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Online Instructional Material for Computer Aided Garment Pattern Making Training in Colleges: A Case Study of Zimbabwe

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Abstract The purpose of this study was to develop an online instructional material for computer aided (CAD) pattern making training in Zimbabwe Polytechnics. The study adopted an experimental design to develop the material. The study identified that CorelDraw; open access software, can be used for the development of basic block patterns. Through a screencast-o-matric tool and VSDC Video Editor, a screen cast was developed to show the progression of size 12 straight skirt block development on the computer screen. The instructional material was tested to thirty Fashion Design students and five pattern making instructors. Findings from the test suggest that majority of the students were able to follow step by step screen casts to develop the skirt block. It was concluded that screen-castscan serve as instructional materials to expose student to CADpattern making and can help instructors change face to face instruction from tradition demonstration lectures to more constructivist learning practices in practically based disciplines like Fashion Design. The authors argue that this study can assist instructors, who have challenges of acquiring subject specific educational software, with instructions on how to make instructional materials like screen casts for teaching CAD concept susing affordable and alternative software such as CorelDraw.

Keywords Pattern making, Computer aided design, Online-based teaching and learning, Instructional materials

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Introduction

As polytechnic colleges around the globe have closed and continue to close due to infectious pandemics such as corona virus (COVID-19), students, instructors, and parents are settling into the new reality for the foreseeable future. Many colleges are implementing distance learning contingency plans and connecting students and teachers through online platforms and tools (Liberman, Levin & Luna-Bazaldula, 2020). Under these unexpected circumstances, teachers and students in practically related academic disciplines such as Fashion Design have to quickly adapt to teaching in this new reality to ensure that students engage in learning. Fashion design encompasses a number of modules that are often done practically and require physical interactions and attention.

One such module is Pattern making. The Pattern Making module involves the art of designing patterns by making templates from which clothing and craft items can be sewn (Datta & Seal, 2018). The process actually helps to come out with the designers' imagination from illustration to the real product. Pattern making is a highly skilled technique and art which calls for technical ability, and a sensitivity to

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interpret a design, with a practical understanding of garment construction. The pattern making process requires body measurements either directly taken from the wearer or the standard size measurements can be used.

Pattern making is a foundation in garment manufacturing. It plays an important role in garment manufacturing as it affects the appearance of a garment. It is one of the initial steps in the garment design development process. Designing a garment is one thing, but making sure that these designs can actually see the light of day is a pattern maker's unique responsibility. Pattern making process combines the knowledge of body measurements and body proportions to create a 3D form, which fits the human shape. In the industrial set up, pattern making is a highly developed technical skill, requiring precision in the drafting and development process (Bhati & Song, 2019). Proper knowledge of pattern making is an important aspect of garment industry functions.

In higher education, the practice of pattern making is taught in a variety of ways, so as in the clothing manufacturing companies (Almond & Power, 2018). This ranges from the traditional methods of flat pattern cutting and tailoring, draping materials on the dress stand, to using complex pattern development software which involves the use of computer technology. Thus developing technology based instructional material that can assist students in the step by step progression of their practical activities in Pattern Making courses have to be considered. Several materials ranging from the traditional materials to computer based materials have been used for demonstrating these complicated ideas in various disciplines. However, in the discipline of Fashion Design in Zimbabwe, lack of practical exposure to use of online technologies in the development of garment patterns has resulted in rarely any online practical based instructional material to assist students and instructors in online learning in pattern making training. Although there are a number of CAD software such as AutoCAD and Gerber, these are only afforded by industries and very few academic institutions (mostly private owned institutions) and cannot be accessed by most students during online home based teaching and learning, the current approach due to COVID-19 pandemic.

According to the study results by Suryani, Imayanti, and Yahya (2018), it has been indicated that the Fashion Design students can use alternative cheaper software such as Adobe illustrator for pattern making but no clarity has been made to inform how these can be used to develop garment patterns. No further researches have been done to demonstrate how one can use the above mentioned CAD programs to develop garment patterns. It is with these observations that the researchers were motivated to identify a digital platform for computer based pattern making and developed an instructional material that can assist both Fashion Design instructors and students in the teaching and learning of garment pattern making in order to perform practical activities whilst at home. The specific objectives that guided the study were;

- To identify an affordable open access computer aided software that can be applied in teaching and learning of garment pattern making.
- To develop and test an instructional material for computer aided garment pattern making training in Zimbabwe polytechnics that can be applied for online teaching and learning.

