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Improving work in garment design and production among secondary school students: A case study of Textiles Technology Design subject at Advanced Level in Zimbabwe

Improving work in garment design and production among secondary school students: A case study of Textiles Technology Design subject at Advanced Level in Zimbabwe

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Abstract
The purpose of the study was to find strategies for secondary school students in Zimbabwe to improve their work in garment design and production. Maximum variation sampling was employed to select 26 schools, whilst 52 students and 26 teachers were randomly and conveniently selected for the study respectively. A time study was done for a basic skirt to estimate the time taken to complete specified operations in design and production. Data was analysed through descriptive statistics and ANOVA. The result showed that the observed average time to make a skirt when students were in their normal school environment was 2014 minutes. Further, the results showed that the average time taken in an improved environment was 449 minutes and 167 minutes using the whole-garment and sectionalisation methods of production respectively. It was concluded that the work output of secondary school students can be improved from a minimum of one to a maximum of 6 clothing items per term within the curriculum time provided and in a well-resourced learning environment. It was concluded that the whole garment method of production would be the best to use in schools as students would need to practise all garment design and production operations to acquire the necessary skills useful to start their own tailoring work or for employment in the clothing industries. The findings imply the Ministry of Education in Zimbabwe on the transformative impact that comprehensive improvements in the practical learning environments could have on improving the work output of students in garment design and production.

Introduction

In Zimbabwe, secondary schools' Textiles Technology and Design (TTD) subject is designed to give a production-oriented learning experience (Coutler, 2023). It focuses on studying the use of textile materials, clothing design, construction, and business enterprise. According to the Curriculum Development and Technical Services (2015), the main objectives of the TTD subject are that upon completing the four years of Ordinary Level and two years of Advanced level studies, the students should be able to explore the creative use of materials, techniques and technologies to design, draft patterns and construct apparel and clothing for different functions and figure types. Additionally, the subject equips students with the knowledge and skills required to work in the textile and clothing industry, start up their small-scale clothing enterprises, introduce their designs and patterns on the market or pursue further studies in related fields based on the skills acquired in school, (Charapa & Mberengwa, 2021).

One of the significant practical sections of the TTD subject is garment design and production, where the emphasis is on the creative aspect of designing, pattern making, and clothing production. However, studies by Charapa and Mberengwa (2021) reveal that the work produced by students in garment design and production in secondary schools is unsatisfactory compared to the expectations in the world of work. One of the main reasons for this is their substandard operations compared to the clothing manufacturing industry. The substandard garment design and production operations are characterised by poor learning conditions, lack of adequate resources, poor methods and work standardisation (Mupfumira & Nyaruwata, 2021). To confirm this, Shoko, Dapira and Mpala's (2022) study in secondary schools in Zimbabwe found that 62.5% of the learners took 18 months, 25% worked in 14 months, and 12.5% worked over six months to complete a clothing item.

After completing the Advanced level, it is intended that through learning garment design and production, the students should be able to run their businesses or attain employment in the textiles and clothing sector with minimum training and supervision. However, renowned academics have bemoaned that the students' work output is not well defined for industrialisation. They will not gain adequate skill by producing one clothing item in over six months (Chuma, 2022). In the same vein, Chirapa and Mberengwa (2021) earlier found that skills and knowledge acquired by A'level students are inadequate as they were not exposed to essential skills in garment designing, pattern making, and construction, which are critical for business or employment in the clothing industry. Studies by Shoko, Dapira and Mpala (2022) echoed the same sentiments that students were not being exposed to adequate practical skills and recommended that the number and types of garments made by students be increased to enable the students to gain a variety of skills. However, this recommendation of Shoko et al. (2022) was based on qualitative assumptions without any time study to determine if improving work output within the provided curriculum time would be possible. The TTD syllabus specifies that the time allocated to learning the subject is 8– 10 for 35 - 40 minutes per week. The practical lesson is expected to have a minimum of 280 minutes and a maximum of 320 minutes per week. Although the Curriculum Development and Technical Services (2015) in Zimbabwe purports that this total of 320 minutes per week afforded students ample time to work and complete one garment per term and have time to concentrate on other components of the syllabus, Chirapa and Mberengwa (2021) bemoaned that some students spent a lot of time on one operation and at time fail to finish their garments well for assessment or ready for functional use. This study finds it prudent to undertake a fieldwork assessment to establish strategies to improve work output in garment design and production among Advanced-level students.

