Research and Development Technical Support Report

Submitted to

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1. Overview

The Research and Development Department at CEMASTEA is preparing to roll out a capacity building training programme for internal staff. The aim is to improve both quality of the research and development programme to ensure consistent, high-quality, and timely data collection based on a strong design that will enable to assess the impact of the training programmes on the target people over time. The technical support was focused on the envisioned training programme and materials will address the identified gap in tracking and assessing impact.

2. Objective of the technical support

Therefore, the objective of the assignment was to:

a. Assess the research questions / objectives of two studies recently designed by CEMASTEA.
b. Assess the quality of some data and corresponding tools in their ability to demonstrate the impact of the training programmes delivered by CEMASTEA.
c. Support the CEMASTEA Research and Development team in developing a training programme and materials for building capacity of internal staff in implementing a robust Research and Learning Agenda.
d. Make recommendations based designing a Research and Learning Agenda that will be rigorous and demonstrating impact of CEMASTEA training programmes.

3. Research Questions / Objectives

Two recent studies had been conducted in CEMASTEA:

a. Impact of SMASE in-service education and training (INSET) programme in teaching and learning: A tracer study of primary and secondary schools in Kenya.
b. A baseline study on implementation of CBC in STEM related Subjects in JSS

The research questions and objectives of the two studies were assessed and here are the key observations:

Key observation

The tools could gather the required data to address most of the objectives of the studies. However, there were some of discrepancies between the objectives / questions of the studies and the tool and specific items that were used to collect the data. The implications is that some of the data collected may not adequately address the study questions and objectives. For instance, one of the study questions in the impact assessment survey was ***What are the teacher's perceptions of the influence of the SMASE INSET on their classroom practice?*** This question was meant to assess the teacher classroom practices. However, as noted elsewhere in this report, teacher classroom practices are validly established through classroom observation by trained classroom observers and teacher self-reports may overate the practices.

4. Data Collection Tools

Some of the data collection tools used in the study were assessed and below are the key highlights of the teacher and learner questionnaires:

Teacher questionnaire – Impact Assessment Study:

a. The teacher questionnaire could collect data to meet the need for understanding their perceptions towards a range of issues including classroom practices and learner achievement. However, the tools lacked some background variables for disaggregation including (a) teaching subject, (b) school, (c) training modules. Without these background data, it could be challenging to disaggregate the findings for deeper insights and learning. For instance, without identifying the 'school' where a teacher was assessed, it is challenging to perform some statistical tests to estimate any relationships between teacher classroom practices and learner achievement. Likewise, without teaching subject identity, it may be challenging to compare teacher classroom practices across the subjects to identify and address any subject contextual issues.
b. Classroom practices are key in establishing teacher pedagogical development and consequently are best assessed through classroom observation by trained classroom observers. In the impact assessment study, the classroom practices were assessed through a survey of teacher perceptions of how the SMASE INSET programmes have influenced their classroom practices. This approach, where teacher self-report on their practices may overestimate the teacher classroom practices.
c. Learner achievement is assessed by administering tests through different approaches (written, oral, performance, observation, etc) to assess the knowledge, skills, and competencies, that learners can demonstrate as results of improved teacher pedagogical practices. In this study learner achievement was assessed by seeking teacher perceptions of how the SMASE INSET programmes have influenced learner achievement. This approach where teachers self-report on their perceptions of learner achievement may over-estimate the learner achievement.

Student questionnaire – Impact Assessment Study:

As noted regarding the teacher questionnaire, the learner questionnaire lacked some background items such as school which may limits the range of statistical tests that could be done to estimate any relationships between the teacher and school attributes with learner perceptions and achievement.

JSS Teacher Questionnaire – Baseline study:

The JSS teacher questionnaire had included the teacher school identity which would enable analysis to establish any teacher relationships. However, the questionnaire lacked some background items such as teaching subject of the teacher which may limit comparisons across the subjects.