Literature Review

Pattern making is a foundation in the garment manufacturing and it plays an important role in deciding how the final appearance of a garment will appear. It is one of the initial steps in the garment design development process. Pattern making process combines the knowledge of body measurements and body proportions to create a 3d-dimensional (3D) form, which fits the human body. In clothing industry, pattern making is a highly developed technical skill, requiring precision in the drafting and development process.

Techniques of pattern making

The practice of pattern making and cutting is done in a variety of ways (Almond & Power, 2018). This ranges from the traditional methods of flat pattern cutting and tailoring,

draping materials on the dress stand, to using complex 2-dimensional (2D) and 3D pattern development software which involves the use of computer technology.

Traditional techniques of pattern making

Traditional techniques such as freehand cutting, draping and flat pattern drafting methods are commonly used in garment pattern making.

Freehand cutting is a method which involves marking the measurements and cutting directly onto the fabric (Gavor & Danquah, 2018). The method is commonly used by experienced fashion designers and clothing producers. It is a quick, easy and cheap method as the designs are drafted out directly on the fabric without any costs and time spent on drafting papers before cutting the fabric. Although the freehand cutting is the quickest method among the traditional pattern making techniques, fabric wastage is often experienced as there are no adjustments to economize the fabric usage. With freehand cutting if there are any mistakes experienced during the cutting it cannot be undone. Efficiency in producing proportional garment sections is also a challenge when one uses free hand cutting technique. For instance armhole and crotch line curves usually do not come out well when garments are worn.

Draping method is a three-dimensional process of pattern making. According to Datta and Seal (2018), in draping pattern making method, a muslin cloth is used to drape over a human body or on a mannequin. The stitching lines are marked with a pencil as the fabric is draped and pinned on the dress form. To get an actual design for finished garment, pattern maker gives ease allowances for movement before the garment piece is cut and sewn. The components on the muslin cloth are then transferred on to paper and seam allowances and other instructions are added. The draping technique requires more material, more expensive and time consuming than flat paper pattern making method.

Pattern drafting technique or 2D flat pattern making involves creating templates from which the garment will be cut. Three different types of flat patterns are produced by designers during the 2D/flat pattern making process (Aldrich, 2015). These three are; block pattern, working pattern and the final pattern. 2D block pattern is often referred to as sloper, block, foundation or master pattern (Obinnim & AfiPongo, 2015). The master pattern block serves as a basis for garment designers to make adaptations in flat pattern cutting for the development of their garment designs in a relatively scientific, accurate and speedy process. The block pattern as the foundation does not have any style details of the design. The working pattern is transferred from the basic block and the design details are added at this stage. From the working pattern, the final patterns from which the garment will be cut are extracted. The final patterns determine the garment appearance as per design on paper, therefore should be marked with all the necessary instructions required for construction. With the development of technology, making garment patterns using paper has shifted to computer (Suryani, Imayanti & Yahya, 2018).

Computer-aided pattern making

Datta and Seal (2018) emphasize that CAD can be used for many fashion design processes including pattern making and it is an integrated system which is used for other processes such as pattern grading, measuring as well as marker making. Dzikite, Nsubuga and Nkonki (2016) identify some examples of modern CAD packages for fashion design related operations including pattern making software. These packages include, Lectra, Gerber Accumark, OptiTex and AutoCad. Dimension CAD, PAD Systems, TUKAcad and Fashion Cad are more examples of CAD Software programs for pattern drafting which are common in industrialized countries.

Pattern digitizing is the most common practice in Zimbabwe, which provides digital scanned lines that are readable by most CAD apparel programs and a cost-effective way to convert old and manually made patterns into digital files. CAD pattern making has several advantages when compared to the traditional methods. The CAD software provides great tools for design professions that will help in carrying out design and analysis of a proposed design. These tools help in producing pattern designs with high accuracy and the scope for errors is much lower when compared to manual pattern making. The higher accuracy will lead to better designs and these better designs help by making manufacturing faster. There is absolutely no doubt about the

fact that the kind of accuracy that CAD software will offer can never be achieved by opting for manual drawings.

Manual pattern making not only takes more time but the errors experienced delay the garment process in overall. Pattern making with the help of CAD can be easily saved and preserved for future use and reference. The saved work can also be edited and printed whenever required. Unlike the manual drafting, the CAD pattern making require less space and patterns can be stored in hard drive, USB pen drive or cloud and can be shared easily. Modifying the CAD geometry is easy with all the tools available. Correcting any errors is much quicker when compared to using a pencil and paper. These methods are also an important consideration in the pattern making training in Polytechnic institutions and ensure that the skills are delivered to Fashion Design students, preparing them for the field of work.

