

Coverage, Placement and Impact of Quality Control and Assurance on Quality of Products in Zimbabwean Polytechnic Clothing and Textile Production Units

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Abstract: This study sought to establish the coverage, placement and impact of Quality Control and Assurance on Quality of Products in Zimbabwean Polytechnic Clothing and Textile Production Units, using the qualitative approach. The population comprised of 103 Clothing and Textiles National Diploma students and 27 lecturers from three polytechnics. Stratified sampling was used to select 32 ND students and 6 lecturers who participated in the study. The study used a questionnaire, FGD and interviews as sources of data. Data was analyzed through the thematic approach. The study established that the component of Quality Control and Assurance contained very important aspects of quality management issues. The quality control component had a positive impact on the quality of products produced in the polytechnic CTPUs as it equipped participants with skills and competences required to produce high quality products that satisfy customers. One of recommendations is that the Ministry of Higher and Tertiary Education, Innovation Science and Technology through the Higher Education Examination Council should reconsider the course structure and placement of Quality Control and Assurance component in the Clothing and Textile curriculum. The fundamentals of quality control in garment industry should be taught at National Certificate level as it can be a terminal course for those who do not wish to advance to National Diploma level.

Keywords: Clothing and Textiles; polytechnic; Production Unit; Quality Control; impact.

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Introduction

Polytechnics in Zimbabwe offer Clothing and Textile courses from National Certificate (NC) to Higher National Diploma (HND). The course curricula aim at producing designers, technologists and managers with knowledge, skills and attitudes required in the clothing and textiles industry (Ministry of Higher and Tertiary Education, Innovation, Science and

Technology Development, 2019). With the introduction of production units in polytechnics, students are exposed to industrial practices and technologies before and after they go for work related learning which in polytechnic education is referred to as On the Job Education and Training (OJET) (Satiya & Chiweshe 2017). Previously, students would wait for OJET period to get an

understanding of the basic skills for every stage of production, the operation functions of the production process, equipment and production management (Nguku, 2012; Mupfumira & Mutsambi, 2020; Donko et al., 2014). Currently the ministry has redesigned curriculum to Education 5.0 which demands that tertiary education does not just teach, do research and community service, but it also innovates and industrialize Zimbabwe. Polytechnics are expected to produce quality goods and services that will act as a powerful catalyst for the national transformation.

OJET gives students the opportunity to practice in real life situations what they would have learnt at college, making learning more realistic. To reach this target, some polytechnics in Zimbabwe attach some of their students at the Clothing and Textiles Production Units (CTPUs) whilst others send their students to relevant clothing industries for a period of 10 to 12 months. Globally, Clothing and Textile training institutions implement work-based learning to give the students a feel of how the clothing industry operates. In Germany and the United States, work-based learning is a major part of the curriculum in clothing, textiles and apparel training institutions (Mosomi et al., 2022).

South Africa improved the clothing and textile training quality using portfolio-based learning that inspires trainees to work on real life projects in the clothing and textile industry and nurtures

entrepreneurship, creativity and problem solving skills. In Kenya, clothing and textile students spend four months on industrial attachment which is not enough to learn in a situational environment to adapt to the business and learn its working process (Mosomi et al., 2021). Furthermore, in the Kenyan clothing and textile training institutions, outdated training and delivery methods, maladaptive and non-modernized syllabus in the colleges and universities, low collaboration between schools and training leaders and lack of structured internship and apprenticeship programs were found to have affected the clothing and textile training quality and investment in the industry (Mosomi et al., 2022, p. 28).

At National Certificate level, students in Zimbabwe do not have a component dedicated for quality control but they have a topic of quality management in general even though they come across quality issues mostly in core components which include Garment Design, Pattern Making and Industrial Sewing Techniques and Clothing Factory Management and Operations. The National Diploma (ND) level is a three year course comprised of ND1 (pre-OJET) ND2 (OJET) and ND3 (post-OJET). In the ND2 level, students spend time doing the OJET for the whole year as indicated in table 1 which shows the general structure of the clothing curriculum in Zimbabwean polytechnics.

