

**THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION AND VOCATIONAL TRAINING**



Field Support Programme for Diploma in Secondary Education

**SELF-STUDY MODULE
MATHEMATICS**

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INTRODUCTION

Dear student teacher, this is your self-study module for mathematics. In the first year of your study, (the college-based learning), you had a direct classroom interaction between you and your mathematics tutor. You have studied mathematics contents outlined in the academic and pedagogy syllabuses in a more theoretical approach.

In your second year (school-based learning or field work) learning to teach mathematics in the real classroom. You are expected to integrate the theoretical knowledge you learnt in the college to practically teach basic or additional mathematics in secondary school so as to bridge the gap between theory and practice. At the end of the second year, you are expected to go back to and prepare yourself for the mathematics final examinations.

Description of the Module

This mathematics module intends to provide you with the opportunity to:

- Teach basic and additional mathematics in the secondary schools using learner centred approaches.
- Continue studying mathematics on your own.
- Prepare yourself for the mathematics final examinations.

Objectives of the Module

The self-study module for mathematics subject caters for both academic and pedagogy syllabuses. Therefore, by the end of the two years, you should be able to:

- Develop deep understanding for basic and additional mathematics content.
- Enhance your knowledge for the selected A-level mathematics content.
- Plan the mathematics teaching sessions.
- Teach competently the basic and additional mathematics content.
- Assess and evaluate mathematics student's learning.
- Reflect on your mathematics teaching for improvement.

Main Competences to be developed

The main competences you will develop as you study this module for mathematics emanates from the academic and pedagogy syllabuses. The competences enhance your ability to:

- Interpret mathematical problems.
- Solve mathematical problems.
- Apply mathematical problems to real life experiences.
- Integrate theory and practice in the classroom context.

Some topics in the academic and pedagogy syllabuses will be cited to demonstrate how to realize those competences using the given activities. It is therefore your responsibility to work on the given activities in the cited topics, and use those activities to work on the topics which are not discussed in details in this module.

HOW TO USE THE MODULE

Dear student teacher. This module works on behalf of your subject tutor. It gives directions on what to do so as to achieve the above stated objectives and competences.

The discussion in this module is guided by particular topics given as examples, brief description about the topic, competences to be developed, activities that will guide the realization of the competences, and assessment questions. The assessment questions intend to guide you to reflect on how you are improving mathematics teaching as well as preparing for your final examinations for mathematics.

You are required to work out all the activities given at the end of the discussion of each topic, answer the assessment questions, and file your answers in the portfolio ready for assessment during and after the field program.

WISHING YOU LUCK!

TOPIC ONE:
PLANNING AND PREPARATION FOR TEACHING

Having gone through the college-based learning, it is expected that, you have developed theoretical knowledge on pedagogy that you need to put into practice. This topic involves using various curriculum materials to plan and prepare mathematics schemes of work, logbooks, lesson plans, teaching and learning resources, teach basic mathematics or additional mathematics, and evaluate your own mathematics lessons. As you do your revision of this topic and apply your theoretical knowledge in teaching mathematics. You will develop the following competences.

Competence 1: Plan and develop mathematics lessons.

Activities

1. Use the basic mathematics syllabus or additional mathematics syllabus and other related curriculum materials to prepare a scheme of work for the class you will be assigned to teach for the time you will be in school.
2. From your scheme of work, choose a sub-topic and prepare of lesson plans (not more than four).
3. Use the first lesson plan to teach your students. After the first teaching and your lesson evaluation, do you think you need to adjust the second lesson plan before using it? Elaborate. Do the same for lesson plans three and four.
4. Write a brief reflective report indicating the changes you made to your earlier plan to suit the real situation after each actual classroom teaching.

Assessment questions

1. What new experiences did I gain by working out the above activities?
2. Am I in a position to plan and develop better mathematics lessons competently?
Give reasons.

Competence 2: Develop and use skills for improvising teaching and learning resources.

Activities

1. Prepare a lesson plan that you will use in your next teaching session clearly indicating the teaching and learning resources to be used.
2. Use the lesson plan to teach your students. While teaching, identify and use other teaching and learning resources available in the learning environment to compliment the resources you prepared earlier.

Assessment questions

1. Have you been able to explore the learning environment and improvise enough teaching and learning resources besides the one you prepared before the teaching session? Explain.
2. What knowledge have you gained from the above activities? How can you utilize it in your future teaching work?

Competence 3: Evaluate and improve mathematics lessons.

Activities

1. Construct guiding questions (not less than five) that will help you to evaluate and reflect on your mathematics teaching.
2. Use those questions to evaluate and improve your next teaching sessions accordingly.

Self - assessment questions

1. From the activity 2 above, what were the weak areas you identified that needed improvement?
2. If for example, among the weak areas you identified include not using the teaching and learning resources, what measures will you take before the next teaching session?
3. Ask yourself; am I improving my pedagogical work? Explain.

TOPIC TWO: FOUNDATIONS OF MATHEMATICS

Dear student teacher, you have gone through the discussion about the meaning of mathematics, importance of mathematics, principles of teaching mathematics, and motivation in teaching and learning of mathematics. With regard to the principles of teaching mathematics, you have to assume the role of motivating your students to love and to learn mathematics.

Most teachers engage more on guiding students to solve and calculate mathematical problems as if they are the only mathematical activities. This habit tends to make some students lose interest in mathematics learning because solving and calculating becomes monotonous.

You as a new mathematics teacher in the school you expected to bring some changes on how to approach and guide mathematics learning; including exploring and using other mathematics activities. Two competences below will be developed as you do your revision and teaching.

Competence 1: Arouse learners' interest in learning mathematics.