CAD garment pattern making training in Zimbabwe Polytechnic colleges

According to Chuma, Chipambwa and Komichi (2018), the use of CAD/CAM in Fashion Design is an essential skill for the generation of apparel fashion students. The modern licensed computer software packages mentioned earlier in this section for fashion industry are not very much common in Zimbabwe training institutions. Due to the high prices of fashion pattern making software, most training institutions face challenges in acquiring these (Satiya, 2017). Open source CAD software have emerged in many field as promising alternative to commercial and licensed off-the-shelf systems. However, Satiya (2017) argue that many colleges courses in Fashion Design in Zimbabwehad never explored the potential of these in their teaching and learning.

Literature shows that the teaching and learning of CAD pattern making require explained demonstrations of complicated routines performed on computers, so that instructors and learners would both understand complex ideas as well as practically implement procedures. There are several materials which can be used to demonstrate the CAD pattern making. According to Omenge and Priscah (2016), instructional media includes all the materials and substantial resources that an educator might use to implement instruction and facilitate students' achievement of instructional objectives. These instructional materials are either printed ones such as course books and workbooks, or non-printed ones such as computer-based materials and videos (Shahid, Aleem, & Islam, 2019)

According to Dzikite (2017), audio-visual aids or multimedia are some of the technological tools which are effective in computer aided learning. Idris, Shamsuddin, Arome, and Aminu (2018) define audio-visual aids as the combination of various digital media types such as text, images sounds and video into an integrated multi-sensory interactive application or presentation to convey a message or information to an audience. Audio-visual material allows an individual or a small group of people to interact with information that is represented in several media, by repeatedly selecting chat to see and hear next. The audience or user controls the content and flow of information. According to Gedera and Zalipour (2018), audio-visual aids are employed for demonstrations or tutorials which the students may need to watch several times. Akhmetshin (2019) allocates two groups of technologies that are suitable for audio-visual aids namely; offline technology (electronic presentations, spreadsheets, video films) and online technology (internet materials, interactive platforms, network video and audio resources).Although the audio-visual materials were found to be useful for teaching and learning, it does not mean that there are no disadvantages. As identified by Mamun (2014), poor quality sound and vision, in some cases are the main disadvantages of audio-visual materials. In this case the instructor must be well-trained to assist and offer guidance to the students in understanding the information conveyed in the video.This study focused on the online based instructional materials in order to assist Polytechnic instructors and college studentsinimplementing distance learning contingency plans and connecting students and teachers through online platforms and toolsespeciallyin this era where physical learning is affected by closure of institutions due to contagious pandemics such as COVID-19.

Methodology

Identification and Selection of the software

As the first step comprehensive internet search was conducted along with literature research as inquiry into open

access free or affordable software. The criterion for selection was based on open-sourced and a fairly accessible in terms of price, hardware compatibility and availability to fashion students. In Fashion design, CAD students need to complete tasks by using the various tools available in CAD software. Hence the CAD system was considered compliant with fashion design education and training if it offers the tool requested for pattern making. The related work bench that were considered were adopted from (Papachristou, Kyratsis, Bilalis, 2019) to include; new pattern creation, draw new pattern piece from scratch with specific measurements, insert new points, to evaluate if a specific distance is correct and to model curves; to edit any part of the pattern and to add darts. Basic block patterns in a standard size 12 were used based on the instruction of Aldrich (2015).

Development of the online instructional material

The researchers adopted an experimental design to develop an online instructional material for garment pattern making. The instructional design development framework (ADDIE) by Watson (1981) was used as a guide to develop an online instructional material. ADDIE is an abbreviation representing the five stages of the model which are; analysis, design, development, implementation and evaluation.

With reference to the model above, analysis stage is carried out to capture the learning environment of the clothing fashion students in Zimbabwe polytechnics and outline the instructional materials which they are exposed to in delivering pattern making training. The phase involved both the students and pattern making instructors to connect their conceptual ideas towards designing and developing of an effective instructional material after they have become aware of the problem being investigated.

On the design stage, an overall blueprint of how the instruction will be delivered is created. This includes choosing the methods of instruction and creating useful action oriented learning objectives to guide the computer aided pattern making learning. The stage gave the researchers time to familiarize with a number of vector based programs and the screen casting tools in order to identify materials for the teaching and learning package. The study identified CorelDraw as an application with easy to master tools which can be used by Fashion Design students. The researchers were able to use CorelDraw program to construct straight lines, curved lines and shapes with accurate measurements which are the basic components of any garment block pattern. An open access tool called a screencast-o-matic was found to be appropriate for capturing the pattern development process on a computer as well as for capturing the narrations. A video editing tool was required in order to perfect the screencast and the study identified VSDC video editor which was used to edit the screencast.