Table 1: Clothing and Textile curriculum in Zimbabwean Polytechnics

SN	National Certificate (1 year)	National Diploma 1 (1 st year)	National Diploma 2 (2 nd year)	National Diploma 3 (3 rd year)
1	Industrial Sewing Techniques	History of Fashion	OJET	Garment Design
2	Industrial Pattern Techniques	Advanced Textile Technology		Clothing Factory Management and Operations
3	Garment Design	Garment Construction		Human Resource Management
4	Textiles Technology	Research Methods		Quality Control and Assurance
5	Clothing Factory Management and Operations	Advanced Pattern Making and Grading		Principles of Purchasing and Supply Management
6	Project	Principles of Marketing		Computer Applications
7	Basic Communication			Project
8	Fundamentals of Information Technology			
9	Entrepreneurial Skills Development			
10	National Studies			

During ND2 OJET period, learners are expected to have a conducive environment to put into practice the acquired knowledge and skills on quality management. At ND3 level, students have a component called Quality Control and Assurance where they are taught the theory and practice of TQM practices. The ND students participate in Clothing and Textiles Production Units (CTPUs) that are at their institutions either as part of the learning infrastructure or separated from the learning infrastructure (Satiya & Chiweshe 2017). ND students produce clothing items under the supervision of lecturers, mostly Personal Protective Equipment and clothing for their institutions and for some external customers. Usually, the ND2 on OJET and the ND3 post-OJET students are the main participants in the CTPUs. Hence, the need for them to have a better understanding and acquisition of quality control and assurance skills before they produce clothing items for customers.

A closer analysis of the placement of the Quality Control and Assurance component in the third year after students have completed OJET period means that the trainees would have spent a whole year in the industry where they are supposed to be putting theory into practice with inadequate knowledge on quality issues. Pattern Making and Grading and Garment Construction which are the core

components for the course are done at National Diploma 1 level during which quality standards are to be implemented, yet students would not have done the component. In the context of these shortcomings, Mosomi et al. (2021) recommended that curriculum reviews are necessary in order to enhance better training and knowledge transfer to the clothing and textiles students.

Pirzada (2018) pointed out that in some cases, clothing and textile students lack the very meticulous and detailed hands-on experience that is required for producing design products. At ND 3 level (post OJET), students work on their final projects and in most cases that is when they participate in production of goods and services. The trainees utilise their experience and skills they acquired during OJET.

Eberly Center (2022) contends that curriculum can be implemented from theory to application or vice versa. This means that learners may be educated first on quality control issues and then go to industry to practice or they may start with practice then acquire the theory later. One then wonders whether students who go to industry or participate in Clothing and Textile Production Units (CTPUs) would have been given enough skills and competences in quality management.

Table 2: Quality Control and Assurance (MHTIESTD ICDC Syllabus, 2019)

Quality Control and Assurance	Objectives -Explain the role of quality in the clothing industry; -Evaluate total quality management; -Describe how quality control and assurance is implemented in the clothing industry; -Outline quality control and assurance procedures; -Explain the role of teamwork in quality; and -Describe how quality costs are incurred in the clothing industry
	Content -Concepts on quality -Total Quality Management -Quality in manufacture -Quality Assurance -Teamwork for quality and -Cost Quality Management.
	Assessment mode Coursework – continuous competence based Skills proficiency Examination

There seems to be a discrepancy on the placement of the Quality Control and Assurance component on the course structure as trainees would be expected

to implement quality management practices throughout the course and in all production activities, yet they are taught the quality control and

assurance component in their final year. Therefore, this study sought to investigate on coverage, placement and impact of quality control and assurance on quality of products in Zimbabwean polytechnic clothing and textile production units.

Quality Control and Assurance component in the Clothing and Textile Curriculum

Quality Control and Assurance component is done by National Diploma year 3 (ND3) Clothing and Textile students after completion of OJET. The aim of the component is to enable students to set quality standards parameters, verify quality specifications and evaluate garments and services. The objectives, content and assessment of Quality Control and Assurance are presented in Table 2.

