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Availability and Adequacy of Teaching and Learning Resources as Determinants of Vocational Education Integration into the Public Secondary School Curriculum in Kilolo District, Tanzania: A Mixed-Methods Study

Baltazar Kinyamaganga [1*], Aloyce Luhamya [2]
[1] Vocational Education and Training Authority (VETA), P.O. Box 778, Iringa, Tanzania
[1-2] Tanzania Institute of Accountancy, Arusha, Tanzania

* Corresponding Author: **Baltazar Kinyamaganga**

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Abstract
The study explored how well vocational education is incorporated in public secondary school curriculum in Kilolo District, Tanzania, given the availability and sufficiency of the teaching and learning resources. Based on the Open Systems Theory, the study used a convergent parallel mixed methods design. The quantitative data was obtained by employing the stratified random sampling method in 139 teachers of 5 public secondary schools using a structured questionnaire. The data for the qualitative strand were collected using purposive sampling of heads of schools and teachers through semi-structured interviews. The results of multiple regression analysis of quantitative data showed that the level of vocational education integration can be predicted by the availability and level of resources with $F(3, 130) = 52.87$, $p < .001$ and the variance explained is 55% ($R^2 = .55$). Availability/adequacy of specialized equipment ($\beta = .43$, $p < .001$), availability/adequacy of instructional material ($\beta = .34$, $p < .001$), and availability/suitability of practical training facility ($\beta = .27$, $p < .01$) were the best predictors. These trends were supported by qualitative results, in which equipment was frequently "present but incomplete," supplies of consumables were also subject to poor funding and infrastructure was unstable, thus imposing hidden restrictions. The composite resource indices for the urban schools were significantly higher than that of the rural schools ($t = 3.89$, $p < .001$). Based on the study, the following recommendations were made; District-level vocational education resource management centre should be set up, a consumables budget line should be provided and a plan for differentiated resource allocation should be set up to enhance the provision of vocation education in secondary schools.

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Introduction

In Tanzania, vocational education has gone through various historical stages, including the Apprenticeship Ordinance (1940), the Vocational Training Act (1974) and the establishment of a Vocational Education and Training Authority (VETA) (1994). In spite of these institutional changes, however, vocational education was still considered a "second choice" to academic education and was poorly represented in the formal secondary school curriculum (Kalolo, 2026) [10]. The 1967 policy of Education for Self-Reliance and the 2014 Education and Training policy both expressed a wish for vocationalization but implementation was generally poor because of lack of resources, weak coordination and lack of political will.

The Education and Training Policy 2023 bring a new focus for education provision in Tanzania. With the reflection on the policy, the new Secondary Education Curriculum (Form I–IV) formally introduced with an emphasis on the dual-track approach of General Education and Vocational Education tracks with fifteen vocational tracks such as Electrical Engineering, Mechanical Engineering, Agriculture, Hospitality, and Cosmetology (Mbogwe, 2025). Vocational subjects are structured around National Vocational Awards (NVA) and are structured around competency-based modules, which is a radical shift from the current academic subject structure and have important implications for resource needs, teacher preparation and assessment practices. Vocational stream was launched in all public and private secondary schools across the country since 2023/24 academic year. There is considerable investment of resources in the curriculum change. Since the 2024/25 financial year, Tanzania Education Authority (TEA) has allocated more than TZS 6.7 billion for procurement of modern equipment for 35 secondary schools with vocational programmes, and each school got more than TZS 400 million (Mwananchi, 2026) [16].

In February 2026, the government provided 18,354 free vocational textbooks for secondary schools, as well as digital versions, which are accessible online. Infrastructure development, as per VETA, has continued with a new college being built in Kilolo District, with a construction budget of more than TZS 1.6 billion, and, as of June 2026, there were a completion rate of about 76%. With the support of the TELMS II project funded by Italy (2025-2030), the enrolment of VET is to be expanded by 43% and 100 new vocational institutions are to be registered (Daily News, 2026) [5]. However, a significant disconnect still exists between policy goals and implementation on the ground. Vocational education is a high-demand process that needs functioning workshops, modern and appropriate equipment, materials, working tools, good electrical and water supply, and practical manuals (The Citzens, 2025).