The development stage relied on both the Analysis and Design phases. Its purpose was to generate an online

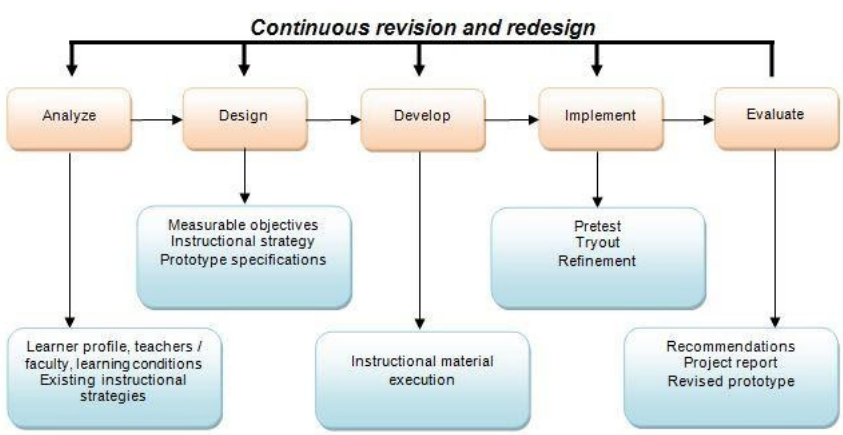

Figure 1. ADDIE Model by Watson (1981)

instructional material. It consisted of creating and organizing the actual instructional material that will be used by Fashion Design students and instructors in Zimbabwe for computer aided pattern making training. The researchers constructed and developed the package with the help of the previously identified media software programs and personal computer for computer aided pattern making and training. The instructional development process was a step by step construction of a Size 12 skirt block with narrations explaining each procedure. Both activities were simultaneously captured using the screencast-o-matic tool, and later edited using the VSDC video editor to add introductory titles. Continuous revisions were made at this stage to ensure a clear narration and precise development of the skirt block.

After the prototype has been developed, the implementation stage was to follow. Implementation stage refers to the actual delivery of the instruction. According to Cheung (2016), the stage can consume much time as it requires alternatively a pre-test first, working with a smaller group before distributing to a larger group of the target population. In this case the researchers pre-tested the material to a small group of students who were not part of the study participants.

Testing of the online instructional material

The online instruction was tested to 5 instructors and thirty students. The method consists of launching the CorelDraw; development of the step by step skirt size 12 basic block and analysis of the results with respect to the time, efficiency, and number of steps followed by the students and instructors participants.

Results

Selection of a computer aided software that can be applied in teaching and learning of garment pattern making

The results of the internet search and literature showed that there was very limited Fashion design specific open access software available for use. The open source pattern making CAD systems that were available were Seamly2D and Wild Ginger's Cameo v6. However, these two were compatible with and available for Windows 10, MacOS, and Linux which were not available among hardware provided at most polytechnic colleges and among students personal hardware. The researchers had to search for the general open access software which can be tailored for patternmaking and found Adobe illustrator and CorelDraw. CorelDraw was selected as vector graphic software with program that allows the user to create and manipulate images through commands, both geometric and mathematical. The rulers available in CorelDraw consisting of vertical and horizontal bars that are marked off in units were considered as best to accomplish pattern making with precision and accuracy.

Instructional material development process

The researchers identified a vector based program which may be of advantage in exposing the Fashion Design students to online learning of pattern making. Table 1 below illustrates the resources and programs which were used in this study for the development of the online instructional material for computer aided garment pattern making. The section also presents flat print of the steps showing computer aided

Table 1. Requirements for instructional material development

Requirements	Purpose
Computer hardware/PC	One of the major requirements which enabled the instructional material development. The researcher used personal computer for the development process.
CorelDraw x3	Vector based program containing tools used to develop the skirt block
Screencast-o-matic	For capturing the computer screen activity and the narrations by the researcher.
Mouse	A necessary tool for the development of a block pattern when using CorelDraw X3
Microphone	Device used by the researcher to convert the narrations into digital sounds.
VSDC	A software program which was used to edit video captured by screen-o-matic

garment pattern making through the development of skirt block. These were later used to develop the online instructional material.

