

Teacher professional development programmes under the Zanzibar improving students' prospect (ZISP) project: Factors for effective implementation

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Highlights

- Adequate financial resources, instructional materials, and physical infrastructure are the primary drivers of successful TPD implementation.
- Targeted ICT and English language training effectively addressed the specific pedagogical needs of the teachers.
- Multi-stakeholder collaboration and alignment with local cultural dynamics ensured the project's acceptance and sustainability.

Abstract

Introduction: Teacher Professional Development (TPD) is critical in advancing educational progress. Many countries have implemented various TPD models, from short workshop conferences to long-term in-school Professional Development (PD) and from peer coaching to online learning communities. In this context, as developing nations, Tanzania and Zanzibar are urgently modernising their education system with new teacher quality reforms and in-service training. The ZISP project, a crucial initiative implemented in Zanzibar from 2016 to 2021, responds to this urgent need for educational modernisation. Therefore, this study investigates enablers and barriers for the implementation of TPD programmes under the ZISP project training. **Methodology:** The study was carried out in Zanzibar, Tanzania, using a Cross-sectional research design, which involved collecting data at a single point in time. The target population consisted of Teacher Centre (TC) trainers, District Educational Officers (DEOs), and the Pemba Project Coordinator (PC). Purposive sampling was used to select key informants for face-to-face interviews. Primary data collection involved conducting Key Informant Interviews (KIIs) using a structured checklist, engaging 13 informants in person and three through telephone interviews. The qualitative data obtained from respondents was analysed thematically. **Results/Discussion:** The study findings identified key determinants for the successful implementation of TPD programs under the ZISP project. Several key factors, known as major drivers in this research, include financial resources, material resources, physical infrastructure, the need for training programs, and project training strategies. Literature has shown the importance of those factors for the implementation of the TPD program, which aligns with our study findings. **Conclusion/Recommendation:** Key findings from our study inform factors necessary to successfully implement such TPD interventions. As revealed from this study, TPD Programs largely depend on the availability of financial and material resources, physical infrastructure and training facilities. The study recommends that appropriate funding be provided so that comprehensive courses can be devised, fitted with suitable materials, and acilitated by expert pedagogical mentors.

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1. Introduction

While global organisations such as UNESCO highlight the importance of Teacher Professional Development (TPD) (Portillo, & Lopez de la Serna, 2021), this research will focus on how these global trends are reflected in the Zanzibar Improving Students' Prospects (ZISP) Project, particularly in the context of challenges specific to Zanzibar, such as resource constraints and the need for subject-specific teacher training. It is widely agreed that (TPD) is an essential ingredient in the improvement of educational progress. It is an array of activities and processes intended to help teachers acquire new competencies or polish existing practices, thus achieving sophistication through pedagogical upgrades (Darling-Hammond *et al.*, 2017). International organisations such as UNESCO and the World Bank emphasise their critical role in meeting global education objectives. The UNESCO 2030 Education Agenda holds that teacher development is important in realising the transformative vision for inclusive and equitable quality education while noting that a huge improvement in student learning outcomes requires well-prepared teachers capable of responding to growing diversity among students (Webb *et al.*, 2019). The United Nations Framework for Action also emphasises good teaching practices as an essential component of quality education to improve educational achievements (Kioupi & Voulvoulis, 2019).

International models of TPD, such as those used in Sub-Saharan Africa, offer insights into scalable interventions (Haßler *et al.*, 2021). However, the unique socio-cultural and resource challenges in Zanzibar mean that such models must be adapted. For instance, the peer coaching model used in Kenya Johnson *et al.*, (2017), could be refined to account for Zanzibar's diverse linguistic and cultural landscape. Many countries worldwide have implemented different models of TPD, from half-day workshop conferences to longer-term in-school PD and from peer coaching to online learning communities (Zepeda, 2019). The education methods have been slowly transitioning from a more traditional system emphasising memorising and repeating to a more innovative, learner-centred approach that should be used in every classroom by 21st-century teachers (Dewi & Alam, 2020). These scholars argued that, to facilitate the transition, PD for teachers is going to have to be a continuous activity so they can provide educational input regarding the 21st-century demands of our education systems.

In countries worldwide that are lagging behind, TPD faces a number of notable hurdles, being overburdened by financial constraints, facing inadequate access to re-training opportunities and being dependent on outdated teaching pedagogies (Hill *et al.*, 2013). While these challenges are widespread, they resonate deeply with the objectives of the ZISP project, which aims to overcome similar barriers in Zanzibar through targeted teacher training programs in subjects such as Mathematics and Science. Large-scale teacher training initiatives rolling out programs nationwide, particularly in Sub-Saharan Africa, tend to focus on these teacher training projects (Conn, 2017). International organisations such as the World Bank have lent a hand to policymakers, helping them design and implement teacher development programs that focus on content knowledge in tandem with improving teaching skills (Fullan, 2014). However, the program's success depends on a host of local factors like government buy-in, infrastructure, and teachers' motivation.

Tanzania is a developing nation trying to modernise its education system with a series of new teacher quality reforms (Wandela, 2014). However, various challenges such as scarcity of resources, increased number of students in classrooms, and differences between urban and rural areas remain. The Tanzanian government has acknowledged TPD as essential for the ongoing development of teaching and learning to address these challenges and enhance overall educational performance (Mgaiwa, 2018). Education in Tanzania seeks to recognise and address these challenges to develop an efficient system where the potential for learning does not vary across households. Given these challenges, the Zanzibar Improving Students' Prospects (ZISP) project was introduced to modernise the education system, with a particular focus on addressing teacher shortages and improving pedagogical practices in key subjects such as Mathematics, Science, and English (World Bank, 2016).

The ZISP project was a five (5) years project from 2016 to 2021, funded by the World Bank and implemented in Zanzibar. The development objectives of the project were to improve the quality of (a) instruction and (b) the learning environment in targeted grades and targeted subjects (World Bank, 2016).

The project had four components; the first was effective instruction for Mathematics, Science subjects, and English, which aimed to transform mathematics, science, and English teaching in upper primary and lower secondary. The second component focused on improving school autonomy and the learning environment. Therefore, school improvement grants (SIGs) were established, removing all charges to the Zanzibar parents. The third component was the construction of herbs for enhanced mathematics, science, and English learning, which aimed to support the impactful provision of learning facilities or resources for improved mathematics, science, and English subjects. The last component was system transformation and project management, focusing on four areas: examination reform, education system planning, strengthening data systems, and supporting project and project implementation (Ali & Wandela, 2023).