The data revealed that the students depend mainly on theory learning, attributed to the scarcity of equipment, insufficient practical hours, and lack of teaching materials, as evidenced in Iringa Region where Kilolo District is located. Equipment procurement is only a one-time requirement, whereas remote schools will require the continuous replacement of consumables, and urban-rural differences will exacerbate the disadvantages. The vocational curriculum has been introduced in public secondary schools in Kilolo District, where 74.7% of the population resides in rural areas and problems of infrastructure and other resources are still a major concern (The Citzen, 2025). To develop a comprehension of the resource availability and inadequacy impacting on vocational education integration, logical interventions that reveals measurable actions and contextual mechanisms are needed. An integrated design of mixed methods convergent parallel designs allows for quantitative testing of the predictive relationship between resources and integration, and qualitative inquiry to explain how and why resource conditions matter, which may include dimensions not captured by structured instruments. The aim of this study is thus to study the relationship between availability and the adequacy of teaching and learning resources and the integration of vocational education in the public secondary school curriculum in Kilolo District in Tanzania.

Statement of the Problem

In 2023, Tanzania's revised Education and Training Policy provided for a dual-track secondary education curriculum that includes a vocational education track, the most ambitious effort to date to include practical skills training in formal education (Mwamakula *et al*. 2023). At the district level, in Kilolo, this policy ambition has been replicated with high levels of infrastructure development, such as the VETA college with an estimated cost of over TZS 1.6 billion, where 76% of the work has been completed as of June 2026 (Daily news, 2026) [5]. Despite this, an underlying question is still not answered: Is public secondary school in Kilolo District well resourced to make the vocational curriculum that these reforms call for a reality? The strategy of building a VETA college and introducing vocational education into secondary schools is crucial because the reforms of 2023 call for the integration of vocational education in secondary schools which requires functional workshops, industry-standard equipment, consumable materials, instructional materials and reliable utilities on a continuous basis (Mgaya & Onyango, 2022) [15].

At the national level, there is evidence that the resource base for the integration of vocational education is seriously deficient. The Parliamentary Standing Committee on Education, Culture and Sports in Tanzania stated in their report in February 2025 that the country needs at least 620 skilled vocational subject teachers but only has 62 available with the remaining 90 percent being a gap. In addition, different studies carried out in Iringa also revealed a shortage of practical sessions and the inadequacy of teaching and learning materials in the implementation process (The citizen, 2024) [20]. Similarly, there is no specific study that has focused on the effects of teaching learning resources availability and their sufficiency on the integration of vocational education in the public secondary schools in Kilolo District. This study will fill this void by using a mixed methods convergent parallel design approach which measures the predictive relationship between resources and integration, and explains the mechanisms underlying vocational education in Tanzania secondary schools.

Theoretical Framework of the Study

The study is based on Open Systems Theory which was first introduced by Ludwig von Bertalanffy in the 1940's and has been extended into a holistic theory of organizations and social systems. Bertalanffy's states that there are similar properties across various scientific fields led him to investigate a common language for describing systems of various kinds, which gave birth to the theory. General Systems Theory, as described in the first modern work on "General Systems", published in 1968 by Bertalanffy, aims to integrate concepts of hierarchical organization, multiple-variable interaction, and goal-directed processes. Open Systems Theory suggests that organisations, like schools, are never a closed and contained world, but rather one which is constantly being influenced by and influencing their surroundings. Katz and Kahn (1978) [11] stated that all social organizations are open systems, that is, they bring in inputs from the environment; they process those inputs in the organization; and they send outputs back out to the environment.

This cyclical movement has to happen all the time or else the organization will be in a situation where they are in danger of dying. The theory specifies four basic components of an open system: inputs, transformation processes, outputs and feedback. Inputs are the resources that the organization obtains from the environment, such as human, material, financial and information resources. Transformation is the internal processes in which these inputs are turned into outputs. Outputs are the results, products or services produced by the organisation. Feedback is any information regarding results and environmental conditions that gets fed back into the system for adaptation and adjustment (Yalcinkaya, 2002). This model has been extensively used in the field of education to analyse interactions between schools and their contexts, as well as how schools respond to external pressures. Schools are reliant on the environment for the key inputs that are required, such as funding, the school staff, learning resources, and they need to constantly adapt their internal configuration and function to achieve a dynamic balance with the environment. Dynamic equilibrium refers to an on-going balance between the organization and its environment, reached by continually readjusting internal structures and operations to allow for the more ready flow of needed resources (Emery, 2004) [8].

