

Diploma Course in Working Mathematically and Education

Duration: One year leading to a NVQ Level 5 qualification

Minimum Admission Requirements: Passing 3 subjects at Physical Science stream of the Advanced Level Examination and having a C grade for the General English Paper

Purpose of the qualification: This course is designed to set suitably qualified GCE (A/L) students on the path to becoming effective teachers of Mathematics for grades 6-11. It is based on the view that teaching is a vocation, which requires positive attitudes as well as practical skills and knowledge. Knowledge should not be confined to theory, but should include wider cognitive abilities and skills, including the capacity to conceptualize. Positive attitudes are developed through attention to soft skills including leadership and decision making ability, teamwork, propensity to consult and ability to coordinate, and commitment to understanding and resolving problems.

By the end of the course qualification holders are expected to develop understanding and fluency in mathematics through inquiry, exploring and connecting mathematical concepts, choosing and applying problem-solving skills and mathematical techniques, communication and reasoning that are essential to become a successful mathematics teachers.

Structure of Course: The course will consist of units;

1. English and Soft Skills = 300 notional hours = 12 NVQ Credits
2. Classroom Management and Group Work = 250 notional hours = 10 NVQ Credits
3. Working Mathematically = 300 notional hours = 12 NVQ Credits
4. Teaching Practice Training – six months = 650 notional hours = 26 NVQ Credits

Note: For taught units 1, 2 and 3, one credit (25 notional hours) is considered as 20 contact hours and 5 self-study hours

Total Volume of Learning = 1500 notional hours = 60 NVQ Credits

Annex

Syllabi for Units 1, 2 and 3

Units 1

Title of the Unit: English and Soft Skills

Credits: 12 Credits (300 notional hours)

Content:

This course is designed to facilitate students entering the world of work with the basic competencies necessary to enable them to move swiftly to positions of responsibility requiring initiative and good presentation skills. Note that before the course begins revision of the competencies that were prescribed for NVQ Level 3 and 4 courses is necessary.

This course should also be used for students on NVQ Level 6 courses, pending curriculum review of that Level.

Expected Learning Outcomes:

At the end of this course students should be able to

- Communicate effectively through understanding and practice of the most effective way of
Expressing opinions, agreeing and disagreeing
Listening productively
Focusing attention
Making effective presentations, including through Power Point, and interactive means and software
Conducting and participating in discussions
Consulting so as to prepare programmes and itineraries

- Read with understanding and write effectively at appropriate levels and in particular effectively
 - Write CVs
 - Reply to advertisements and inquiries
 - Prepare an itinerary
 - Fill forms
 - Take notes and keep minutes/ records
 - Understand and use conditional sentences
- Students should understand the structure of English so as to use it effectively, with regard to
 - Passive voice
 - The Perfect Tense, Reported Speech
 - Noun Clauses
 - Use of Participles
 - Less common tenses – Past Continuous, Past Perfect
 - Phrasal verbs
 - Prepositional Phrases, Adjectival and Adverbial
 - Participial Phrases
 - Gerunds
 - Conditional Sentences
- Students should further develop cognitive abilities and skills with regard to effective work, with strengthening of the capabilities developed at previous levels. They should also Identify appropriate skills for particular tasks
 - Understand and be able to practise categorization with appreciation of differences
 - Work with maps and graphic information, in particular digital information streamed via the Internet and in digital fashion
- Students should develop the capacity to work effectively on their own and in harmony with others, with strengthening of the capabilities developed at previous levels. They should develop heightened awareness of the need to

Fulfil responsibilities

Do reference work

Practice Presentation Skills, alone and in teams

Coordinate with others, while understanding different priorities

Understand the need for conflict resolution and develop appropriate negotiating skills

Have goals in mind and evaluate degree of success

Evaluation:

The course will be assessed through formative assessments for 50% of the total mark. This will include

10% for classroom participation

10% for oral responses to questions

10% for short quizzes testing English as well as cognitive skills

There should be several tests during the course and the best three marks should be taken into account

10% for a group project with a report

10% for an individual project with a report

A summative test for 50% inclusive of an oral component for 20% will be conducted at the end of the course.