Better quality of teaching and learning, better access, and strengthened systems are crucial to improving student outcomes. Training for teachers in Mathematics, Science, and English bettered the quality of teaching: for instance, some arts teachers are trained for mathematics and sciences. The school grants remove financial barriers since the elimination of parental fees at schools guarantees retention. Overcrowding was reduced by expanding classrooms and equipping schools with science laboratories and ICT facilities, giving a more hands-on approach to learning, such as enabling students to actually do science experiments. These early reforms in exams and data systems helped identify learning gaps sooner, while targeted interventions include better formative assessments. This was both an enabling and supporting learning environment that prepares students for performance and their future.

In the first component, effective instruction for Mathematics, Science, and English subjects, the project aimed to support trained mathematics and science teachers in increasing their English proficiency and enhancing their pedagogical skills (World Bank, 2016). Therefore, this study examined factors that facilitated or hindered the implementation of this training from the ZISP project to see whether this PD program under the ZISP Project was successful.

The lack of effective TPD programmes is considered to be one of the key factors contributing to students' low performance, with only a small percentage of students meeting the expected learning standards (MoEVT, 2016), which are essential for improving teaching effectiveness and student learning outcomes (Bashir *et al.*, 2018). This is why the government of Zanzibar emphasises implementing different TPD programmes, including the ZISP Project. However, despite the emphasis and financial investments in such programs, the students' academic performances are still low, especially regarding their national examination results (Ahmed & Ayoub, 2018). The study objective was to examine the enablers and barriers for the implementation of TPD programmes under the ZISP project training. This objective intended to answer the question of what factors facilitated or hindered the ZISP Project training and whether the Project training was successful.

Identifying the factors that facilitate or hinder TPD is essential for the effective delivery of the ZISP initiative. Recognising these elements equips policymakers and project implementers with the potential to design strategies that put forward a solution by addressing challenges and leveraging enablers. The research can inform improvements in TPD within Zanzibar and potentially impact student learning outcomes. The results will also provide useful feedback for similar efforts in environments with related cultural, geographical or economic characteristics that are still far short of satisfying UN basic needs standards. It is hoped that, by disseminating best practices and lessons learned, this study may inform an academic viewpoint on effective TPD in difficult conditions at the global level.

2. Literature Review

This study was guided by the Theory of Change (ToC), which was first introduced in the 1990s to assist evaluators in addressing challenges associated with assessing the impact of complex social development programs (Peta, 2018). ToC provides a framework for conceptualising the causal linkages between actions and outcomes, emphasising the importance of a well-defined causal pathway for the success of initiatives (Kiettikunwong & Narot, 2024). ToC, in this context of the Zanzibar Improving Student Prospect Project, maps out the inter-relating details of input to activities and on to outputs and eventually outcomes and impact that describe the activities under TPD initiatives. Some of the inputs, for instance, involved financial

investments, facilitators with the requisite training, and materials. The activities involved training workshops for teachers and subsequent follow-through. These outputs, the effective ZISP project implementation, therefore, directly contributed to the immediate outcomes of improved teacher pedagogical skills and subject knowledge.

2.1 Theoretical Framework

This study is guided by the Theory of Change (ToC), which conceptualises program implementation as a structured causal chain linking inputs, activities, outputs, and outcomes. Rather than functioning as a descriptive model, ToC in this study serves as an analytical framework to examine whether the conditions necessary for effective teacher professional development were present and functionally aligned.

Within the ZISP intervention, inputs included financial allocations, instructional materials, policy alignment, infrastructure, and stakeholder coordination. These inputs were expected to enable training activities delivered through Teacher Centres. Effective implementation of these activities was anticipated to produce outputs in the form of active teacher participation and instructional skill acquisition. The short-term outcomes targeted improved pedagogical competence in Mathematics, Science, and English. This framework guided both data coding and interpretation. Identified themes were examined as enabling or constraining mechanisms within this causal pathway.

2.2 Empirical literature review

The literature on Teacher Professional Development is immense, many-faceted, and with increased acknowledgement of the role it can play in bringing improvement in the field of learning outcomes (Zeng, 2023), particularly in regions like Zanzibar, where educators face some rather unique challenges, both pedagogically and due to the resources available (Ryan & Tilbury, 2013). Therefore, an in-depth review of TPD is relevant specifically within the purview of the Zanzibar Improving Students' Prospect Project for addressing certain specific needs and challenges educators face in Zanzibar. While most of these studies allow for a general understanding of the effectiveness of TPD (Mosha, 2016; Mosha, 2015; Alawi, 2023), most are in respect to generally broad perspectives and require linking specifically into the context of Zanzibar in relation to how TRCs, integration of ICTs, the factors influencing its effective implementation and teacher networking have been realised or under-realized within the ZISP framework.

Mosha (2015) highlights the pivotal role of Teachers' Resource Centres (TRCs) in promoting TPD and improving primary education in Zanzibar. Mosha reveals a significant gap in understanding how TRCs contribute to Professional Development (PD), emphasising the need for structured in-service training programs aimed at both qualified and unqualified teachers. This foundational work underscores the importance of local resources in facilitating TPD, setting the stage for subsequent discussions on broader challenges and opportunities. Logation and Mbepera (2021) noted that while TRCs can be effective in enhancing teacher competencies, their impact is dependent on sustained financial and administrative support. Within the ZISP project, TRCs were utilised as key hubs for teacher training and resource sharing; however, there are concerns about whether such a centre was well supported institutionally for its sustainability.

Like in Tondeur *et al.*, (2016), successful TPD needs the meaningful integration of ICT, which also requires alignment with the teachers' instructional needs and a shared vision from the stakeholders. Yet in Zanzibar, the adoption of ICT within teacher training remains inconsistent, while infrastructural challenges hamper their effectiveness (Lawrence & Tar, (2018). While the ZISP project introduced digital learning resources and ICT-focused training, its longer-term impact is unclear, especially in rural schools with limited connectivity and technological access. This calls for further investigation into how the project succeeded in overcoming such logistical challenges and whether the teachers were well prepared to integrate technology into their everyday teaching practices.

The study by Namamba and Rao (2017) shows that examining teacher educators is necessary for effective TPD in Tanzania. They advocate for collaborative networks and communities of practice that can enhance the PD of teacher educators, thereby improving the overall quality of teacher education. This emphasis on

community and collaboration resonates with the needs articulated in the ZISP Project, where collective efforts are vital for sustainable educational reform. Indraswari and Kuswandono (2018) revealed the motivations and challenges faced by teachers in vocational contexts, illustrating that TPD is essential for developing teaching skills and improving educational outcomes. Their research highlights the necessity for supportive environments that encourage teachers to engage in PD activities, which is particularly relevant for addressing the specific needs of Zanzibar's educators.

