The Contribution of School-Based Teacher Professional Development to Learner-Centred Pedagogical Practices in Secondary Schools in Tanzania

Allen Rugambwa[1], William A. L. Anangisye[2], Mpoki J. Mwaikokesya[3]

[1&2&3] School of Education, University of Dar es Salaam-Tanzania

E-mail[1]: rugambwaallen@gmail.com

Abstract

The study investigated how school-based teacher professional development (SB-TPD) contributes to learner-centred pedagogical (LCP) practices in secondary schools in Tanzania. The study employed a mixed-methods research approach and a convergent-parallel design in collecting and analysing data from a sample of 111 teachers participating in the Probono Teacher Training (PTT) Programme in Kilimanjaro and Dar es Salaam regions. The study revealed that the PTT Programme contributed to the improvement of the application of learner-centred teaching (LCT) techniques, improvisation of teaching aids, and laboratory management practices. It also contributed to the active participation of students in group discussions and laboratory-based experimental activities. It was, therefore, the conclusion of the study that SB-TPD contributes significantly to the improvement of LCP in secondary schools.

Keywords: *engagement in learning, learner-centred pedagogy, professional development*

Introduction

Continuing teacher professional development (TPD) is significant in enhancing teacher performance and learning outcomes. It is so because; TPD updates teachers' subject content knowledge in the light of recent advances. It also enables teachers and schools to develop and apply new strategies in implementing the school curriculum and other aspects of teaching practice (Maciejowska, Čtrnáctová & Bernard, 2015). It is upon that significance that education systems worldwide consider TPD important in maintaining high standards of teaching (Davidson, Jensen, Klieme, Vielu & Baker, 2009). In the Tanzanian context, TPD is considered an important factor for improving teacher performance. For that reason, several professional development programmes have been conducted within and off schools to enhance teaching and learning (Komba & Mwakabenge, 2019).

Professional development practices can be classified as traditional (off-site) or school-based (on-site) depending on the location where they are offered. The traditional model of TPD is the most commonly practised in many countries including Tanzania (Anangisye, 2011). It is mainly characterized by workshops, seminars, subject associations, and short courses that take place away from teachers' working places and are usually conducted as a single event that lasts for a few days (Anangisye, 2011). Despite the popularity of the traditional model of TPD, some critics have raised concerns about its effectiveness. It is argued that in most cases traditional TPD programmes are costly and hence occur irregularly and cater their services to relatively very few teachers. Moreover, traditional workshops lack length (sustainability) and intensiveness to produce desired changes in teaching practices (Gulamhussein, 2013). They provide knowledge but do little to help the teachers to put into practice the acquired knowledge. Similarly, in Tanzania, even though traditional programmes have aimed to equip teachers with pedagogical and content knowledge for improving their teaching and learning processes (Anangisye, 2011), in many situations, teachers have been lacking school-based support that would have had a significant impact on their performance while implementing concepts learned in traditional programmes (Dachi, 2018).

It is against the mentioned weaknesses of the traditional model of TPD that over a long period of time, several other models of TPD have evolved, including SB-TPD which has been adopted in different countries (Svendsen & Marion, 2014). Unlike the traditional model, SB-TPD involves professional development whereby activities take place at a school level, either initiated by the school (or teachers) or implemented by an external agency like NGOs based on curriculum or teachers' learning needs. The common SB-TPD activities include whole-staff workshops, online reading, visits to other schools, and professional discussions (Desta, Desalegn, Chalchis & Girma, 2013). Some literature indicates that in some places such as South Africa and the Republic of Zambia, the SB-TPD model has been increasingly practised because it is assumed to be less costly relative to the traditional model and allows better use of local resources (Ministry of Education, Republic of Zambia, 2009). In addition, the SB-TPD model is said to respond to teachers' immediate needs, and provide opportunities for on-site practice and reflection (Knudsen, – Bubanja, Nielsen, Petkova, & Nikolovska, 2013).