The textiles and fashion industry in Zimbabwe

Zimbabwe's textiles and fashion industry has a long history dating back to the colonial era when the country was a major cotton producer. The sector continues to play a major role in the economy as one of the key manufacturing sub-sectors in Zimbabwe. The textile industries, such as Spin and Weavers, focus on processing cotton fibre to make fabrics, and some of the raw cotton is exported (Chisosa & Chipabwa, 2018). The apparel and clothing industry is characterised by various original equipment manufacturers and original design manufacturers (Chuma, Chipambwa, & Komichi, 2018). The industry's diverse product range covers men's, ladies', children's, casual, handcrafts, and contemporary fashion designs that blend traditional and modern styles (Islam, 2022). Today, the industry is relatively small and faces several challenges, including competition from imported goods, high production costs, and a shortage of skilled workers. However, many talented designers and manufacturers are still working to revitalise the industry. The Ministry of Education in Zimbabwe has reviewed and designed many technical subjects in secondary schools, such as textile technology and design, to produce production-oriented students who want to revitalise the textiles and fashion industry.

The education system in Zimbabwe

The education system in Zimbabwe consists of primary, secondary, and tertiary education. The primary level is a seven-year cycle from grade one to grade seven. Secondary school education comprises a four-year ordinary-level cycle, which starts in Form One (Grade 8) to Form 4(Grade 11) and a two-year advanced cycle from Form 5 to Form 6 (Ministry of Education, Sports and Culture, 2001). The Ordinary level cycle covers a broad curriculum, and different schools offer different subjects such as Mathematics, English, Science, Shona, Geography, Textiles Technology and Design, Wood technology, etc. At the end of the four-year cycle, the students sit for the Zimbabwe General Certificate of Education Ordinary Level (O'Level) examination, where each student is expected to pass at least five subjects. Progressing to the advanced level (A'level) is based on performing ordinary-level examinations. At A-Level, students major in at least three subjects based on combinations such as pure science, commercial, and arts and technical subjects. The choice of A-level subjects is usually based on the student's long-term career goals. Like primary education, the secondary school curriculum is centrally designed by the Curriculum Development and Technical Services in the Ministry of Education in Zimbabwe. This unit designs the syllabus and teaching materials for the various subjects in Zimbabwe.

Textiles Technology and Design (TTD) education in Zimbabwe

TTD is one of the technical subjects of secondary school education and is offered in public schools from O'level to A'level. The TTD subject has undergone modifications and reviews as a breakthrough for its viability as a technological learning area in Zimbabwe's curriculum for secondary schools (Sibanda & Young, 2020). The government considered the findings reached by the Nziramasanga Commission of Inquiry into the Zimbabwean education system to transform the structure and curriculum to adequately meet the evolving developmental aspirations (Katsande, 2016). Out of the Nziramasanga inquiry, the Ministry of Primary and Secondary Education decided to change the educational curriculum taught in schools and constructed its vision of a radical philosophy of education, the thrust of which was Education with Production (EWP). The EWP sought to make the school experiences meaningful and worthwhile regarding real-life activities outside of school (Nyathi & Shonhiwa, 2020). The EWP aimed to create a dynamic link between work and school through enhancing productivity. According to (MoPSE, 2015), the government made stakeholder consultations which spanned two years from 2014-2015. Technical education was changed to technology education (now called Design and Technology). Among the subjects that transformed was TTD, formerly known as Fashion and Fabrics. This subject equips students with the knowledge and skills required to work in the textile and clothing industry or pursue further studies in related fields. Despite efforts to improve the TTD subject, it's not competitive enough within the rapid pace of globalisation as expected (Charapa & Mberengwa, 2021). The main reason is their substandard operations compared to the clothing manufacturing industry. The TTD subject in Zimbabwe comprises major components, which include textiles science, garment design and production, business, and enterprising (Curriculum Development and Technical Services, 2015). Assessment is done through continuous and summative assessments that entail the syllabus's theory assignment and practical components.