JSS Student Questionnaire – Baseline study:

The JSS student questionnaire had included the school which would make it possible to conduct statistical analysis by establishing any relationships between teacher practices, and school attributes, and learner experiences and achievement.

5. Research and Development training programme

In support the Research and Development team to develop a training programme and materials for building capacity of internal staff in implementing a robust Research and Learning Agenda, the support focused on key decisions, actions, and best practices in delivering high quality and credible studies. Therefore, the team was taken through the key questions and consideration in planning for a study including: (a) decisions and actions at study planning stage, (b) basic sections of a study report, and (c) study tools development matrix.

a. Several decisions and actions to be made:

i. What is the purpose of the study?
ii. What will be the title of the study?
iii. Why is the overall objective of the study?
iv. What are the specific objectives of the study?
v. What methodology will be employed in carrying out the study?
vi. How will the findings be presented?

a. Key sections of study report

i. Introduction
ii. Literature Review
iii. Design and Methodology
iv. Findings
v. Conclusion and Recommendations
vi. References
vii. Annexes

b. Study tools development matrix

In developing the study tools, the specific questions and objectives should be subjected to a matrix and articulate the variables, measurement scale, specifics tools that will be used and items for each tool. The matrix ensures necessary items and tools are developed to collect the required data, while avoiding the collection of redundant data. Where existing tools are to be re-used, subjecting them to the matrix enables any required adjustments based on the context of the current study. Ideally, the matrix should exhaustively be discussed by the study team.

Table 1: Study tools development matrix

Specific Questions	Variables	Type of variables	Measurement Scale	Name of tool	Specific Items in the tool
How has the SMASE INSET affected learner achievement?					
To what extent are teachers who have attended SMASE INSET using learner-centred pedagogies?					
What are the principals' perceptions of the SMASE INSET influence on the teacher's classroom practice?					
What are the teacher's perceptions of the influence of the SMASE INSET on their classroom practice?					
What are the learners' perceptions of their classroom experience in learning mathematics and science?					
What kind of support exists in schools for effectively implementing SMASE INSET teaching and learning strategies?					
Background Information					

6. Classroom Observations:

Given that CEMASTEA support teachers to improve their pedagogical practices in teaching of STEM subjects, it is imperative that any impact study should not only incorporate assessment of both learner achievement and teacher classroom practices.

6.1 Classroom practices

The Research and Development team should compile a priority list of a glossary of classroom practices that target teachers are expected to improve upon and apply in their teaching and learning process. These classroom practices would form the basis of developing specific items in the classroom observation tools with room for review to incorporate new ideas depending on emerging knowledge.

Figure *1* shows sample classroom observation tool.

Figure 1: Sample classroom observation tool

Section B: Teaching and Learning Process

1. Questioning techniques

Guidelines	Rating				
Does the teacher primarily ask questions that can be answered with one or two words, or that can be answered through rote memorization? Does s/he encourage Learner to ask questions and express new ideas?	□	□	□	□	□
	1	2	3	4	5
	The teacher did not ask any questions throughout the lessons and mainly issued instructions on what the Learner should do	The teacher asked questions that have one correct answer or requires rote memorization	Sometimes the teacher asks questions whose answers are not memorized by rote, and that can have more than one correct answer. However, the teacher does not shows interest in Learner's questions and their expressed thoughts	Sometimes the teacher asks questions whose answers are not memorized by rote, and that can have more than one correct answer. The teacher shows interest in Learner's questions and their expressed thoughts	Frequently the teacher asks questions whose answers are not memorized by rote, and that can have more than one correct answer. The teacher encourages Learner to express and elaborate on their ideas, through which their learning is stimulated.