In Tanzania, the Ministry of Education, Science, and Technology (MoEST) has adopted SB-TPD for teachers' professional growth in addition to traditional programmes. SB-TPD model is expected not only to increase teachers' access to professional development but also improve teachers' instructional practices hence, better learning outcomes (MoEST, 2017). SB-TPD for in-service

teachers, which is the focus of this paper, can be traced back to the late 1990s and early 2000s during which projects such as Education Quality Improvement through Pedagogy (EQUIP–Oxfam) and Collaboration to Support Mathematics Teachers (COSMAT) were implemented to improve classroom practices and learning (Kitta, 2004; Sedere, Mengele & Kajela, 2008). Moreover, the adoption of the SB-TPD model in Tanzania has been documented in several policy documents such as the Teacher Education Management and Development Strategy (Ministry of Education and Vocational Training, 2008) and the National Framework for Continuing Professional Development for Practising Teachers (MoEST, 2017). All these policies require school authorities and management to supervise the implementation of SB-TPD activities for teachers' professional growth. Specifically, the National Framework for Continuing Professional Development promotes SB-TPD with the argument that "teacher learning which is embedded in the context of schools tends to address the relevant needs of teachers, students, and schools" (MoEST, 2017, p.5). All these efforts suggest that Tanzania considers SB-TPD significant in the improvement of the quality of teaching and learning as well as being the fundamental approach for teachers.

Following these government policies guiding the implementation of SB-TPD several secondary schools in some regions such as Kilimanjaro and Dar es Salaam are engaging in SB-TPD programmes (Rugambwa & Joseph, 2014). However, the mere conduction of or teachers' access to SB-TPD practices may not be sufficient. What is more important is how they contribute to the teaching practices and student learning (MoEST, 2017). It was against this background that a study to investigate the contribution of SB-TPD to learner-centred pedagogical (LCP) practices was deemed imperative. The study was guided by two research questions:

1. To what extent and how does SB-TPD contribute to the improvement of LCP practices in terms of a) learner-centred teaching techniques, b) the improvisation of teaching aids, and c) laboratory-based experimental skills?

2. To what extent and in what ways does SB-TPD contribute to the improvement of student engagement in the learning process?

Meanwhile, the concept of LCP in the Tanzanian context can be well understood from the perspective of the secondary education curriculum. Tanzania has institutionalized LCP (Vavrus. 2013). The secondary education curriculum indicates the shift from a content-based to a competency-based curriculum that promotes a learner-centred approach to teaching (Tanzania Institute of Education, 2007). Furthermore, the perceptions of LCP in Tanzania can be summed up by the definition adopted from Collins and O'Brien (2003) by

Keith, Rugambwa, Vavrus, and Maganga (2016) from their experience of facilitating TPD on LCP in Tanzania. That is:

> Learner-centred pedagogy is an instructional approach in which students influence the content, activities, materials, and pace of learning. This approach places the learner in the centre of the learning process. The teacher provides students with opportunities to learn independently and from one another and engages them actively in learning the skills they need. (Keith *et al*, 2016, p.3)

Based on this definition, LCP consists of three important attributes which are: a) involving students actively in the learning process, b) providing students with opportunities to develop higher-order thinking skills, and c) engaging students in critical inquiry—the need to investigate or search for an answer to a puzzle (Keith *et al*, 2016, p.3).

Theoretical Framework

This study was guided by Guskey's "model of teacher change" (2002). According to the model, any TPD programme has three major goals. These are "change in classroom practices of teachers, change in their attitudes and beliefs, and change in the learning outcomes of students" (Guskey, 2002, p. 383). Therefore, one may render an SB-TPD programme effective if it leads to the improvement in teachers' classroom practices, better students' learning outcomes, and change in teachers' beliefs and attitudes (Guskey, 2002; MoEST, 2017). According to Guskey (2002), the term learning outcomes may have different connotations including academic achievement and active engagement of students in the learning process. Guided by Guskey's model (2002) this study investigated how SB-TPD contributes to the improvement of teachers' classroom (learner-centred pedagogical) practices and student learning outcomes in terms of active engagement in the learning process.