Recommended Readings:

- Text book: Advancing Career Skills

Units 2

Title of the Unit: Classroom Management and Group Work (This component consists of 4 modules labeled as Module B, Module D, Module E, Module G)

Credits: 10 Credits (250 notional hours)

Module B: Plan Teaching and Learning Activities - *100 teaching hours + 25 self-study hours = 125 notional hours*

Module D: Develop Learning Activities, including material - *45 teaching hours + 10 self-study hours = 55 notional hours*

Module E: Organize learning environment - *25 teaching hours + 5 self-study hours = 30 notional hours*

Module G: Develop and Conduct Appropriate Assessments 1- *30 teaching hours + 10 self-study hours = 40 notional hours*

Content:

Available in the following four tables

Module Title and Code:	Module B: Plan Teaching and Learning Activities Time Frame: 100 Teaching Hours
Reference to NCS:	See Competency Profile of DTET (2016)
Competencies (job functions and soft skills) and descriptions:	
<p>The trainees sight the learning outcomes listed in technical curricula and develop them further into a more detailed planning phase. In doing so, they also look at the content to be included and decide what is needed to promote the envisaged competencies.</p> <p>In the process, they plan student-centered learner activities like small group work, case studies, brainstorming plus mindmapping methods, practicals, role plays, assignments and games. Moreover, the trainees schedule and plan workshop and laboratory activities, field trips and expert meetings. Consequently, they plan for large-scale simulation and project work.</p> <p>Trainees work out icebreaker and introductory as well as energizer and brainer teaser teaching situations, teacher instructions and supporting media for announcing work tasks. They plan short phases of demonstrations and lectures as well as debriefing and homework phases. Trainees come up with a positive teaching methodology for oral learner questioning and written assessments, formative (including journals and portfolios) and summative style.</p> <p>Altogether, they turn their planning activities into meaningful lesson sequences, summed up in complete written lesson plans and review the planning.</p>	
Typical related work situations to master:	
<p>(3) The trainer gets a new competency-based curriculum and is asked to plan teaching a module in that course.</p> <p>(4) A group of trainers sits together and comes up with student activities and lesson plans for the training center to increase quality.</p> <p>(5) The trainer needs to write a lesson plan for a certain lesson.</p>	
These situations should be conjured up for teaching such competencies as given above!	
Important pertinent Content (knowledge):	Student-centered teaching methods Simulation and project work Formative and summative assessment Learning diaries, journal and portfolios Types Teacher questions Form of Lesson Plans Typical Phases (Sequences) of a Lesson
Potentially useful teaching methods (optional):	e. g. <ul style="list-style-type: none"> - Planning Simulation - Project Work - Task-Based Learning - Authentic planning - Self-directed learning via tutorials and manuals - Input lecture (e. g. about assessment) - Station learning (e. g. about teaching methods)

Assessment: An example could be 60 % of long-term training/lesson plans, 40 % creativity and variety of methods envisaged to use in planning.

Continuous assessment: Progress Discussions with Project Groups and Intermediate Short Status-Quo presentation.

Module Title and Code:	Module D: Develop Learning Activities, including material
	Time Frame: 45 Teaching Hours
Reference to NCS:	See Competency Profile of DTET (2016)
Competencies (job functions and soft skills) and descriptions:	
<p>The trainees understand the basics of student-centered learning via online research and plenary group discussion and that students need assignments, work-based tasks and problems to work on independently. These backdrop situations of student-centered learning need to be designed.</p> <p>As a consequence, the trainees develop guidelines and example content for:</p> <ul style="list-style-type: none"> small group activities and large group activities role play activities educational game activities brainstorming plenary and group work technical case studies individual assignments independent self-study activities work simulations in workshops practice activities laboratory work field trips and exploration learning journals, learning diaries and portfolio work work instructions and rules for projects and simulations etc. <p>Finally, the trainees present examples of their designed learning instructions and material via Powerpoint presentation to a CRITICAL audience.</p> <p>In the end, they exchange their new material and get a habit of cooperating and sharing.</p>	
Typical related work situations to master:	
<ul style="list-style-type: none"> (1) The trainer designs the activities in her or his classroom/workshop. (2) Fellow teacher design work assignments and tasks together to share. ... <p>These situations should be conjured up for teaching such competencies as given above!</p>	
Important pertinent Content (knowledge):	<p>Typical written teacher instructions and language used</p> <p>Binding character of teacher language</p> <p>Design of assignments</p> <p>Design a work-based situation in tasks, problems etc.</p> <p>Types of learning activities</p> <p>Small groups, large groups and plenary session (advantages and drawbacks of each)</p> <p>Exchange of learning material</p> <p>Criteria for good student-centered learning material</p>
Potentially useful teaching methods (optional):	<p>e.g .</p> <ul style="list-style-type: none"> - Simulation of Situation to create learning material and tasks for a certain technical module - Group Discussion of need of teaching instructions and learning material - Presentation via visual powerpoint of results - Exchange “bourse” of learning material, being displayed on tables (stands) and to be acquired for free

