of skill, ranging from high to moderate. The findings indicate that a notable number of the participants exhibit a fundamental or limited range of competencies, understanding, and proficiencies in the domain of generating and manipulating two-dimensional patterns for the purpose of manufacturing clothing items. Individuals possessing a restricted level of competency

may demonstrate competency in fundamental pattern making activities, although encounter difficulties when confronted with intricate approaches, precision, and the ability to modify patterns to suit diverse design notions.

The study aimed to ascertain the perspectives of the respondents regarding various degrees of pattern making and their corresponding levels of competence. The results are depicted in Figure 4.9.

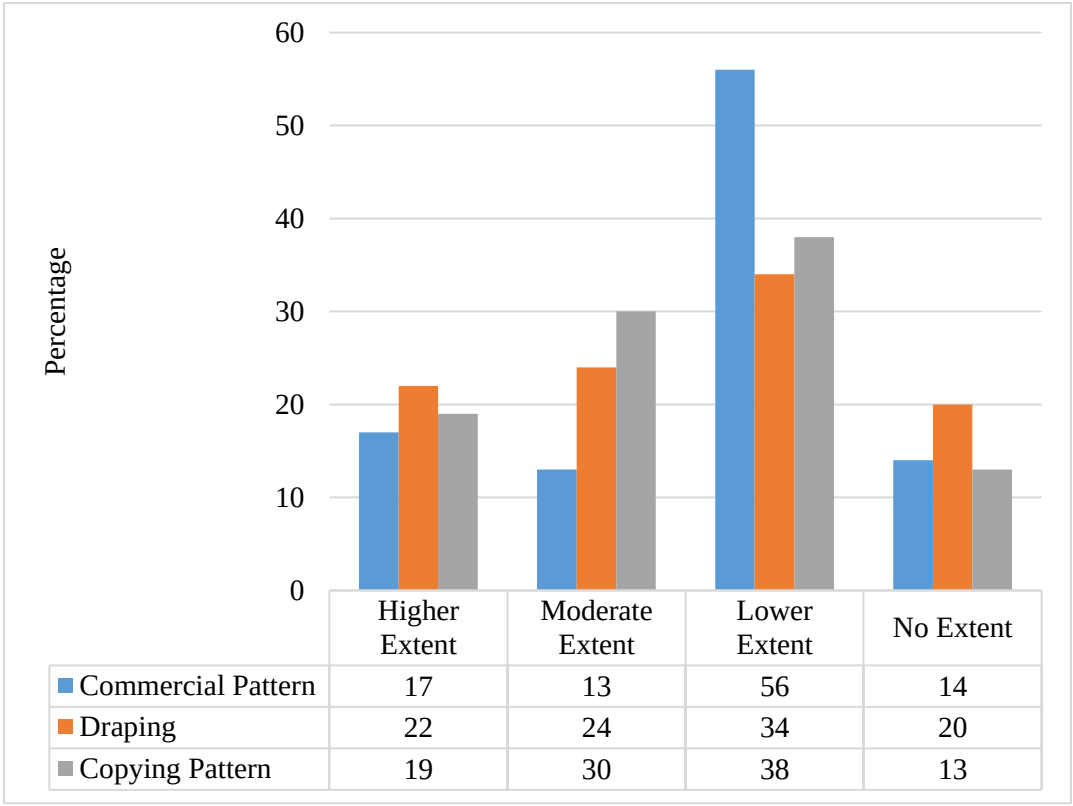


Figure 4. 9: Other Levels of Pattern Related Competencies

Source: Field Survey, 2023.

According to the data presented in Figure 4.9, a notable percentage of the participants (56%) exhibit little competency in flat pattern making, while the remaining respondents (44%) demonstrate varying degrees of skill, ranging from high to moderate. The findings indicate that a notable number of the participants exhibit a fundamental or

limited range of competencies, understanding, and proficiencies in the domain of generating and manipulating two-dimensional patterns for the purpose of manufacturing clothing items. Individuals possessing a restricted level of competency may demonstrate competency in fundamental pattern making activities, although encounter difficulties when confronted with intricate approaches, precision, and the ability to modify patterns to suit diverse design notions.

4.4 Challenges of Pattern Making

The study proceeded to analyse the responses from the survey regarding the challenges of pattern drafting. Table 4.4 and Figure 4.10 shows the details.