Methods Used for Garment Production in the TTD Subject

Garment production follows an organised process that helps to plan the workflow and produces a complete clothing item (Rama, 2020). Rama explains that in all production products, there are different ways to organise the actual production of garments according to the type, amount and diversity of products to be made. The production quantity determines the type of production system in garment construction. According to Rama (2020), the garment production system depends on the affordability, equipment, number of tasks, curriculum policy and personnel training. Sizwe and Charles (2017) explain the process of garment construction, which begins with detailed specifications, followed by design development, pattern design, laying and cutting, fusing or pressing, sewing, finishing and quality control. Sizwe and Charles (2017) also recommended

quality management, close supervision, adequate equipment and workflow guide, and adequate clothing manufacturing operators for quality production.

The first garment production method is the individual production or make-through system, sometimes called the whole garment system. This is a traditional method where one person assembles the entire garment (Mazharul, 2022). Each product is made only once or in very small quantities. The system requires highly skilled, experienced operators and efficient machinery. The same person does pattern making, fabric cutting, and the final finish of the garment.

The second method is the sectionalisation or bundle; more skilled operators are needed to sew garment parts from beginning to end. This system has a small influence on personnel changes and easy style changes. Complete all the operations for every garment component requires more versatile operators. When one operation ends, it is passed on to the next (Ahmad., Miskon, Alabdan, & Tlili, (2020). It was discovered that some schools opt to eliminate such learners from participating in the line (Satiya, 2017). The last system is mass production, where large quantities of identical products are made continuously. The high utilisation of machinery and labour allows a high level of automation and specification needed to implement and develop the process control charts for recording all activities (Muhammad et al., 2022).

In a study (Tilahun, 2020) on the optimisation of the production process in sewing work for Ethiopia, it was concluded that sewing should improve in quantity and quality to maintain the competitiveness and validity of the enterprise. This can be achieved by deploying improvement techniques to enhance the use time and improve the operator's performance. A work-study is carried out in the sewing section to identify sewing faults and reworks to eliminate them, save time and cost, and improve product quality and quantity (Beloor, Shekar, & Hegde, 2020). Nabi, Mahmud and Islam (2015), in their study on improving sewing section efficiency through the utilisation of worker capacity by time study technique in Bangladesh, concluded that the sewing section can be improved through time study technique as Standard Minute Value (SMV) can be calculated for all operations and establish each operator's capacity and work challenges. They emphasise the significance of time study in improving the effectiveness of the sewing section.

