

**YEAR 3**

**SEMESTER 2**

# Four-Year B.Ed. Course Manual

## Mathematics: Teaching and Assessing





GOVERNMENT OF GHANA



mastercard  
foundation



**UKaid**  
from the British people



Published by the Ministry of Education; Ghana, under Creative Commons Attribution-ShareAlike 4.0 International License.

# FOREWORD

These Initial Teacher Education course manuals were developed by a team consisting of members from Colleges of Education and four universities namely the University of Ghana, Kwame Nkrumah University of Science and Technology, University of Education, Winneba, and University for Development Studies. This team was originally constituted by the National Council for Tertiary Education (now the Ghana Tertiary Education Commission) in 2019 to support the delivery of the new B.Ed. curriculum with assistance from T-TEL and UK Aid. The revision, finalization and printing of these manuals took place in 2021 with support from T-TEL and Mastercard Foundation.

The course manuals have been produced for use as general guides for the delivery of the new four-year B.Ed. curriculum in Colleges of Education in collaboration with their affiliated universities. They are designed to support student teachers, tutors, and lecturers in delivering a complete B.Ed. course for training student teachers which meets the requirements of the National Teachers' Standards, enabling them to teach effectively in basic schools.

The first section of the manuals is focused on the course information and vision for the B.Ed. curriculum. The second section presents the course details, goal for the subject or learning area, course description, key contextual factors as well as core and transferable skills and cross-cutting issues, including equity and inclusion. The third section is a list of course learning outcomes and their related learning indicators. The fourth section presents the course content which is broken down into units for each week, the topic and sub-strands and their related teaching and learning activities to achieve the learning outcomes and the teaching and learning strategies. This is followed by course assessment components in section five. Each manual contains a list of required reading and references as well as teaching and learning resources. The final section presents course related professional development for tutors and lecturers to be able to use each section of the manual.

Field instructions to guide Supported Teaching in School are integrated into the course manuals to provide the student teacher with guidance in developing teaching throughout the entire period of study to be able to meet the requirements of the National Teachers' Standards (NTS) and the National Teacher Education Curriculum Framework (NTECF). To ensure maximum benefit the course manuals should be used in addition to other resources such as the NTS, NTCEF, National Teacher Education & Assessment Policy and the National Teacher Education Gender Equality and Social Inclusion (GESI) Strategy and Action Plan.. This will help to ensure that student teachers' learning is integrated within the wider teacher education policy framework.

**Professor Mohammed Salifu**

Director General, Ghana Tertiary Education Commission

## ACKNOWLEDGEMENTS

The course manuals were developed through the collaborative efforts of a team of individuals from Colleges of Education, University of Ghana, Kwame Nkrumah University of Science and Technology, University of Education, Winneba, and University for Development Studies. They were produced in association with the Ghana Tertiary Education Commission of the Ministry of Education, Ghana.

A participatory team approach was used to produce this set of resources for tutors/lecturers, mentors, and student teachers. We are grateful to the specialists who contributed their knowledge and expertise.

Special thanks to Professor Jophus Anamuah-Mensah - T-TEL Key Advisor, Dr. Eric Daniel Ananga - T-TEL Key Advisor for Curriculum reform and Beatrice Noble-Rogers who provided key editorial, review and content input and facilitated the process of drafting and finalising the course manual.

Patricia Appiah-Boateng and Gameli Samuel Hahomene, served as typesetting and formatting coordinators and designed and produced the illustrations, tables, and other graphics which appear in the pages. They spent time and effort designing and redesigning the graphic layout and producing the camera-ready copy resulting in a set of materials that are easy to use, read, and reference.

Thanks also goes to all T-Tel staff members who worked to support production of these course manuals, particularly Beryl Opong-Agyei and Gideon Okai. Their frankness and co-operative attitude complimented the team approach used to produce this manual.

We are indebted to the Ministry of Education and the Ghana Tertiary Education Commission (GTEC) for the general support and specific helpful advice provided during production of the course manuals. Recognition and thanks must go to Chief Technical Advisor for T-TEL and Policy Advisor to the National Education Reform Secretariat, Akwasi Addae-Boahene, Prof. Mohammed Salifu, the Director General of GTEC and Mr. Jerry Sarfo the coordinator for the colleges of education, who in diverse ways supported during the course manual writing workshops.

In addition to all the staff who participated visibly in the development of these materials we would like to acknowledge all those people from the many colleges of education and universities in which we have worked who have, directly or indirectly, shared their views on the curriculum with us.