Learners perform competence-based assessments to demonstrate their understanding of the component area. They are given tasks, for example, setting quality parameters, inspecting incoming raw materials, in-line or end-line inspection and evaluate quality of finished garments where the performance indicator will be a quality specification sheet and quality inspection reports (Ministry of Higher and Tertiary Education, Innovation Science and Technology Development, 2019). An expert from the clothing industry comes to assess and test the students on the same tasks given by the trainer for validation of the marks acquired.

TQM Education and Training in CTPUs

It is necessary for Clothing and Textiles students to be trained on quality management in order for them to be able to implement the TQM during production. Deming's framework demands that organizations should introduce rigorous and all-encompassing education and training programs to the workforce on quality management (Subedi et al., 2008). TQM tools and methods such as Statistical Process Control require extensive training for employees to be able to use it (Zhang, 2001). Petty et al. (2012) advocated that TQM training programs in terms of special classes and seminars can be employed to teach the workforces about the significance of quality control and techniques in which to produce excellent quality work. However, according to Forest (2008) training for skills is limited as it ends when capability has reached a stable state whereas education is infinite. In other words, training is a technique that focuses on acquiring new skills in a specialized field that will enable one to perform certain duties whilst education is a process of learning to deepen

knowledge and mindset. Therefore it is imperative that clothing and textile students who participate in the CTPUs be trained and educated on quality management so that they will be able to carry out quality control tasks before, during and after production.

Pratama and Triyono (2018) postulated that highly trained and skilled employees will be able to intensify the added value of products produced through features of improved productivity, reduced production cost, great quality outcomes and quicker rate of return. Enhancing knowledge in the sphere of clothing quality assurance will help the clothing students better understand the production process, reduce defects and increase product quality (Fashive Team, 2021). The purpose of education and training is to build the understanding and awareness of workers to accomplish their tasks more efficiently, effectively and to be accountable for their actions towards quality achievement (Mitrev & Nakov, 2014). Furthermore, adapting the correct quality control methods and the right quality management tools is critical in ensuring smooth and successful production flow in the CTPUs. Possessing adequate knowledge in the area of quality control and assurance enables clothing and textile students to better contribute to the CTPUs. Less knowledgeable employees may be disadvantaged at the work place when it comes to work payments.

Research Methodology

This section describes the methods that were used to guide the study. The study was guided by pragmatism philosophy which is fundamentally practice driven. Pragmatism philosophy believes that the ultimate test of what is right or true must be sought in the practical consequences, that is, practical experience is what defines truth and knowledge (Cohen et al., 2011). When Clothing and Textiles students are taught Total Quality Management at college, they can test what is right or true practical experiences as they participate in CTPUs.

Research Design

The study employed the qualitative research approach to do multiple case studies of three Polytechnic CTPUs. The qualitative approach enabled the researchers to gather data from participants who narrated their experiences and interpretations related to quality control and assurance. Multiple cases were selected to show

different perspectives among the polytechnic CTPUs.

Population and Sampling Technique

The study population was 103 Clothing and Textiles National Diploma (ND) students and 27 lecturers from three polytechnics who participated in CTPUs. The polytechnics were identified as polytechnic A, B and C. Stratified sampling technique was used to select 32 students who were put in two groups: ND2 attached to a polytechnic CTPU and ND3 final year students. Fourteen students were selected from polytechnic A, eight from polytechnic B and ten from polytechnic C. Six lecturers, two from each polytechnic were purposively selected.

Research Instruments

A self-made questionnaire was given to six CTPUs lecturers in charge/supervisors from the three polytechnics codenamed A, B and C, two from each polytechnic. These were identified as PAL1, PAL2, PBL1, PBL2, PCL1 and PCL2. Focus Group Discussions done with Clothing and Textile students (ND2 and ND3) from two polytechnics lasted for 40 to 45 minutes. There were no students attached in the CTPU at polytechnic C. Students from polytechnic A and B were put in two groups of 6-8, FGDA1, FGDA2, FGDB1 and FGDB2. Focus group discussions were carried out at different times and settings with students from polytechnic A and B. Fifteen to twenty minutes telephone interviews were conducted with students from polytechnic C and the students were codenamed PCS1, PCS2, PCS3, PCS4, PCS5, PCS6, PCS7 PCS8. The Clothing and Textile syllabus was analyzed to verify the placement of the Quality Control and Assurance component and the content it covered.