In this study, Open Systems Theory is used as a framework for analysing the relationship between resources used in teaching and learning with the integration of vocational education. The teaching and learning resources are defined as the input factors; these are materials, manpower and facilities which are needed in the school to carry out the vocational curriculum. Transformation process takes place in the secondary school curriculum when vocational education is integrated, and such process involves the conversion of the inputs of these resources into the process of activities delivery, practice and learning for students. The degree of vocational education integration is the criterion used to assess the outputs in order to get an idea of the level of implementation of the curriculum.

Adjustments in resource provision and approach/handover strategies are informed by feedback mechanisms such as monitoring, evaluation and stakeholder reaction. The concept of the theory is directly relevant to this study: If the inputs of a transformation process are not readily available or are not sufficient in quantity, then the outputs cannot be produced. The literature on vocational education in Tanzania has shown that where schools do not have functional workshops, industry standard equipment and consumable supplies they are unable to provide vocational education that includes practical learning. The Open Systems framework, therefore, offers the theoretical framework for analysing the effects of resource conditions under the public secondary schools in Kilolo district on the integration of vocational education in the curriculum.

Integration of Vocational Education And Resources Availability In Tanzanian Secondary Schools

The incorporation of vocational education into the secondary school education has become an important policy agenda in both developed and developing countries due to the prevailing unemployment and lack of skills among the youth and desire to provide students with work-related skills (Mwamakula *et al*. 2023). A comparison of vocational integration approaches across different countries shows that there are different models for vocational integration, which vary in their structure according to the historical, economic and social contexts of the countries. In every instance, however, the literature consistently reports that policy enactment requires not only the ability to articulate the policy, but to also obtain sufficient resources that are essential to successful implementation, including qualified teachers, working equipment and a long-term funding source for consumables (TIE, 2023). The vocational education system in Tanzania has drastically changed over the past few years. In 2023, a revised Education and Training Policy were implemented that added a dual-track approach to secondary education, with a specific vocational track, which marked the most ambitious step yet to incorporate practical skills training into mainstream education.

This reform is on the basis of the previously implemented policy, such as the VET Policy (1993), TVET Policy (2012), and the National Skills Development Strategy, which were all aimed at addressing the mismatch between educational outcomes and labour market demands. The government has made substantial investments in infrastructure to support these policy decisions, such as building 64 new VETA colleges and allocating more than 100 billion Tanzanian shillings for vocational training capacity expansion in the budget for financial year 2022/23. It has also released over 6.7 billion shillings in support of procurement of modern learning equipment for 35 secondary schools that run vocational programmes since 2024/25 through the Tanzania Education Authority (Xinhua, 2025) [27].

Despite these investments, it has been consistently found in the literature that resource constraints are the biggest barrier to effective integration of vocational education. It has been revealed on a report of the Parliamentary Standing Committee that there is a 90 percent shortage in the skilled vocational subject teachers (62 teachers against 620 demand) and there is 81 percent shortage in Business Education teachers. The committee also highlighted the lack of workshops, demonstration farms and laboratories for hands-on training and said vocational education may turn out to be merely theoretical rather than a practical solution for skills development (Policy Forum, 2022).

The national trends are reflected in regional research. In its study of rural Iringa, Swai and Burton (2026) [18] discovered that teachers, students and parents had positive attitudes towards vocational education, but the implementation was greatly hampered because of a shortage of practical sessions and the inadequacy of teaching and learning materials. The study, based on Open System Theory, revealed that the resources required for the successful implementation of curriculum change are qualified teachers, good workshops, learning materials and supportive infrastructure. An important issue in the literature is the character of vocational education itself, and this requires an initial investment in equipment, as well as ongoing investment in consumables. Vocational teaching differs from the academic subject, as there is a need to use ingredients of wood or metal or electronic components or food ingredients to teach the subject; this is different from the academic subject, which uses textbooks and chalkboard. Much like many developing countries, funding strategies in Tanzania have focussed on capital expenditure and not recurrent expenditure, resulting in a sustainability gap that compromises the sustainability of vocational programmes (TCU, 2025).