## CORE WRITING TEAM

Names of writers	Subject	Names of writers	Subject
Dr. Isaac Eshun	African Studies	Cletus Ngaaso	Social Studies
Dr. Anthony Baabereyir		Mohammed Adam	
Ms. Shirley Dankwa		Dr. Emmanuel Adjei-Boateng	
Prof. S.Y. Annor	Agriculture	Dr. Yaw Nyadu Offei	Special Education
Dr. Salome praise Otami	Early Grade	Prof. Samuel Hayford	
Dr. Samuel Frimpong		Dr. Awuni	
Robert Quansah		English Language	Rev.(Dr) Nyueko Avotri
Dr. Abraham Kwadwo Okrah	Elizabeth Lani Ashong		
Dr. Sarah Emma Eshun	Michael Tsorgali		
Vivian Acquaye	French	Ernasis Donkor	Pedagogy
Felix A. Odonkor		Dr. Maxwell Nyatsikor	
Dr. Cecilia Esinam Agbeh		Prof. Salomey Essuman	
Ibrahim Osmanu	Geography	Dr. Paul Kwadwo Addo	Arabic
Dr. Kofi Adu-Boahen		Dr. Winston Kwame Abroampa	
Dr. M. Kusimi		Mr. Kwaku Esia-Donkoh	
Dr. Aboagye Dacosta	Ghanaian Language	Mohammed Z. Abdulmumin	Music
Mr. Alexander Otoo		Dr. Mohammed Hafiz	
Dr. Yvonne A.A. Ollenu		Iddris Mohammed	
Kwasi Adomako	History	Mohammed Almu Mahaman	Physical Education
Dr. Akwasi Kwarteng Amoako-Gyampah		Murtada M. Muaz	
Anitha Oforiwah Adu-Boahen		Dr M. Q. Adjahoe	
Gertrude Nkrumah	Literacy	Prof Cosmas Mereku	ICT
Prof Charles Owu-Ewie		Prof. Reginald Ocansey	
Dr. Ahmed Amihere		Dr. Emmanuel Osei Sarpong	
Zakaria Sadiq	Mathematics	E. Kwaku Kwaa-Aidoo	
Dr. R. Addai-Mununkum	RME		

# INTRODUCTION TO COURSE MANUALS

Welcome to this B.Ed. Course manual.

Following the accreditation of the B.Ed. by the national accreditation Board with its recognition as a world class teacher education curriculum, the decision was taken to support effective implementation through the development of course manuals. The course manuals provide tutors and lecturers with the materials necessary to support teaching each of the B.Ed. courses. The manuals adhere directly to, and emphasise, the principles and standards set out in the NTS, NTECF and in the B.Ed. and will help ensure operationalising the Government's teacher education reform Policy.

The manuals serve the following purposes:

- they are the key educational agreements between the training institution and the student teachers. In this way student teachers know what the expectations are for them and for the training they will receive.
- they lay out the course outcomes, content, strategies, and assessment, thereby providing direction to and consistency in training and B.Ed. implementation among tutors across the country.
- they are explicit documents that provide other institutions with information on which to base transfer/ articulation decisions.

Specifically, they also:

- support coherent lesson planning and teaching which will enable student teachers to achieve the NTS and become good teachers who ensure all pupils' learning whilst offering tutors the flexibility for adaptation for local needs and contexts.
- Provide a lesson by lesson overview of the course, building on and developing the material in the course specifications.
- Inform tutors, student teachers and others working with student teachers about:
  1. What is to be taught and why.
  2. how it can be taught.
  3. how it should be assessed.
- Provide opportunities for student teachers to develop and apply knowledge during supported teaching in school, creating a strong bond between learning in school and in the training institution.
- Reflect the stage of student teacher development, set out in the model for progress across the four years of the B.Ed.
- Can be used as self-study tools by student teachers.
- Ensure that all information necessary to inform teacher training is in one place (serves as reference document).
- The manuals are the basis of the codes and university professional development sessions to ensure Principals, tutors, lecturers and heads of department are fully familiar with the details of: courses, outcomes, content, approaches, assessments and lessons.

Who are course manuals for:

- College of Education Tutors
- Teacher Education University Lecturers
- Student Teachers
- Mentors and Lead Mentors
- All Those with An Interested In Teacher Education.

## USING THIS MANUAL

Writers of the manuals engaged widely with colleagues in each subject area at each stage of development. Besides, writers envisaged themselves in varied contexts as they wrote, to suggest methodologies and strategies for teaching the strands which would ensure student teachers are enabled to achieve the learning outcomes. In view of our commitment to creativity, problem solving, collaboration and to lifelong learning, we expect that individual tutors will “own” their manuals and become user-developers. Lessons in the manuals will be strands for weekly Pd meetings where tutors/lecturers will situate the lessons in the contexts of their colleges and their student teachers, to maximize the benefits.

It is also expected that tutors will model the best pedagogic practices for student teachers. Key among such practices is the communication of the importance of having a personal teaching philosophy. We expect that tutors and lecturers will explicitly communicate their personal teaching philosophies to their student teachers during the first meeting of every course. In preparation for this, we suggest you set out your personal teaching philosophy and how it will be demonstrated in your teaching using, or adapting, the sample sentence introductions below.

My teaching philosophy is .....

In view of this philosophy, I will facilitate this course by/through .....