The study done by Tantawy (2020) presents a comprehensive analysis of the influence of PD on teachers' performance and career progression. The study subscribes that effective TPD enhances teachers' knowledge and confidence and positively impacts student outcomes. This aligns with the goals of the ZISP Project, which aims to elevate teaching standards and ultimately improve student achievement. Moreover, Li (2022) concludes the reviewed literature by discussing the evolving landscape of TPD in the context of globalisation and the ever-increasing expectations placed on educators. It highlights various approaches, including reflective practices, collaborative learning, and technology integration, all of which contribute positively to enhancing teachers' competence. However, Li also points to the unevenness of some of the approaches applied and calls for more context-sensitive, sustainable, and personalised TPD programs considering diverse teacher needs.

The reviewed literature collectively underscores the critical importance of TPD in enhancing educational quality in Zanzibar. They highlight the multifaceted nature of effective TPD, including the roles of local resources, technological integration, collaborative practices, and the necessity for context-specific approaches, but did not specifically identify well-detailed specific factors for the success of TPD programs in the Zanzibar region. The limited focus on Zanzibar's contextual challenges leaves a gap in understanding the specific enablers and barriers to the sustainability of TPD programs in the region. These insights provide a robust framework for understanding the factors contributing to the successful implementation of TPD within the ZISP Project, setting the stage for further exploring best practices and policy frameworks tailored to Zanzibar's unique educational landscape.

2.4 Conceptual Framework

According to the Theory of Change, the conceptual framework of the TPD activities within the ZISP project is hinged on structured progress from input to impact. Key inputs necessary to drive teacher activities (training) include financial resources, training materials, and policy support. These activities lead to particular outputs, such as effective project implementation. Improved teachers improved in knowledge and skills as an outcome. The framework looks to motivation, cultural relevance, ongoing support, and resource availability as the leading factors in determining if TPD would be successful and sustainable to ensure that the quality of education would be positively modified in Zanzibar. Arrows have been used to show that each element influences another and contributes to the project's outcome. Trainers are involved in both input and intermediate variables leading to the effective project implantation.

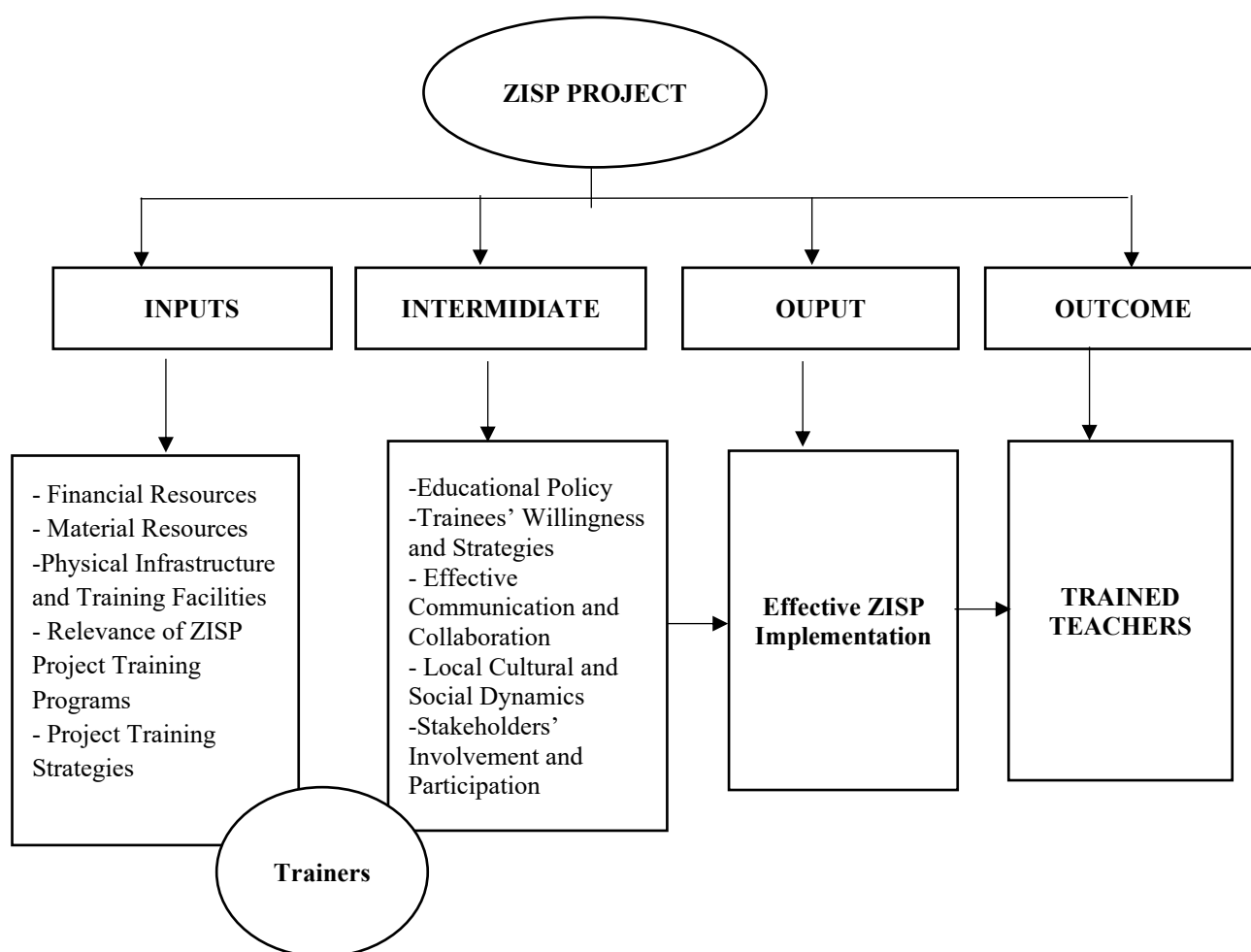


Figure 1: Showing the factors (inputs) for the project training that contributed to the ZISP project's effective implementation (output), leading to trained teachers (outcome).

3. Methodology

3.1 Description of the Study Area

The study was conducted in Zanzibar, Tanzania, where the ZISP Project was implemented from 2016 to 2021. The specific area of this study was the North Pemba Region in two districts: Wete and Micheweni districts. The region has 50 secondary schools and 773 teachers (Statistics Coordinator Pemba, personal communication, 21st September 2023). North Pemba Region is characterised by rural communities with varying access to educational resources, which can influence the outcomes of professional development programs.

