International Journal of Social Science and Education Research Studies

ISSN(print): 2770-2782, ISSN(online): 2770-2790

Volume 05 Issue 09 September 2025

DOI: https://doi.org/10.55677/ijssers/V05I09Y2025-07, Impact Factor: 7.573

Page No : 912-923

Adequacy of Teaching, Learning and Assessment Processes in the Design and Technology Subject in Secondary Schools of Kapiri Mposhi District, Zambia

Dr. Nephat Kasebusha, PhD*[1], Prof. Innocent Mutale Mulenga, PhD[2], Dr. Kapambwe Mwelwa, PhD[3]

[1,2,3] School of Education, University of Zambia

ABSTRACT

The purpose of the study was to assess the adequacy of the teaching, learning and assessment processes in Design and Technology in selected secondary schools of Kapiri Mposhi district. The mixed research approach was used to collect and analyse data. An embedded research design was used. Questionnaires were used to collect data from 64 Design and Technology learners while interviews were conducted to 10 Design and Technology subject teachers to collect qualitative data. The quantitative data were analysed using descriptive statistical analysis using SPSS. Cross-tabulations were conducted for categorical variables to compare levels of agreement. The weighted mean was calculated to measure overall perceptions on specific questions, with results interpreted based on whether scores fell above or below the weighted mean. Constant comparative method of qualitative data analysis was used to analyse the data from the interviews. The findings of the study established inadequate teaching, learning and assessment in the implementation of the Design and Technology subject in schools due to inadequate workshops, tools, machines, equipment and well trained Design and Technology subject teachers, and reduction of the number of periods for the subject. The study recommended that the Government through the Ministry of Education should increase recruitment efforts to attract qualified teachers with expertise in the Design and Technology subject. The Ministry of Education should procure more tools and machineries for Design and Technology subject. The secondary schools should implement the Design and Technology subject according to the number of periods recommended in the 2013 curriculum framework.

Published Online: September 17, 2025

KEYWORDS:

Adequacy, teaching, learning, assessment, design, technology.

INTRODUCTION

Education is an avenue of training and learning, especially in schools or colleges, to improve knowledge and develop skills. The ultimate purpose of education is to empower learners to excel in a chosen field of endeavor and to positively improve their environment. Zambia has had two major curriculum shifts or orientations from the inception of formal education by the various missionary groups. The first curriculum that Zambia used was a Content-Based Curriculum which it has been using since its political independence in 1964 (Mulenga and Kabombwe, 2019). However, Zambia's education system has experienced dynamic and quick changes that have had far reaching consequences for learners, educational institutions, and society. According to Tuchili (2022), there have been significant changes in policy development and directives since the country's independence in 1964, one of which was establishing a vocational career route in the educational system.

The education system adopted an Out-Based Curriculum in 2013. This was reformed to prepare learners for future challenges in the rapidly changing global world. In an effort to revise and tailor the school curriculum to the changing educational needs, Wood Work, Metal Work, Technical Drawing, Building and Plastering and Graphical Communication were integrated into Design and Technology at secondary school level. This was done to produce holistic learners with knowledge and skills (Ministry of General Education, 2013). It was meant to provide practical education, so that learners develop specific industry skills to jump right into their profession and get started. Thus without adequate and conducive context with appropriate inputs, it

Corresponding Author: Dr. Nephat Kasebusha

Cite this Article: Dr. Nephat Kasebusha, Prof. Innocent Mutale Mulenga, Dr. Kapambwe Mwelwa (2025). Adequacy of Teaching, Learning and Assessment Processes in the Design and Technology Subject in Secondary Schools of Kapiri Mposhi District, Zambia. International Journal of Social Science and Education Research Studies, 5(9), 912-923

would be difficult to effectively and successfully implement the subject to achieve its main intended goals and objectives. Mubangwe (2016) discussed that the environment where teaching and learning of Design and Technology subject takes place is an important educational factor that needs to be considered, the environment needs adequate attention in the area of infrastructural facilities, and made conducive for learning purposes in order to achieve the set goals and objectives. Kakupa (2017) discussed that the 2013 curriculum declared the vocational career pathway as a progressive and a giant step in helping youths acquire skills for self-reliance, but its successful implementation remains uncertain. The context in which Design and Technology should be implemented is cardinal and should be greatly considered.

There has been an observed consistent and steady decline in financing the education sector from 2015 to 2022 which does not only pose a threat to the furtherance and aspiration of the country's ability to sustain the provision of quality education, but is also fundamentally dichotomous to the global/regional benchmark of 20% or 4% - 6% of GDP of annual national budget to the education sector (UNESCO, 2016; Hampongo, 2020). Sustainable quality education cannot be realized without a significant and well-targeted increase in financing the sector (UNESCO, 2016; World Bank, 2019; and Yang, 2019) for required demand driven investments. Masaiti et al., (2018:89) also observed an amusing drastic steady reduction in sectoral budgetary allocations from 2015 to 2017 with an emphatic recommendation for an in depth analysis of the phenomena as no study had been done to specifically address the occurrence.

Design and Technology are expensive to effectively implement because of the context and inputs which should be in place before the implementation. This was the more reason why ZANEC (2017) got concerned with the education budget for 2017 which was at 16.5 % from 20 % in 2014 of the total budget, and that education system continued to receive diminishing funds. This might have directly affect the implementation of vocational education. Thus the spillover effect of the inadequate financing of education would manifest itself in the failure of the government to ensure learners develop practical vocational skills (UNICEF, 2022). Design and Technology is a vocational subject which is demanding and expensive because it requires a lot of funding for its effective and successful implementation due to its high cost (UNICEF, 2016 and Kakupa, 2017). Zambia's budget distribution to the education sector as a percentage of the overall national budget shows a downward public education expenditure budget trend from 2014 to 2022.