<h1>Mathematics Course Manual</h1>
<b>Resources for Course Manual Writing</b>
<ul style="list-style-type: none"> <li>• Soft copies of the CWG, New Four-Year B.Ed. Curriculum introduction</li> <li>• Soft and hard copies of the course specifications for the subject for year one and two</li> <li>• Soft and hard Course Manual Writing Guide (CMWG)</li> <li>• Relevant subject texts</li> </ul>
<b>Target Audience</b>
<ul style="list-style-type: none"> <li>• College of Education Tutors</li> <li>Teacher Education University Lecturers</li> <li>• Student Teachers</li> <li>• Mentors</li> </ul>
<b>The purpose of course manuals</b>
<ul style="list-style-type: none"> <li>• To provide a lesson by lesson overview of the course, building on, adapting and developing the material in the course specifications</li> <li>• To provide a resource to support professional development sessions for tutors/lecturers on how to plan for and teach courses from the New Four-Year B.Ed. Curriculum</li> <li>• To inform tutors /lecturers, student teachers and others working with student teachers about: <ul style="list-style-type: none"> <li>– what is to be taught and why</li> <li>– how it can be taught</li> <li>– how it should be assessed</li> </ul> </li> <li>• To support consistency in the implementation of the New Four-Year B.Ed. across institutions who train teachers</li> <li>• To ensure that all <b>training</b> information on skills, processes, and other information necessary to perform the teaching task are together in one place.</li> <li>• To operationalize the Teacher Education Reform Policy; the requirements of the NTS &amp; NTECF and the Four-Year B.Ed.</li> </ul>
<b>Guiding principles of course manual writing</b>
<ol style="list-style-type: none"> <li>1. They are written with the learner, the student teacher, in mind: what they will <i>be able</i> to cope with and only include what student teachers need to know, understand, be able to do and be as a basic school teacher</li> <li>2. They take in to consideration the learner’s, the student teacher’s, context and possible barriers to, and enablers for, learning</li> <li>3. They are written with the tutors /lecturers who are going to teach the course in mind. Tutors must be able to adapt and develop the plans in course manuals to fit the context they are teaching in and to support their teaching</li> <li>4. They are aligned to the key principles and practices of the Teacher Education Reform Policy: the NTS, the NTECF and the New Four-Year B.Ed.</li> <li>5. They are written to provide opportunities for student teachers to develop and apply knowledge during supported teaching in school</li> <li>6. They are written to reflect the stage of student teacher development, set out in the model for progress in the New Four-Year B.Ed.</li> <li>7. They are written to support progress in student teacher learning, including building on prior learning from the previous programme or course/s and supporting progress to the next course.</li> <li>8. They are to be used as self-study tools.</li> <li>9. They are written to have the following characteristics: easy to read; uses active voice and avoids jargon; uses bullet points to offset text; uses images</li> </ol>
<b>What a teacher educator needs to know, understand and use to inform what they do</b>
<ul style="list-style-type: none"> <li>• The aims and structure of the education system and Education strategic Plan</li> <li>• The Basic School Curriculum</li> <li>• The Inclusion Policy</li> <li>• The teacher education system: The National Teacher’s Standards, the vision for teacher education and the core principles of the New Four-Year B.Ed.</li> <li>• Andragogy, effective methods and practices for teaching adult learners</li> <li>• Assessment Literacy. Assessment for, of and as learning -Educative Assessment</li> </ul>
<b>Guidance for completing the mathematics course manual writing</b>
<b>A. Course Information</b>
<i>Title Page</i>
<b>i. Course name: as in course specification unless important reason why not</b>
<b>ii. The vision for the New Four-Year B.Ed. Curriculum</b>
<p>“To transform initial teacher education and train highly qualified, motivated new teachers who are effective, engaging and fully prepared to teach the basic school curriculum and so improve the learning outcomes and life chances of all learners they teach as set out in the National Teachers’ Standards. In doing this to instil in new teachers the Nation’s core values of</p>

honesty, integrity, creativity and responsible citizenship and to achieve inclusive, equitable, high quality education for all learners. “					
<b>iii. Course Details: as in course specification unless important reason why not</b>					
<b>Pre-requisite/s</b>	The programme / previous semester courses studied.				
<b>Co-Requisites</b>	Links to other courses being taught, support coherence in student experience and avoid duplication				
<b>Course Level</b>		<b>Course Code</b>		<b>Credit Value</b>	3
<b>Table of contents</b>					
Each manual will include:					
<ol style="list-style-type: none"> <li>1. The goal for the subject or learning area</li> <li>2. Course description</li> <li>3. Key contextual factors</li> <li>4. Core and cross cutting issues, including equity and inclusion</li> <li>5. Course Learning outcomes</li> <li>6. Course content</li> <li>7. Teaching and learning strategies</li> <li>8. Course Assessment components</li> <li>9. Reading and reference list</li> <li>10. Handouts, power points and other resources for lessons</li> <li>11. Plans for each lesson in the semester</li> </ol>					
A. Course information					
<b>1. Goal for the Subject or Learning Area</b>					
This can be found in subject goal document. It should be a short statement which captures what new teachers will know, understand and be able to do in this subject at the end of their training. This statement should be linked to achieving the vision for the curriculum.					
<b>2. Key contextual factors</b>					
This can be found in the course specification. It should address what needs are to be considered to reflect the Ghanaian context at local and national levels.it includes potential knowledge and skills gaps and any specific: gender, cultural, linguistic, conceptual, infrastructural issues, for example, that might be barriers to learning for student teachers and eventually basic school children? E.g. issues of subject related bias that need addressing. Potential barriers to learning must be explicitly addressed to enable student teachers to achieve the learning outcomes.					
<b>3. Course Description</b>					
This can be found in the course specification. This brief statement should provide a clear understanding of what studying this course involves, what student teachers will get out of studying this course.					
<b>4. Core and transferable skills and cross cutting issues, including equity and inclusion</b>					
This can be found in the course specification. Which core and transferable skills or cross cutting issues will be applied or developed through this course? This needs to be made explicit to student teachers. Are there specific issues to do with equity and inclusion which must be addressed so that all student teachers can fully take part? For example, issues related to gender and mathematics or science.					
<b>5. Course Learning Outcomes</b>			<b>6. Learning indicators</b>		
These are in the course specification. The course learning outcomes should specify the expectations of what the student teachers will know, understand and be able to do at the end of the course <b>not</b> what student teachers will do <b>on</b> the course. They must be appropriate and realistic to the learner’s abilities, experience, the identified level of the course and <i>content</i> . They must be measurable – allowing assessment of student teacher achievement			<ul style="list-style-type: none"> <li>• Measurable/assessable/observable performances that provide evidence of learning or other changes taking place in student teachers’ behaviour which demonstrate that they have met the learning outcome/s.</li> <li>• What the student teacher will need to do to show they have achieved the learning outcome. (in an inclusive lesson, this should vary and be responsive to student teacher’s individual characteristic)</li> </ul>		
<b>7. Course content</b>					
In the course specification. This should provide an outline of the academic and / or practical content of the course. It should be clear how this content relates to the achievement of the intended learning outcomes.The name of each unit in the course should be <i>briefly</i> set out – the name should make it clear what the unit is about.					