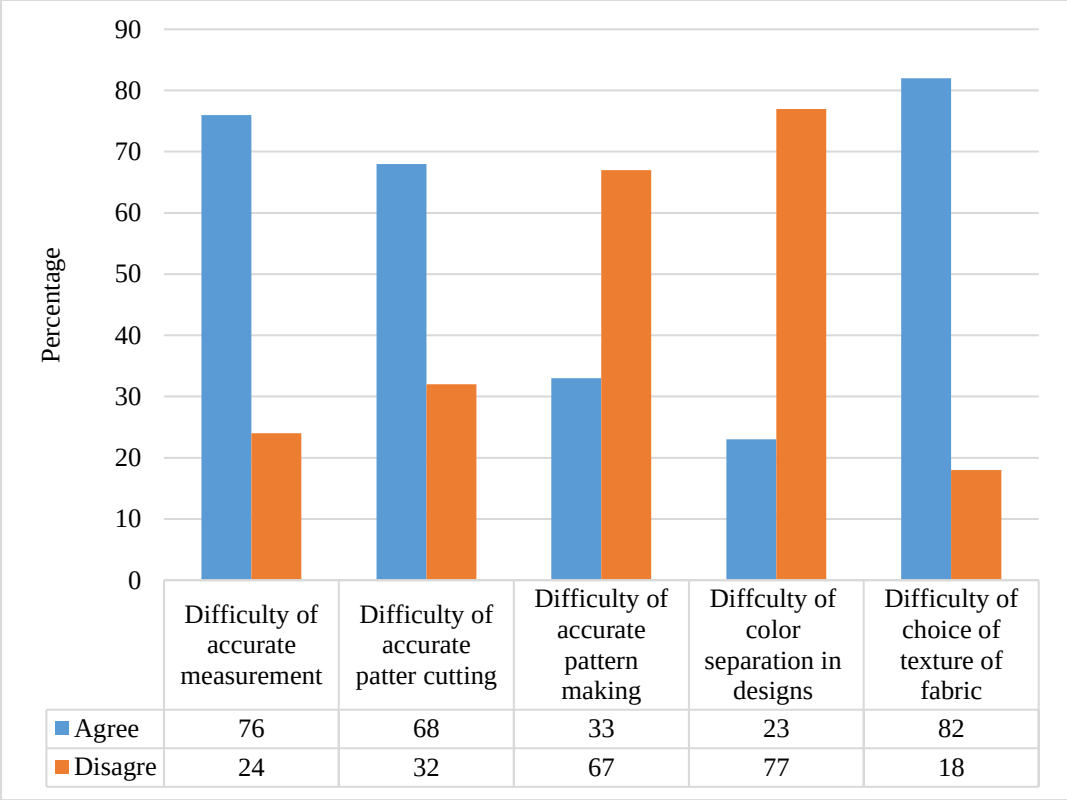
Table 4. 8: Challenges of Pattern Making

Challenges	Responses		Total
	Agree	Disagree	
Difficulty of accurate pattern measurement	76	24	100
Difficulty of accurate pattern cutting	68	32	100
Difficulty of designing accurate figures and styles	33	67	100
Difficulty of choice of texture of fabrics	23	77	100
Difficulty of color separation in designs	82	18	100
Total	282	218	500

Source: Field Survey, 2023.

In Table 4.4, it is evident that majority of the respondents agree to the ascertions that there are challenges bedeviling pattern making in the schools. In all, 57 respondents agreed that there are difficulties whiles 43% of the respondents disagreed. To give a

quick visual impression, Figure 4.10 sheds light on respondents perspective about the challenges.



	Difficulty of accurate measurement	Difficulty of accurate patter cutting	Difficulty of accurate pattern making	Diffculty of color separation in designs	Difficulty of choice of texture of fabric
Agree	76	68	33	23	82
Disagre	24	32	67	77	18

Figure 4. 10: Challenges of Pattern Making

Source: Field Survey, 2023.

The data presented in Figure 4.10 suggests that the pattern making process is fraught with numerous obstacles. The data clearly indicates that a significant number of respondents face considerable difficulties in accurately creating patterns and color differentiations in their designs. In the present study, it was observed that 67% of the respondents reported encountering difficulties in pattern drawing, whereas 77% of the participants indicated difficulty in color separation. During the focus group discussion, the researcher investigated the underlying factors that influenced the decision-making process of the participants.