Literature on the Contribution of SB-TPD to LCP Practices

Although the available literature is generally silent on how SB-TPD contributes to LCP practices, a few studies in Tanzania and elsewhere have dealt with this theme. For instance, in a study conducted in the US, Matsumura and Steinberg (2002) worked to find out how an SB-TPD programme improved instructional practices and student learning. The findings of the study revealed that the participation of the teachers in the programme influenced their learning and the refinement of instructional strategies as well as how they provided feedback to students. Moreover, the study found that student learning

improved due to the teachers' participation in the programme. This included students being more engaged with what they were reading and making more connections across books and stories.

A different study conducted in Tanzania by Anne (2013), indicated that an SB-TPD programme can improve LCP practices and enhance student learning. The study investigated first, teachers' understanding of learner-centred teaching (LCT), and then the impact of the SB-TPD intervention on their LCT practices. The study found out that at first teachers didn't understand the meaning of LCT and their teaching approach was teacher-centred. However, after the intervention, their classroom practices improved through using LCT methods in preparing, teaching, and involving students actively during the lesson. Meanwhile, Hardman *et al.* (2015) report the findings of a pilot SB-TPD programme that was conducted in eight districts in Tanzania. The programme aimed to change teachers' pedagogical practices for better learning outcomes. This study revealed that the teachers who participated in the programme showed significant improvement in their teaching practices in terms of: "explaining material accurately and clearly, creating a positive classroom climate, using paired or group work, changing the classroom layout to facilitate the learning, and using a plenary to summarize" (Hardman *et al,* 2015, p.618). However, although the programme influenced classroom practices, the study found out that one of the limitations in the evaluation of the programme was the lack of robust evidence of its impact on children's learning. Hence, they called for further research on this problem.

As hinted by Hardman *et al*. (2015), some studies are not conclusive on whether SB-TPD contributes to the improvement of LCP pedagogical practices and student learning. For instance, Wondem (2015), reports that although SB-TPD has been implemented in Ethiopia since 2004, it has not been able to achieve its major objectives of improving teachers' classroom practices and consequently student achievement. This is due to the observation that teachers lack professional support and follow-up from professional development facilitators. Moreover, other studies such as those of Millinga (2014) and Rawle *et al.* (2019) have revealed that an SB-TPD programme can have a mixed impact on teachers' classroom practices. For example, according to Millinga (2014), while an SB-TPD programme in Tanzania was effective in helping teachers to make good use of chalkboards, organizing the classroom to facilitate learning, and encouraging pupils to ask questions, it failed to promote the use of instructional materials and a variety of teaching and learning activities. Similarly, referring to EQUIP's school-based teacher programme, Rawle *et al*. (2019) observed that, while teachers demonstrated improved classroom practices such as inclusion and interaction with students, these practices declined with time.

They concluded that "on the pedagogical practices measured by this impact evaluation it is unclear if EQUIP-Tanzania has helped to improve teaching quality overall" (Rawle, *et al*, 2019, p.iii).

It is evident from the reviewed literature that there exists a lack of consensus on whether SB-TPD contributes to improved LCP practices. This disagreement made the current study significant by investigating further into how SB-TPD contributes to student learning outcomes in terms of student engagement in the learning process.

Methodology

The study employed a mixed-methods research approach with a convergent parallel (also known as concurrent triangulation) design. The researcher collected concurrently a set of qualitative data obtained from interviews and a set of quantitative data obtained through questionnaires and structured classroom observations, analyzed the two sets of data separately, and compared them to see if they confirm or disconfirm each other in an effort to understand the research problem (Bian, 2011).