In addition, the social status of vocational education is still an issue, as studies point out that some parents are pushing

students to choose the general academic curriculum rather than vocational education because of their lack of knowledge about the value of vocational education. This attitudinal barrier adds to the problem of resource constraints, making the problem of policy implementation multidimensional (Adiyaman & Ozmantar, 2023) [1]. Comparisons with other nations is instructive. Studies in France and the Netherlands show the importance of not specialising too early, at the risk of reinforcing socio-economic disadvantage. Sorting students into prevocational, general or pre-university courses at the age of 12, as done in the Dutch system, has come under increasing inequality and offers proposals for change. Likewise, in Australia, the integrated senior secondary certificate in Victoria, which allows for subjects to be mixed and matched provides a good illustration of the importance of permeability between academic and vocational pathways, and the flexibility that it offers to students, whilst also maintaining the credit transfer mechanism (Zhang & Li, 2026) [29].These experiences indicate that there is a need to pay attention to both the structural design and the conditions for providing a meaningful practical instruction when developing a vocational integration.

The extent of research specifically looking at resource availability and resource adequacy in public secondary schools in Tanzania is still very limited. Although Swai and Burton's study offers helpful qualitative observations from the rural community in Iringa, it fails to quantify the relationship between the dimensions of these resources and the level of integration and did not concentrate specifically on the resource situation in Kilolo District. The Parliamentary Committee report provided only a national level analysis and not a district or school level analysis. This is an important gap as there are no empirical studies to date that have examined the relationship between resource availability and adequacy with integration at the school level, which is important for district education authorities to make informed decisions about priorities for allocation. In order to fill this gap, the present study investigates the level of influence of teaching and learning resources on vocational education integration in the public secondary schools of Kilolo District with a mixed methods design that measures the predictive relationship, and at the same time, provides an explanation to the process of how the teaching and learning resources determine the level of vocational education integration in the public secondary schools of Kilolo District.

Research Methodology

The study took place in one of the administrative districts of Iringa region in the Southern Highlands of Tanzania (Kilolo district). Most of Kilolo District's population is rural (74.7%) and the district has an agriculture-based economy. The district chosen is one that is currently undergoing a significant development of vocational education with the construction of a VETA college with TZS 1.6 billion being the amount of money invested to date, with a completion rate of 76 percent by June 2026. Further, being a rural district, Kilolo is faced with many common challenges such as infrastructure and resource conditions that are encountered in many rural districts in Tanzania, creating a realistic setting for examining the effect of resource availability and adequacy on vocational education integration.

In addition, the district public secondary schools have already adopted the vocational curriculum for 2023 but the situation of teaching and learning tools in the schools have not been investigated in the system, which makes Kilolo district an appropriate and opportune school to study as per the present study. Moreover, the district public secondary school have already adopted the vocational curriculum for 2023 but the situation of the teaching and learning tools in the district have not been studied in the system, which makes Kilolo district an appropriate and opportune district for the present study.

This study used a convergent parallel mixed methods design, which involved the collection of quantitative data and qualitative data concurrently, and subsequently analysed and combined these data for interpretation. The justification for the use of a mixed-methods approach is that quantitative data can be used to test the direction and strength of the relationship between resource availability, adequacy, and vocational education integration, whereas qualitative data can provide in-depth explanation of the mechanisms, contexts, and lived experiences of resource constraints. The convergent parallel design proved to be most appropriate for this study, which focused on only one specific objective, given that it enabled the researcher to quantitatively examine the predictive relationship between resource availability and integration levels, qualitatively describe how and why resource conditions impact integration, and combine both strands to create a comprehensive understanding of the resource-integration relationship.

The population for this study was all public secondary schools in Kilolo District that provide vocational courses in the 2023 revised curriculum and all teachers of vocational courses in the schools. Stratified random sampling was used for the quantitative strand. Schools were first sorted by geographical area (urban and rural). Five schools were chosen (3 rural and 2 urban) from the accessible population. In each chosen school, all teachers who taught vocational course(s) were randomly selected, resulting in 134 teachers. The table for determining the sample size from a known population by Krejcie and Morgan (1970) [13] was used to assess the sample size. In addition, Cohen (1992) [3] recommended a sample size of 134 for multiple regression analysis with a medium effect size ($f^2 = 0.15$) for a power of.80 and a significance level of $\alpha = .05$. Sample of five heads of schools (one from each participating school) was generated by purposive sampling for the qualitative strand. To be included in the selection, participants had to be directly involved in vocational education implementation, have at least three years' experience in school leadership and be willing to give in-depth information. Heads of school were identified as key informants as they have strategic oversight of school-level decision making, curriculum implementation and resource allocation.