4.4.1 Difficulty of Accurate Pattern Measurement

In relation to the obstacle of accurately measuring patterns, a majority of 76% of the respondents expressed agreement, indicating the difficulties involved. Conversely, 24% of the respondents disagreed with this assumption. During the focus group discussion, the participants observed that an impediment exists within the domain of pattern drafting, wherein the attainment of accurate and uniform measurements is necessary for the development of patterns that yield properly fitted clothes.

During the focus group discussion, the participants ascribed this particular problem to the inherent unpredictability observed in the diverse range of body forms and sizes. It is observed that human bodies exhibit considerable variation in terms of their shapes and sizes. Accurate measurement of individuals necessitates a comprehensive comprehension of diverse bodily proportions and distinctive traits. Failure to consider these variations may result in inadequate alignment of patterns with diverse body types. Furthermore, a subset of the interviewees expressed that inconsistencies in measuring methodologies can give rise to mistakes. The respondents elucidated that there may be variations in measurement techniques across individuals, as well as differences in the amount of tension applied to the measuring tape, resulting in inconsistencies.

Furthermore, it was noted by other participants that the challenge of achieving precise pattern measurement arises from the improper positioning of measuring points, the presence of multiple garment layers, and the lack of availability of professional measurement resources. Despite the results of the focus group discussion, the participants expressed the belief that it is possible to implement effective measures and methods to address this significant difficulty.

4.4.2 Difficulty of Accurate Pattern Cutting

Once again, a considerable proportion of participants (68%) acknowledge experiencing challenges in achieving precise pattern cutting. A total of 32% of the respondents expressed disagreement. The discussions revealed that accurate pattern cutting is a notable obstacle within the domain of pattern drafting. It was further emphasized that precise pattern cutting is crucial for attaining the required fit, proportions, and design elements of a garment.

> "One of the participants acknowledges that: The task presents a challenge because to the varying behaviors exhibited by different fabrics during the processes of cutting and sewing. In order to maintain the desired shape and proportions of the final garment, it is necessary to make appropriate adjustments to patterns, taking into account the stretch, drape, and texture of the fabric. This task is not straightforward or simple... Once more, the presence of elaborate design components in garments, such as many panels, darts, and seams, presents a formidable obstacle in achieving precise pattern cutting. Achieving precise alignment of all components necessitates a diligent focus on detail".

Various participants provided diverse rationales for perceiving pattern cutting as a formidable task. There are several factors that contribute to these discrepancies, such as differences in body measurements, the transfer of pattern designs, and the inclusion of seam allowances. In general, it is evident that successfully addressing the obstacle of pattern cutting has considerable importance in improving the design procedure, guaranteeing appropriately fitting apparel, and bolstering the reputation and financial viability of fashion labels.

4.4.3 Difficulty of Designing Accurate Figures and Styles

As per the accounts provided by the participants, pattern making encompasses the process of converting design thoughts into accurate pattern components, which, upon assembly, yield garments that fit impeccably. It is emphasized that the creation of precise figures and styles plays a critical role in attaining the intended aesthetics, proportions, and visual allure of garments. A subset of the participants observe that certain articles of clothing exhibit elaborate design characteristics, including complicated silhouettes, complex seams, and distinctive embellishments.

The creation of precise figures and styles for such clothes necessitates a profound comprehension of garment production and the capacity to transform intricate design concepts into pattern components. Several participants noted that the task of fashion designers to create figures and designs that enhance the appearance of varied body types is a complex endeavor, necessitating a deep understanding of how various design aspects interact with diverse body proportions. It has become evident that the precise design of figures and styles necessitates the careful consideration of how materials drape and interact with the human body. Designers must proactively anticipate the behavior of various fabrics during the cutting and sewing process to guarantee that the ultimate garment aligns with the planned design. One of the participants rapidly expressed the notion that:

> “the process of creating precise figures and styles frequently necessitates engaging in experimenting and the iterative process of trial and error. It is my belief that given the arduous nature of the designers' work, it may be necessary to generate numerous iterations in order to attain the intended design outcome. Additionally, it may be necessary to engage in collaboration with pattern makers who possess the ability to accurately transform design

> thoughts into meticulous patterns. Effective communication is crucial in order to accurately manifest the design vision".