The Education 2030 Incheon Declaration and Framework for Action, a global plan agreed upon by countries in 2015 for the implementation of SDG 4, urges governments to allocate at least 15-20 % of their total public expenditure at all levels of education, while the second, more widely accepted, set spending of 4-6 % of GDP on education. Zambia's declining share of education has significant implications for attaining SDG 4 and Vision 2030. However, as a share of total expenditure, the allocation to education reduced from 11.5% in 2021 to 10.4% in 2022 (UNICEF, 2022, and Banda, 2021). Therefore, there is no well-documented evidence-based research assessing the teaching, learning and assessment processes of Design and Technology subject in secondary schools in Kapiri Mposhi district, which was the researcher's motivation and pre-occupation of the study.

LITERATURE REVIEW

This section presents the review of relevant literature to evaluate the adequacy, usability and functionality of the infrastructure necessary in the implementation of Design and Technology curriculum in secondary schools.

Global Studies on the Teaching and Learning of Design and Technology Subject

The context Design and Technology subject should be implemented as a replica of the environment such as workshops and laboratories where learners will apply Design and Technology knowledge and skills acquired from school. The learners should touch and manipulate the tools and equipment for an effective learning that can enable them to acquire knowledge and develop practical design and technology skills. The context should be a replica of the working environment such as industries; workshops trained personnel apply their acquired knowledge and skills (Roberts, 2015; Paliwe, Siphelo, Veronica and Mariana, 2015). Thus schools should have laboratories, workshops and classrooms for practical lessons if Design and Technology subject is to be effectively implemented and achieve its intended objectives. Todd and Dunbar (2018) pointed out that the context in which Design and Technology subject is taught should be conducive for the teaching and learning of the subject. Therefore, it should allow for a free exchange of ideas, thoughts and skills among the teachers and learners to achieve the expected educational goal by considering the physical and psychological needs of learners.

Tang and Shi (2017) indicated that the infrastructures for practical subjects should be well stocked with tools and equipment as teaching and learning resources (inputs). Thus in order for learners to improve their performance, learning should take place in a conducive environment, and they should be able to see and touch the tools, equipment and other materials unlike learning from abstract. This can enable them comprehend properly and evaluate their understanding of the learnt content in an effective way. Roberts (2015) discussed that for Design and Technology lessons to be practical, both teachers and learners should have to demonstrate the practical aspect of teaching and learning. Thus the inputs should be readily available and adequate to allow all learners and teachers have equal access to them and be appropriate in terms of the level of education of learners.

The manipulation of the tools and equipment is critical for practical lessons if knowledge and practical skills is to be developed among learners of Design and Technology subject. This is why Marx (1866) indicated that man learn by acting on the natural phenomena, transforming them while experiencing their influence. Marxist epistemology views this experience as criterion of truth. Thus the implementation of Design and Technology should seek to integrate theory and practice. The learners have to be exposed to both theory and practice, hence experiential learning requires learners practice what they learn from theory in order to experience its influence. Valerie etal (2014) pointed out that learners need to benefit from what the good infrastructure can offer to teaching and learning of practical subjects. Therefore, schools that do not have infrastructure for Design and Technology may face challenges when it comes to teaching and learning because learners are likely to be denied the opportunity for practical acquisition of knowledge and development or improvement of their skills.

Mkonongwa (2017) discussed that the inadequate provision of physical facilities in Tanzania led to poor school curriculum implementation, and that the lack of school facilities such as laboratories compromises the implementation of practical subjects because topics meant to be taught practically were taught theoretically due to lack of supporting physical facilities and equipment. Therefore, the availability of facilities in schools affects learners' practical performance positively and enables acquisition of practical education for self-reliance among the learners. Thus Design and Technology is a practical subject and should be taught using a practical approach that requires workshops, tools, equipment for demonstrations and practical works.

The Teaching and Learning of the Design and Technology Subject in Africa

Constantino and Mariana (2015) pointed out that as far as infrastructure is concerned, required resources such as textbooks, tools, specialists, and rooms should be available. Okebuka (2016) also indicated that without adequate funding to procure the needed equipment, books, and inputs for appropriate structures to create a conducive infrastructural base, implementation of practical subjects including Design and Technology would be a mockery to learners and society. Thus the availability of a conducive infrastructural base is an important contributor to the successful and effective implementation of Design and Technology in schools.

Practical education cannot be complete without adequate facilities (Ebenechi, 2016; Chedi and Hamza, 2019). Therefore, successful and effective implementation of Design and Technology requires a lot of resources and careful planning. The introduction of the vocational path should not just be looked at in terms of its desired possible results. Without adequate resources, teaching practical subjects would be as theoretical as academic ones. The lack of facilities would negatively affect the quality of education in the vocational pathway as rote learning, instead of actual performance, is likely to result.

Implementation of Design and Technology Subject in Zambia

The implementation of the Design and Technology subject require schools to have the necessary educational requirement, which includes infrastructure (workshops, laboratories and classrooms), desks, chairs, text books have to be readily available in in the institutions of learning that adopted Design and Technology. Inputs of Design and Technology are essential resources for effective implementation of the subject in schools. For an effective implementation to occur, the resources should be available during the teaching and learning process of the subject. These may enable learners acquire knowledge and practical skills useful after the completion of the program. Mubangwe (2016) indicated that the quality assurance practice of training teachers aim to equip and handle Design and Technology. Hatiya (2016) discussed that a good learning environment is important for learners' good academic achievement. However, equipping the workforce with relevant job skills is a continuing challenge worldwide. Thus schools should establish infrastructural facilities for practical subjects in secondary schools for effective implementation of Design and Technology subject.