Stage 1: Launching CorelDraw X3

To launch the CorelDraw X3, the following procedures were made:

- Click on the start menu of the task bar (at the bottom left corner of the screen)
- Move cursor and select CorelDraw X3
- Double click on CorelDraw X3 to display it.

When the CorelDraw is launched, the application window opens containing a drawing window. Although more than one drawing window can be opened, one can apply commands to the active drawing window only. The CorelDraw application window appears as in Fig. 2 with a description of its parts.

- *Window Title bar* - It displays the name of application / document (file name)
- *Menu bar* - Provides access to Corel Draw 12 mean commands
- *Tool box* - The tool box provides Coral 12 tools. These are the default tools.
- *Status bar* - Displays Status or mode information (object information)
- *The Drawing Window* - Actually you can draw anywhere but the drawing area shows the printable area. It also shows the size of paper you can print.
- *Ruler* - The rulers are used to measure the sizes of object. It also shows positions of objects. They are aligned vertically and horizontally along the drawing window edges.
- *Document navigator* - This enables you to add pages and also to see next or previous pages.
- *Colour Palette* - Displays default colours

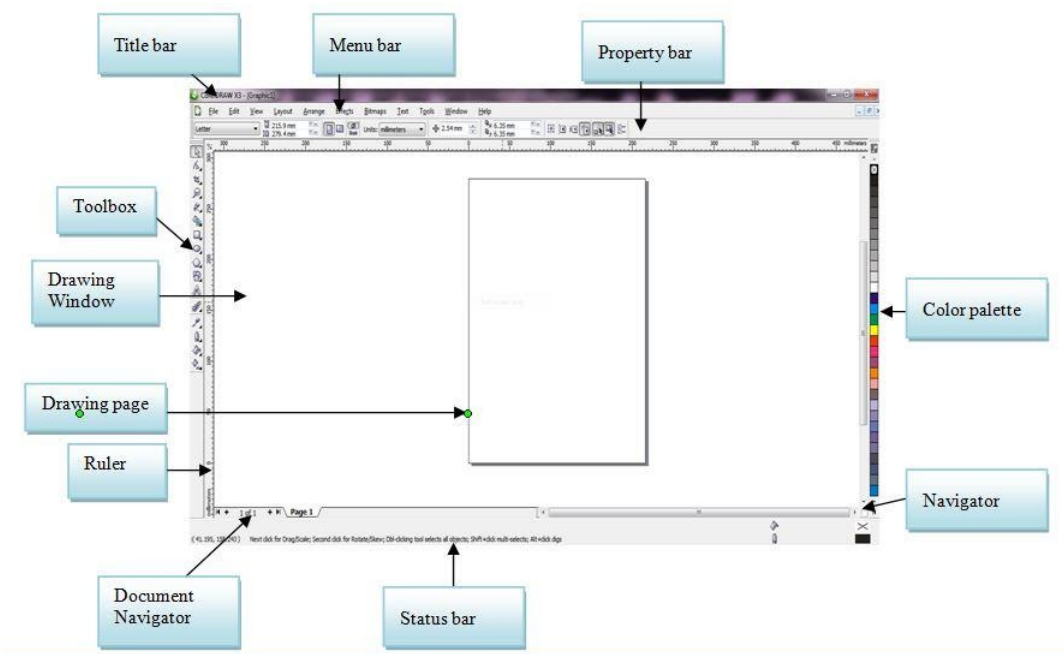

Figure 2. CorelDraw application window

Stage 2: Basic Size 12 skirt Block development with CorelDraw X3

CorelDraw X3 default tools which were used for the skirt development are described in the table 2 below. These tools were used for the construction of straight and curved lines with accurate measurements.

Table 2. CorelDraw default tools for skirt block development

DEFAULT TOOL	FUNCTION
Pick tool	To select construction lines or object
Shape tool	to reshape lines and moving nods or control points
Pen tool	To draw straight lines and perpendicular lines
Rectangle tool	To draw the outer line of the skirt block
Outline tool	To add the outline weight of the block
Text tool	To add titles and names of the block components