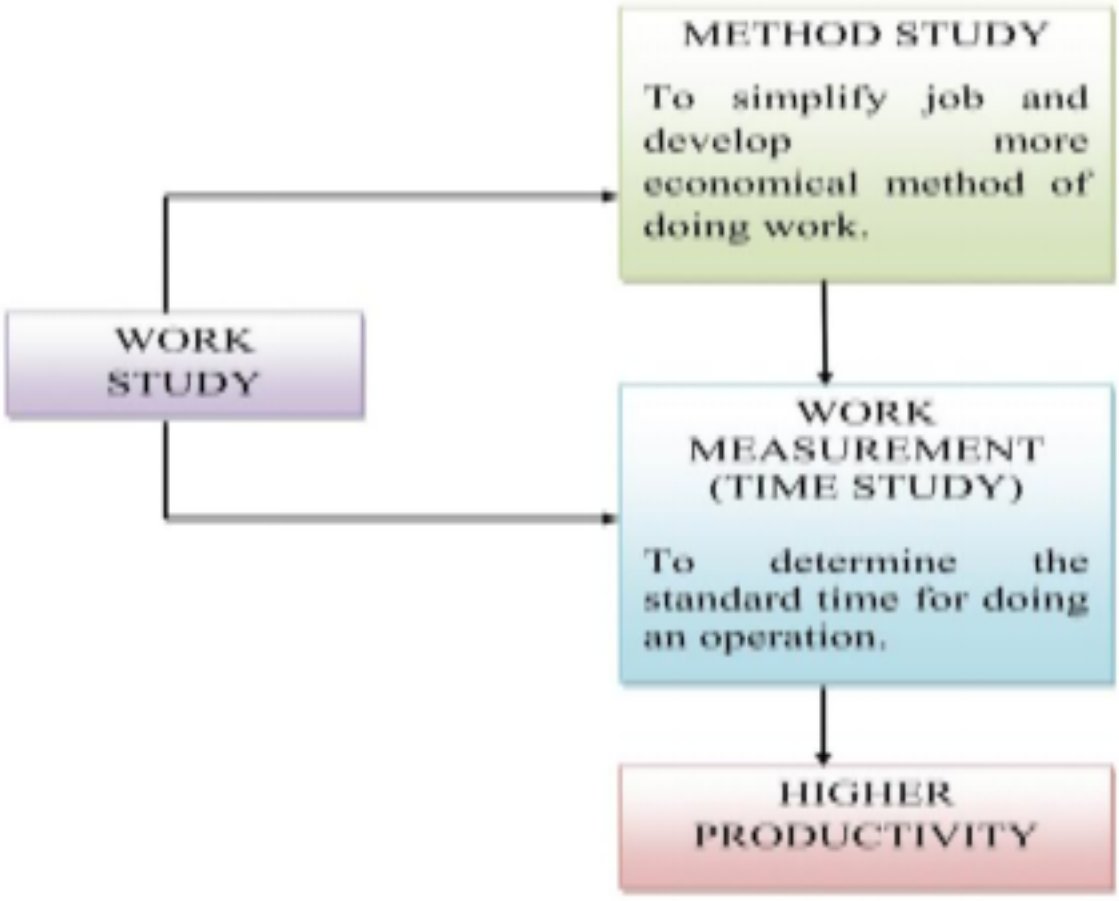
The conceptual framework that guided the study

The study adopted concepts of the work-study framework to help frame the method for studying strategies to improve garment design and production work among secondary school students in Zimbabwe. Many companies have used work study to improve productivity. Linking work-study, garment design, and production in schools could help enhance students' work output (Chisosa & Chipambwa, 2018). According to Sigh (2016), a work study solves operational challenges in China and South Africa. In China, it has been attributed to the growth and success of manufacturing and the fusion of work-study into their school curriculum. In the Chinese view, work-study serves an ideological purpose and meets vocational needs in secondary school learning (Khan, 2014). The work-study aims to examine the method and work measurement currently used and then find ways of simplifying or modifying the operation (Sigh, 2016). Work measurement is the standard time for an activity specific to completing an operation using the predicted method with provisions for delays beyond the student's control (Rao, 2023). The main objective for work measurement is to find alternative methods to enhance work output in garment design and production to help students be exposed to a variety of practical tasks, which might, in turn, improve their acquisition of skills in producing quality clothing items. In this study, the technique of work measurement through time study was employed. The American National Standard Institute (2017)) stated that time study consists of careful measurement of the task with a time measuring instrument, adjusted for any observed variance from normal effort or pace and to allow adequate time for such items as foreign elements, unavoidable or machine delays, rest to overcome fatigue and personal needs. The exercise of timing different operations is done to calculate a garment's Standard Allowed Minute (SAM) or SMV (Standard Minute Value). The Standard Allowed Minute of the task or operation is calculated as *basic time (observed time) + operator rating +*

relaxation allowance + additional allowance (e.g. bobbin replacement). Then, the time for each operation will be recorded in a time study sheet for the pre-decided number of cycles of the task. After removing the extreme fluctuation, the average time for each task is separately calculated to get the basic time (Chowdhury, et al., 2022).