In conclusion, it is evident that effectively tackling the task of creating precise figures and styles necessitates the integration of imaginative foresight, proficient technical knowledge, and cooperative engagement with adept pattern designers. Designers that possess the ability to successfully manage these aforementioned hurdles are able to produce clothing that not only embody their aesthetic vision, but also exhibit a high level of fit and visual appeal that resonates with their intended target demographic.

4.4.4 Difficulty of Color Separation in Designs

A significant proportion, specifically 77% of the participants in the survey, acknowledged that the process of color separation poses a considerable difficulty within the domain of pattern generation. This obstacle is particularly pronounced when attempting to generate patterns for designs that incorporate several colors or intricate elements. Color separation refers to the procedure of dissecting a pattern into distinct color elements, which can be printed or applied independently during the manufacturing of garments.

The complexity of effectively translating complicated or multi-colored drawings into printable patterns gives rise to this challenge. Based on the perspectives shared by a subset of participants engaged in focus group discussions, the attainment of accurate color representation is a formidable task, as it necessitates the faithful replication of the intended color palette inside the design patterns. Deviations from the original design's visual impact may occur as a consequence of color separation mismatches. It has been observed by several scholars that various printing procedures, such as screen printing or digital printing, necessitate the implementation of distinct color separation

methodologies. The procedure becomes more intricate when one gains comprehension of the specific demands associated with each printing technique. Notwithstanding these problems, the participants emphasize the indispensability of color separation in the production of clothes featuring complicated and multi-colored motifs. Successfully addressing this obstacle necessitates the amalgamation of technical acumen, adeptness in software utilization, meticulousness, and efficient communication among pattern makers, designers, and manufacturing teams. The visual quality and aesthetic appeal of the final garment are enhanced by precise color separation, which guarantees that the pattern is accurately portrayed in the completed item.

4.4.5 Difficulty of Choice of Texture of Fabric

As can be induced from Table 4.4, 23% of the study respondents agree with the assertion that they faced the challenge of choice of texture of fabrics. Another 77% disagreed. In the focus group discussion, a section of the respondents note that selecting the appropriate fabric texture is a critical decision that can influence the success of the design and pattern making process. They note that different fabric textures drape and behave differently when cut and sewn. Some textures have more stretch or give than others. This affects the ease of movement and comfort of the garment. It therefore means that pattern making students must always consider how the chosen fabric texture will interact with their pattern pieces and how it will affect the overall fit and silhouette of the garment. In the words of one of tutors:

> "The texture of the fabric contributes to the overall theme and aesthetics of the design. It can convey different emotions or visual narratives. Different textures may require specific sewing techniques or finishes to achieve a polished result. The complexity of fabric texture can affect the ease of garment construction. More intricate textures might demand more time and

skill to handle during sewing. Students must therefore anticipate these requirements and plan their patterns accordingly".

Overall, the study found that navigating the challenge of choosing the right fabric texture involves a combination of design intuition, fabric knowledge, and understanding of pattern-making techniques. Pattern making students must develop a keen sense of how fabric textures interact with their designs to ensure that the resulting garments are both visually appealing and functional.

4.5 Strategies to enhance the knowledge and competencies of students in pattern making. The development of students' knowledge and skills in the field of pattern making is of utmost importance in adequately equipping them for prosperous professional trajectories within the fashion industry. Pattern drawing is a fundamental skill that serves as the fundamental basis of garment design and manufacturing. Through the implementation of efficient methodologies, educators and academic institutions have the capacity to deliver complete training to students, equipping them with the necessary technical competency, creativity, and problem-solving skills essential for the practice of pattern drawing. Given the aforementioned considerations, the present study aimed to ascertain the viewpoints of the participants on approaches to augment the knowledge and skills of students in the field of pattern drafting. During the focus group discussion, the participants expressed diverse viewpoints.

Some participants in the study highlight the importance of directing efforts towards developing a comprehensive curriculum in order to improve knowledge and skills in pattern drafting. It is observed that the development of a meticulously organized and all-encompassing curriculum, which encompasses both academic understanding and practical implementation, while gradually progressing from fundamental principles to

advanced methodologies, is of utmost importance. They argue that the creation of a comprehensive curriculum that encompasses both practical and theoretical elements of pattern making is crucial in delivering a thorough and efficient education to students pursuing a career in fashion design. The utilization of this comprehensive method guarantees that students not only comprehend the fundamental principles of pattern drafting, but also obtain the practical abilities and experiential knowledge necessary to excel in the industry. One of the course teachers expressed their opinion that:

> "The incorporation of both theoretical and practical elements provides a comprehensive educational encounter. Students get a profound comprehension of the fundamental principles while simultaneously employing such principles in practical situations. Furthermore, the actual application of academic information enhances its significance for students. A thorough educational program serves to bridge the divide between theoretical knowledge and practical application, enabling students to get a deeper understanding of how abstract concepts are manifested in tangible shapes and patterns".