3.2 Research Design

This study adopted a cross-sectional qualitative research design. In this context, cross-sectional refers to the collection of qualitative data at a single point in time following implementation of the ZISP teacher professional development program. Unlike longitudinal qualitative studies that trace evolving experiences across multiple phases, this design captured participants' retrospective reflections on implementation conditions and perceived effectiveness during the project period. The design was appropriate because the study sought to identify enabling and constraining factors within a defined implementation window rather than measure change trajectories over time. Data were therefore temporally bounded but analytically focused on reconstructing implementation processes.

3.3 Study Population

The targeted population consisted of trainers from three Teacher Centres (TCs) who conducted training for the ZISP Project. The study targeted trainers with varying years of experience, from novice to seasoned educators, District Educational Officers from Wete and Micheweni Pemba, and the Project Coordinator, to gain a broad perspective on the implementation of the ZISP Project.

3.4 Sampling Strategy and Sample Size

The study employed purposive sampling to select participants directly involved in the implementation of the ZISP TPD in North Pemba. Participants were selected based on their functional roles within the project structure, including included 16 respondents: 13 trainers from three Teacher Centres (TCs) where training in North Pemba was conducted, 2 District Educational Officers (DEOs) and a Project Coordinator (PC) in Pemba. This criterion-based approach ensured inclusion of individuals possessing direct experiential knowledge of implementation processes.

A total of 16 participants were interviewed. In qualitative research, sample adequacy is determined not by numerical representativeness but by the depth and relevance of information generated. The concept of information power (Malterud et al., 2016) guided sample sufficiency: because the study had a narrow aim (implementation factors within a specific program), a relatively homogenous participant group, and strong theoretical anchoring in the Theory of Change framework, fewer participants were required to achieve analytical depth.

Data saturation was reached when no new themes emerged from successive interviews. After the fourteenth interview, thematic repetition was observed across structural inputs, stakeholder coordination, trainee engagement, and implementation barriers. Two additional interviews were conducted to confirm stability of thematic patterns. No substantially new codes emerged, indicating saturation. The sample also reflected role-based variation across implementation levels, enhancing analytical triangulation. This multi-level representation strengthened credibility by capturing perspectives from policy, coordination, and training implementation.

To enhance credibility, data were triangulated across participant categories to identify convergence and divergence in perspectives. Prolonged engagement during interviews (45–70 minutes each) facilitated depth of inquiry. Member checking was conducted with selected participants to validate interpretation of key themes.

3.5 Data Collection Method and Tool

Primary data were collected through Key Informant Interviews (KIIs) through a checklist of questions. The interviews were face-to-face with 13 respondents, and telephone interviews were conducted with three informants about the factors that facilitated or hindered the implementation of ZISP project training conducted during the time of project implementation.

The interview guide was organised around four thematic domains aligned with the Theory of Change framework:

1. Structural Inputs (e.g., financial, material, policy, infrastructure support)
2. Implementation Processes (e.g., coordination, communication, stakeholder engagement)
3. Participation and Engagement (e.g., motivation, attendance, perceived relevance)
4. Perceived Outcomes (e.g., changes in instructional competence)

Sample interview questions included:

- “How were financial and material resources managed during the training sessions?”
- “In what ways did the training align with national education policy?”
- “How did stakeholder collaboration influence implementation?”

Each interview lasted between 13 and 18 minutes and was audio-recorded with participant consent. The interview guide was reviewed by two educational research experts to enhance content validity and clarity prior to data collection.

Ethical clearance was obtained from the relevant institutional authority prior to data collection. Participants were provided with written information explaining the purpose of the study, voluntary nature of participation, confidentiality safeguards, and the right to withdraw at any stage without consequence. Written informed consent was obtained before interviews commenced. To protect anonymity, pseudonyms were used in reporting, and identifying information was removed from transcripts. Audio files and transcripts were securely stored on password-protected devices accessible only to the researcher.

3.6 Data Analysis

Qualitative data were analysed using Thematic Analysis (TA) following Braun and Clarke's six-phase framework. This approach was chosen because it provides a systematic way of identifying, analysing, and interpreting patterns within qualitative data. Audio-recorded interviews were transcribed verbatim and subjected to iterative familiarisation. Initial inductive codes were generated from meaningful text segments aligned with the research objective. Codes were subsequently clustered into candidate themes representing enabling and constraining implementation factors.

Themes were reviewed for internal coherence and external distinction before final definition and naming. Analytical interpretation was guided by the Theory of Change framework, linking themes to broader implementation mechanisms. Peer debriefing and member checking enhanced credibility, while illustrative excerpts supported interpretive validity.

Excerpts of participants' responses supported the final themes identified, and these excerpts were thus used to back up the findings. Some of the key themes in this regard are related to how training is delivered collaboratively, the availability of resources, the relevance of the training, physical infrastructure and how financial incentives prove to be motivating. These themes provided insight into how the ZISP project was successfully implemented, offering a basis for interpreting findings and relating them to the literature.

4. Results/Discussion

This section discusses the key role of Zanzibar's educational policy and enablers for effective implementation of ZISP Project training, highlighting their contributions to enhancing educational quality and student outcomes. Also, rather than presenting findings descriptively, this section synthesises patterns across participants' responses to explain how multiple enabling factors interacted to influence the successful implementation of the ZISP Project training. Participant quotations are used selectively to support analytical interpretations rather than as standalone evidence.

The findings are organised in alignment with the Theory of Change framework. Themes identified during analysis correspond to specific stages within the causal chain. Financial resources, material adequacy, infrastructure, and policy alignment are interpreted as structural inputs. Stakeholder collaboration and communication function as governance mechanisms shaping implementation processes. Trainees' willingness and perceived relevance operate at the level of implementation outputs, influencing the extent to which training activities translated into professional engagement.

4.1 Educational Policy

Zanzibar has taken steps forward in educational policy, especially around the hard sciences. Notable changes include a shift from Kiswahili to English as the medium of instruction in 2014 in science and mathematics after Grade 5, with an eye toward enhancing students' literacy in English for post-secondary education and international competitiveness (Maalim, 2015). Alongside this, there is considerable emphasis on teacher training, providing extensive PD for all teachers to implement a curriculum that introduces English as the medium of science instruction (Brumfit *et al.*, 2022). Providing better laboratory facilities, particularly textual books, are also available on and off-line to improve the teaching and learning process. Policies are also emerging to advance inclusive education to ensure that all children, including those with

disabilities, have the opportunity for high-quality science teaching (Kambuga & Mgonja, 2023). These align with the island's efforts to tackle its problems and are part of Zanzibar's effort to prepare its students for the challenges ahead.

Educational policy alignment functioned as a structural enabler of ZISP implementation. The Zanzibar Education Policy (2006) and subsequent reforms emphasising science education and competence-based curriculum (CBC) created institutional legitimacy for targeted teacher training. Respondents indicated that alignment between project objectives and national policy reduced bureaucratic resistance and facilitated stakeholder endorsement.