Unit	Topic	Sub-topic (If any)	Teaching and learning activities to achieve the learning outcome
1	Place value on 10,000,000 and numeration systems	Place value in numeration systems-base 2 and five	Demonstrating place value using ten structured materials i.e 100s, 10s and 1s, (bundled/loose sticks; a flat, long, and unit lego-blocks; flat strips and loose square cut-outs; etc. Using both English and a Ghanaian language;) Representing and counting numbers (10 to 10,000,000) using multiple of base ten structured materials (in both English and a Ghanaian language) Discuss numeration systems in ancient cultures and in some Ghanaian cultures Use manipulatives and/or technology to represent and write numbers in other bases particularly-base 2 and five.
2	The four basic operations on number and Number facts within 99	The four basic operations on number within 99; and then within 999	Discussions and peer presentations on the four basic operations on numbers within 99; and then within 999 Demonstrating the use of mental strategies in carrying out the four basic operations on numbers Developing and playing math games based for consolidating number facts Use manipulatives and/or technology to use the basic operations to represent numbers and statements in a multiple of ways.
3	Fractions, decimal fractions and percentages including ratio and proportion	Fractions: meaning of fractions, relationship between common fractions, decimals and percentages; Basic operations, PEDMAS; Mental strategies for multiplying and dividing by special fractions $\frac{1}{2} s, \frac{1}{5} s, \frac{1}{10} s, \frac{1}{100} s, \frac{1}{1000} s, etc.,$ Problem solving	Using manipulatives to demonstrate meaning of fractions as (i) equal part(s) of a whole, and as (ii) equal part(s) of a group of given objects Using manipulatives, number line and fraction chat to demonstrate the concept of equal (or equivalent) fractions, operation on fractions Using manipulatives, number line and fraction chat to demonstrate the relationship between common fractions, decimals and percentages; Demonstrating of mental strategies for carrying out basic operations (including the use of the BODMAS rule) as well as multiplying and dividing by special fractions $\frac{1}{2} s, \frac{1}{5} s, \frac{1}{10} s, \frac{1}{100} s, \frac{1}{1000} s, etc.,$ Engaging in micro lesson design on problem solving involving fractions, teaching with peers and doing critics
4	Diagnosis and remediation; assessment resources/records, and monitoring progress	Misconception diagnosis, classroom assessment resources and records interpreting data/reports on performance and providing feedback. Evaluating performance and monitoring progress	Designing tools to diagnose misconceptions and designing/implementing remediation Identification of resources that should be available in the classroom for effective assessment in specialism-including examples of standardised tests (NEA), teacher made tests, record sheets, cumulative records forms, reports forms, etc., Studying and completing student's cumulative record form Analysing learners' performance (or assessment data) to provide feedback to stakeholders-students, colleagues and parents, PTA and role playing a School Appraisal Meeting (SPAM)
5	Micro lessons and use of technology across upper primary numeracy	Importance of lesson planning Micro lesson planning formats Design of micro lessons Engagement in micro teaching with peers	Verbal exposition and discussions on importance of lesson planning, micro lesson planning formats and technology use in teaching numeracy in the across upper primary Reading teaching scenarios (and/or watching

		Exploring of technology use primary mathematics.	video clips) on teaching numeracy in the upper primary and doing critic based on using mathematical learning theory and knowledge of curriculum content pedagogy and resources to critique a mathematics lesson Engaging in micro lesson design, teaching with peers and doing critics Observing and reflecting upon how mathematics lessons are currently taught in schools
6	Shape and space	Informal geometry and spatial sense; Nets of 3-D shapes; Shapes and their properties; Hand sketching of common solids; Relationship among faces, edges and vertices;	Through interactive and collaborative group work, student-teachers explore 2D shapes and their properties; Construct 3D shapes from the nets; Investigate the properties of 2D and 3D shapes- congruencies, similarities, diagonals, parallel, symmetries, etc. Using ICT tools and other manipulatives to investigate properties of 2D and 3D shapes;
7	measurement	Concept of measurement; using non-standard and standard units of measurement; Angles Perimeter and areas of triangles Circumference and areas of circular regions; Surface area and volumes of prisms and pyramids;	Explore how student-teachers perceive children's understanding of the concept of measurement; Using manipulatives and other TLMs through mathematical discourse identify referent non-standard units for measuring length, mass and capacity Demonstrating with cut-out shapes and supported with video clip the process of deriving the formula for $\pi r^2$ , circumference and area of a Demonstrating strategies for finding the surface area and volumes of prisms and pyramids.
8	Handling Data	Collecting, interpreting and presenting data ideas of chance and uncertainty	Verbal exposition, student-teacher presentations on collecting, interpreting and presenting data, and ideas of chance and uncertainty Finding examples of graphs in print and electronic media such as newspapers, magazines, and the internet and interpreting it. Engaging student collect, display, and analyse data to solve problems Engaging in micro lesson design on problem solving involving handling data, teaching with peers and doing critics