The target population consisted of students, teachers, and heads of schools of the eleven secondary schools that implemented an SB-TPD programme called the PTT Programme. Using the deviant case sampling, six PTT schools were selected for the study to represent urban and rural contexts in the study. The pseudonyms of sampled schools were Maono, Faraja, and Kavalu secondary schools that are located in Dar es Salaam (urban), and Aisha, Mlogi, and Kilombili secondary schools located in Kilimanjaro Region (rural). The study also employed key informant sampling to select the participants who were well informed about the implementation of the PTT Programme. The key informants were the PTT Programme Coordinator, heads of schools (HoS), and guardian teachers. Besides, purposive sampling was used to select all 98 PTT Programme trainees (teachers) from all the six sampled schools. In total, the sample consisted of 111 participants whose composition was one programme coordinator, six HoS, six guardian teachers, and 98 teachers.

The study employed questionnaires, in-depth interviews, and classroom observations to collect data. 74 teachers were involved in filling the questionnaires, and six HoS and 12 teachers participated in in-depth interviews. Moreover, other 12 teachers were involved in classroom observations.

Following the use of convergent parallel design, the quantitative and qualitative data were analysed separately and then compared before the interpretation was made (Creswell, 2014). Collected qualitative data were organized according to research questions, then coded, and lastly described narratively with the help of

direct quotes. Meanwhile, the quantitative data obtained from the questionnaire and structured classroom observations were organized according to the research questions, and then descriptive statistics was used to transform the organized data into frequency tables from which the interpretation was made.

Findings and Discussion

The extent to which PTT Programme improved LCT Practices

Nearly all the respondents who filled the questionnaires thought that the PTT programme contributed to a large extent to the improvement of their LCT practices. At least 64 out of the 74 (86%) respondents either "agreed" or "strongly agreed" that PTT programme improved every rated aspect of LCT (Table 1). The items in Table 1 were adapted from Vavrus (2013) to assess teachers' LCT skills after attending a TPD programme.

Table 1: *Contribution of PTT Programme in improving LCT Practices*
($N = 74N = 74$)

S/N	Aspect of Learner-centred Teaching	n	SD	DS	NS	AG	SA
1	I can now improvise and use locally available teaching materials	74	0	0	0	47	27
2	My laboratory management skills have improved significantly	74	7	0	3	44	20
3	I am now able to arouse students' interests and participation through a variety of LCT strategies	74	0	3	0	17	54
4	My lessons address multiple intelligences	74	0	3	0	54	17
5	My lessons promote conceptual understanding (not just factua)	74	0	0	4	40	30
6	I start my lesson with a hook to attract students' attention	74	0	0	0	34	40
7	I respond positively to questions asked by students	74	0	0	4	30	40
8	I motivate students by rewarding or praising them during lessons	74	0	0	0	27	47
9	I promote critical thinking by asking open-ended questions	74	0	0	0	34	40
10	I am able to devise a variety of procedures to evaluate a lesson	74	0	0	0	37	37

Key: SD -Strongly disagree; DS - Disagree; NS - Not sure; AG - Agree; SA - Strongly agree

Notably, all the 74 respondents (100%) believed ("agreed" or "strongly agreed") that PTT programme contributed to improving: their use of locally available resources in teaching, starting their lessons with the hook; motivating students by rewarding or praising them (item 8); promoting critical thinking through open-ended questions, and evaluating the lesson through a variety of procedures.

The PTT programme was also highly rated for improving teachers' skills in addressing multiple intelligences (96%); arousing students' interest through the use of different LCT strategies (96%); promoting conceptual understanding (95%); and responding positively to students' questions (95%). However, despite this generally positive outlook, a small but considerable number of the respondents (10 out 74 which equals to 14%) rated the PTT programme low in improving their laboratory management practices (item 2). This implies that the programme contributed more to some aspects of LCT practices than others.

Table 2 summarizes data obtained from classroom observations. The observed PTT programme trainees were rated on a scale of 1 to 5 depending on the extent to which they displayed LCT skills. The observation guide was adapted from the one developed in the study by Vavrus (2013).