For the quantitative strand, a scale on Vocational Education Resources and Integration developed by the author was used. The instrument was administered into 2 subscales. The Resource Availability and Adequacy Scale consisted of 25 items rated on a 5-point Likert scale related to three scales: availability, adequacy of specialized equipment, availability, adequacy of instructional material and availability, suitability of practical training facilities. There were 12 items on the Integration Level Scale, which was rated on a 5-point Likert scale, to measure the depth and breadth of vocational curriculum implementation. The instrument was then reviewed for content validity by three experts in the field of education and pilot-tested with 20 teachers. The resource scale had a Cronbach's alpha coefficient of.87 and the integration scale had a Cronbach's alpha coefficient of.83.

A semi-structured interview guide was created and structured under four themes for the qualitative strand: resource acquisition channels, resource adequacy experiences, impacts of resource gaps on vocational education integration and suggestions for improvement. Interviews were conducted for 45-60 minutes, with the consent of the participants, and then audio-recorded. SPSS version 27.0 was used to analyse quantitative data. Descriptive statistics were calculated to describe and summarize the level of resource availability and adequacy, and integration level. Independent samples t-tests were performed to assess differences in resources between urban and rural schools. Multiple regression analysis was conducted to determine if there was a significant relationship between the three resource dimensions and level of vocational education integration, at the $p < .05$ level of significance.

Thematic analysis as described by Braun and Clarke (2006) [2] was employed to analyse the qualitative data and NVivo 14 software used to facilitate coding and theme management. Trustworthiness was achieved by member checking, triangulation and thick description. Results from quantitative and qualitative data were combined in the interpretation stage by laying them out in a joint display matrix, looking for convergence, divergence and expansion in the two sets of data. The research ethics committee of the university gave ethical clearance before the data was collected. The Kilolo District Executive Director and District Education Officer were requested for permission to conduct research activities within the district. All participants were given informed consent following a thorough explanation of the nature of the study, the voluntary nature of participation, and the possibility of withdrawing at any time without penalty. All data was anonymised, confidential and only accessible by the researcher.

Research Findings

The quantitative sample consisted of 134 teachers from five public secondary schools in Kilolo District with 56.7 per cent being male and 43.3 per cent female. Most of the teachers belonged to the age groups 30 to 39 and 40 to 49 years with 37.3 percent and 33.6 percent respectively. Thirty percent had taught for 5 to 10 years and 35.1 percent had taught for 11 to 20 years. Fifty-two percent of the sample were rural school teachers, and 47.8 percent were urban school teachers. The qualitative strand comprised five heads of schools, three from rural and two from urban schools, all with experience in leadership ranging from 4-12 years.

The quantitative results indicated that overall, the resources for Vocational Education in public-secondary schools in Kilolo District were at moderate level (3.13/5) based on the composite mean. As for the three resource dimensions, the instructional material availability and adequacy scored highest with a mean of 3.43, the availability of specialized equipment scored 3.10 and the mean for practical training facility availability and suitability was the lowest with a mean of 2.87. These figures show that although some schools had some materials and equipment needed for instruction, the other dimension of resources in which the schools were weakest was the facilities for practical training.

Moreover, the resource indices for urban schools were significantly greater than those for rural schools, with the composite resource index for urban schools being 3.48 and its rural counterpart being 2.81 ($t = 3.89$, $p < .001$). The disparity between urban and rural schools also stood out in Kilolo District for specialized equipment and practical training facilities, indicating compounded resource disadvantages for rural schools in this District. The multiple regression analysis also showed that the three dimensions of resources accounted for 55 percent of the variance in vocational education integration ($R^2 = .55$, $F(3, 130) = 52.87$, $p < .001$). The strongest predictor ($\beta = .43$, $p < .001$) was specialized equipment availability and adequacy, followed by availability and adequacy of instructional material ($\beta = .34$, $p < .001$) and availability and suitability of practical training facility ($\beta = .27$, $p < .01$). Therefore, the null hypothesis was rejected with these results and it can be concluded that there is a significant positive predictive relationship between the availability and adequacy of teaching and learning materials to the level of integration of vocational education.