Another tutor response emphasizes that:

> "practical instruction has the potential to develop students' technical skills. Students acquire the skills to create, modify, and customize patterns, therefore enabling them to effectively implement their design concepts with precision. Allow me to further contribute by stating that practical exercises provide students the opportunity to encounter a diverse range of obstacles that arise in the process of pattern drawing. Through the process of solving these difficulties, students are able to cultivate and enhance their problem-solving abilities, which are crucial in the context of design and production".

According to some participants, the integration of theoretical concepts and practical applications fosters a climate that stimulates creative and inventive thinking among students. One can engage in the exploration of various pattern alteration techniques in

order to generate distinctive patterns. The respondents cited several reasons for the necessity of curriculum design, including the attainment of industry relevance, the ability to adapt to industrial trends, the cultivation of critical thinking skills, and the preparation for real-world scenarios. In general, it has been determined that via the provision of both information and skills, educators are able to ensure that graduates possess the ability to generate original designs, resolve intricate challenges, and make valuable contributions to the realm of fashion design and manufacturing.

Once more, a subset of the participants emphasizes the immense value of practical experience in the field of pattern drawing. Consequently, it is recommended that students be afforded abundant opportunities to engage with patterns, fabric, and sewing machines. It is observed that the inclusion of diverse pattern projects in the curriculum facilitates the acquisition of a comprehensive range of skills among students. By incorporating a variety of garment types such as tops, bottoms, and dresses, as well as varying design complexities and fabric textures, students are exposed to a multitude of problems and techniques. In general, the participants expressed consensus regarding the efficacy of incorporating frequent practical exercises and projects in the educational curriculum, since these activities enable students to actively engage with theoretical concepts and enhance their competency.

In addition, the participants also emphasized the need of promoting collaborative learning. According to them, the promotion of collaborative learning through the implementation of group projects or peer assessments facilitates the exchange of knowledge, stimulates problem-solving dialogues, and provides individuals with the opportunity to engage with diverse views and perspectives. Additionally, it has been proposed by others that the organization of visits to garment production facilities, fashion studios, and design workshops would provide students with valuable hands-on

experience and the opportunity to witness the practical use of pattern making skills in authentic contexts. One of the participants indicated that:

> "it could be beneficial to bring professionals from the industry and experienced pattern designers as guest lecturers in order to offer students valuable insights into the real-world, practical advice, and exposure to current practices within the business. Through the use of this approach, it is anticipated that we would successfully surmount the significant obstacles encountered during the pattern making process. In addition, it is my belief that the school administration may consider organizing seminars that specifically address various pattern manipulation techniques, including but not limited to dart manipulation, pleating, gathering, and seam manipulation. These workshops will augment our capacity to creatively alter patterns".

Furthermore, some other participants suggested the implementation of pattern making challenges that simulate authentic real-world events. According to the proponents, this approach is expected to promote critical thinking and creativity among students by encouraging them to address fit difficulties, make design improvements, and resolve other technical challenges. In addition, the participants proposed that the implementation of simulated fashion exhibitions would provide students with a platform to present their pattern making endeavors. This particular experience will provide individuals with the opportunity to witness the exhilaration of witnessing their concepts being brought to fruition on the fashion runway.

In general, the respondents reached a consensus that the implementation of these tactics enables educators to offer students a full and dynamic learning experience in the field of pattern drafting. Students who possess a robust set of technical skills, demonstrate originality, and exhibit adaptability to industry trends are more apt to succeed in the fiercely competitive and constantly shifting realm of fashion design and production.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The purpose of this study was to examine the challenges faced by clothing and textiles students in pattern making in technical and vocational schools within the Volta Region of Ghana. There were three research objectives: to assess the knowledge level of clothing and textiles students on pattern making in garment production process; to eexamine pattern making skills or competency in garment production process of clothing and textiles students, and to examine challenges faced by clothing and textiles students in pattern making garment production process in selected technical and vocational schools within the Volta Region of Ghana. Using both primary and secondary data, the research that led to the findings provided in the previous chapter was conducted. This chapter aims to summarize the research's findings, conclusion, and recommendations.