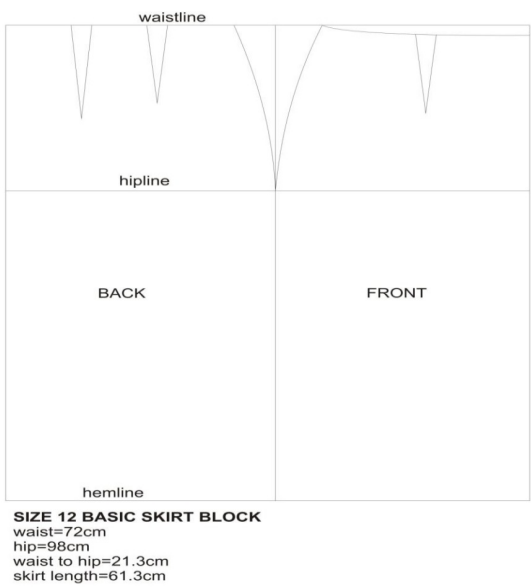

Figure 3. Size 12 skirt block preview

Figure 3 shows the preview of the final block which was developed using CorelDraw x3. The block contains back and front skirt block with detailed construction lines. The measurements which were used for the development of this block are; Waist= 72cm, Hip= 98cm, Waist to hip= 21.3cm and Skirt length= 61.3cm. The following steps were used to achieve the above outcome.

Stage2.1: Paper Size, Drawing Units and Guidelines for the Major Lines

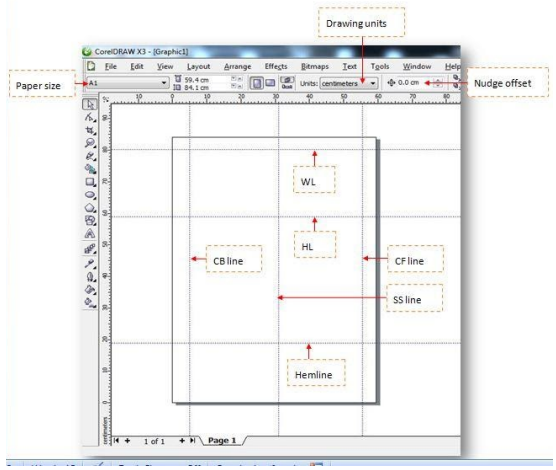

Figure 4. Pattern development stage 2.1

The skirt block development process began by changing the working paper size to A1, the drawing units to centimetres and nudge distance/offset to 0.0cm as shown in Figure 4. A1 paper size was used because of its size which accommodated a size 12 skirt block. The horizontal guidelines (waist, hip, hem guidelines) were positioned by moving cursor to the horizontal ruler or x-axis ruler, long press the mouse left key and dragged guides to the correct positions along y-axis. The vertical guidelines (CB, SS, CF guidelines) were also positioned by moving cursor to the vertical ruler or y-axis ruler, long press the mouse left key and dragged guides to the correct positions along x-axis. The construction line guides were positioned as follows:

- Waistline guide= 80cm of y-axis
- Hipline guide= 58.7cm of y-axis
- Hemline guide= 18.7cm of y-axis
- Centre back line guide= 5cm of x-axis
- Side seam line guide= 31cm of x-axis
- Centre front line guide= 55.5cm of x-axis

Waistline to hipline guide measured as waist to hip measurement; 80cm-58.7cm = 21.3cm. Waistline (WL) to hemline guide measured as skirt length measurement;

80cm-18.7cm= 61.3cm. From the centre back guide line to side seam guideline, quarter hip measurement plus 1.5cm ease allowance was measured. The centre back guide is located at 5cm of x-axis and side seam guide at 31cm of x-axis. From 5cm x-axis to 31cm x-axis, the measurement is 26cm (quarter hip =24.5cm plus 1.5cm ease allowance at the back= 26cm). From the side seam to centre front guide, quarter hip measurement 24.5cm plus 15cm ease allowance was measured, (55.5cm less 31cm = 24.5cm). The guidelines were carefully positioned by correcting the x and y co-ordinates at the property bar.

Stage2.2: Drawing the outer and inner construction lines

Second stage of the skirt block development was to draw the outer and inner construction lines. These construction lines include the (CB, WL, CF, hemline) outer construction lines and the inner construction lines (hipline, side seam line). Figure 5 illustrates the outcome of the second stage.

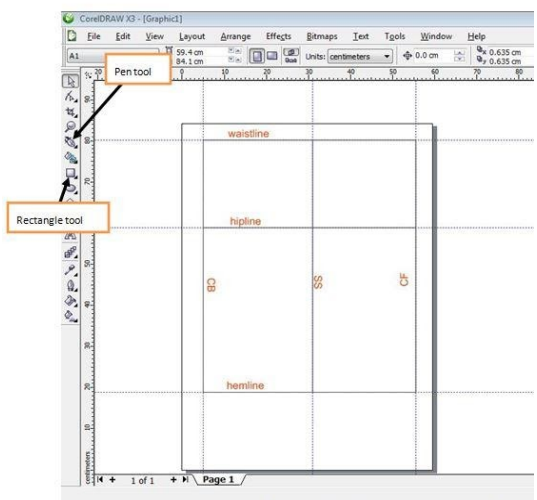

Figure 5. Pattern development stage2.2

As illustrated in Figure 5, the outer and inner construction lines can be seen in bold black line along the guidelines. Rectangle tool was used to construct the CB, waistline, CF and the hemline which are connected forming a rectangle shape. The hipline and the side seam lines were constructed using the Pen Tool.