Assessment: An example could be 75 % of learning material created, according to criteria, 25 % presentation of products.

Continuous assessment: Progress Discussions of learning material-creation.

Module Title and Code:	Module E: Organize learning environment
	Time Frame: 25 Teaching Hours
Reference to NCS:	See Competency Profile of DTET (2016)
Competencies (job functions and soft skills) and descriptions:	
<p>The trainees organize their own physical arrangement of their classroom/workshop and discuss the pros and cons of certain sitting arrangement (e. g. with the teacher up front and rows of students often a bad example). Moreover, they ensure and style an esthetic, culturally and linguistically integrating and clean teaching environment, enable differentiation (arranging of facilities for learners with differing abilities) in the teaching facility, have needed resources ready and set up things so as to minimize potential teaching disturbances und interruptions (e. g. people walking in and out, calling and texting etc.). They make very alternative and open teaching settings possible (e. g. all chairs out or sitting circles) and create an appealing learning atmosphere (e. g. posters, students' products on display etc.).</p> <p>Evidently, they ensure safety in workshops, laboratories, work sites, on field trips and in classrooms and make student stick to rules being introduced that avoid accidents.</p> <p>For reflection purposes, all trainees discuss various layouts of workshops and classrooms as products of styling them.</p>	
Typical related work situations to master:	
<ol style="list-style-type: none"> (1) An empty of plain workshop/classroom needs to be styled and properly equipped. (2) Trainees imagine a teaching room of their dreams and create it. 	
These situations should be conjured up for teaching such competencies as given above!	
Important pertinent Content (knowledge):	Safety rules and regulations Different sitting and teaching arrangements Style options of workshops and classrooms Sense of aesthetics and cleanliness Avoidance of teaching disturbances Optimum teaching environment
Potentially useful teaching methods (optional):	e. g. <ul style="list-style-type: none"> - Written planning and drawing of ideal workshop/classroom - Action-based styling of plain and empty workshop and classroom as team activity - Group Discussion of aesthetics in the classroom and workshop - Simulation of short teaching sequences in newly styled room - Taking pictures and group products and discussing pros and cons of different settings

Assessment: An example could be 60 % written plan and drawing, 40 % styled physical classroom.

Continuous assessment: Progress Discussions of planning and implementing "ideal setting".

Module Title and Code:	Module G: Develop and Conduct Appropriate Assessments 1
	Time Frame: 30 Teaching Hours
Reference to NCS:	See Competency Profile of DTET (2016)
Competencies (job functions and soft skills) and descriptions:	
<p>The trainees identify the context of assessment (i. e. what is being done and learned in the module they teach), and come up with the criteria and standard solution or benchmark against which to appraise the student performance. They decide which assessment instruments and/or tools to use and design them. Before conducting the assessment, they arrange the facilities and have potentially needed resources ready. Then they conduct the assessment(s) and observe the process, maybe with relevant grading notes already. The trainees conduct potential corrections, make an unbiased, fair and transparent assessment decision, which needs to be documented according to a system of documentation.</p>	
Typical related work situations to master:	
<ol style="list-style-type: none"> (1) The trainer needs to assess the trainees at the end of the module. (2) The trainer wants to council and help students via formative assessment. 	
Important pertinent Content (knowledge):	Fair Assessment criteria Standard and Benchmark solutions Standard Pool of Methods and Tools of Assessment Fair correction Feedback situation
Potentially useful teaching methods (optional):	e. g. <ul style="list-style-type: none"> - Simulation of Module and group of learners that needs to be assessed - Students Assignment to create assessment tools - Presentation and critical discussion of assessment tool products (e. g. via exhibition) - Simulation of Feedback Session (Micro Teaching) - Reflection Session on what constitutes a fitting and fair assessment

Assessment: An example could be 60 % finalized assessment tools, 40 % presentation of assessment tools.