5.2 Summary of Key Research Findings

The first objective was to assess the degree of knowledge among clothes and textiles students about pattern making in the garment production process. The results of the study indicate that students had a level of knowledge regarding the various procedures employed in pattern drawing as outlined in their curriculum. However, their understanding of the actual information pertaining to pattern making is deemed to be moderate. The findings indicate that all of the participants acknowledged that they were aware of the inclusion of the flat pattern method in the curriculum for apparel and textile

design. However, only 56% of them demonstrated a substantial degree of understanding in this particular area. Additionally, the study revealed that respondents possess a higher level of familiarity with pattern making approaches compared to their overall expertise on the subject matter. In general, the data indicated that the students' knowledge level in pattern making is moderately satisfactory. It is crucial to have a comprehensive grasp of the overall knowledge level in pattern draftmaking, as this information is vital for designing effective interventions aimed at enhancing the skills and capabilities of the participants.

The second objective aimed to assess the competency of apparel and textiles students in pattern making skills within the context of garment production processes. The findings indicate that a significant proportion of the participants exhibit competency in pattern making. However, their level of competence in this area is relatively insufficient, suggesting the necessity for further efforts to enhance the students' skills and competences in pattern drafting. The aforementioned outcome was encapsulated by one of the participants' statement, which suggests that pattern makers with a high degree of competency are able to demonstrate expertise in various techniques, possess a comprehensive comprehension of garment construction principles, and effectively translate creative ideas into accurate and well-fitting patterns. The research findings indicate that there is a significant need for further efforts to enhance the competency levels of students in order to effectively apply the skills and techniques acquired in the field of pattern making.

The third objective of the study was to investigate the challenges encountered by students specializing in clothes and textiles during the pattern making and garment production process. The findings indicate that the pattern making procedure is characterized by a multitude of challenges associated with color distinction, precise

pattern measurement, pattern cutting, and the creation of exact figures and styles. Numerous students encountered difficulties in comprehending the complex principles of pattern drafting, which encompass the comprehension of dimensions, proportions, and procedures for manipulating patterns. A considerable proportion of the pupils exhibited a deficiency in the technical aptitude necessary for precise pattern drafting. The individuals encountered difficulties in achieving accurate measurements, producing straight lines, and converting concept sketches into practical patterns. The results highlighted the necessity of implementing focused interventions aimed at addressing these obstacles and enhancing students' competency in pattern drafting. In general, the participants express the belief that implementing various measures such as incorporating practical exercises, organizing workshops for advanced techniques, improving access to tools and software, and cultivating a supportive learning environment that promotes communication and personalized guidance will help address the complex challenges in pattern making education. These initiatives are expected to provide valuable insights for enhancing the educational experience of aspiring fashion designers.

5.3 Conclusion

In conclusion, this research investigation has provided insights into the challenges encountered by students specializing in clothing and textiles, specifically in the area of pattern drafting, within technical and vocational educational institutions situated in the Volta Region of Ghana. By employing rigorous methodologies for data collecting, meticulous analysis, and meticulous interpretation, an in-depth understanding of the challenges faced by students in acquiring competence in pattern making procedures has been attained. The study's findings have unveiled that students face numerous

challenges pertaining to color discrimination, precise pattern measurement, pattern cutting, limited access to resources and modern technology, as well as developing precise figures and styles. The aforementioned problems together impede the development of skills, thereby leading to deficiencies in the students' competency in pattern making.

Moreover, the research emphasized the need of tackling these obstacles in order to guarantee the comprehensive growth of forthcoming fashion practitioners. The cultivation of proficient pattern makers who can make meaningful contributions to the fashion industry necessitates an education that encompasses both academic understanding and practical application.

The findings obtained from this study carry substantial consequences for the creation of curricula, teaching approaches, and resource distribution in technical and vocational educational institutions. Educators and policymakers can promote a more effective learning experience by acknowledging these limitations and implementing policies aimed at improving students' pattern making skills. Consequently, this would provide students with the essential knowledge and skills required to meet the requirements of the business and make valuable contributions to the expansion of the clothes and textiles sector in the Volta Region and other areas.