#### **8. Course Assessment Components**

In the course specification. The NTS and the NTECF require a move away from largely examination-based assessment to strategies to enable assessment of student teachers' skills, knowledge and understanding against the learning outcomes and through these the against the NTS

- There should be a maximum of 3 assessment components per 3 credit-course; to avoid over loading student and tutors/ lecturers
- The learning outcomes to be assessed by each assessment component should be identified.
- Each assessment component should explicitly reference the NTS or aspects of the NTS it will assess.
- Each assessment component should include:
  - The category or type, for example: written, coursework or practical, teaching, examination, collaborative project or presentation, poster, TLM
  - The type of assessment: of, for and /or as.
  - An indication of the size of each assessment component (e.g. duration of exams, word limit of written submissions, length of presentations; whether presentations have an individual or group etc.).
  - The weighting of each assessment component should be expressed as a % of total course mark (overall in each course: 60% continuous assessment of course work, 40% examination of course work).
- Each assessment should be manageable and relevant to supporting the student teachers' development.

The guidance on assessing student teachers from the NTS, the NTECF the CWG and the New Four Year B.Ed. should be used.

<b>9. Teaching and learning strategies</b>
Detail in this section should show how the total learning hours will be used to achieve the intended learning outcomes, to provide a guide to the teaching and learning strategies to be used. Each teaching strategy should be selected as most appropriate to achieving the learning outcomes. This may include team teaching or additional tutors. As stated in the B.Ed. experiential learning and interactive teaching approaches are encouraged
<b>10. Required Reading and reference list</b>
One or two compulsory texts which must be made available to the student teachers and a SHORT list of 5 relevant references. These lists should be annotated with the key value of each text. Use APA style of writing.
<b>11. Teaching and Learning Resources</b>
Instructional resources required to support learning during the course e.g.: TLMs, lab and workshop equipment, videos, projectors
<b>Course related professional development for tutors/ lecturers</b>
<b>This is not included the course manual</b> but professional development needs must be identified to ensure all tutors / lecturers are prepared to teach the course identify any specific topics or issues which may be challenging for tutors / lecturers.

<b>B. Semester lesson plans</b>	
<b>Guidance for Lesson planning</b>	
The expanded format is designed to support writing lessons which address the key features of the new B.Ed. curriculum The completed format will be an important piece of evidence for CoE in being awarded <b>Transitional Support Funding (TSF)</b>	
Things to consider when writing and reviewing lessons:	
<ul style="list-style-type: none"> <li>• Will all student teachers be able to achieve the learning outcomes and demonstrate the indicators by undertaking the activities set out in the lesson?</li> <li>• What might be barriers to learning? How can you address these barriers?</li> <li>• How does the lesson support progress in and or consolidate student teacher learning; including building on prior learning and supporting progress to next lessons?</li> <li>• How will you can address transition from school to CoE in the first semester?</li> <li>• Are there explicit links between learning outcomes, learning indicators and assessments?</li> <li>• Do all activities support student teachers in achieving the lesson learning outcomes?</li> <li>• Is there an emphasis on interactive, learner focused approaches to training new teachers?</li> <li>• Does it explicitly address cross cutting -issues: equity and inclusion, gender, SEN,ICT?</li> <li>• Does it explicitly develop core skills, including: professional values and attitudes, classroom enquiry and reflection?</li> <li>• Overall the lesson must be 'do-able' for the student teacher <ul style="list-style-type: none"> <li>• in the time available</li> <li>• with the skills, knowledge and understanding they have</li> </ul> </li> </ul>	
<b>Title of Lesson</b>	
<b>Lesson Duration</b>	
<b>Lesson description</b>	<b>It is essential that student teachers know what this lesson is about. The lesson description should be short, clear, and accessible to all students.</b>
<b>Previous student teacher knowledge, prior learning (assumed)</b>	<ul style="list-style-type: none"> <li>• What links to previous knowledge / prior learning need to be built in to the lesson?</li> <li>• Prior learning could be from: this course and previous lessons; from senior high school; from supported teaching in school/practicum; from other courses. NB important to build on work from previous lessons</li> <li>• If you are unsure about previous knowledge or prior learning how you need to check for this as part of the activity in the lesson/s.If the expected prior knowledge is not adequate you will need to modify the lesson.</li> </ul>
<b>Possible barriers to learning in the lesson</b>	<ul style="list-style-type: none"> <li>• What specific conceptual, linguistic, social, cultural, conceptual, gender, or ability related issues might stop student teachers in achieving the learning outcomes; act as barriers to their learning?</li> <li>• How will you address these?</li> <li>• Does this lesson require that student teachers examine their own bias? If so, you will need to plan to support and address this</li> </ul>
<b>Points on equity, inclusivity (gender, SEN), and addressing</b>	<ul style="list-style-type: none"> <li>• You need to represent and address diversity in your lesson-plan. Are there multiple diversity issues (see <a href="#">diversity wheel</a>) ?</li> <li>• How would these issues be addressed with student teachers during activities for both their</li> </ul>