The TTD subject curriculum specifies the standard time for the practical continuous assessment, which is 900 minutes per week. This serves as the standard time for the subject at implementation, which can be used to estimate the number of garments expected per term. However, as previously noted by researchers such as Chirapa and Mberengwa (2021), some students spent a lot of time on one operation and sometimes failed to finish their clothing items well for assessment or ready for functional use. Hence, there was a need to conduct time studies on garment design and production in secondary schools to determine if the work could be improved.

Figure 1: Conceptual framework that guided the study adopted from (Castro, 2022)



Research Methodology

A case study of Zimbabwe secondary schools offering TTD subjects at A'level was conducted. The study employed a time study experiment to study garment design and production operations among secondary school students. Non-probability sampling techniques were used to select participants for the study involving teachers and students studying TTD subjects at the Advanced level. This level of students was selected because they had knowledge and skills in garment design and production because they had studied the subject at the Ordinary level. Maximum variation sampling was employed to select 26 schools that varied along different criteria, that is, two schools from each province, one with the highest number of students and another with the lowest number of students who were registered for their lower sixth form (Form 5) for the ZIMSEC examinations between 2022-2023. Convenience sampling was used to select one teacher teaching TTD subject at an advanced level from each selected school, totaling 26 for the study. Simple random sampling was used to choose two students from the selected schools in Zimbabwe, totaling 52 for the study.

Time study experiments were conducted to establish strategies to improve garment design and production work among secondary school students in Zimbabwe. Three study experiments were conducted in which students designed and produced a basic skirt. The first-time study estimated the student's time to design and construct a skirt using the resources available within their schools.

The second study was done in an improved workshop using the whole garment method of production. Each student was provided with all the necessary resources laid out correctly for all operations, from design to finishing the skirt. The time taken for each skirt production operation was recorded and analysed.

The third study was done using the sectionalisation method of production, where the 52 students were grouped into four lines, and each student worked on an operation. The standard industrial processes operational chart was prepared to guide the setup, and all recommended equipment was listed and provided according to the TTD subject syllabus. The teachers assisted in setting up the experiment and recording the time. Each group had 13 students, and each specialised in an operation until it was completed for all skirts. The analysis of major sections of making a basic skirt was done manually, and time was recorded with the help of a stopwatch. Pattern drafting, laying and cutting out were done in bulk for 26 skirts for each group, and the time taken for these operations was only included in the first skirt. After that, production was recorded hourly with a target of 26 skirts per group in 5 hours. The results were analysed through SPSS software to get the minimum and maximum time for each operation. The results of the time studies are presented in the next section.

Results and Discussion

The demographic profiles

Table 1: Demographic profile of the respondents

Variable	Specific variable	Frequency	
		Teachers	**Learners**
Gender	Male	5	7
	Females	21	45
	Total	**26**	**52**
Age	16-17		5
	18-19		47
	19-25		0
	25- 30	3	
	40 -50	18	
	Above 50	5	
	Total	**26**	**52**
Experience	3 years	2	
	4-6 years	4	
	7-10 years	5	
	Above 10 years	15	
	Total	26	-
Qualification	Diploma	18	
	Degree	6	
	Above Degree	2	
	Total	**26**	**-**

Table 1 above shows that the TTD subject is female dominated by 21 and 45 teachers and students, respectively being females, whilst five teachers and seven students were males. This might show that most females prefer teaching and learning the TTD subject than males. Most students were between the ages of 16 and 18, which implies maturity for engagement in the improved TTD curriculum, and the age bracket between 16 and 18 is the best group to train in technological operations for future development in Zimbabwe. A similar pattern was also noted by Coulter, (2023), where the researchers found that females dominate the TTD subject.