In conclusion, the results of this study highlight the necessity for ongoing enhancements in pattern making education, with a particular emphasis on practical instruction, guidance from instructors, and availability of contemporary resources. Educational institutions have the potential to significantly influence the development of proficient and adept pattern makers who possess the necessary skills to effectively navigate the dynamic requirements of the always expanding fashion industry. The findings of this

study provide a basis for significant actions that will have a favorable influence on the educational and professional opportunities of students specializing in apparel and textiles in the Volta Region of Ghana.

5.4 Recommendations

Based on the findings of the research study that investigated the challenges faced by clothing and textiles students in pattern making within the technical and vocational schools of the Volta Region, several recommendations can be made to address these challenges effectively:

1. **Curriculum Enhancement:** It is imperative to establish a collaborative partnership between industry professionals and academics in order to critically evaluate and enhance the curriculum for pattern making courses. The partnership should aim to guarantee that the curriculum encompasses a wide array of pattern drawing procedures, encompassing both fundamental and intricate issues that students may potentially face.

2. Hands-on Workshops: There is the need to organize regular hands-on workshops where students can practice pattern making techniques under the guidance of experienced instructors. These workshops should focus on specific challenges identified in the study and offer practical solutions.

3. Guest Lecturers: It is imperative to make concerted efforts to consistently extend invitations to active pattern makers and fashion designers in order to provide guest lectures and impart practical knowledge and experiences from the industry. The opportunity for students to interact with professionals from the business can serve as a source of motivation and offer useful perspectives on how to navigate and overcome obstacles. Furthermore, it is imperative to foster an environment that promotes the

formation of study groups among students, facilitating the exchange of ideas, discussions about difficulties encountered, and collaborative problem-solving. The provision of peer help has the potential to augment comprehension and foster the development of effective problem-solving abilities.

4. The Integration of Digital Tools in Education: It is imperative to exert efforts towards the integration of digital pattern making software into the curriculum. This approach is considered highly effective, particularly in the current period characterized by globalization and rapid technical progress. It is imperative to offer training sessions that focus on industry-standard software in order to acquaint students with contemporary pattern making procedures.

5. Industry Internships: Again, the administrators of the schools should facilitate internships or apprenticeships with local fashion houses or garment manufacturers. Practical exposure to real-world pattern making challenges can help students bridge the gap between classroom learning and industry demands.

6. Resource Materials: The school administrators should develop a library of reference materials, including books, articles, and online tutorials, specifically addressing pattern making challenges. They should make these resources readily accessible to students.

7. Mentorship and collaborative programs: There exists a necessity to build mentorship programs that facilitate the connection between seasoned pattern makers and students. Mentors play a crucial role in offering direction, counsel, and motivation to individuals in their efforts to surmount obstacles. Furthermore, it is imperative to implement initiatives aimed at facilitating collaborative endeavors that foster interdisciplinary collaboration among students. The utilization of an interdisciplinary

approach has the capacity to replicate real-world cooperation and foster the cultivation of inventive problem-solving skills.

8. Networking events and skill clinics: These are two important components of professional development. These events provide individuals with opportunities to expand their professional networks and enhance their skill sets. By attending networking events, individuals can connect with like-minded professionals, potential mentors, and industry experts, which can lead to valuable collaborations and career It is imperative to undertake endeavors aimed at facilitating the coordination of events that foster collaboration among students, instructors, and industry professionals. Networking events can provide students with the opportunity to engage with a diverse array of opinions and potential solutions. Furthermore, it is recommended that skill clinic programmes be implemented in order to provide students with targeted pattern making problems, including but not limited to fitting difficulties, intricate design components, and fabric choice considerations. These clinics have the capacity to offer specialized solutions and enhance pupils' competency.

In conclusion, the adoption of these suggested measures has the potential to foster a more conducive and efficient educational setting for students specializing in pattern making within technical and vocational institutions situated in the Volta Region. By effectively addressing the difficulties that have been highlighted, it is anticipated that there would be a positive impact on the production of graduates who possess the necessary skills and confidence to thrive in the fashion and textiles business.

5.5 Areas of Further Research

While the research study aimed to investigate the challenges faced by clothing and textiles students in pattern making within the Volta Region of Ghana, there are several challenges that need to be acknowledged:

1. **Sample Size and Generalizability:** findings from the study are based on sample of students from technical and vocational schools within the Volta Region. As such, the results might not be fully generalize to all students in the region or beyond.