Table 2: *Observed Improvement in Teachers' LCT Techniques*

($N = 12N = 12$)

S/N	Observed Learner-centred Aspect	1	2	3	4	5
1	The lesson began with a **hook** to get students' attention.	1	2	2	2	5
2	The lesson addressed multiple intelligences.	0	2	3	6	1
3	The lesson promoted conceptual understanding, not just factual learning.	0	0	1	9	2
4	The lesson was relevant, drawing connections to real-world phenomena.	0	0	2	7	3
5	The teacher responded positively to questions asked by students.	0	1	5	3	3
6	The teacher rewarded or praised students during the lesson.	0	0	1	7	4
7	The teacher asked open-ended questions (e.g. Why…, How…, etc.)	1	2	1	5	3
8	The teacher was able to arouse students' interests and participation through a variety of learner-centred strategies.	0	0	1	8	3
9	The teacher was able to devise and use a variety of procedures to evaluate the lesson	0	2	1	5	4

Source: Field data, 2021

Key: 1-Not observed; 2-Rarely observed; 3-Not sure; 4-Frequent; 5-Very frequent.

These findings from classroom observations (Table 2) indicate that PTT trainees displayed a range of competencies in applying different aspects of LCT techniques. For instance, 11 out of 12 observed teachers (92%) were able to: arouse students' interests and participation through a variety of learner-centred strategies; promote conceptual understanding (item 3); and reward or praise students during the lessons (item 6). Meanwhile, at least 4 out of the 12 observed teachers (33%) did not ask open-ended questions; were not positive with students' questions; did not address multiple intelligences and did not start a lesson with a hook.

Like the findings from questionnaires, the findings imply that in general PTT programme contributed to the improvement of LCT techniques. However, this contribution differed from one aspect of LCT to another. While the observed teachers did well in some aspects such as items 3, 6, and 8, they did relatively poorly in other aspects especially items 1, 2, and 5.

PTT Programme's Contribution to the Improvement of LCT Practices

The findings from the questionnaires and classroom observations were complemented by those obtained through the interviews. The 12 interviewed teachers were asked to state how the PTT programme improved their use of LCT. Their responses indicated that PTT programme contributed to LCT by equipping them with skills needed in engaging students actively in the learning process, updating their theoretical knowledge of LCT, and making LCT the teaching culture in their schools. The most notable improvement attributed to PTT intervention was the use of the LCT approach. Before the programme started, the teachers mostly used questions and answers, and group discussions in teaching (Kivuyo, 2014). However, after the PTT intervention, teachers were exposed to the new LCT techniques and applied them in their classes. For instance, one interviewed teacher witnessed that:

> PTT equipped me with many techniques which apply to learner-centred strategies through PTT programme. Up to now, I have a lot of teaching and learning strategies that I can use according to my needs considering the terms and conditions leading to the selection of teaching and learning strategies and techniques.

Based on the responses of other interviewees, the new LCT techniques learned during the programme included loop the loop game, think-pair-share, hot seat, and interactive lectures. The finding that the PTT programme contributed to teachers' improvement in the use of LCT techniques was also witnessed by heads of schools. For instance, one headmistress argued that in her school

"at least half of the teachers were applying LCT in their classrooms. The popularly applied strategies were: group discussions, interactive posters, and experiments" (Headmistress at Aisha Secondary School).

The contribution of the PTT programme to teachers' improvisation skills

The study also examined how SB-TPD contributed to teachers' skills in creating and using teaching aids made from cheap and locally available materials as one aspect of LCP in enhancing learning. Before the interviews, teachers were asked through questionnaires whether or not PTT programme improved their improvisation skills. 67 out of 74 respondents (92%) believed that PTT programme improved their improvisation skills, while 7 of them (8%) considered the programme not useful in improving their improvisation skills. These findings from the questionnaires were explained by those obtained from the interviews held with 12 teachers and 6 heads of schools. The teachers were asked to provide some examples of how the PTT programme improved their improvisation skills. They responded by citing examples of the teaching aids they created and used in classrooms. In response, a female biology teacher at Faraja Secondary School argued that due to her participation in PTT programme she was now able to prepare different substances such as "soap, esters, alcohol, but also preparing atomic models using grains, and beakers using plastic bottles*". Similarly, a male physics teacher at Mlogi claimed that he managed to create models from the knowledge he obtained from the PTT programme: "I have managed to make a wireless charger and wireless energy transmitter which can light CFL bulb without direct connection to electric power.*" Another teacher claimed also that she is putting into practice what they learned from the PTT programme.