Estimated time required by students to produce a specified clothing garment

This objective sought to determine the time students spend designing and producing a skirt using resources available in their schools. The results are presented in Table 2.

Table 2: Time study when the participants were working with available resources in their schools

Observed Time taken to design and construct a skirt

0peration Name	N=52	Minimum time	Maximum Time	Average Time	Standard Deviation
1.Sketching the design	52	120	322	221.61	64.157
2.Making patterns	52	112	248	184.67	51.891
3.Laying out	52	30	167	110.24	46.802
4.Cutting out	52	30	96	59.89	25.726
5.Sewing darts	52	30	36	33.00	101.263
6.Working on seams	52	122	62	213.48	95.736
7.Attaching Zip	52	119	370	234.41	124.560
8.Prepare Waistband	51	145	254	188.55	28.269
9.Attaching Waistband	52	112	368	233.09	126.470
10.Button and buttonhole	52	34	257	143.91	94.408
11.Hemming the skirt	52	15	245	114.46	104.765
12.Finishing	52	45	119	80.5	168.313
13. Packaging	52	15	55	35	148.567
Valid Total	**52+**	**929**	**3099**	**2014**	

Table 2 above shows considerable variability in the operational time for each operation, as indicated by the standard deviations. Some tasks have larger spreads in their times, suggesting potential inefficiencies or inconsistencies in the time taken among students. The average domain for making the skirt had a maximum of 3099 minutes and a minimum of 929 minutes in garment design and construction production. When teachers were asked how long students take to finish a garment, one teacher said, "*Students take their time, and most of them hardly finish a full garment in a term" (P6).* Another teacher said*: "The students come for extra time to complete their tasks. They can do at least one item per term with extra time" (P12).* Some schools found that some students waited for equipment while others hung around, not doing anything and holding their work aimlessly, leading to a longer time to complete tasks.

Based on the data found in this section and the calculation of the average time of 2014 minutes, students were slower than expected regarding the curriculum plan time. According to the syllabus assessment objectives, the average time to make a clothing item was 900 minutes (TTD syllabus, 2015-2022). This finding of 2014 minutes showed a 123.8% increase from the curriculum plan time. The students could not finish even one clothing item per term within the stipulated curriculum time. The finding of this study extends to inadequate equipment and a sub-optimal learning environment in schools that contributed to slower and less productive work in garment design and construction (Chikoore & Museva, 2014). Thus, sharing insufficient and outdated equipment can impede the efficiency of operations, leading to time-consuming processes and delays in completing tasks. These findings corroborate those of Sithole's (2021) study, which attested that schools needed more resources as they could not finish most of the garment design and construction work.

An effective method for secondary school students in Zimbabwe to improve their work in garment design and production

This objective sought to find effective methods for secondary school students to improve their work in garment design and production. Students were recorded recording the time taken to design and produce a skirt using the whole garment and sectionalisation methods. The results are presented in the tables below. The time taken using the different methods was compared.

Table 3: Time study in improved environment when using the whole garment method

Basic Skirt	**Time taken to complete an operation in minutes**				
Operation Name	**N=52**	**Minimum time**	**Maximum time**	**Average Time**	**Standard Deviation**
1.Sketching the design	52	30	64	47.50	0.894
2.Making patterns	52	23	60	46.50	0.683
3.Laying out	52	15	34	24.33	1.211
4.Cutting out	52	30	45	38.83	1.366
5.Sewing darts	52	10	30	20.50	0.730
6.Working on seams	52	20	37	29.67	1.483
7.Attaching Zip	52	45	62	54.50	1.366
8.Prepare Waistband	52	15	33	24.75	0.930
9.Attaching Waistband	52	30	45	38.83	2.338
10.Button and buttonhole	52	15	33	24.75	0.683
11.Hemming the skirt	52	15	45	25.58	0.930
12. Finishing	52	10	18	14.0	0.683
13. Packaging	52	10	14	12.0	0.365
Total	**52**	**268**	**530**	449	