The policy aligned with project training, and this alignment has provided a clear framework and support for the project's objectives, particularly in improving student performance in science subjects and addressing the shortage of qualified teachers, as the ZISP Project Coordinator in Pemba narrated.

"Zanzibar, we use the educational policy of 2006, in that policy and different announcements emphasise science subjects, so the ZISP project aligned with the policy of 2006 because this project emphasises science subjects. That is due to the bad results that students performed before the ZISP project in these science subjects, especially physics and mathematics. So, due to the shortage of teachers in those subjects and other factors, that is why the project came and taught teachers on those subjects; that is to say that the policy is aligned with the ZISP targeted subjects; therefore, this policy facilitated the project's progress." (Key informant, Project Coordinator-Pemba, 24th May, 2024).

The literature supports this alignment, indicating that coherence in policy design and inclusion of key stakeholders is among the solutions to effective education policy implementation (Viennet & Pont, 2017). The emphasis on enhancing 21st-century skills corresponded with findings from another part of Tanzania (Hardman *et al.*, 2015), where national policies when district-level school-based teacher development focused on aspects lead to significant improvement in pedagogical practices. However, the stress on interactivity in pedagogy is extremely important, as evidenced by its lack of prominence in Tanzanian teacher colleges, where classroom realities often stall policy aspirations to introduce competency-based approaches (Kavindi, 2013).

4.2 Factors for ZISP Project Training Success

4.2.1 Financial Resources

The implementation of teacher PD(TPD) programs is significantly influenced by financial resources, which are essential for effective training and support. Adequate funding facilitates the development of high-quality TPD programs and ensures that teachers receive the necessary resources to enhance their skills and teaching practices. The ZISP project budgeted about US\$9 million for the first component, effective Mathematics, Science, and English Instruction (World Bank, 2016). This component fundamentally transformed the way in which MSE is taught in upper primary and lower secondary grades, which had three types of activities: (a) retraining of selected in-service teachers to increase the supply of Math and Science teachers in lower secondary grades; (b) training of all MSE teachers in targeted grades in enhanced student support; and (c) teacher management reforms to strengthen teacher accountability and motivation structures (World Bank, 2016).

Respondents reported that the financial resources were available, and the allocation of these resources under the ZISP Project played a crucial role in shaping training. Consistent funding motivated trainees and trainers and enhanced the quality of training sessions, contributing to a more engaged and committed teaching workforce. Providing financial support for transport and refreshments minimised barriers to attendance, especially transportation.

Trainers and trainees appreciated this and allowed them to focus on the training rather than worrying about costs, thus enhancing overall participation and leading to the success of the training sessions. This is because the funds paid to the trained teachers and trainers helped them transport to the training areas and solve other issues, including buying laptops. Project coordinator Pemba confirmed when he reported.

“Financial resources were enough for the project implementation since the project had enough funds and other resources were available for teacher training in this project. For example, in this project, every trainer and trainee was given a certain amount of money, which was enough for transport and refreshment during the whole training”. (Key informant, Project Coordinator-Pemba, 24th May, 2024).

Our results show that the allocation of financial resources under the ZISP Project significantly influenced the quality and engagement of training sessions. According to the results, the allocation of financial resources under the ZISP Project was related to the quality of training sessions and engagement. The lessons learned from both analyses were answered, such as the need for consistent funding, which not only enthused trainees and trainers but also removed some operational barriers, i.e. transportation and refreshments, which optimised attendance and participation. These results are consistent with research highlighting the central role of financial resources in the implementation of educational programs, given their effects on teacher incentives and training quality (Tiberious *et al.*, 2016; Murithi, 2016). In addition, the availability of financial assistance for tools such as laptops further helped free up energy and focus on training students rather than worrying about money, a finding that reaffirms broader trends in education (Long'ore *et al.*, 2023). The successful effects seen in both training sessions demonstrate the importance of financial investments towards maintaining an engaged teaching workforce, as witnessed in many educational endeavours (Masango *et al.*, 2022; Leigh *et al.*, 2024). In contrast, while financial resources are necessary, spending must be programmed to accommodate the program requirements of educational programs because low funding can worsen between-school learning disparities (Tiberious *et al.*, 2016).

Also, in contrast, factors including lack of financial resources, inadequate follow-up support, low educator participation, and ineffective human resource strategies hindered the implementation of TPD programmes in the Eastern Cape (Zindi & Sibanda, 2023), which is against our study findings. Our findings show that the availability of financial incentives project implementers received from the ZISP project facilitated the project training, leading to the success of the project where insufficient funding and infrastructure can hinder the availability, quality and implementation of TPD programs (Khairiah *et al.*, 2024; Basri *et al.*, 2023).

Other studies have shown that factors like family responsibilities, time constraints, lack of administrative support, financial costs, and irrelevance to teaching areas hindered the implementation of TPD programs (Butt *et al.*, 2021; Suryandari *et al.*, 2024). This result does not concur with our study findings since the respondents reported that the ZISP Project had enough financial resources provided to the trainees and trainers, which made them not face any financial problems, including helping them with transport and help them to other economic responsibilities. Our study findings have shown how the training effectively met the expectations, leading to the success of project training.

4.2.2 Material Resources

Material resources-including instructional modules, laboratory equipment, ICT tools, and visual aids contributed directly to training quality. Respondents emphasised that adequate materials enabled practical demonstrations, subject simulations, and collaborative exercises that strengthened pedagogical application. Importantly, resource availability influenced training fidelity. Unlike contexts where TPD is delivered abstractly due to material shortages, ZISP sessions incorporated practical experimentation, particularly in science subjects. This improved experiential learning. The respondents reported that the project had enough material resources to implement the training. Adequate material resources provided by the ZISP Project ensured that the training provided was high quality and met the project's objectives. The project coordinator confirmed that material resources were available and adequate for successfully implementing the ZISP Project training. This availability and sufficiency of material resources ensured that all necessary resources for training were available and accessible on time.

However, the long-term effectiveness of material investment depends on post-training utilisation within schools. Without maintenance budgets and ongoing replenishment, initial material sufficiency may not translate into sustained instructional improvement. Therefore, material adequacy should be interpreted as a necessary but not self-sustaining driver.

The findings underscore the critical role of adequate material resources in enhancing training quality. This is consistent with the literature that generally supports resource availability as a major determinant of success in education and effective performance implementation (Omachonu *et al.*, 2023; Cohen *et al.*, 2003; Mangele, 2012). The degree of material resources available influences the achievement of training goals, with better-resourced education efforts having better results and satisfaction, as suggested by Omachonu *et al.*, (2023).