> So many things that we learned in PTT I can apply in the classroom. For example, preparing different substances which I was teaching theoretically. Example soap, esters, alcohol, but also preparing atomic models using grains, beakers using plastic bottles, and so on.

Other teachers outlined examples of teaching aids they have improvised using cheap and locally available materials. The list included: cuttings of manila to create polygons; pyramid of tenses; model of sand-filter; models of apparatus such as burette; first aid box; samples of invitation cards; and a periscope model.

Heads of schools being supervisors of the PTT programme at their respective schools were asked to give their opinions on how the programme contributed to their teachers' ability to improvise teaching aids. They came up with a set of related responses. It was the view of the headmaster of Maono Secondary School

that the programme was significant in equipping teachers with knowledge in the use of teaching aids. He said, "The programme wanted to expand the minds of teachers in the use of teaching aids and teaching methods". Similarly, the headmaster of Kilombili Secondary School claimed that "Teachers [can now] prepare before going for teaching since they have to prepare teaching aids. A similar opinion came from another head of school who said that:

> Teachers in my school make models for teaching science subjects from local waste; teachers use students to make geography and language models like those demonstrating orogeny (mountain formation) kidney and its functions (biology).

These responses from teachers and heads of schools suggest that PTT programme improved teachers' skills in improvising teaching aids. The programme was significant in improving both teachers' awareness of the significance of teaching aids in student learning as well as their skills in creating teaching aids to enhance student learning in their classes.

The contribution of the PTT programme to laboratory management skills

One aspect of LCP practice examined in this study was the ability to manage hands-on laboratory-based activities. Therefore, the contribution of the SB-TPD to teacher practices was also judged based on how it contributed to teachers' laboratory management skills. Through questionnaires, 24 science teachers were asked to give their opinions on whether the PTT programme improved their laboratory management skills. The findings revealed that 22 out of 24 respondents (91%) believed that PTT programme improved their laboratory management skills, and only two of them perceived PTT programme as not contributing to these skills. This might have been caused, as noted in several interviews, by some weakness in the facilitation of PTT sessions.

Through the interviews, the 12 participants provided a very long list of laboratory management skills they acquired from the PTT programme and which they applied in classrooms. These skills include experimental skills such as carrying out volumetric analysis, conducting practicals on the rate of the chemical reaction and qualitative analysis, preparation of soaps and petroleum jelly, maintenance of laboratory equipment, being aware of locally available chemicals, developing interactive experiments; conducting the experiment as a starter of the lesson, developing students' interest on interacting with instruments, designing some instruments for teaching and learning, preparing cleaning reagents and various solutions, preparing gases, and making charcoal.

Therefore, for the first research question, the study established that, to a large extent, the PTT programme improved LCP practices particularly in the

application of LCT techniques, the ability to arouse students' interest and participation in the learning process through praise and rewards, improvisation of teaching aids to promote active learning, and laboratory management skills. These findings are partly in agreement with the findings of the study conducted in northern Tanzania by CSR Group of Africa (2016) that evaluated an SB-TPD programme under the ITT Project. The study revealed that ITT Project enabled its beneficiaries (teachers) to use teaching aids to "create a conducive learning environment for their students" (p.34). Moreover, as it was in this study, Perrone, Confer, Scott, Livingston and Bradburn (2016) established that an SB-TPD programme may improve laboratory management skills. Their study evaluated a mentored professional development programme in laboratory leadership and management and found that most of the participants made substantial improvements in their laboratory performances, leadership, and management skills.