The qualitative results supported and clarified these quantitative patterns and provided additional insights into the processes by which the integration of vocational education was influenced by conditions of resources. Head of schools reported that there was a common trend of equipment being available, but not always complete, with the schools receiving equipment kits from the Ministry of Education. These kits were often lacking in the range of functionality needed to serve the entirety of the curriculum competencies as said by one of the head of school, *"Welding equipment was provided, but it didn't come with the necessary safety equipment or ventilation system".* In addition, another rural head of school said that, *"At the school, there are safety issues during practicals and real time for instruction is limited"*. An additional head said that *"the Ministry provides a basic kit, but their programme provides several directions in carpentry, for instance, varying specification of planers and saw tables allow for the most basic exercises to be carried out"*. This result paralleled the quantitative finding that the availability and/or adequacy of specialized equipment was a key factor in integration, but that simply having equipment did not mean it was effectively being integrated. Another theme that developed from the qualitative information was that of a constant stream of consumable materials, which was only partially addressed in the quantitative instrument. Vocational courses involve a continuous use of raw materials like wood, metal, electronic components and food ingredients, but funding mechanisms were focused on procuring equipment in one-time amounts rather than reoccurring expenses. One head of school commented, *"Equipment's is a one-off cost but consumables are ongoing cost. Schools have no budget line, so they have to carve out sufficient funding from other cost centres, or incentivise parental contribution – which is challenging in rural schools"*. This qualitative result contrasted with the quantitative one of the questionnaires as it indicated a critical resource dimension that was not included in the questionnaire, which emphasized the importance of the qualitative strand in revealing the dimensions of resource inadequacy that were not detected by a purely quantitative approach.

The third theme was the invisible limitations that are placed by a lack of a stable infrastructure, especially electricity and water. One head of school explained, *"With the loss of power, cooking class becomes a theory class, students review recipes and don't actually cook; this can occur four or five times throughout a term"*. This qualitative finding complemented the quantitative findings by revealing that the lowest scoring dimension in the quantitative survey, the practical training

facility dimension was not only about the physical state of the workshops but also about the reliability of the facilities upon which vocational training itself relied, such as utilities. The fourth theme showed that the concept of resource adequacy was considered a relative and context-dependent one. One urban school head commented, *"We have a lot more equipment than the rural schools, but in a practical class with 45 students even our two workshops are not enough. Adequacy is about comparing this with something, right?* This supported the quantitative findings by showing that there was no reductionism in the concept of the adequacy since this was to be considered in line with the requirements of the curriculum, the number of students and the contextual expectations.

Results of the integration of quantitative and qualitative findings showed that there was a convergence in the importance of specialized equipment as the strongest predictor of vocational education integration. The findings of the regression analysis showed that the availability and adequacy of specialized equipment had the highest standardized coefficient. The qualitative data stated that equipment was sometimes incomplete in its functional aspects, so availability alone was not enough and that it was also necessary to be adequate in terms of being functional and aligned to the curriculum. The two strands also focused on the importance of teaching materials, but the qualitative findings gave more detail on this, suggesting that although textbooks had been issued, there were no practical manuals or consumable teaching guides. On the dimension of practical training facilities, the quantitative and qualitative strands complemented each other, as the survey suggested that this resource dimension was the scarcest, and the interviews explained that there were hidden constraints due to the instability of the infrastructure that could not be captured by the quantitative score.

The most important difference was the issue of consumables, which was a theme that came out of the qualitative data and was not included in the quantitative instrument. This difference underlined the importance of mixed methods to gain insight into aspects that cannot be captured with one approach alone and highlighted that an adequate understanding of resources in vocational education requires both the availability of equipment and facilities and sustainability of consumable resource supply over time.

Discussion

The results of this study indicate that the teaching and learning resources are an important factor in the integration of vocational education in the public secondary school curriculum in Kilolo District. The quantitative results showed that resource availability and adequacy accounted for 55 percent of the variance in integration level, indicating that resource inputs to curriculum implementation were not just facilitative but were determinant of success in implementing the curriculum. This result supports the main tenet of the Open Systems Theory that the quality of the systems inputs directly determines the effectiveness of the transformation processes and the production of the desired outputs (Yalcinkaya, 2002). It was found that the capacity of specialized equipment was the most important predictor of vocational education integration, which has a direct relation to the nature of vocational education as a practice-oriented endeavour, in which students manipulate tools and operate various machines to produce tangible artifacts, and without functional equipment, the essence of vocational education turns into theoretical education and vocational education loses its core value. The qualitative findings resulted in explanations for why equipment was not enough, particularly equipment that was available but not fully complete, and was often basic equipment that was not able to support the entire scope of curriculum competencies.