4.2.3 Physical Infrastructure and Training Facilities

The success of TPD programs heavily relies on the quality of physical infrastructure and training facilities (Luqman *et al.*, 2019). Infrastructure cannot be denied, as it impacts clean and quality learning in terms of well-maintained buildings, equipped classrooms, training centres, and other similar provisions (Barrera-Pedemonte, 2016). This allows them to exercise teaching skills through models and practice, collaborative learning, and educational technology that are essential in boosting the efficiency of teachers. Siregar & Aziza, (2021) noted that training that takes place in adequate and functional space, staff availability to participate in PD activities without being called away from the facility to cover shifts, have a consistent staffing pattern eliminating last-minute scheduling adjustments for those who planned to attend training as well as benefit from faculty models of behaviour with residents holding everyone accountable each other may help promote supervision quality.

The results indicate that the availability of training facilities such as libraries, science laboratories, and TC environments where project training was conducted contributed to the success of the project training where TCs had a conducive learning environment. Although there were some limitations, they did not affect the training, and the resources were generally sufficient and conducive to effective learning. The infrastructure and other facilities ensured that trained teachers had access to theoretical and practical learning experiences, leading to a more comprehensive and engaging educational process. For example, for science subjects, training was conducted at the TCs, where laboratories with full science equipment were available, which led to the success of the project training. As reported by Project Coordinator Pemba about physical infrastructure and facilities.

“This project training was planned and conducted in special Teacher Centres (TCs) in a special school. So, we chose the TCs with enough infrastructure, classrooms, and science laboratories per subject. So, it contributed enough since there were adequate physical infrastructures of classrooms, libraries, and ITC resources, including computers, which contributed significantly to the success of these training sessions.” (Key informant, Project Coordinator-Pemba, 24th May, 2024).

The studies done by (Jamil *et al.*, 2018; Barrett *et al.*, 2019; Kirui Kipng’Etich *et al.*, 2014; Lowe *et al.*, 2013), pointing out that provision of proper utilities in schools improves education quality by giving teachers required tools to implement contemporary teaching practices and for which they need continuous PD. For example, studies suggest that modern laboratories "contribute significantly to the improvement of science education outcomes", granting teachers hands-on experience in effectively demonstrating experiments and practicals. Although there are limitations of the quantitative data, ranges across resources and conducive environments reported by the study appear to be generally sufficient and consistent with other research that demonstrates robust infrastructure is necessary for effective teacher development and overall educational betterment (Mutiarra *et al.*, 2022; Rock, 2019).

4.2.4 Relevance of ZISP Project Training Programs

TPD programs are beneficial in bringing about educational reform. The requirements of the programs depend on who the programs are being directed to and in what ways they seek to support the growth of teachers’ pedagogical content knowledge (Herranen *et al.*, 2021). For example, previous research suggested that primary teachers learn enrichment courses to develop their ability to integrate subjects, understand pedagogy, and link to practice. This aspect looks at content relevant to the teachers' actual teaching and is active in the learning process, encouraging collaborative practices, using effective strategies and practices, and providing feedback through Continuous Professional Development (CPD).

According to our results, the respondents agreed that the ZISP project training was effective and relevant according to the demands of targeted teachers. This is because the project provided specific subject teachers with various training sessions that built their capacity and improved the effectiveness of their teaching compared to before. The project training has proven effective and relevant because it covered all aspects of the subjects' content and teaching methods in terms of ICT integration in teaching, English language training, and teaching methodologies for MSE subjects for the trained teachers.

The results of the training of teachers in the ZISP project demonstrate how effective and useful the training was in addressing the needs of a particular group of selected teachers. A number of studies stress the need for context-based in-service training within the PD approach when aiming to increase teachers' instructional abilities and effectiveness (Van Veen *et al.*, 2012; Postholm, 2012). In recognising this lack, the ZISP project provided teacher-focused training on particular subjects, which resulted in the enhancement of teachers' practices. In recent studies, it has been found that if the PD activities are organised in relation to the subject areas and teaching strategies of the teachers, the teaching quality and the learning achievements will be positively impacted (Luneta, 2012). The extensive content and teaching strategies provided to cover areas such as audio-visual and computer education as well as English teaching are quite relevant in where teachers can be able to fit into the current education situation.

Furthermore, the aspect of ICT usage in teaching within the framework of the ZISP project is noteworthy. Understanding the role of technology in education has been acknowledged throughout the world as a vital aspect of education and learning in the 21st century (Seenivasan, 2024). In this project, which included ICT training, the enhancement of teachers' technical abilities was accompanied by their ability to use digital technologies in the classroom to promote a more active form of teaching and learning. This is similar to the results from other studies in which the practices of incorporating ICT in course content were found to promote the practices of teaching for learning by the students (Khan, 2014). Also, good attention is paid to teaching the English language and MSE (mathematics, science, English) teachers' training with methodologies. This correctly shows that teachers follow a balanced development practice, which helps them deliver quality education on several main subjects (Bautista *et al.*, 2016). In relieving the space, training used throughout the course serves players and supporters who are flooded with activities that foster the PD of teachers, and such has been one of the objectives set out within the ZISP project.

4.2.5 Trainees' Willingness and Strategies

The findings indicate that the willingness of trainees to engage in professional development (PD) is a critical factor for enhancing educational quality and student outcomes. Educators who are enthusiastic about participating in training are more likely to acquire new skills, apply innovative teaching methods, and foster a culture of continuous learning within their institutions (Darling-Hammond *et al.*, 2017). In the context of the ZISP Project, which aimed to improve teachers' pedagogical and subject matter knowledge in Mathematics, Science, and English (MSE) subjects, strategies to motivate trainees were essential to ensure effective engagement and successful training outcomes.

The results show that trainees demonstrated a strong willingness to adopt new knowledge and skills in science subjects. Project implementers employed multiple strategies to enhance this readiness, including raising awareness about the importance of science and technology, offering certifications upon training completion, advance communication regarding the training's relevance, and providing logistical support such as transport allowances and meals. District Educational Officers (DEOs) noted that head teachers actively promoted these strategies, which positively influenced teacher participation and project success. As one respondent explained,

"Some of the strategies used to ensure teachers are willing to participate in this training include motivation; we motivate them through certifications and provide advance information on how the training will be and how it will change their subject matter knowledge as well as their teaching methodologies and skills. Also, during training, we provided financial support, lunches, and breakfast for trainers and trainees who attended the training" (Key informant, Project Coordinator-Pemba, 24th May 2024).