Contribution of SB-TPD to Students' Engagement in the Learning Process

The second objective of the study was to investigate the extent to which and how SB-TPD contributed to the improvement of students' engagement in the learning process. As noted earlier, the approach to teaching in the sampled schools before the intervention of the PTT Programme was mainly teacher-centered which ultimately led to passive learning (Kivuyo, 2014). It was, therefore assumed in this study that once teachers were trained on the LCP, they would be able to engage students actively in the learning process.

The extent to which PTT programme contributed to student engagement in learning

The respondents were asked through questionnaires to rate their views on the extent to which the PTT programme improved students' engagement in the learning process as a result of their participation in the programme. Table 3 summarizes their views.

Table 3: *Contribution of PTT Programme to Students' Learning* ($N = 74N = 74$)

S/N	Learning Area	To no extent	To litle extent	To some extent	To a large extent	N/A
1	PTT Program has increased students' interest and motivation to learn	0	0	20	54	0
2	PTT Program has improved students' participation in group discussion	0	0	20	54	0
3	Through PTT Program students can now ask more questions than before	0	0	44	30	0
4	Through PTT Program students are now answering more questions than before	0	0	54	20	0
5	Through PTT Program science students' experimental skills have improved	0	0	30	34	10
6	PTT Program has contributed to the improvement of students' academic performance	0	0	40	34	0

Source: Field data, 2021

It is noted that at least 64 out of 74 respondents (86%) thought that PTT Programme contributed "to some" or "to a large extent" to the improvement of student engagement in the learning process in all rated areas. According to the respondents, PTT Programme increased students' interest and motivation to learn (item 1), made students more active in group discussions (item 2), increased students' rate of asking and answering questions (items 3 and 4), and improved student achievement (item 6). Notably, 54 out of the 74 respondents (73%) were of the view that PTT Programme "to a large extent" has increased students' interest and motivation as well as their participation in group discussion. However, it is also noted that ten teachers (14%) did not respond to item 5 (on students' experimental skills), and these might be those who didn't teach science subjects. These findings suggest that PTT Programme contributed considerably to the improvement of student engagement in the learning process.

Ways in which PTT programme improved student engagement in learning
Interview data provided a detailed explanation of how the PTT programme contributed to students' engagement in the learning process. The participants described three major ways in which students' engagement in the learning process was improved. These are participation in group discussions, asking and answering questions, and engagement in experimental works.

(i)   *Participation in group discussions*

It was the opinion of teachers that, as an outcome of their participation in the PTT programme, students' participation in group discussion improved. For instance, one teacher argued that:

> Students are so happy when discussing in their groups as they become so curious and creative when discussing concepts in their learning…The assignment of tasks distributed among members of a group makes learners more confident and this helps in retaining knowledge and making it lifelong.

This teacher implied that the active participation of students in group discussions was caused by curiosity and increased confidence when collaborating with other group members. The opinion of the female teacher at Aisha was echoed by another teacher in the same school who said, "*Since students vary in understanding abilities when LCT is used they always interact to accomplish learning activities*" (male teacher at Aisha Secondary School).

In general, based on interviews, the increase in students' participation in group discussions was caused by three main factors. One was the improvement of teachers' skills in managing group work. For instance, "*A teacher does monitor and observe groups while assisting by giving chance for oral questions and answers and making clarifications*" (male teacher at Kilombili Secondary School). Another factor was an increase in teachers' use of teaching aids. In this aspect, a male teacher at Mlogi Secondary School believed that due to the availability of learning resources students were now more active in group discussions as compared to the past. Moreover, student active participation in groups was caused by the encouragement students received from their teachers when applying LCT strategies. Students were active "*because of the confidence that the teachers have built or imparted to them. The learners are encouraged to learn as every idea from the learners is appreciated*" (female teacher at Kilombili Secondary School).