Kakupa (2017) indicated that Zambia was still struggling to provide access to and improved quality of education due to inadequate qualified teachers to deliver practical subjects effectively. Most vocational subjects lack expert teachers to deliver the content competently, this situation seemed to be a challenge in many secondary schools including in urban areas. Tamil (2021) explained that no meaningful teaching and learning occurs without adequate resource materials and appropriate infrastructure. The availability of resource materials and appropriate facilities greatly influence the quality of implementing Design and Technology in schools to help learners acquire practical knowledge and skills. Kabeta (2022) pointed out that implementation of the 2013 curriculum was poorly conducted as most educators' perception and knowledge on vocation education was below expectation. Teachers were set to take on the task but were disadvantaged by lack of orientation or retraining.

Research gap and its justification

From the reviewed literature, there is no empirical study that established the adequacy of the teaching, learning and assessment processes in the Design and Technology subject from 2014 when the 2013 curriculum was first implemented in secondary schools. Thus this study was conducted in Kapiri Mposhi district of Central province in Zambia in order to reduce the gap.

RESEARCH METHODOLOGY

The study employed both the quantitative and qualitative research methods to collect, integrate and analyze data. The study utilised the embedded research design. Questionnaires were used to collect quantitative data from 64 Design and Technology learners while interviews were used to generate qualitative data from 10 Design and Technology subject teachers. Simple random sampling was employed with the use of the lottery method to select the Design and Technology learners while purposive sampling was used to pick the Design and Technology subject teachers.

The quantitative data were collected through questionnaire using the five point likert scale (1 = Strongly Disagree (SD), 2 = Disagree (D), 3 = Neutral (N), 4 = Agree (A) and 5 = Strongly Agree (SA)) from the 64 Design and Technology subject learners while the interview schedule was used to collect qualitative data from the 10 Design and Technology subject teachers. The quantitative data were analysed using descriptive statistical analysis. Cross-tabulations were conducted for categorical variables to compare levels of agreement. The weighted mean was calculated to measure overall perceptions on specific questions, with results interpreted based on whether scores fell above or below the weighted mean. Constant comparative method of qualitative data analysis was used to analyse the data from the interviews.

RESULTS AND DISCUSSION

This section presents the findings of the study based on the research question; How comprehensive is the adequacy of the teaching, learning and assessment processes in the Design and Technology subject? The results of the study showed inadequacy of the teaching and learning and assessment in the implementation of Design and Technology

Teaching, Learning and Assessment Practices in Design and Technology Subject

The teaching methods and assessment practices in Design and Technology appear to focus heavily on theoretical instruction, with learners acknowledging consistent theoretical lessons (mean = 5). Practical lessons and demonstrations were provided but were insufficient to meet the expectations of hands-on learning. For example, while hands-on learning was rated positively (mean = 5), learners noted limited opportunities for manipulating tools and machinery, with a low perception score of 3. This imbalance between theoretical and practical elements raises concerns about the effectiveness of skill acquisition in the subject. Assessments followed a similar pattern, with theoretical evaluations being more common than practical ones. This emphasis on theory could lead to disconnection between learners' knowledge and their ability to apply it in real-world scenarios.

Table 1: Perception of learners on Teaching, Learning and Assessment Processes in Design and Technology Subject

Items	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	σ	Decision
We do have practical lessons in DT	-	-	-	17(27)	47(73)	5	0.4	High Perception
We do have theoretical lessons in DT	-	-	-	23(36)	41(64)	5	0.4	High Perception
We do have both practical and theoretical lessons in DT	-	-	-	23(36)	41(64)	5	0.4	High Perception
We have demonstration lessons with tools, equipment and machineries in DT	06 (9)	15(23)	-	16(25)	27(42)	4	1	High Perception
We do have hands on type of learning DT	-	-	-	21(33)	43(67)	5	0.4	High Perception
We have more theoretical learning than practical in DT	36(56)	15(23)	-	10(16)	03(5)	2	1	Low Perception
Demonstration method is used in the teaching and learning process of DT	05(8)	12(19)	01(2)	19(30)	27(42)	4	1	High Perception
DT teacher spend most of the time giving us the information	11(17)	09(14)	-	30(47)	14(22)	3	1	Low Perception

We always touch and manipulate the tool, equipment and machineries in DT	18(28)	15(23)	-	13(20)	18(28)	3	2	Low Perception
We are given individual tasks to work on in DT	22(34)	28(44)	-	09(14)	05(8)	2	1	Low Perception
We are given activities to work on in groups in DT	05(8)	04(6)	-	25(39)	30(47)	4	1	High Perception
We do not have practical assessment in DT	04(6)	09(14)	03(5)	37(58)	11(17)	4	1	High Perception
We do not have theoretical assessment in DT	-	-	-	24(38)	40(63)	5	0.4	High Perception
We do not have both practical and theoretical assessment in DT	03(5)	05(8)	02(3)	37(59)	17(27)	4	1	High Perception
We do not have hands on type of assessment in DT	05(8)	12(19)	-	29(45)	18(28)	4	1	High Perception
We have more theoretical assessment than practical in DT	50(78)	07(11)	01(2)	04(6)	02(3)	1	1	Low Perception