These findings align with prior research emphasizing the importance of teacher readiness, motivation, and a nurturing learning environment in PD programme success (Prenger et al., 2017; Bakogianni et al., 2020). Evidence suggests that strategies such as awareness campaigns, motivational incentives, and structured support enhance teacher engagement and foster positive attitudes toward adopting new knowledge and skills (Karimi et al., 2019; Iordache Platis & Romanowicz, 2020). Additionally, the commitment of trainers and enforcement of punctuality were noted as critical for sustaining momentum and discipline, highlighting the multifaceted approach required to maximize PD outcomes. Overall, the study demonstrates that targeted motivational strategies, combined with logistical support and structured facilitation, are essential for fostering trainee engagement and ensuring the success of teacher professional development initiatives.

4.2.6 Project Training Strategies

The training strategies employed in a TPD program underscore the significance of experiential, collaborative learning opportunities that closely resemble authentic classroom dynamics. Facilitators frequently exemplify various project processes, such as brainstorming, group formation and storyboarding, to assist educators in seamlessly integrating project-based learning within their pedagogical practices (Guo & Yang, 2012). These strategies encompass practical applications and peer collaboration, enabling educators to design and execute projects with efficacy (Lo, 2021). This pedagogical framework not only augments teachers' instructional capabilities. However, it also cultivates a profound comprehension of how to engage students in meaningful, active learning experiences (Guo & Yang, 2012) because it emphasises the importance of active participation in the learning process.

The study results indicate that the trainers agreed that the project training strategies were effective, especially when focused on the important areas where trained teachers were not good enough. They mentioned that ICT, English language training, support, and incentives provided by the project helped them achieve the project's training success. The most important strategy is a combination of ICT and English language training. These issues ensured that teachers were well-prepared to teach their subjects effectively in English and use ICT tools, as one of the trainers reported.

"The strategies began with the project itself. The decision to provide teachers with ICT training was a major and very important strategy because it automatically led to a change among the teachers. Another thing I observed was in the English subject. The project developed a strategy for teachers to learn English, regardless of whether they taught English, Physics, Mathematics, or Biology, as all these subjects are taught in English. The teachers were scheduled to learn at least the English language basics (A B C). The strategy of preparing teachers to learn the basics of ICT and English was a significant approach that led to success, and the teachers were able to change as expected." (Key informant, Teacher Centre trainer North Pemba, 14th May, 2024).

Additionally, the commitment of the teachers played a crucial role. Their readiness to change and understanding that they were being guided onto the right track was essential. The readiness of the teachers, combined with the project's support, such as the small subsidies they received, also contributed to their willingness to participate in the training and achieve the success I mentioned." (Key informant, Teacher Centre trainer North Pemba, 14th May, 2024).

The study done by Al Ofi (2022) revealed the effectiveness of the CPD training strategies as one of the respondents (trainer) reported that they design training based on the teachers' needs and what teachers should do and take it to bring to their students, in relation to our study findings where the project was designed to cover teachers' needs to be competent in their teaching practices. The project focused on integrating ICT in teaching and English language proficiency to teachers, as reported by ZISP Project trainers, where teachers were their primary areas of weakness.

The findings from the existing studies and literature support the effectiveness of the project training strategies in subject areas such as ICT and English language training. For example, Voogt & Roblin, 2012; Richards & Rodgers, 2014; Darling-Hammond *et al.*, 2017. Some of the findings from prior research indicated that ICT integration in teacher training had bettered the technological competency of educators quite significantly, which further enhanced the integration of digital learning tools in their pedagogical

practices and increased levels of students' approach towards learning. In addition, in non-English speaking countries, English language training is an important aspect because it instils in teachers the necessary language ability to provide content in English with ease (Richards & Rodgers, 2014). Other studies also emphasise the role of support and incentives within a PD program for such aspects, which will encourage teachers to put into practice their newly acquired skills to maintain their PD process (Darling-Hammond *et al.*, 2017). ICT training combined with English language training, with certain incentives, guarantees that the teachers are well prepared to meet the modern demands for education and, hence, subsequently, their students.

4.2.6 Stakeholders Involvement and Participation

The findings indicate that stakeholder involvement and participation are critical determinants of the effectiveness of TPD programmes. Internal stakeholders, including teachers and students, and external stakeholders, such as community representatives and educational authorities, jointly contribute to enhancing the relevance and quality of training initiatives. Evidence from the ZISP Project shows active engagement of multiple stakeholders, including the State University of Zanzibar (SUZA), educational institutions, the health sector, NGOs like Milele Zanzibar Foundation, and local communities. Such collaboration supported teacher training, improved infrastructure, and promoted health and well-being, fostering community ownership and enhancing the project's overall effectiveness. As a district education officer highlighted,

"In terms of participation from various entities, including government bodies, educational institutions, and the local community, we can say that the district government, through the district commissioner and district administrative officers, actively promoted and appreciated the training provided to teachers. Additionally, the Ministry of Health has been working closely with us to monitor the health of the trainers and trainees, ensuring they can learn effectively and efficiently" (Key informant, District Education officer Wete-Pemba, 21st May 2024).

The ZISP Project ensured sustained engagement through structured mechanisms such as regular meetings, feedback channels, and responsive adaptation, which strengthened relationships among stakeholders and contributed to successful programme outcomes. These findings align with existing literature emphasizing the importance of multi-stakeholder engagement in education. Darling-Hammond *et al.* (2017) note that effective teacher preparation programmes involve education authorities, local communities, and external specialists to ensure relevance and sustainability, while Fullan (2015) highlights the role of government bodies and educational institutions in policy alignment and programme support.

Additionally, integrating health sectors and NGOs addresses barriers to learning, reflecting WHO recommendations (2018) for holistic educational approaches. Community involvement also fosters ownership, cultural relevance, and responsiveness to local needs, thereby increasing the sustainability of outcomes (Balinas, 2018; Zadorozhna-Kniahnytska & Khadzhinova, 2023).

4.2.7 Effective Communication and Collaboration

Effective communication and collaboration among training implementers are vital for the success of TPD programs (Hairon & Tan, 2017). Considering clear objectives and shared goals helps align all team members toward a common purpose, ensuring everyone understands the desired outcomes. Open communication channels, facilitated by regular meetings and feedback loops, promote transparency and allow for the swift identification of challenges. Clearly defined roles within the team enable the implementers to own their tasks and engender responsibility and effectiveness. Nguyen & Ng (2022) emphasise that much focus should be directed toward training implementers to be communicative so that they can adequately engage participants and listen actively for mutual trust within the team and among its trainees. Regular monitoring and evaluation of training outcomes enable implementers to assess effectiveness and make necessary adjustments, while timely conflict resolution helps maintain a positive collaborative environment (Akiba & Liang, (2016).