Validity and Reliability

To ensure content, construct and face validity, the instruments were given to two colleagues who specialized in clothing and textiles curriculum in polytechnics before they were printed out and distributed. The experts suggested some adjustments for corrections. The researchers double checked the instruments to reduce measurement errors. To ensure reliability, the researchers used a focus group discussion, a questionnaire, an interview schedule and document analysis to allow triangulation.

Statistical Treatment of Data

Data was analyzed through the thematic approach whereby similar themes were assembled together

so as to answer the research questions that guided the study.

Ethical Considerations

Ethical clearance was sought from Midlands State University, Post Graduate office at which one of the researchers studied. Permission to carry out the study in polytechnics was then sought from the Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development in Zimbabwe and then from principals of the three polytechnics studied. Appointments to visit the polytechnics were made by the researchers before any data collection instruments were distributed. Informed consent was sought from all participants before they participated and they were offered an explanation of the purpose of the study and why and how they were selected. The participants were informed that their names would not be exposed and they had the right to object to participation or withdraw from participation at any given time.

Results and Discussion

This section presents the results of the study and the discussion based on the data elicited through interviews, questionnaires, Focus Group Discussion and documents.

Research Question 1: Which aspects of total quality management are covered in the Quality Control and Assurance syllabus?

Data gathered through the questionnaire regarding content covered in QCA component contained very important aspects of quality management issues which include TQM implementation, quality control tools, quality gurus, quality inspection and cost of quality. All the lecturers/ supervisors concurred that the content included topics on TQM implementation in clothing industry from design to dispatch, quality gurus and their contributions to TQM, teamwork for quality and cost quality management. PBL1, for instance, reported that "Topics covered Implementation of TQM from design to dispatch, inspection and specification sheets for every product to be produced." Furthermore, PAL2 revealed that "the topics include quality inspection checks. For example, incoming materials inspection, inline and end-line inspection."

Responses from ND3 students were in sync with what the lecturers/supervisors reported. Students mentioned topics like quality tools and techniques. They also mentioned quality gurus like Deming 14 points and the PDCA cycle, Juran's trilogy and

Crosby and implementation of quality management in clothing manufacture from designing to dispatch as outlined in the syllabi (Ministry of Higher and Tertiary Education, Innovation Science and Technology Development, 2019). PCSC1 reported that “topics included implementation of quality in manufacture departments like design room, cutting room, sewing, floor finishing and dispatch. There is also topic on quality inspection and teamwork.”

During FGD, One ND3 student reported that “topics include specification sheets to be used in designing, cutting room and production floor. Another topic is on in-line and end-line inspection, quality gurus, TQM and seven quality tools.”

Evidence gathered from documents of the Quality Control and Assurance component concurred with the lecturers’ and students’ views. The documents revealed that content covered in QCA component was very relevant and it intended to give students a grounded foundation for TQM implementation. The quality control and assurance component outline indicated that Total Quality Management, Quality in manufacture, Quality Assurance, Teamwork for quality and Cost Quality Management were the topics covered (Ministry of Higher and Tertiary Education, Innovation Science and Technology Development, 2019). Issues like teamwork for quality, TQM and quality tools were emphasised by quality gurus who include Deming, Juran and Crosby.

Research Question 2: What are perceptions of students and lectures on placement of Quality Control and Assurance component?

It emerged from the FGDs with students and the questionnaire with lecturers that the quality control and assurance component was taught at ND3 level. There was also evidence from the syllabi documents that the component should be taught at ND3 (Ministry of Higher and Tertiary Education, Innovation Science and Technology Development, 2019). The fact that the component was covered at ND3 level was supplemented by the fact that some ND2 students were not even aware that the component exists as one of them said: “we are not aware of some of the names of the components that we have not yet covered. Since that component was not on the list of those that we did at ND 1 level, it therefore means we will do it at ND3 level” (FGA1). Another student reported that “during OJET, we just concentrated on industrial attachment not

on components, so we will study that component at ND3 level” (FGA2).