2. **Geographical Focus:** The study focused exclusively on the Volta Region of Ghana. Therefore, the challenges identified may not fully capture the diversity of experiences faced by students in other regions or in different educational settings.

3. **Self-Reporting Bias:** Participants' responses might be influenced by social desirability bias or their personal interpretations of challenges, potentially leading to an underrepresentation of certain issues.

Building on the insights gained from this study, there are several avenues for further research that could provide a more comprehensive understanding of the challenges faced by clothing and textiles students in pattern making:

There must be efforts to conduct a comparative studies across different regions of Ghana or even internationally to identify commonalities and differences in the challenges faced by students in pattern making education.

Also, there must be efforts to evaluate the curriculum of technical and vocational schools to determine how it aligns with industry needs and whether it adequately addresses the identified challenges.

By addressing these challenges and delving into further areas of research, a more comprehensive understanding of the challenges faced by clothing and textiles students in pattern making education can be achieved, leading to more effective strategies for curriculum improvement and skill development.

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APPENDIX A

QUESTIONNAIRE

This questionnaire is meant to gather data for a case study titled: "***Challenges of Pattern Making in Garment Production Process: The case Of Volta Region***". The information you give will help teachers, researchers and policy makers to appreciate the problems faced by learners. Be reminded that the data will be held in confidence to the extent allowed by law. Should the data be published, your identity will not be showed. Taking part in this study is voluntary. However, if you decide to be part, you are kindly requested to read the items and respond to them as frankly and objectively as possible. Thanks for being part of this study.

SECTION A: Demographic Information

Please place a tick (√) in the proper box

1. Gender: Male [ ] Female [ ]

2. Age of respondents a. 18-25 [ ] b. 26 - 39 [ ] c. 40-49 [ ]

3. Education of respondents a. Non Formal [ ] b. Basic school [ ] c. SHS, Diploma, HND [ ], d. First Degree [ ] e. Masters [ ]

4. Occupational Distribution a. Students [ ] b. Tutor/Instructor [ ]

5. Form/Grade of students: a. SHS 1/Year 1 [ ] b. SHS 2/Year 2 [ ] c. SHS 3/Year 3 [ ] d. Any other [ ] Please, specify……..

SECTION B: KNOWLEDGE OF PATTERN MAKING

Please the items are related to knowledge indicators. By use of a tick (√), please show the extent to which you ***have knowledge of pattern making:***

Key: 1 = No Extent; 2 = Low Extent; 3 = Moderate Extent; 4 = High Extent

No	Statement	Response			
		1	2	3	4
1	Knowledge of pattern Making techniques				
2	Knowledge of freehand cutting method				
3	Knowledge of commercial pattern method				
4	Knowledge of draping method				
5	Knowledge of copying method				
6	Knowledge of flat-pattern making				
7.	Knowledge of Digital pattern				
8.	Knowledge of color and neckline				

SECTION C: PATTERN MAKING SKILLS OF STUDENTS

Please the items are related to knowledge indicators. By use of a tick (√), please show the extent of competency in ***pattern Making skills:***

Key: 1 = No Extent; 2 = Low Extent; 3 = Moderate Extent; 4 = High Extent

No	Statement	Response			
		1	2	3	4
1	Competency in pattern making				
2	Competency in freehand cutting				
3	Competency in commercial pattern making				
4	Competency in draping				
5	Competency in copying patterns				
6	Competency in flat-pattern making				

SECTION D: CHALLENGES FACED BY STUDENTS IN PATTERN MAKING

Please these items are related to challenges in pattern drafting. By use of a tick (√), please show the extent agreement or disagreement.

No	Statement	Response	
		1	2
1	Difficulty of accurate pattern measurement		
2	Difficulty of accurate pattern making		
3	Difficulty of accurate pattern cutting		
4	Difficulty of colour separation in designs		
5	Difficulty of choice of texture of fabrics		
6	Difficulty of designing accurate figure and styles		

SEMI-STRUCTURED INTERVIEW GUIDE

Introduction

This interview guide is designed to seek your opinion on challenges of pattern making in garment production process. Please be assured that any information given will be treated with the outmost confidentiality and all information provided shall be used for research purpose only.

Thank you.

1. What is your gender?
2. What is grade/class?
3. In your view, how knowledgeable are you of the various methods of pattern making?
4. How competent or skilful are you using the various methods of pattern making?
5. What are your views on using pattern Making in garment production?
6. What challenges do you experience in pattern making?