Stage 2.3: Side Seams and Front Waist Shaping

At this stage, the back and front side seams, and the front waistline were shaped as shown in Figure 6.

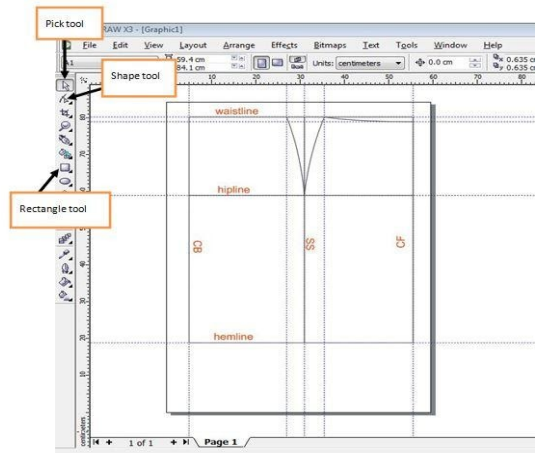

Figure 6. Pattern development stage2.3

Firstly, the guidelines for the back and front side seam shaping were marked. The guides were marked taking into consideration that the back block was having two darts whilst the front block had only one dart. The following calculations were made for the side seams and front waist shaping guides:

- Back side seam shaping guide was positioned at 27cm of x-axis which is quarter waist 18cm plus 4cm allowance for two back darts. From the CB line (5cm x-axis) to side seam shaping guide located at 27cm x-axis, a total of 22cm was measured.
- Front side seam shaping guide was positioned at 35.5cm of x-axis which is quarter waist 18cm plus 2cm allowance for the dart. From the CF line (55.5cm x-axis) to side seam shaping guide located at 35.5cm x-axis, a total of 20cm was measured.
- Front waist shaping guide was positioned at 78.7cm of y-axis which is 1.3cm below the waistline. From the waistline (5cm x-axis) down to 78.7cm of x-axis, a total of 1.3cm was measured.

The pen tool was used to draw the back and front side

seams, and the front waist. The lines were carefully converted to curves using the shape tool.

Stage 2.4: Dart Positioning and combining the construction lines

Allowance of 4cm was used for the two back darts, and 2cm was allowed for front dart. The inner back dart (located towards the CB line) is 11cm long and 2cm wide. The outer back dart (located towards the back side seam) is 10cm and 2cm wide. The front dart is 10cm long and 2cm wide.

As shown in Figure 7, guidelines were used to mark front and back darts allowances and the dart lengths positions. Rectangle tool was used to construct the darts, which were then shaped using the shape tool to give a tapered end. Guidelines were removed afterwards, after serving their purpose, and titles and dimensions were added as shown in Figure 7. The construction lines were combined using the combine tool and the outline width was changed to 0.25cm on the property bar.

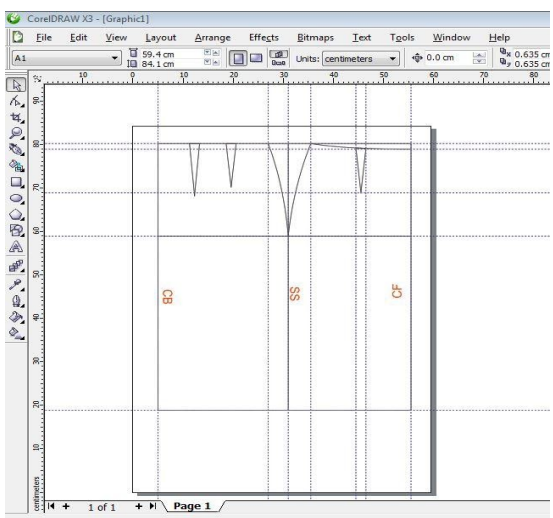

Figure 7. Pattern development stage2. 4

The title of the skirt block and measurements were added afterwards using the text tool. The skirt block and text added were grouped together using the group tool. A boarder line was added to demarcate the A1 paper size, which is necessary for printing, and the file was saved in PDF form.