As views were sought from lecturers and students on which level they thought the component should be best placed, findings revealed mixed feelings especially amongst students on the placement of the QCA component. Whilst the majority of ND3 students strongly recommended that it was best that the component be taught at ND1 level, some of the students on OJET thought it was good to have the component at the ND3 level. One of students remarked:

Surely it is best that QCA be taught at ND1 level and even other management components like Purchasing and Supply Management and Human Resource Management. We were supposed to be implementing quality control in the industry during OJET and during production activities in the production unit but we could not contribute much because we were not familiar with the concepts (FGA2).

Another student argued that “when we were taught QCA at ND3 level, how I wished I had that information during my OJET period. It does not make sense at all to be taught very important concepts and skills in quality control when you are back form OJET” (FGB2). One student opined that “we should learn the component at ND1 level before OJET so that when we go for attachment, we have knowledge of TQM. Actually, we should learn all the components first and then go for attachment at the last level-ND3” (FGA2).

Two lecturers concurred with students that the component be taught at ND1 level to prepare the trainees for production in the CTPUs and clothing industry so that they could easily merge theory with practice. Lecturer (PBL2), for instance, commented that it was ideal to have the students grounded in quality issues at the foundational level. This would enable the students to produce high quality products when they participate in CTPUs as well as on OJET. Respondents further thought that the component should be taught at ND2 level. If it is done during attachment, it helps student to learn and grasp quality control during production because that’s where all the stages can be seen. This will be good because the students will be seeing quality checks on the ground and they will read and understand when they are at college (PCS8). This

idea is supported by the literature that the purpose of education and training is to build knowledge and awareness for one to perform tasks more efficiently, effectively and be responsible for actions towards quality achievement (Mitreva & Taskov, 2014); Mosomi et al. (2021) added that training helps to improve the output quality.

Data gathered through questionnaire concurred that QCA component should not be taught at ND3 level. One of the lecturers remarked: “the essence of having students participating in the CTPUs is for them to marry theory and practice, how then would we expect the students to practice and contribute meaningfully to the production processes if they lack relevant theory?” (PAL1). It was further cemented that *“the component should be placed from onset so that the learners are equipped with TQM principles (PCL1).* FGD participants also supported the idea by arguing that “this component should be taught at National Certificate (NC) level so that we will have a strong foundation on quality management and we will be able to produce best quality products that will satisfy our customers throughout the course” (FGB2).

On the contrary, one student had this to say “I think it is good to go for OJET before studying QCA, because we are going there to learn. If you go there knowing everything you would become boastful and people in the industry will not assist you (FGA2). This idea was supported by one CTPU supervisor who believed that trainees should be educated on quality management from design to dispatch at Higher National Diploma (HND) level because that is the level at which they want to upgrade themselves. While some educationists contend that curriculum can be implemented either from theory to application or vice versa (Eberly Center 2022), it has been noted by other researchers that TQM tools and methods such as Statistical Process Control require extensive training at earlier stages for potential practitioners to be able to use it effectively (Zhang, 2001). Hence, having clothing and textile students participate in production units before they receive intensive training on TQM may result in production of substandard outputs. A study in Kenya revealed that outdated training and delivery methods, maladaptive and non-modernized syllabus in the colleges and universities, low collaboration between schools and training leaders and lack of structured internship and apprenticeship programs affected the clothing and textile training quality and investment in the industry (Mosomi et al., 2022).

Literature further report that when there is less focus on industry components, clothing and textiles institutions create graduates who have theoretical knowledge but lack the practical edge to be successful in the clothing and apparel market (Mosomi et al., 2021). Therefore, it is important that the Quality Control and Assurance component be delivered at ND1 level as this would give learners a strong foundation in TQM concepts before they participate in CTPUs or clothing industry. This will enable students to participate and contribute meaningfully to the production of quality goods and services in the CTPUs and the clothing industry at large.