As shown in Table 3, the participants took an average of 449 minutes to complete a skirt in the improved setting using the whole garment method. The standard deviations are generally lower, indicating less variability in the time taken for each task. In almost every task, the meantime has decreased significantly after the improved conditions. This showed a decrease of -50.1% from the curriculum plan time. This means that when using the whole garment method of production, students can make 3 to 6 garments within the provided curriculum time. The decrease in time taken to finish the skirt might be attributed to the improvements made in terms of the provision of equipment resources for each participant and teacher supervision. This method of production had a positive impact on reducing operational times and increasing consistency across tasks.

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Table 4: Time study after improved learning environment using the sectionalisation method

Skirt 1	**Time taken in minutes**					
Operation Name	**Line 1**	**Line 2**	**Line 3**	**Line 4**	**Mean-time**	**Std. Dev.**
1 Sketching the design	30	32	30	32	30.8	0.251
2. Making patterns	23	25	24	25	24.2	0.373
3. Laying out	15	15	13	17	15.2	1.180
4. Cutting out	32	30	30	32	30.4	1.143
Total time 26 skirts (1 skirt)	100(3.8)	102(3.9)	107(4.1)	106(4.08)	104(4.15)	0.341
5.. Sewing darts	10	10	10	12	10.4	0.730
6. Working on seams	22	18	21	22	20.4	1.483
7. Attaching Zip	43	47	45	47	45.6	1.366
8. Prepare Waistband	16	18	15	17	16.6	0.930
9. Attaching Waistband	32	25	30	30	29.8	2.338
10. Button & buttonhole	15	13	14	15	14.2	0.683
11. Hemming the skirt	16	16	14	15	15.6	0.930
12. Finishing	10	10	11	9	9.8	0.683
13. Packaging	5	5	5	5	5.2	0.365
Total Time for 1 skirt	**169**	**162**	**165**	**172**	**167**	

Table 4 shows the time taken after an improved learning environment using the sectionalisation method. The data shows that the minimum and maximum times for the first skirt included all the sections from pattern development to cutting, which was done for 26 skirts. The average time taken to make the first skirt was 167 minutes. This was a 74.1% decrease from the observed school operational time used to make a skirt. Additionally, the standard deviations were generally lower in the first skirt. Hourly production from each line for the remaining skirts is presented in Table 5 below.

Table 5: Hourly Operations Report for sectionalisation method by participants

		Skirt 1	**1hrs**	**2hrs**	**3hrs**	**30min**	**4hrs**	**5 hrs**	**Total time taken**
Line 1	Skirt Quantity	1	4	9	14	**A**	19	24	
	Minutes Worked	169	229	289	349	**L**	409	469	469
Line 2	Skirt Quantity	1	6	12	18	**L**	23	26	
	Minutes Worked	162	222	282	342	**O**	402	462	462
Line 3	Skirt Quantity	1	5	10	15	**W**	20	25	
	Minutes Worked	165	225	285	345	**A**	405	465	465
Line 4	Skirt Quantity	1	4	6	10	**N**	15	20	
	Minutes Worked	172	232	292	352	**CE**	412	472	472
Average skirts /time taken								**23**	**467**

Table 5 shows the hourly operations report for the sectionalisation method by participants. The data shows that students produced an average of 23 skirts in 467 minutes. The findings above reveal that the production time decreased after the first skirt in the sectionalisation method. More skirts were produced and recorded at hourly intervals, and the calculations revealed that students could make an average of 1 skirt in 20 minutes. This highlights that the provision and layout of adequate machinery have a positive impact on reducing operational time.