Key: *SD = Strongly Disagree, D= Disagree, N= Neutral, A = Agree, SA= Strongly Agree.σ = Standard deviation*

Decision (Weighted average) $=\frac{58.0639}{16} = 3.629$, *= 4*

Reduction in the Number of Periods for the Design and Technology Subject in Schools

The sentiments shared by most of the teachers during the interviews regarding the adequacy of the teaching and learning of the subject showed the inadequacy of the implementation of the subject as they indicated the reduction of the allocated number of periods for the Design and Technology subject against the 2013 curriculum framework underscore notable concerns saying that:

> *The periods or sessions allocated for Design and Technology subject to my analysis, are not enough per week due to the content that Design and Technology subject required to teach the children. It requires a lot time and personally, I feel the 12 periods we have been given are not enough. I say so because sometimes we even us in our time we create to catch up with the syllabus. The periods are not enough in the sense that DT is bulky for a lack of a better term, I can say it is because it has a good number of components we have to teach the children. At the end of the program, children are supposed to know all the components that the syllabus requires us to teach. I am saying that the 12 periods are not enough because the content is a lot and demands another teacher to teach to finish the lesson (TR2 A).*

The time allocated to Design and Technology subject on the timetable was not adequate to effectively carry out practical teaching. The inadequacy of the practical teaching and learning in the Design and Technology subject significantly impedes the acquisition of knowledge and the development of practical skills among learners in secondary schools, resulting in multifaceted challenges that hinder their holistic understanding the teaching of the subject. Roberts (2015) explained that for Design and Technology lessons to be practical, both teachers and learners have to demonstrate the practical aspect of teaching and learning of the subject. The time should be enough with inputs readily available and adequate to allow all learners and teachers have equal access to them and appropriate in terms of the level of education of learners (Alexander, 2015 and Amechi, 2016). Thus the inadequacy of practical teaching and learning within the Design and Technology subject poses significant impediment to the acquisition of knowledge and the development of practical skills among learners in the subject, leading to complex challenges that hinder their comprehensive educational growth in the subject.

One teacher from school C submitted that:

> *According to the 2013 curriculum, the periods allocated to the Design and Technology subject are enough. But the challenge is that we have so many subjects in school that have their own allocation. Now you will discover that we do not get the 12 periods that are required instead the periods have reduced the least is 9 periods*

> *per week. Now! Imagine reducing from 12-9 periods. That is a serious down grade in terms of the session. So as for Design and Technology subject, learners to be trained in that kind of the subject area because in a session that you are supposed to in a week, you would not have enough time for, say practicals. Learners cannot do practicals perfectly if time is not enough; if you are going to conduct practicals, you will do it within a short period. It is not possible to finish practicals within a short period of time. Because of that, the periods given to Design and Technology subject are not sufficient (TR2 C).*

Chikoore (2014) and Changwila (2016) discussed that limited time restricts the inclusion of practical activities; this therefore compromises the depth and breadth of hands on experiences critical for comprehensive skills development. Design and Technology education is characterised by its hands on, experiential in nature, thus demand substantial time for practical application, experimentation and iterative design processes. Hence the reduction in the number of periods for the Design and Technology subject limits the time available for learners to engage meaningfully with these critical aspects of the subject. Consequently, there is a curtailed opportunity for learners to immerse themselves in practical work; explore materials, experiment with design concepts, and iterate on their projects. This limitation directly hampers the depth of understanding and skills development, hindering the acquisition of practical expertise and critical thinking skills vital for success in the subject.

The reduction in periods adversely affects the breadth of the curriculum that teachers should cover (Ackram, 2022; Alexander and Lewis, 2014). This is because the Design and Technology subject is a multidisciplinary subject that encompasses various design principles, technological applications, materials and problem solving methodologies. Thus a decrease in the number of sessions limits the scope of the content that can be taught, potentially leading to a shallow understanding of fundamental concepts and omitting essential topics by teachers. This compromise learners' exposure to diverse techniques, processes, and emerging technologies within the subject. The concerns raised by most teachers from various schools regarding the insufficient training of teachers in the Design and Technology education reflect a critical issue within the implementation of the subject.

Sufficient Training of Teachers in the Design and Technology Subject

Design and Technology education encompasses theoretical knowledge and practical skills, integrating these elements from disciplines such as building and plastering, metal fabrication, electrical and carpentry and joinery requires teachers to possess not only a deep understanding of content but also proficiency in pedagogical strategies and technological applications. The concerns raised by most teachers regarding the insufficient training of teachers in the Design and Technology subject reflect a critical issue within the implementation of the subject that:

> *We may also need teachers to be refreshed in terms of courses because most of the teachers just did wood work, or metal work or technical drawing, and Design and Technology subject is a new concept to them. There are many things which we do not have as capacity. Therefore, there is need to build capacity through trainings. It is very difficult to teach Design and Technology subject when a teacher just specialised in a single component of the subject. Most teachers shun from teaching the science aspect of Design and Technology subject. So mostly, they call upon other teachers to do that for them (TR3 C).*

Furthermore, well knowledgeable teachers motivate learners by diversifying approaches, methods, and assessments throughout the teaching and learning sessions to prepare them for future professions. Therefore, if schools have adequate and well trained teachers in the Design and Technology subject, they may easily apply methods that promote the manipulation of the tools and equipment for practical teaching and learning. Mkonongwa (2017) explained that the deficiency in practical teaching affects learners' understanding of the learnt content in the subject. Thus in an era where technical proficiency and practical expertise are highly valued, learners lacking exposure to hands on learning experiences may face challenges in transitioning to professions requiring practical competencies. Thus teachers' lack of adequate training hinder learners' ability to facilitate engaging hands on learning experiences and impede their practical skill development.