Research Question 3: How does Quality Control and Assurance impact the quality of products produced in the CTPUs?

In response to this question, all the ND3 students in two focus group discussions and those interviewed unanimously shared the same opinion that the Quality Control and Assurance component equipped them with skills and competences required for production of quality products that satisfies the customer. One students remarked: “the component was helpful in determining that the products we produce will be accepted by customers because there will be no defects” FGB2). Another student reported that “we can inspect garments and note errors and rectify them before the products reach our customers. We can now work without supervisors using specification sheet” (FGA2). Furthermore, “quality Control and Assurance positively impact quality of products in the CTPU in the sense that it educates someone about all the areas that need attention when it comes to quality and shows how to achieve excellent quality and therefor meet customer expectations” (PCS1).

Lecturers supported the view of students by arguing that “learners know what will be expected of them when checking quality of a garment” (PAL2) and that “trainees are enlightened to understand quality dynamics of the clothing industry and customer quality expectations” (PBL1). The results reinforce the fact that the component should be taught an ND1 level so that learners are deeply grounded on the quality management practices before they participate in the CTPU or industry.

Literature reveals that trained and skilled employees intensifies the added value of products produced through features of improved productivity, reduced production cost, great quality outcomes and a

quicker rate of return (Pratama & Triyono 2018). Training on quality is beneficial as proficient employees know advanced techniques of quality and basic physiognomies of their industry structure. Furthermore, training decreases customer complaints (Wanyoike, 2016). In the clothing manufacturing industry, quality control is a crucial factor that helps to maintain consistency and to ensure that all garments meet a specific set of standards and specifications (HQTS, 2022). Enhancing knowledge in the sphere of clothing quality assurance helps the clothing students better understand the production process, reduces defects and increases product quality (Fashive Team, 2021). Adapting the correct quality control methods and the right quality management tools is critical in ensuring smooth and successful production flow in the CTPUs. Learning and understanding garment construction quality standards helps students to acquire skills to produce well made products (Przybylek, 2023). Possessing adequate knowledge in the area of quality control and assurance enables clothing and textile students to better contribute to the CTPUs.

Conclusions and Recommendations

Conclusion

Based on the findings of this study, it can be concluded that the component of Quality Control and Assurance contained very important aspects of quality management issues which include TQM implementation, quality control tools, quality gurus, quality inspection and cost of quality. The quality control component was taught at ND 3 level after the national diploma students have completed their OJET. However, having clothing and textile students participate in production units before they received intensive training on TQM may result in production of substandard outputs. Students and staff who participated in the CTPUs anticipated that the component of Quality Control and Assurance and other management components like Purchasing and Supply Management and Human Resource Management be taught at the National Diploma 1 level. The quality control component had a positive impact on the quality of products produced in the polytechnic CTPUs as it equipped participants with skills and competences required to produce high quality products that satisfy customers. Education and training can be effective and efficient only when it is delivered to the right level of learners at the appropriate stage of their learning.

Recommendations

The study recommends that the Ministry of Higher and Tertiary Education, Innovation Science and Technology through the Higher Education Examination Council in Zimbabwe reconsiders the course structure and placement of Quality Control and Assurance component in the Clothing and Textile curriculum. The fundamentals of quality control in garment industry should be taught at National Certificate level as it can be a terminal course for those who do not wish to advance to National Diploma level. For the students who proceed to National Diploma level, the advanced concepts of quality management should be taught at the first year before the trainees go for industrial attachment. This will give the students a strong foundation in the implementation of quality management practices throughout their course and especially when they participate in polytechnic CTPUs.

The ministry may implement the clothing curriculum through having the National Diploma learners complete all their course components, except project first before they go for OJET in the first and second year of their course. OJET and final project can then be done in the final year. In that way, students will be able to marry theory and practice in the real world of work and they will have the opportunity to progress into their chosen careers without going back to the polytechnics after OJET.

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