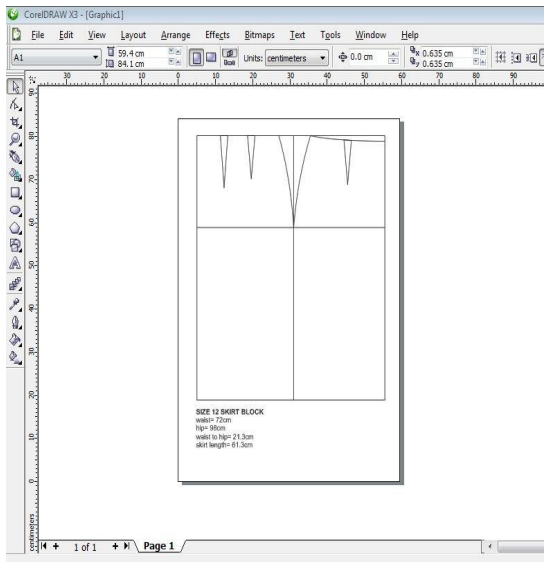

Figure 8. Preview of the completed skirt block.

Stage 3: Screen Capturing, Narration Recording and video editing

The development process of a size 12 straight skirt block was captured using the screencast-o-matic tool. The screen recording was accompanied by narrations which explained the pattern development process along with the screen recording. VSDC Free Video Editor was used to combine and edit the video.

Testing the instructional material (screen-cast)

The results of the testing showed that; when the screen cast was played to students, majority of them were able to develop the skirt size 12 basic block using the launched CorelDraw. The students could follow the step by step screen casts. Those who needed to play the earlier steps were catered for by replay and pause sessions. However, the software required well serviced hardware that can work efficiently. When the instructional tool was exposed to students they were also able to work manually to produce the skirt block. The speed at which the screen cast plays can be adjusted using the VSDC video editor. Therefore students needed personalized desktops to play the video at varying paces in-order to accomplish the task. Both instructors and

students had challenges in manipulating the CorelDraw tools to produce curved lines on the block.

Discussion and Conclusion

The results on selection of the software showed that there was very limited Fashion Design specific open access software available for use. The available open sourced pattern making CAD systems in form of Seamly2D and Wild Ginger's Cameo v6 could not be launched as these were not compatible with hardware provided at most polytechnic colleges in Zimbabwe and to students. This reveals the challenges of hardware experienced by most institutions in Zimbabwe as have been confirmed by Satiya (2017).

The findings revealed that CorelDraw was selected as it was easy to launch on most hardware found at the institutions. The CorelDraw served asalternativevector graphic software with program that allows the user to create and manipulate images through commands, both geometric and mathematical. The rulers available in CorelDraw consisting of vertical and horizontal bars that are marked off in units were considered as tools to accomplish pattern making with precision and accuracy. As such it was possible to develop garment block patterns using the alternative vector based program CorelDraw. The study found out that the creation of darts in the basic block was managed; however curved lines were difficult to create. While the CorelDraw can manipulate standard demands such as creation of new patterns from the rectangular drawing paper, it was noted that dealing with complicated pattern making tasks such as dart manipulation and grading could be through trial and error. As such an instructional material showing the development of skirt basic block was developed. The study also identified the screencast-o-matric tool as the effective tool for capturing the audio-visual activities of the skirt block development on the computer screen.

It was concluded that, although the Zimbabwe polytechnic education lack necessary resources such as licensed fashion design CAD software for pattern making training process, online based instructional tools such as screen cast showing computer aided pattern making through vector based programs can be developed to assist in exposing students to CAD concepts and help instructors implement remote online practical activities. The authors argue that this study can assist instructors, with challenges of acquiring subject specific educational software with instructions on how to make online instructional materials like screen cast for teaching CAD concepts using affordable and alternative software such as CorelDraw.

Limitations and further studies

The testing of the online based instructional material which involved delivering the screen cast was tested out in only three Polytechnic institutions among thirty students and five instructors which were conveniently selected; therefore the findings may not be representative of all the Polytechnic institutions in Zimbabwe and elsewhere.The researchers used alternative software CorelDraw which was compatible with the hardware available at the institutions and among students under study, the findings may not be generalized to institutions elsewhere but may be transferred to those with similar situations. The researchers, however, recommend that further researches could be done in order to evaluate the effectiveness of screen-cast material in assisting both pattern making instructors and Fashion Design students to teach and learn the computer aided garment patterns using CorelDraw.

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