The quality of the skirts produced by the participants during the time study

To analyse the quality of the operations, all the skirts produced during the time study were analysed in terms of the correct procedure, stitchery, neatening, and evenness of each operation. Only those operations that presented challenges were thoroughly analysed. Operations such as zip insertion, attaching waistbands and making buttonholes were unevenly done by some students. Broken stitchery was noted on stitching lines of zips on 32 of the skirts during the sectionalisation method of construction. When asked about zip insertion, one of the participants had to say, '*l find zip insertion quite challenging as l was worried about my time to finish the operation before the next skirt (L21).* The buttonhole operation was not evenly done as some bar ends were too wide, and the stitchery was broken. This showed that these operations need much attention during production and more operational time.

Although much focus was on improving work output within the curriculum time provided, the garments' quality was compared. The findings showed that some of the skirts constructed by students during the sectionalisation method of production had poor workmanship, suggesting that students were more concerned about finishing than making a correct operation. Even though the sectionalisation method has had a better positive impact on reducing operational time, it would not be the best method to recommend in schools as students would need to practise all operations to acquire the necessary skills for garment design and production useful to start their own tailoring work or employed in the clothing industries.

Comparison of a number of skirts produced according to curriculum plan time in an improved environment using the whole garment and sectionalisation methods.

Calculation of time taken to make a skirt

Maximum curriculum time for a skirt= 900 minutes

Average time observed in school operation= 3099 minutes + 929 divided by 2 = 2014 minutes

Average time for the whole garment method= 268 minutes+ 530 minutes divided by 2 = 449 minutes

Average time for the sectionalisation method= 162 minutes + 172 minutes divided by 2 =167 minutes for 1 skirt

Time taken for 23 skirts using sectionalisation method= 462 minutes +472minutes/23=467minutes

Time for one skirt =467minutes /23=20minutes

Calculations for the number of skirts that could be produced per term

Number of skirts = Total time allocated per term divided by the observed time.

Table 6: Summarised table comparing the time and the number of skirts that can be produced using different methods

Number of periods	Time allocation per period	Total time per term	Curriculum plan time per garment(/minutes)		Average observed time in school per garment		Average observed time using whole garment method		Average observed time using sectionalisation method	
			Minutes	*Number of garments*	*Minutes*	*Number of garments*	*Minutes*	*Number of garments*	*Minutes*	*Number of garments*
4	35	1680	*900*	*1.8*	*2014*	*0.82*	*449*	*3.74*	167	10
4	40	1920	*900*	*2.1*	*2014*	*0.9*	*449*	*4.27*	167	11
6	35	2520	*900*	*2.8*	*2014*	*1.3*	*449*	*5.61*	167	15
6	40	2880	*900*	*3.2*	*2014*	*1.4*	*449*	*6.41*	167	17

Table 6 shows that more skirts were produced using the whole garment and the sectionalisation method of production. The comparison of the skirts produced before and after time study shows that work output among students can be improved from producing less than one garment to six garments when using the whole garment method and to an average of 17 garments when using the sectionalisation method per student per term within the provided curriculum time. This significant increase in work output was attributed to the improvement in resources added to the practical learning environments. This highlights the importance of schools addressing key areas such as providing adequate resources, supervising students, and creating a conducive, practical working environment with well-laid-out equipment and machinery. Addressing these factors makes it possible to increase work output in garment design and production, enabling students to acquire skills useful in the textile and clothing industry.

Conclusion

Based on the study's findings, it was concluded that the work output of students can be improved from a minimum of 1 garment to a maximum of 17 garments within the curriculum time provided and in a well-resourced learning environment. Also, the whole garment method will be the best in schools as learners must practise all production operations to acquire the necessary skills to start their tailoring work or be employed in the clothing industry. These have implications for the Curriculum Development and Technical Services in Zimbabwe and schools, as well as the need for extensive improvements in the learning environments and the provision of modern equipment to improve the work output of students in garment design and construction components. As this study was conducted with only one stream of students, it may serve as a basis for other preceding cycles of studies that can be done to find a standardised time for each operation in garment design and construction in secondary schools in Zimbabwe.

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