2. Peer learning or group work

Guidelines	Rating				
Do Learner have opportunities to work in pairs or small groups for peer learning, where they need to collaborate with each other to complete a shared task? (Peer learning does not mean Learner simply sitting together in a group while they complete their work individually. Peer learning means Learner are working together on one task through which they are learning from each other.) Note for Option 2, 3, 4 & 5: Do not consider activities which have been assigned individually to Learner, in which they are helping each other out of their own wish, without the teacher's guidance.	□	□	□	□	□
	1	2	3	4	5
	No opportunities for peer learning. Almost all activity is in large groups or assigned to Learner to complete individually.	Minimal opportunities for peer learning. Learner sometimes works in small groups.	Some opportunities for peer learning. Learner work in pairs or small groups for at least 25% of the lesson	Regular opportunities for peer learning. Learner often collaborates in pairs or small groups on shared tasks for at least 50% of the lesson.	Frequent opportunities for peer learning. Learner frequently collaborates in small groups on shared tasks for more than 50% of the lesson

6.2 Conducting Classroom Observation and Inter-Rater Reliability

Class practices can only be authentically assessed through classroom observations by trained observers. The training for classroom observations is a key step in ensuring quality classroom observation data. Therefore, as part of the improved practices in the research and development, training on classroom observation should be conducted for all classroom observers in every wave of classroom observation. This will ensure that the observers are consistent in their observations. The consistency of the classroom should be determined by computing an inter-rater reliability coefficient and ensure that the team of observers has attained the standard benchmark before embarking on classroom observation. **Figure 2** shows the benchmarks for inter-rater reliability:

Figure 2: Benchmarks for inter-rater reliability

Range	Description
Less than 0.50	Poor reliability
Between 0.5 and 0.75	Moderate reliability
Between 0.75 and 0.9	Good reliability
Greater than 0.9	Excellent reliability

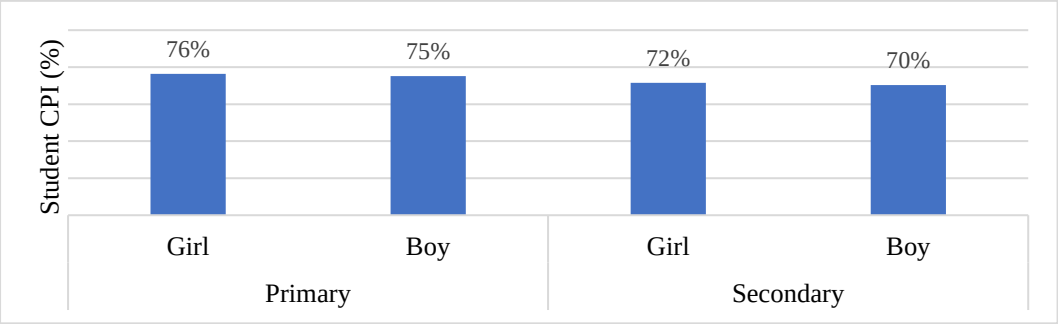
The classroom observers should attain a minimum of 0.7 inter-rate reliability coefficient during the training for classroom observation to enhance reliability of the data that will be collected in the field. The training can be conducted first using videos and secondly through piloting of

the tools in actual classroom situations. Additionally, as a standard practice, to ensure high quality classroom observations studies at CEMASTEA, the classroom observers should be paired at least for the first 5 classroom observations in the field, and their inter-reliability computed and confirmed before they can conduct independent observations individually. Additionally, a data collection quality assurance team member should sample and pair with classroom observers in the field and different points across the duration of data collection and further confirm inter-rater reliability. Further, reflection sessions should be conducted at the end of each day of classroom observations at least in the first few days to discuss any variations while identifying specific items in the classroom observation tools that could be cause of most variations, and institute corrective measures.

7. Dummy Output Tables and Graphs

As part of standard practice during the planning stage of a study, dummy output tables and graphs should be discussed and prepared to illustrate how the findings from the data analysis will be presented. This practice will not only ensure that the tools used in data collection have all the required items to gather the relevant data, but also that the tools avoid inclusion of redundant items that gather unnecessary data. The dummy output tables and graphs should be developed and agreed upon for each of the study question /objective. **Figure 3** shows a dummy student classroom practices index.