diversity	<p>own learning and the learning of the students they will teach?</p> <ul style="list-style-type: none"> <li>• How are issues of diversity (equity and inclusion) addressed in your lesson plan so that student teachers can see diversity modelled during this teaching and learning activity?</li> <li>• How are issues of diversity (equity and inclusion) addressed in your lesson plan so that student teachers can learn how to address it with the students they will teach?</li> <li>• For example: gender stereotype issues related to: PE, literacy and language, science and mathematics.</li> </ul>						
Lesson Delivery – chosen to support students in achieving the outcomes	Face-to-face	Practical Activity	Work-Based Learning	Seminars	Independent Study	e-learning opportunities	Practicum
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	<p><b>Face-to-face:</b> opportunity for an extended and coherent line of argument. It includes discussion, brainstorming, question and answer, etc. This can be tutor and / or student teacher led. It should not usually be the main mode.</p> <p><b>Practical Activity:</b> enabling experimentation and the analysis and discussion of issues, documents and materials, as well as physical activities.</p> <p><b>Work based learning:</b> to allow students to undertake observation, enquiry and/or hands-on development work (mostly TVET)</p> <p><b>Seminars:</b> to generate group and individual creativity, discussion and reflection: student and / or tutor led</p> <p><b>Independent study:</b> to enable students to engage with relevant and appropriate materials to promote individual and collaborative enquiry, more in-depth analysis and development. This can be part of any of the above modes</p> <p><b>E-learning opportunities</b> – involving the use of interactive packages and virtual learning environments. This can be part of any of the above modes of delivery. It is unlikely to be a delivery mode in its own right.</p> <p><b>Practicum (supported teaching in school):</b> support to enable student teachers to experience and learn from the basic school context by doing observations and child study in Y1 to full class teaching in and action research in Y4.</p>						
<ul style="list-style-type: none"> <li>• Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.</li> <li>• Write in full aspects of the NTS addressed</li> </ul>	<ul style="list-style-type: none"> <li>• What is the main thing you want student teachers to know, understand and be able to do as a result of this lesson?</li> <li>• Is this lesson aimed at: Learning or embedding a new concept? Developing a skill? Understanding how various concepts and skills come together to create a body of knowledge? Practicing the application of new knowledge?</li> <li>• This will relate back to the overall intention and learning outcomes for the course.</li> </ul>						
<ul style="list-style-type: none"> <li>• Learning Outcome for the lesson, picked and developed from the course specification</li> <li>• Learning indicators for each learning outcome</li> </ul>	<p><b>Learning Outcomes</b></p> <ul style="list-style-type: none"> <li>• The learning outcomes for the lesson will enable student teachers to achieve the purpose for the lesson.</li> <li>• For example, in mathematics: student teachers are prepared to teach a specific mathematics operation. In this instance, the learning outcomes would be the things the students would need to know and do in order to be able to teach the operation.</li> <li>• What the student teacher will know and be able to do as a result of this lesson. ‘By the end of the lesson the student will....’</li> <li>• Learning outcomes may be developed and re-visited over a number of lessons</li> <li>• Be realistic in terms of what can be achieved in any one lesson</li> </ul>			<p><b>Learning Indicators</b></p> <ul style="list-style-type: none"> <li>• Measurable/assessable/observable performances that provide evidence of learning or other changes taking place in student teachers’ behaviour which demonstrate that they have met the learning outcome/s.</li> <li>• What the student teacher will need to do to show they have achieved the learning outcome. (in an inclusive lesson, this should vary and be responsive to student teacher’s individual characteristic)</li> </ul>			