(ii)   *Engagement in experimental works*

PTT programme, among other objectives, trained teachers in laboratory management skills including designing and conducting science experiments. Based on the findings from the interviews with science teachers, the skills obtained from the training helped their students mainly in two ways, namely to: increase their motivation in experimental activities; and acquire experimental skills. For instance, one teacher noted that:

> Students are motivated to participate in experiments. They

> are very eager to learn as we conduct practicals as well as
> manufacturing goods which students use in their homes such
> as soap, petroleum jelly, charcoal, and ceiling board candles.

This quote hints that the active engagement of students in experimental works was triggered by the fact that teachers conducted experiments that involved the students in creating materials that were used in daily life. Another male teacher at Kilombili Secondary School asserted that students "are now knowledgeable to conduct various practicals and can obtain results which are more precise than before, especially in mechanics, electronics and current electricity." This observable improvement in students' laboratory skills, as interpreted by another teacher, was because "*the experiments were done by students under the influence of teachers who needed the students to develop experiments carefully in a successful manner*" (female teacher at Maono Secondary School).

(iii)   *Asking and answering classroom questions*

It was also the opinion of some research participants that the application of skills obtained from the PTT programme contributed to students' motivation to ask and answer questions in classrooms. In explaining this attribute of the PTT programme, a male teacher at Kavalu Secondary School said that the use of LCT encouraged students to "*find knowledge on their own and hence they understand many things...so it leads a teacher to provide answers for easy questions for them and ask them challenging concepts*." Another interviewee asserted that: "*Through presentations, students gain confidence and as teachers scaffold in teaching the students understand they have safe guides in their learning and ask questions to satisfy their inquisitiveness*" (Male teacher at Faraja Secondary School). Other stated evidence that the PTT programme contributed to the increased ability of students in asking and answering questions were: active participation of students in classroom activities that required them to ask and answer questions such as 'hot seat' and 'loop the loop'; and free and friendly classroom interactions between teachers and students.

In a nutshell, PTT programme contributed significantly to the improvement of student engagement in the learning process by influencing: active participation in group discussions; interest and active involvement in experimental works; and increased curiosity and confidence in asking and answering questions in a classroom context.

As hinted in the literature review section, these findings differ from some other studies conducted in Tanzania and elsewhere. One of the arguments of these studies is that student learning is influenced by different curriculum experiences and hence it is difficult to link the improvement in learning with one teacher's

activity (Holloway, 2006). Nevertheless, this study agrees with some other studies such as Darling-Hammond, Hyler, and Gardner (2017), Yoon (2016), and Rawle *et al*. (2019) who still believe that a well-designed and implemented SB-TPD can contribute to enhanced student learning outcomes in terms of knowledge, skills, and competencies. The findings of this study support this belief by indicating that an SB-TPD programme has a potential to contribute to the improvement of students' engagement in the learning process.

Conclusions and Recommendations

It can be concluded from the findings of this study that the SB-TPD contributes to the improvement of learner-centred pedagogical practices. SB-TPD programmes, as evidenced by PTT programme, contribute to a great extent to improving the application of learner-centred teaching approach, improvisation and use of teaching aids and engaging student in laboratory works. Moreover, from the experience obtained from PTT programme, an SB-TPD programme improves teachers' LCT skills by equipping the teachers with skills needed in engaging students actively in the learning process, updating their theoretical knowledge of LCT, and making LCT the teaching culture in their schools.

It can also be concluded from the study that to a great extent SB-TPD contributes to the improvement of student engagement in the learning process, particularly in three ways: participation in group work, asking and answering questions during lessons, and engaging in laboratory-based experimental works.

Therefore, based on these findings, it is recommended that the Ministry responsible for education in collaboration with local governments and heads of schools need to ensure that SB-TPD programmes are established and sustained in all secondary schools for improving teaching practices and student learning. This may also include training the facilitators of SB-TPD programmes, preparing useful training resources, and instructing district education officers and quality assurance officers to oversee the implementation of the programmes in all schools. As of now, SB-TPD practices in secondary schools are neither mandatory nor institutionalized despite the existing policy that guides their implementation.

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