The other teacher indicated that:

> *Sometime back, it was very interesting as a teacher when you are teaching because you really know what you are talking about. So apa, it means for us who majored in one of the components of Design and Technology, that is wood work or metal work or Technical Drawing, we are disadvantaged. Apa, we are planning to go back to school so that we can advance more about Design and Technology subject, more especially in the components we are not trained in. This will help us to know what we are talking about. It is very cumbersome, you are in*

> *class talking about metal work which you did not do way back, like ku college. That is when they introduced this Design and Technology subject whereby they just merged everything. For the materials, the materials for the components; metal work, wood work, and graphical communication, so when you are talking about, you are not even sure what you are teaching the learners is the truth kayili you are just book lifting, whereby if you have the experience and the knowledge about it way back, it is very easy for you to flow even when you teaching. Personally, I did wood work which is carpentry and joinery. Therefore, I find it a challenge to teach other components, but have adapted with other components. I'm planning to go to either Kabwe Institute of Technology or TVTC to fully specialise in the Design and Technology subject (TR1 C).*

The concern raised regarding inadequate teacher training in the Design and Technology subject resonates with several significant issues that:

> *Some teachers lack adequate training in the Design and Technology subject, being proficient only in specific components of it, raises important concerns about the breadth and depth of teachers' preparedness to deliver comprehensive teaching to learners. This fragmented knowledge base can present challenges when teachers are required to teach topics outside of their area of expertise. Instances where teachers invite colleagues to assist in teaching topics they are not familiar with highlight the need for a more holistic approach to teacher training and subject delivery (TR2 B).*

Ebenechi etal (2016) explained that the inadequacy and non-availability of educational and human resources for a successful teaching of the practical subject have an effect on the effective implementation of subjects. Thus the shortage of adequately trained teachers in the Design and Technology subject area significantly impacts the delivery of comprehensive and high quality teaching and learning. When teachers lack specialised training struggle to effectively convey complex theoretical concepts and guide the learners through practical applications and iterative design processes, thereby limiting the depth of understanding and practical skills development among learners. Obwano (2021) discussed that the deficiency in trained teachers directly correlates with limitations in curriculum coverage and instructional methodologies. Thus teachers without sufficient training in the Design and Technology subject may possess a narrow understanding of the subject, leading to a restricted scope of instruction and potential omissions of critical areas within the subject area. This limitation curtails learners' exposure to diverse design methodologies, emerging technologies, and practical skills applications critical for their holistic development in the subject.

Kabeta (2022) also revealed that the implementation of the 2013 curriculum was poorly conducted as most educators' perception and knowledge on vocation education was below expectation. This is because teachers were set to take on the task but were disadvantaged by lack of orientation or retraining. Odu (2020) explained that the absence of adequately trained Design and Technology teachers hampers the integration of innovative pedagogical approaches and hands on learning experiences because the Design and Technology education relies on interactive workshops and practical learning through practical demonstrations. Thus, teachers lacking appropriate training might struggle to effectively implement the methodologies, limiting learners' opportunities for engaging in practical application and development of the essential skills.

Kakupa (2017) indicated that Zambia was still struggling to provide access to and improved quality of education due to inadequate qualified teachers to deliver practical subjects effectively. Most vocational subjects lack expert teachers to deliver the content competently; this situation seemed to be a challenge. Thus schools with a scarcity of qualified Design and Technology subject teachers might fail to provide quality learning opportunities to learners. It is for this reason that when teachers are inadequately trained, they deprive the learners to access quality Design and Technology education essential for their future careers and technological literacy. Thus trained teachers play pivotal roles in guiding learners in facilitating the connection between theoretical concepts and practical application. Ngige (2022) explained that the teaching and learning in the Design and Technology subject plays a crucial but complex role in the development of practical skills among the learners in schools. The theoretical understanding forms the foundation of knowledge; however its direct translation into practical skills requires a careful and strategic approach to ensure effective skill development among learners in schools.

Grouping of Learners in Teaching and Learning of Design and Technology Subject

The experiences shared by the other teacher regarding the shortages of resources required in teaching of the Design and Technology subject shed light on a significant challenge in the teaching and learning of the subject that:

> *We sometimes use theoretical questions, question and answer method, and demonstration method to teach the learners. We usually manage to teach*

> *learners using demonstration method because we want the skills to be enhanced in learners, so we do not just sit because we do not have enough tools, equipment or machines, then we stop, no! We make it with the little tools that we have so that we can enhance skills in them. We do just struggle to just make things do by way of grouping the children, putting them in groups so that atleast in groups each one can try here there, here there and so on, but it is not adequate to practice in groups, it is not very, very adequate (*TR1 B).

The inadequacy of trained teachers in the Design and Technology subject profoundly undermines the implementation and efficacy of the Design and Technology education, resulting in multifaceted challenges that impede the quality of instruction, learners' learning experiences and the overall advancement of the subject. The Design and Technology subject implementation demands well trained teachers as Fan (2017) explained that Design and Technology education requires specialised knowledge encompassing design principles and technological applications. The shortage of trained teachers in this subject creates significant hurdles in delivering comprehensive and high quality instruction. Teachers lacking adequate training and expertise may struggle to effectively impart complex theoretical concepts or guide learners through practical application as the Design and Technology education demands specialised knowledge encompassing various disciplines, including design theory, technological applications, materials science, and problem-solving methodologies (Kanorio, 2016).