Figure 3: Dummy student classroom practices index



8. Analysis of Qualitative Data

The research and development team should develop an data analytical framework for qualitative data based on the research and learning agenda focusing on the anticipated outcomes of training programmes. The analytic framework should be a living document that allows for review to incorporate emerging knowledge from research. The following steps are followed to develop and refine a coding scheme for data analysis:

a. **Create an analytical framework:** this is a listing of the themes that are expected to emerge from the qualitative data based on a review of literature and practice.
b. **Apply the analytic framework to the qualitative data:** identify and aggregate statements on the listed themes from the qualitative data.

c. **Verbatim excerpts:** Identity verbatim narrative/voices of respondents from the qualitative data to validate the identified themes.
d. **Additional themes:** Identify new themes from the qualitative data that are not initially identified in the analytical framework (not documented in literature or practice). These will be new learning that will inform future programming. The new themes can be used to enrich the analytical framework.
e.

9. Training Programme and Research and Learning Agenda

Both teacher training and research and learning agenda are complementary as two sides of the same coin. Therefore, the research and training should be aligned for consistent learning through the programme life cycle. **Table 2** shows how to align a teacher training programme and research and learning agenda across time of implementation of teacher professional development programme.

Table 2: Alignment of training programme and research and learning agenda

Program	Training and Research	Year 1			Year 2		
		Term 1	Term 2	Term 3	Term 1	Term 2	Term 3
Secondary	Training on IBL	IBL	Mentoring support	Mentoring support	Refresher on IBL	Mentoring support	Mentoring support
	Research	Baseline	Classroom observation	Classroom observation	Classroom observation	Classroom observation	Endline
		Teacher	Teacher	Teacher	Teacher	Teacher	Teacher
		Student	Student	Student	Student	Student	Student
		Principals					Principals
		School					School

Adopting this approach will enable the Research and Development Team to map studies and data collection across the training programmes life cycles and apply the **Repeated Measures Research Design**, a strong design that will enable impact assessment over an adequate period of time to demonstrate changes at the level of teachers, students, principals and schools. Further, the consistent periodicity in data collection, will ensure the generation of quality information for progressive decision-making on any adjustments, while providing sufficient data for impact assessment. Importantly, the nexus between training and research is further strengthened by in-building teacher mentoring as part of the classroom observation and not as two unrelated activities.

10. Recommendations

From a review of the available documentation (tools, study objectives) and extensive discussion with the Research and Development team, the following are the key recommendations.

10.1 Operational definition of terminologies

The R&D department should develop operational definitions of key terminologies as they apply to CEMASTEA to ensure consistency in studies. Example of terminologies that need operational definitions are SMASE INSET Programme, Impact, classroom practices, learner achievement, among others.

10.2 Glossary of classroom practices

Alongside the operational definition of terminologies, the R&D should embark on compiling a glossary of the classroom practices that are being promoted through the programmes being implemented at CEMASTEA.

10.3 Tools and guidelines

The R&D department should develop and promote the application of a range of guidelines for ease of reference and promoting good practices in studies. Examples of guidelines that need to be developed include the tool development matrix, qualitative analytical framework, among others.

10.4 Adopt best global practices.

The R&D should promote global best practices in the delivery of a robust research and learning agenda. For instance, training and harmonizing classroom observation teams before every wave of classroom observations and achieving a threshold of inter-rate reliability should be adopted as a best practice to improve the quality of studies at CEMASTEA. Additionally, the R&D department should identify and apply strong research designs to ensure high quality studies are implemented.

10.5 Alignment between the training programme and the research and learning agenda.

Given that training and research are the two sides of the same coin, both the training department and the research & development departments should align their programmes to ensure seamless and cost-effective implementation of both training and research and learning agenda.

10.6 Training of staff on the Research and Development Processes.

With the mandate to deliver training and research and development for educators, the staff at CEMASTEA should understand the processes in each department. Therefore, the planned R&D training programme should ensure that all staff are trained to understand the Research and Development Proceseses, particularly on the difference phases of studies and how this are aligned with training programmes.