Activities

1. Discuss with examples the importance of learning mathematics.
2. Conduct a mini-research to find out how your students perceive mathematics, and why?
3. From the findings in activity 2 above, design and discuss different activities that will arouse learners' interest in learning mathematics.
4. Besides solving and calculating mathematics questions, design other in- and-out of class activities that can motivate mathematics learners.

Self - assessment questions

1. Having realized the significance of learning mathematics, how will you share it with your students?
2. What other ways can you improvise to help your student develop positive attitude to mathematics subject?

Competence 2: Initiate, organize and conduct mathematical activities.

Activities

1. Identify and describe situations in the classroom, outside the class and in life experiences where mathematics is applicable.
2. Design and supervise a mini-project that will lead your students to explore, identify and realize the extent to which the surrounding environment is rich in mathematics.

Self assessment questions

1. What have you gained from the above activities?
2. Describe situations in which mathematics is important in daily life. Can you initiate, organize and conduct mathematical activities from those situations? Give examples.

TOPIC THREE: TRIGONOMETRY

This is one of the A-level academic topics. It is expected that, you have worked out trigonometric problems related to compound angle formulae, double angle formulae, and factor formulae during the college-based learning. However, you have to continue revising for better preparation of your teaching. That is to transform the academic knowledge pedagogically to facilitate the learning of either basic mathematics or additional mathematics. Your self study about the topic will better prepare you for your final examinations as well.

Competences to be developed or enhanced

- Interpret the trigonometric problems.
- Show the link between the trigonometric problems and real life experiences.
- Teach trigonometry (either basic mathematics or additional mathematics).

Activities

1. The angle of elevation of the top A of a building from a point 10m away from the foot B of the building and in the same horizontal plane as the foot of the building is 60 degree.
 - How can you interpret this problem?
 - Calculate the height of the building.
 - What meaning can the school community gain from this problem?
2. If you are teaching basic mathematics to a form three class, how can you introduce them to the concept of angle of elevation?
3. If you are teaching additional mathematics to a form four class, how can you use the concept of angle of elevation to guide your students derive the compound angle formulae?

Self assessment questions

1. What have I learnt from the above activities?
2. Have I realized all the intended competences? If yes, how? If no, why and what should I do?
3. Using the activities above as examples, can I study other topics in the academic syllabus focusing on the main competences?
4. By so doing, am I improving my mathematics teaching as well as preparing for my final examinations?

TOPIC FOUR: SIMILARITY AND CONGRUENCE

In this topic, you have learned about similar figures and congruency of triangles with their related proofs during your college-based learning. Being in the field of training means putting into practice what you learnt theoretically.

Competence to be developed: apply mathematical knowledge, skills and techniques in other fields.

Activities

1. Discuss with examples, how the topic of similarity and congruence is applicable to your second teaching subject (i.e. physics, chemistry, geography, etc)?
2. Discuss with examples, how the topic of similarity and congruence is applicable to your daily life experiences?
3. How can you share your experiences in activity 1 and 2 to your form two students?

Self assessment questions

1. After you have worked on the above activities, answer the following questions:
 - Have you been able to apply the knowledge, skills and techniques of similarity and congruence in other fields?
 - What did you observe from your students while sharing your experiences in activity 3?
2. In your study time, do the following:
 - Solve problems using similarity theorems of triangles.

TOPIC FIVE: FUNCTIONS

In your A-level studies and in your college-based learning, you have come across many incidences where you used the concept of functions. For example, trigonometric functions, differentiation of a function, integration of a function, hyperbolic functions, to mention a few. It is high time to see how best you can synthesize your learning about the concept of functions and teach the topic of functions in basic mathematics.

Competences to be developed

- Communicate effectively in a mathematical language.
- Present the concept of functions accurately and interactively.

Activities

1. Discuss with examples how the concept of function displays different meaning in the mathematical context as it is in normal daily usage.
2. Design learning tasks that will explore what your students already know about the concept of functions.
3. Describe how you will use student's ideas to help them develop mathematical meaning of functions.
4. Given $y = x^2 - 4x + 5$. Find dy/dx from the first principle.

Self assessment questions

1. What have you realized after working on activity 1?
2. What methods and techniques did you use in getting students' ideas and in facilitating their participation and interaction?
3. Identify teaching and learning activities which enhanced learner centered teaching approach.
4. By working on activity 4 above, what mathematical language did you develop?
5. Using the guiding activities above, how can you introduce the concept of set when teaching basic mathematics and the concept of logic when teaching additional mathematics?

TOPIC SIX:

ASSESSMENT IN MATHEMATICS

In your college based learning you were exposed to skills for constructing mathematics test, moderating it, marking it, standardizing test results, and keeping record of test scores. However, you need to be aware that, there are various mathematics assessment tools where mathematics test is only one of them.

For example, while teaching, what makes you to feel that the introduction stage is successful before going to the following stage? Put down your ideas. In addition to your ideas, it is advisable that, a good teacher assesses his/her lesson development and act accordingly. Therefore, you will be constructing assessment questions for assessing the achievement of each stage of the lesson development before moving to the next stage.

Competence to be developed: construct and develop assessment tools for mathematics subject.

Activities

1. Mention the assessment questions you prepared in the lesson plan used in your teaching. How relevant were those questions in terms of what you wanted to assess?
2. From the adjusted lesson plan you used in your actual teaching, construct a mathematics test to assess the students' learning for the respective sub-topic.
3. Moderate the mathematics test you have constructed.
4. Conduct the mathematics test to your students.
5. Prepare marking scheme for the mathematics test.
6. Mark the test, standardize the test scores and keep record of the scores in your portfolio.

Assessment questions

1. What can you comment on the raw scores and the standardized one?
2. Besides classroom assessment questions and mathematics test, identify and describe other mathematics assessment tools.