The shortage of adequately trained teachers in the Design and Technology subject significantly impacts the delivery of comprehensive and high quality practical instruction (Amechi and Thomas, 2019). For this reason, teachers lacking specialised training may struggle to effectively convey complex theoretical concepts or guide learners through practical applications and iterative design processes, thereby limiting their depth of understanding and development of practical skills. Therefore, the practical education can only be effective if teachers have successful experience of applying skills and knowledge regarding operations and work processes. It is quiet important to point out that the Design and Technology subject requires trained and adequate facilities for effective teaching and learning. When schools do not have adequate teachers and facilities, the learners cannot acquire the envisaged skills, and their education could then be considered a waste. Atsumbe, Raymond and Mele (2022) discussed that when teachers have the right competencies in the subject, it is easy to help learners acquire the knowledge and develop the practical skills. The deficiency in trained teachers directly correlates with limitations in curriculum coverage and instructional methodologies. Teachers without sufficient training in the Design and Technology subject are likely to possess a narrow understanding of the subject, leading to a restricted scope of instruction and potential omissions of critical areas within the Design and Technology curriculum in school.

The other techer revealed that:

> *It is not always that we have to conduct practicals in Design and Technology subject, but I feel with limited teaching and learning materials, group work method is employed. Therefore, when the other learners are using the tools or operating a welding machine, the other learners observe the friends and by doing so they acquire the knowledge apart from the practical part of the subject which requires learners develop the skills. In times when we do not have enough tools, equipment and machines and other materials, the group work is employed. I feel this is also an effective way of teaching Design and Technology subject when the teaching and learning resources are not enough. We group them due to limited resources as you know the goal is to make every learner acquire the knowledge and develop expected skills (TR1 D).*

When schools are faced with inadequate resources or limited practical learning opportunities, learners' ability to engage meaningfully with the subject is severely restricted. This limitation directly affects the learners' acquisition of knowledge, as theoretical concepts often need practical application for a deeper understanding. This is because the Design and Technology education is inherently reliant on hands on experiences, practical application, and real-world problem-solving. Obwano (2021) explained that the availability of teaching and learning resources in schools help to offer practical education that is cardinal if learning has to take place in a meaningful manner. This limitation may directly impacts the learners' acquisition of knowledge, as theoretical concepts often require practical application, understanding and retention of the content in the subject. Bandele (2022) explained that the inadequate practical teaching and learning experiences restrict learners' exposure to diverse materials, design methodologies and technological applications of what they learnt. Consequently, learners struggle to contextualise theoretical knowledge within practical settings, resulting in a gap between theoretical understandings as the subject demands the practical application (Ayeni, 2022; Chedi and Hamza, 2019).

The other teacher from school B said that:

> *Sometimes resources are not always enough, learners are taught the subject as theory, and when the time for the final*

> *examinations is near, the tools, and other materials are bought. How can you ensure learners acquire the necessary knowledge and skill, and how do you conduct practicals when examinations are near. We cannot just sit simply because what to use is not there or not enough. Grouping of learners is done when the section do not have the necessary teaching and learning materials for practicals. Design and Technology subject, just as the nature of the subject is a hand on subject most of the time. So we do practicals, there is also a part for theory, the designing itself. I think those are the methods. In terms of practicals, instead of testing them individually we test them as a group so that the tools are sufficient for them because if we say each child should carry a practical on her own, it means will not do that practical in a day, it will require us to do more than one day (TR2 A).*

The other teacher from school D revealed that:

> *When it comes to testing of learners in the subject, we use both theory and practicals. But it is very easy to test learners in theory part as opposed to practicals. In practical assessment we need to have in place the necessary tools, equipment and machines and other resources. Now with the inadequacy of these resources, according to me, learners are not adequately assessed to determine their levels of knowledge acquisition and skills development. Therefore, I can say that we need more resources in the teaching and learning of the Design and Technology subject in school. In Design and Technology subject, we assess the learners 2 times per term, but there is also an ongoing assessment for the portfolio in term 1 and 2. The inadequacy of the materials for the subject has got a bearing on the way the assessment of the learners in the subject is done. It is because of this that we assess our learners in groups of 5. I don't think if learners are adequately assessed in the subject amid limited resources and infrastructure for the practical subject (*TR3 D).

The inadequacy of practical assessment in the Design and Technology subject significantly impacts the implementation and effectiveness of the subject, presenting complex challenges that hinder both learners' learning experiences and the overall advancement of the field. Okoye (2015) discussed that the inadequacy of practical assessment in the subject profoundly influence the implementation and efficacy of the subject, presenting complex challenges that impact learning, instructional strategies, and the overall advancement of the subject. The inadequacy of practical assessment methodologies in the Design and Technology subject significantly impedes the effective implementation of the subject (Ravitch and Carl, 2016; Roberts, 2015). Assessment practices play a role in the implementation process of the Design and Technology subject in schools. This is because the evaluation methods that primarily measure theoretical knowledge through written exams might undervalue practical skills. Learners might prioritise memorisation of theoretical content over hands on application, perpetuating the disregard for practical competencies in assessments.

The practical assessment in the Design and Technology education plays a crucial role in evaluating learners' application of the theoretical knowledge, problem-solving abilities, design skills, and innovative thinking within real practical contexts. Roy (2022) explained that when learners are faced with inadequacies in practical assessment methodologies, several challenges arise, impacting the implementation of the subject. Practical assessment serves as a critical tool to evaluate learners' application of theoretical knowledge, problem-solving skills, and creative design abilities. Thus when confronted with inadequacies in the practical assessment of the subject, several challenges emerge, significantly impacting the implementation of the subject as the practical assessments serve as a crucial tool for evaluating learners' hands on skills, critical thinking, and creativity.