Continuous assessment: Progress Discussions of assessment tool-creation.

Units 3

Title of the Unit: Working Mathematically

Credits: 12 Credits (300 notional hours)

Content:

The following fifteen mathematics topics in the areas of Number, Measurement, Geometry, Statistics and Sets and Probability chosen from the school curriculum will be considered to facilitate investigative learning through a combination of processes developed as per websites <http://www.maths300.com/> and <http://rich.maths.org/>.

Number

1) *Set of Real Numbers*

- Identifying the rational numbers
- Terminating decimals
- Recurring decimals
- Identifying irrational numbers
- Representing the set of natural numbers, set of integers, set of rational numbers, set of irrational numbers and the set of real numbers using set notation

2) *Surds*

- Recognizing surds as irrational numbers
- Converting Entire surds \Leftrightarrow Surds

3) *Surds*

- Addition
- Subtraction
- Multiplication
- Division

- Rationalizing the denominator

(Only of the form $\frac{a}{\sqrt{b}}$)

Measurement

4) *Time Zones*

- Introducing time zones
- Time at a location with respect to the standard time

Algebra

5) *Matrices*

- Introduction (Up to 3×3)
- Addition and subtraction (Up to 3×3)
- Multiplying a matrix by an integer (Up to 3×3)
- Multiplication (Up to 2×2)

Geometry

6) *Rotational symmetry*

- Concept
- Centre of rotation
- Order of symmetry
- (For geometric shapes only)

7) *Chord*

- Application and proof of the theorem “The straight line joining the mid-point of a chord of a circle to the centre is perpendicular to the chord”
- Application of the theorem “The perpendicular from the centre of a circle to a chord, bisects the chord” (Proof not expected)

8) *Angles*

- Application and proof of the theorem “The angle subtended at the centre of a circle by an arc is equal to twice the angle subtended on the circumference by the same arc”
- Application of the theorem “Angles in the same segment of a circle are equal” (Proof not expected)

9) *Cyclic Quadrilaterals*

- Application and proof of the theorem “The opposite angles of a cyclic quadrilateral are supplementary”
- Application of the theorem “If a pair of opposite angles of a quadrilateral are supplementary, its vertices are con-cyclic” (Proof not expected)
- Application of the theorem “If one side of a cyclic quadrilateral is produced, the exterior angle so formed is equal to the interior opposite angle of the quadrilateral” (Proof not expected)

Statistics

10) *Interpretation of data*

- Introducing quartiles and the inter quartile range
(Using row data)

11) *Cumulative frequency curve*

- Quartiles
- Inter quartile range

Sets and Probability

12) *Sample space of a random experiment (With dependent events)*

- Representation on a grid
- Representation in a tree diagram
(Not more than two stages)

13) *Solving problems involving dependent events using a grid or a tree diagram*

14) *Sample space of a random experiment (With independent events)*

- Representation on a grid
- Representation in a tree diagram

(Not more than two stages)

15) Solving problems involving independent events using a grid or a tree diagram

Expected Learning Outcomes:

At the end of the course, the learner will be able to develop understanding and fluency in mathematics through inquiry, to explore and connect mathematical concepts, to make use of a strategy toolbox in problem solving, to communicate mathematical ideas and to apply mathematical reasoning.

Evaluation: In course assignments: 40 marks, End semester examination: 60 marks

Recommended Readings:

- *Learning and Doing Mathematics* by John Mason
- *Thinking Mathematically* by John Mason, Leone Burton and Kaye Stacey
- *Habits of Mind: an organizing principle for mathematics curriculum* by Al Cuoco, E. Paul Goldenberg & June Mark
- Website: <http://mathematicscentre.com/taskcentre/work.htm>
- Website: <http://nrich.maths.org/8963>