Our results show effective communication and collaboration among the project implementers, which helped the project's training success. Effective communication and collaboration were evident in the interactions between trainers, TC coordinators, the SUZA project team and educational officers. Trainers received procedures and guidance from TC coordinators, facilitating smooth project activities. Regular meetings and reflections were conducted in TCs, where training was conducted, and trainers and TC Coordinators discussed progress, problems, and potential improvements. The respondents reported that clear communication between trainers and project administrators was characterised by transparency and openness, which meant there were no secrets or issues, facilitating a collaborative and supportive environment for the project's implementation. The results show that the collaborative efforts of trainers, supervisors, and education administrators helped the training program succeed. Continuous feedback and regular evaluations were done to ensure that the project training went as planned and achieved its intended objectives.

The findings of our study are closely aligned with the existing literature, which identifies effective communication and cooperation in the process of implementing educational projects. Successful educational interventions indeed sometimes depend on good communication among involved stakeholders, who are trainers, coordinators, and other educational administrators (Kirkpatrick & Kirkpatrick, 2006; Li *et al.*, 2017); long-term support and practice facilitated successful Project Based Science (PBS) implementation (Gale *et al.*, 2017). This is reflected in our findings, whereby regular meetings and open dialogues between trainers and TC coordinators not only allowed the sharing of procedures but also made the identification of challenges and solutions feasible on the spot. Similar proactive communication mechanisms, as highlighted in studies such as Garmston & Wellman, 2016 and Garmston & Zimmerman, 2013, build on increasing trust and mutual support among team members, which is essential for program continuity in education.

Conversely, although our results point to a collaborative setting, previous research also suggests a few inhibiting factors in communications within the same project groupings. For instance, Nisbet *et al.* (2003) note that even minor misalignments in communications can and do cause major lapses in project effectiveness. Our respondents described a culture of transparency and openness, but research by Kempen and Steyn (2017) indicates that hidden agendas or misunderstandings may compromise collaboration. Our results, therefore, present a largely successful training program because of good communication practices, but at the same time, provide insight into the balance that must be struck to continue such an environment and the vigilance necessary in monitoring emerging conflicts that may be created by miscommunication.

4.2.8 Local Cultural and Social Dynamics

The findings indicate that cultural alignment played a significant role in the acceptance and success of the ZISP Project in Zanzibar. TPD programmes are often shaped by local social and cultural dynamics, which influence how educators relate to their communities and integrate contextual elements into their teaching (Langan & Lawrence, 2023; Nganga & Kambutu, 2024). Place-based and culturally responsive education promotes authentic learning environments, while intercultural competence strengthens teacher identity and pedagogical practices in diverse contexts (Muszkat-Barkan, 2022; Singh *et al.*, 2021; Stephenson *et al.*, 2008). Respondents highlighted that the cultural environment in Zanzibar places high value on education, with over 90% of children participating in both formal school and madrasa, reflecting the community's strong commitment to comprehensive learning. The ZISP Project built upon this cultural inclination, ensuring that its training programmes did not introduce foreign cultural elements, thereby facilitating acceptance and participation.

These results are consistent with literature emphasizing that culturally embedded programmes are more likely to gain community support and achieve sustainability (Schein, 2015; Chaudhary, 2019). The project's alignment with Zanzibar's historical and social commitment to both formal and religious education created a strong motivational basis for acceptance, as observed in prior studies that stress the effectiveness of educational interventions congruent with daily cultural practices (Aronson & Laughter, 2016). Additionally, respecting local customs and the community's disposition toward lifelong learning was critical to fostering broad-based support and ensuring long-term sustainability of the project (Fullan, 2015).

The empirical findings largely validate the underlying assumptions of the Theory of Change. Structural inputs were present and operational, enabling effective implementation processes. However, the analysis also reveals conditional dependencies. For example, financial adequacy influenced trainee willingness, suggesting interdependence between input and output levels. This indicates that the causal chain is not strictly linear but contextually mediated.

Key findings from the study inform enablers necessary to successfully implement such TPD interventions. Whether TPD is transferred, however, largely depends on the availability of financial and material resources, physical infrastructure, and training facilities. A second aspect crucial for obtaining meaningful results, in addition to the training programs' relevance to the teachers' context, was well-designed training strategies. Furthermore, the authors concluded that the effectiveness of TPD depended on supportive educational policies and trainees' professional learning attitudes as well as implementation strategies. Another factor is the effective communication and collaboration between stakeholders, combined with a vision that considers the local culture and social dynamics; the active participation of multiple stakeholders also contributes to successful ZISP project training.

The findings have clear implications for regional education policy in Zanzibar, particularly in prioritising sustained funding for TPD, institutionalising Teacher Centres, and integrating ICT and language support into in-service training. At a global level, the study contributes to the discourse on TPD in low-resource settings by demonstrating that context-sensitive, well-resourced, and collaboratively implemented training models can yield meaningful improvements in teacher competence.

5. Conclusion/Recommendation

The findings imply that education policymakers in Zanzibar should institutionalise sustained funding for Teacher Professional Development, strengthen Teacher Centres as permanent training hubs, and integrate ICT and English language support into in-service training policies. Globally, the study demonstrates that context-sensitive and resource-supported TPD models are effective in low-resource settings, offering transferable lessons for similar education systems.

Based on the results of the study, it is recommended that appropriate funding is necessary so that comprehensive courses can be devised, fitted with good materials and facilitated by expert pedagogical mentors. Teaching aids, technological tools, and learning resources must be in place to complete quanta of the offerings and make the training session more effective and qualitative. In addition, purchasing digital resources can also be beneficial in supporting both face-to-face and online training, allowing teachers to consume learning content when and where they want to and use it effectively in the classroom. This additional funding will directly translate to more well-trained teachers and a better student educational experience. Therefore, for financial sustainability, the government and local authorities should integrate school-based budget management.

Additionally, training programs should be designed after conducting a thorough needs assessment and should characterise the real-world problems teachers are facing. Training must be designed accordingly. The objectives should be to provide culturally sensitive content that can readily dovetail into the local curriculum and classroom setting. Teachers are more likely to actively participate in learning and use training strategies effectively in their classrooms because they are relevant. Training programs should also be grounded in illustrative and case examples and problem-solving scenarios related to the Zanzibar education system so that training materials are embedded in the context of teachers' own experiences as they apply their new skills in their teaching settings.

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Declaration of generative AI and AI-assisted technologies in the writing process

I used some of AIs in preparing this manuscript, specifically in literature review. Their contribution was to help me to get study articles related to my study, including google scholar and scispace ai.

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