Kanorio (2016) explained that if the assessment methods are insufficient or poorly designed, they are likely to fail capture the diverse range of skills and competencies that learners develop through practical work. This inadequacy can therefore result in an inaccurate or incomplete evaluation of learners' abilities, leading to an undervaluation of their practical expertise and innovation. Thus the insufficient practical assessment methodologies hinder the accurate evaluation of learners' hands on skills and critical thinking abilities. Therefore, if assessment methods are poorly designed or limited in scope, they may fail to comprehensively capture the diverse range of skills and competencies learners develop through practical work. Thus the group method of assessing learners lead to an incomplete assessment, potentially undervaluing the learners' practical experience and innovative capacities.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

Design and Technology are heavily theory-based, with insufficient practical exposure for learners. While hands-on learning is acknowledged, limited opportunities to

manipulate tools and machinery hinder effective skill acquisition. The dominance of theoretical assessments further reinforces this imbalance, potentially affecting learners' ability to apply their knowledge in practice.

Recommendations

Having established the inadequate teaching, learning and assessment processes in the Design and Technology subject, the study suggested the following recommendations:

i. The Government through the Ministry of Education should increase recruitment efforts to attract qualified teachers with expertise in the Design and Technology subject.
ii. The Ministry of Education should procure more tools and machineries for Design and Technology subject.
iii. The secondary schools should implement Design and Technology subject with the number of periods recommended in the 2013 curriculum ramework.

REFERENCES

1. Ackram, M. (2022). Formal Education Skills Development and Vocationalization: The Missing Link. *A research on Humanities and social sciences*. 2 (8), 142-145.
2. Alexander, R, J. (2015). *Vocational Education and Training, Inequality and Labour Market in Brazil and India: A policy review.* New Delhi: Sao Paulo.
3. Alexander, D., and Lewis, L. (2014). Condition of America's public school facilities: 2012-13 (NCES 2014-022). Washington, DC: U.S. Department of Education, National Center for Education Statistics.
4. Amechi, J, E., and Thomas, C. G. (2016). Strategies of Effective Teaching and Learning Practical Skills in Technical and Vocational Training Programmes in Nigeria. *International Journal of Scientific Research Engineering and Technology (IJSRET), ISSN 2278-0882 Volume 5, Issue 12: 598-603.*
5. Atsumbe, B. N., Raymond, E., and Mele, E. F. (2022). Retraining Needs of Technical Educators for the Implementation of the Junior Secondary School Basic Technology Programme in Nigeria. *Journal of Mechanical and Civil Engineering 1 (4): 7-13.*
6. Ayeni, J. (2022). Improving learning infrastructure and environment for sustainable Quality Assurance Practice in Secondary Schools in Ondo State. *International Journal of Research Studies in Education: Vol 1 Number 1, 61-68.*
7. Ayonmike, S. C. (2020). Skill Training in Nigerian Technical Colleges: Benefits and Challenges. *Journal of Qualitative Education 6(1), 75-86.*
8. Bandele, S., and Faremi, Y. (2012). An Investigation into the Challenges Facing the Implementation of Technical College Curriculum in South West Nigeria. *Journal of education and practice, 3(12), 8-13.*
9. Barlex, D. (2014). Design and Technology-The Nuffield Perspective in England and Wales. *International Journal of Technology and Design Education. 8:45-60.*
10. Chedi1, J, M., and S. Hamza. S (2019). *Design and Technology for Sustainable Technologically Development in Nigerian System of Education.* AKWANGA 2019 Proceedings of the 32nd TEPAN Annual National Conference.
11. Chikoore, M. (2014). Obstacles in the Path of Implementing Technical and Vocational Education in Zimbabwean Secondary Schools. How can the situation be solved*? International Journal of Education and Development. Volume 5(4), 561-562.*
12. Dasman, A. (2022). Challenges of Secondary Vocational Education in Latin America and East Asia. *Asia - Pacific journal of cooperative education, 12(2), 67-69.*
13. Ebenehi, A., Rashid, A., and Baker, A. (2016). Predictors of Career Adaptability Skills among Higher Education Students. *International journal for research in vocational education and training, 3 (3), 212-214.*
14. Fan, D. D. (2017). Competence-Based Education in China's Higher TVET: The Case of Shenzhen Polytechnic. *Technical and Vocational Education and Training, 23, 429-448.*
15. Hampongo, C. (2020). *Sustainability Implications of Universal Free Primary Education Policy Amidst Declining Education Financing in Lusaka, Zambia. Masters Dissertation: Cavendish University Zambia.*
16. Hatiya, B. (2016). Relationship among schools infrastructural facilities and learners outcomes in Lusaka District. Masters Dissertation: UNZA
17. Kabeta, R. (2022). Evaluating the Feasibility of Implementing the Revised Curriculum of 2013 in Secondary Schools of Central Province, Zambia. *International Journal of Science and Research (IJSR) Volume 10 (12): 1397-1403.*
18. Kabombwe, M. Y., and Mulenga, I, M. (2019). *Implementation of the Competency-Based Curriculum by Teachers of History in selected Secondary Schools in Lusaka district, Zambia. DOI: http://dx.doi.org/10.17159/ 2223-0386/2019/n22a2.*
19. Kakupa, P. (2017). The Vocationalization Policy in Zambia's Secondary Education: A Critical Analysis. *International Journal of Vocational and Technical Education. Vol. 9(4), pp. 31-39, DOI: 10.5897/IJVTE2017.0229*
20. Kanorio, F, K., and Godfrey, M. (2016). Curriculum Implementation: Strategies for Improved Learning

Outcomes in Primary Schools in Kenya. *Journal of Curriculum and Teaching, volume 5 (1), pages 19-26 URL: http://dx.doi.org/10.5430/jct.v5n1*.