	<ul style="list-style-type: none"> <li>Some learning outcomes may address specific student teacher needs</li> </ul>			
<b>Content of lesson picked and developed from the course specification</b>  <b>Unit/s covered from the course specification:</b>	<b>Time or stage</b> Identify how much time will be required for each part of the lesson	<b>Topics and sub-topics (if any):</b>	<b>Teaching and learning to achieve learning outcomes: depending on delivery mode selected. Teacher led, collaborative group work or independent study</b>	
			<table border="1"> <thead> <tr> <th>Teacher Activity</th> <th>Student Activity</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>Plan to model what is expected of student teachers</li> <li>Plan for activities to support student teachers in working towards and / or demonstrating achieving the learning outcomes.</li> <li>Where possible set up activities with students as active participants</li> <li>Make links to other aspects of the New Four-Year B.Ed. programme or between subject and pedagogic knowledge</li> <li>State if team teaching involved or additional tutors contributing</li> </ul> </td> <td> <p><b>For example: Interactive and collaborative group and pair work, e.g.,</b></p> <ul style="list-style-type: none"> <li>identifying, developing, presenting and evaluating suitable resources and materials</li> <li>picking out key points from education texts, raising questions and issues</li> <li>sharing practice and experience</li> <li>preparing for school visits</li> <li>self and peer assessment</li> </ul> <p><b>Other examples</b></p> <ul style="list-style-type: none"> <li>Student teacher led seminars</li> <li>ICT e.g. discussion using VLE</li> <li>Video observation of and analysis of teaching</li> <li>Role-play</li> </ul> </td> </tr> </tbody> </table>	Teacher Activity
Teacher Activity	Student Activity			
<ul style="list-style-type: none"> <li>Plan to model what is expected of student teachers</li> <li>Plan for activities to support student teachers in working towards and / or demonstrating achieving the learning outcomes.</li> <li>Where possible set up activities with students as active participants</li> <li>Make links to other aspects of the New Four-Year B.Ed. programme or between subject and pedagogic knowledge</li> <li>State if team teaching involved or additional tutors contributing</li> </ul>	<p><b>For example: Interactive and collaborative group and pair work, e.g.,</b></p> <ul style="list-style-type: none"> <li>identifying, developing, presenting and evaluating suitable resources and materials</li> <li>picking out key points from education texts, raising questions and issues</li> <li>sharing practice and experience</li> <li>preparing for school visits</li> <li>self and peer assessment</li> </ul> <p><b>Other examples</b></p> <ul style="list-style-type: none"> <li>Student teacher led seminars</li> <li>ICT e.g. discussion using VLE</li> <li>Video observation of and analysis of teaching</li> <li>Role-play</li> </ul>			
<b>Which core or transferable skills will be used or developed and how</b>	Core and transferable skills include: critical thinking, problem solving, social skills, creative thinking and communication skills, use of ICT			
<b>Which cross cutting issues will be addressed or developed and how</b>	ss cutting issues include: assessment literacy and assessing students' progress and professional values and attitudes, reflection and classroom enquiry			
<b>Lesson assessments – evaluation of learning: of, for and as learning within the lesson</b>	<ul style="list-style-type: none"> <li>Assessment as learning: ongoing self-<i>assessment</i> by student teachers reflecting on their own <i>learning</i> and making adjustments so that they achieve deeper understanding, occurs throughout the learning process. <i>This needs to be planned for in the lesson.</i></li> <li>Assessment of learning: is usually summative and is mostly done at the end of a task, unit of work, placement etc. Weighted Assessment Components in course outlines. <i>This needs to be planned for in the lesson.</i></li> <li>Assessment for learning: is using assessment as a means of finding out what students know, understand and are able to do and using that information to adapt teaching approaches and to differentiate according to different student needs, it occurs through the learning process, may be part of the Assessment components, and it occurs when assessing prior learning</li> <li>Differentiation in lessons (UDL guidelines): the lesson needs to include a range of teaching and assessment strategies to motivate and reach all learners</li> <li>The approach to assessment in lessons must be appropriate to the teaching and learning strategies</li> </ul>			
<b>Instructional Resources</b>	This may include: handouts, power points, examples of children's work, video, ICT activities, examples of previous student teachers' work			
<b>Required Text (core)</b>				
<b>Additional Reading List</b>				

# Lesson 1

Year of B.Ed.	3	Semester	2	Place of lesson in semester	1 2 3 4 5 6 7 8 9 10 11 12
---------------	---	----------	---	-----------------------------	----------------------------

Title of Lesson	Place Value (Teaching and Assessing)			Lesson Duration	3 Hours		
<b>Lesson description</b>	This is the first lesson which focuses on developing an understanding of Teaching and Assessing Primary School Mathematics and about the concept of place value. The topics to be considered include introduction of Course Manual, Place value in numeration systems-base 2 and five, and Counting and representing numbers in multiple of ways and in different bases, for example, bases two and five. It also covers Teaching and Assessing place value as outlined in the basic school curriculum.						
<b>Previous student teacher knowledge, prior learning (assumed)</b>	Student-teachers have been exposed to numbers and numerals, number names and counting numbers.						
<b>Possible barriers to learning in the lesson</b>	Different entry behaviours, Socio-cultural issues, different learning needs, misconceptions about mathematics and methods of teaching mathematics. Conscious efforts should be made to address them before, during and after the lesson.						
<b>Lesson Delivery – chosen to support students in achieving the outcomes</b>	<b>Face-to-face</b> <input checked="" type="checkbox"/>	<b>Practical Activity</b> <input checked="" type="checkbox"/>	<b>Work-Based Learning</b> <input type="checkbox"/>	<b>Seminars</b> <input type="checkbox"/>	<b>Independent Study</b> <input checked="" type="checkbox"/>	<b>e-learning opportunities</b> <input checked="" type="checkbox"/>	<b>Practicum</b> <input type="checkbox"/>
<b>Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.</b>	<p><b>Face-to-face and e-learning opportunities</b></p> <ul style="list-style-type: none"> <li>The face-to-face mode will include lecturer/tutor-initiated class discussions, small group in class exploration, group presentations, think-pair-share moments, lecture, etc.,</li> <li>The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers</li> <li>Independent study would include writing self-assessment and presenting reflective papers or journals.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.</b></li> </ul>	<p>The purpose of the lesson is to;</p> <ul style="list-style-type: none"> <li>Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson.</li> <li>Develop student teachers' understanding of the nature and importance of the concept of place value to primary school learners.</li> <li>Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially School Mathematics curriculum to Primary Schoollearners.</li> <li>Prepare the student teacher for a future mathematics classroom</li> </ul>						
<ul style="list-style-type: none"> <li><b>Learning Outcome for the lesson, picked and developed from the course specification</b></li> <li><b>Learning indicators for each learning outcome</b></li> </ul>	<b>Learning Outcomes</b>		<b>Learning Indicators</b>		<b>Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?</b>		
	Demonstrate knowledge and skills of observation and reporting on class teaching and wider school activities <b>(in School 1)</b> <i>(College &amp; School induction by tutors, school heads, lead mentors and mentors)</i>		<ul style="list-style-type: none"> <li>Produce well-prepared induction schedule and procedures</li> <li>Show evidence of keeping records of specific observations from wider school environment and induction</li> </ul>		<ul style="list-style-type: none"> <li>Inclusion and Equity: by supporting student teachers to recognize institutional and personal sources of barriers to leaning and making conscious efforts to address them.</li> <li>Diversity: Support student teachers with the opportunities to explore diversity within the</li> </ul>		