One rural school head commented that welding equipment had been provided without accompanying safety equipment and ventilation systems, making for safety concerns and limiting the time available to students for welding, and another school head reported that the basic kits provided by the Ministry were appropriate for simple exercises, but the modular curriculum needed specific tools and equipment. The example accounts show that adequacy, which is functional completeness and curriculum alignment, is as important as the mere presence. The qualitative results also uncovered an important element not addressed by the quantitative instrument; the need for a constant flow of consumable materials in vocational courses, recurrent costs were also not a priority as they focused only on the provision of equipment. One head of school commented that the school's equipment was based on a one-off investment, but its consumables were based on an ongoing need, which meant that the school had to take money from other budgets or have to ask parents to pay for this, both of which were a hard sell in a rural school environment.

The high level of educational inequality observed in this study was also evident in the Tanzania wide inequality in resource availability and adequacy as observed between urban and rural schools with values of 3.48 and 2.81 respectively, which was statistically significant and consistent across all the resource dimensions. This is especially significant in VET as the resource requirement is more than in academic subjects and the practical training must be conducted in rural schools in Kilolo District, which do not have access to the specialised facilities being constructed at the VETA college. But the qualitative result revealed that the concept of adequacy is relative and contextual based, with one urban school head explaining that his school had more equipment than rural schools, and that with forty-five students in a practical class, even two workstations were not enough.

In addition, the qualitative results of the infrastructure constraints showed that it is important to understand that there are unspoken constraints that are not completely represented in the quantitative analysis of facility availability, such as electricity failures that make cooking classes into class theory sessions and unreliable water supply that restricts what can be done in a class. The implications of these findings are important for both policy and practice, and the main message is that policy and one-off investments in curriculum reform are not enough. The 2023 revised curriculum requires all secondary schools to integrate vocational education and the government has committed politically by investing heavily on the VETA infrastructure, equipment procurement and even the curriculum, but the secondary schools delivering the vocational stream might not have the resources to successfully implement the set targets (Toroka & Kafanabo, 2024) [22].

The lack of a separate budget line for consumables implies that funding models need to move away from a capital expenditure focus towards one that supports resources across the entire life cycle, encompassing consumables,

maintenance, and upgrading within existing budgets. The substantial disparity in funding per urban school versus rural schools indicates that a unified funding model may be inadequate and that differentiated support for rural schools, in terms of the level of support provided, may be necessary to achieve equitable implementation. The study also makes a contribution to theory by showing the applicability of the OST to the context of integrating curriculum in vocational education in the rural contexts of Tanzania and recommending that OST must be supplemented by an awareness of the unique nature of vocational education as an educational system, such as its reliance on consumable materials and on reliable infrastructure to enhance the acquisition of practical skills to students in secondary schools.

Conclusion and Recommendation

Based on the findings from the study, the researcher concludes that the availability and adequacy of T/L resources play significant roles in determining the integration of vocational education in the public secondary school curriculum in Kilolo District. Particularly, with specialized equipment availability and adequacy being the most influential, followed by availability, adequacy of instructional material and suitability of practical training facility in the schools. The results also highlight the urban-rural inequality in resources, with rural schools having far lower overall resource indices on all dimensions and qualitative evidence revealing that some schools had not had the funds to purchase the consumables, and that basic equipment kits were often not fully functional, and that electricity and water were often unreliable in the rural context.

The study proposes that the District Education Authority set up a District Vocational Education Resource Management Centre to facilitate equipment sharing, consumables procurement, maintenance services and continuous practical instruction. In addition, there is a need to introduce a separate annual vocational education budget line to meet the needs for continuous practical instruction, and strengthen the construction of infrastructure in the rural schools to remove the hidden obstacles to the implementation of the vocational curriculum. The Ministry of Education and TIE should adopt a different model for allocation of resources, moving from a one-off resource to a full cycle support for the resources with an integrated approach to consumables, maintenance, upgrading, in accordance with the regular budgets. Similarly, there focus should be on developing low resource dependent practical solutions for schools of which the resources are not well distributed, and introducing minimum standards of resources which take into consideration the demands of the curriculum, the student population and the school context, instead of assuming a uniform package of resources. Furthermore, Heads of schools should explore the mechanisms of cooperation between schools and enterprise and the mobilization of resources from the community: include local businesses, artisans and farms in the network of school resources, while boosting teachers' capacity building in the use of school resources for better utilisation of existing resources.

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