21. Kasaro, J. (2021). *Analysis of the Implementation of the Vocational Career Pathway of the 2013 Curriculum in Selected Schools in Lusaka District, Zambia.* Masters Dissertation: Chalimbana University.
22. Kekeya, J. L. (2014). Curriculum Development and Implementation in Papua New Guinea. *Contemporary PNG Studies: DWU Research Journal Vol. 2 Contemporary PNG Studies: DWU Research Journal Vol. 21 1.*
23. Masaiti, G. (2013). *Re-engineering Public University Financing Policy in Zambia: An Empirical Study with a Mixed Method*. PhD Dissertation: Huazhong University of Science and Technology.
24. Ministry of Education, Science, Vocational Training and Early Education (2013). *Zambia Education Curriculum Framework 2013.* Lusaka: CDC.
25. Mubangwe, M. (2017). The nature of Infrastructure in Teaching and Learning Design and Technology in Technology Studies at Kitwe College of Education. *Masters Dissertation: University of Zambia.*
26. Mulenga, I. M., and Kabombwe, M. Y. (2019). Understanding a Competency-Based Curriculum and Education: The Zambian Perspective. *Journal of Lexicography and Terminology, 3(1):106-134.*
27. Mulenga, I., M., and Kabombwe, M. Y. (2019). A Competency-Based Curriculum for Zambian Primary and Secondary Schools: Learning from Theory and some Countries around the World. *International Journal of Education and Research. Volume 7, No 2. Page117-130.*
28. Mkonongwa, L. M. (2017). How Competence Based Curriculum Promotes Self Reliance and Industrial Economy. *http://library1.nida.ac.th/termpaper*.
29. Obwano, N. J. (2021). *Challenges Affecting the Effective Implementation of Vocational Education Program.* Nairobi: St. Paul University.
30. Odu, K. (2020). Skills Acquisition in Nigerian Education System: Problems and Prospects in Technical education. *Journal of Qualitative Education, 6(1): 20-26.*
31. Okoye, R. E., and Odoudo, E, S. *(2015).* Vocationalisation of Secondary Education in Nigeria: Issues, Challenges and Prospects. *Journal of Education and Practice. Vol.6, No.30.*
32. Okebukola, P. (2022). Meeting the challenges of secondary school administration in Nigeria. *Journal of All Nigeria Conference of Principals of Secondary Schools, 2002, 159- 171.*
33. Peliwe, L., Siphelo, N., Claudia, J., Verónica, M., and María, E. M. (2015). *Accessing Skills Development and Employment for Youth in Argentina and South Africa: Synthesis Report.* Johannesburg: Network for International Policies and Cooperation in Education and Training.
34. Roberts, P. (2015) Discussion Topic: Design and Designing in General Education, The *Journal of The National Association for Design Education (NADE Journal): No 2 1995, ISSN 1354-408X.*
35. Roy, C. (2022). The Vocational Curriculum in the Lower Secondary School: Material and Discursive Practices. *Curriculum Journal, 23(3): Pages 327-347.*
36. Sancer, H., Baturay, H., M., and Fadde, P. (2013). Applying The Context, Input, Process, and Product Evaluation Model for Evaluation, Research, and Redesign of an Online Master's Program. *The International Review of Research in Open and Distance Learning, 28* (3), 274-290.
37. Shirley, M. H., and Leslie, H. A. (2016). Effective Curriculum Implementation: Some Promising New Insights: *The Elementary School Journal, volume 87(1): Pages 96-98.*
38. Tarman, B., Kilinc, E and Aydin, H. (2019). Barriers to the Effective use of Technology Integration in Social Studies Education. Contemporary Issues in Technology and Teacher Education, 19(4). 736-753. https://citejournal.org/volume-19/issue-4-19/social-studies/barriers to the effective-use-of-technology-integration-in-social-studies-education
39. Tang, N., and Shi, W. (2017). Youth Employment and Technical and Vocational Education and Training (TVET) in China. *Technical and Vocational Education and Training, 24, 269–283. https://doi.org/10.1007/978-3-319-47856-2-14*.
40. The Zambia National Education Coalition (2017). *Policy Brief on the Status of Education in Zambia Report: A Special Focus on the Quality of Education.* Lusaka: ZANEC.
41. Todd, R., and Dunbar, M. (2018). *Taking a Whole of Government Approach to Skills Development Training in Africa.* Ouagadougou: ADEA
42. Tuchili, A. M. (2022). Eight Years of a Two Tiered Curriculum: Lessons from Selected Secondary Schools in Zambia. *International Journal of Humanities Social Sciences and Education (IJHSSE). Volume 9, Issue 4, April 2022, PP 113-121. doi.org/10.20431/2349-0381.0904009*.
43. UNICEF (2016). *Zambia Education Budget Brief Review Of Budget Performance and 2016 Allocations*. Lusaka: UNICEF.

44. UNESCO (2016). *Zambia Education Policy Review: Paving the Way for SDG 4 – Education 2030.* UNESCO
45. Valerie, W and Marlene, H. (2014). Creating Change? A Review of the Impact of Design and Technology in Schools in England. *Journal of Technology Education Vol. 15 No. 2.*