	<p>Demonstrate knowledge and Understanding of place value specifically focusing on mathematics curriculum and their associated expected learning outcomes (NTS, 2a).</p> <p>Carry out action research and classroom enquiry to improve practice in the upper primary classroom and reflect on their teaching practices for continuous professional development (CPD) (NTS 1a, pg.12,NTS 3b, pg.14)</p>	<ul style="list-style-type: none"> <li>Produce a report on small group discussions with mentors and peers on the concept of place value.</li> <li>Submit a write-up of the developing teacher's knowledge of self-awareness, beliefs, and values of teaching and learning (personal teaching philosophy)</li> <li>Make oral presentations of knowledge gained during teaching and learning interaction on the concept of place value by studentteachers in their groups or individually.</li> </ul>	<p>class/subject and potential barriers to inclusion (including personal bias, stereotypes and institutional discrimination).</p> <ul style="list-style-type: none"> <li>Collaboration: is fostered through assigning group projects and presentation of various topics across units.</li> <li>Communicative skills of student teachers: can be enhanced through the examination, interrogation and presentation to identify the specific literacy and language of the subject/s taught as well as supporting pupils in acquiring these and in their ability to use language for academic purposes</li> </ul>	
Topic	Sub-topic(s)	Stage/ Time	Teaching and learning to activities to achieve learning outcomes depending on delivery mode selected. Teacher-lead collaborative group work or independent.	
			Teacher Activity	Student Activity
Place value on 10,000,000 and numeration systems	<b>Review</b> Introduction of Course Manual	<b>20 mins</b>	Introduces student teachers to the Course Manual and discuss the various components including assessment procedures ( <b>See Course Assessment Components</b> ), <b>(PD Theme 1)</b>	Participate in the discussion of various components of the course manual, take opportunity to ask questions about the Course Manual including assessment procedures. Outline their expectations and views about the mathematics course.
	Place value in numeration systems-base 2 and five Introduction  Counting and representing numbers in multiple of ways and indifferent bases, for example, bases two and five	<b>20 mins</b>  <b>20 mins</b>	Introduce the Upper Primary Mathematics curriculum, and relate it to Teaching and Assessing relevant Primary School Mathematics <b>(PD Themes 1 &amp;3)</b>  Represent and counting numbers (10 to 10,000,000) using multiple of base ten structured materials (in both English and a Ghanaian language) <b>(PD Themes 1 &amp; 3)</b>	Listen attentively to the tutor or lecturer's verbal exposition and to supply responses to Teaching and Assessing Primary School Mathematics 1  Engage in counting activities to represent numbers in multiple of ways and in different bases

		<p><b>30 mins</b></p>	<p>Assign student teachers to explore Number patterns and to develop understanding of large numbers including the use of the base ten and other place value systems <b>(PD Themes 3 &amp; 4)</b></p>	<p>Engage in a think-pair-share session to explore Number patterns and the development of understanding of large numbers including the use of the base ten and other place value systems</p>
		<p><b>30 mins</b></p>	<p>Monitor student teachers as they develop and refine strategies for solving problems showing evidence of understanding the place value concept <b>(PD Theme 1 PD Themes 1 &amp; 3)</b></p>	<p>Engage in a group discussion to explore strategies for solving problems showing evidence of understanding the place value concept</p>
		<p><b>30 mins</b></p>	<p>Demonstrate place value using ten structured materials i.e 100s, 10s and 1s, (bundled/loose sticks; a flat, long, and unit lego-blocks; flat strips and loose square cut-outs; etc. Using both English and a Ghanaian language ;)</p>	<p>Discuss place value using ten structured materials i.e 100s, 10s and 1s, (bundled/loose sticks; a flat, long, and unit lego-blocks; flat strips and loose square cut-outs; etc. Using both English and a Ghanaian language ;)</p>
		<p><b>30 mins</b></p>	<p>Engage student teachers in a discussion of the characteristics of our numeration system</p>	<p>Participate in the discussion of the characteristics of the numeration system, that is.</p> <ol style="list-style-type: none"> <li>i. Any amount can be expressed using only the basic 10 digits</li> <li>ii. It is based on groupings (powers) of ten and other bases</li> <li>iii. The value of any digit depends on its place</li> <li>iv. Zero can represent both a value and an empty place</li> </ol>
<p><b>Lesson assessments – evaluation of learning: of, for and as learning within the lesson</b></p>	<p><b>Subject Portfolio</b>  <b>Summary Assessment Method: reflective paper presentation</b>  Student teachers to write a reflective paper on the figurative numbers, using different but concrete based approaches to be presented the following week in groups. <i>To be included in their portfolio</i>  <b>Related CLOs:</b> 1, 3 and 6  <b>NTS:</b>  1a) Critically and collectively reflects to improve teaching and learning.  2 b) Has comprehensive knowledge of the official school curriculum, including learning outcomes.</p>			

	<p>2b) Has comprehensive knowledge of the official school curriculum, including learning outcomes</p> <p>3l) Listens to learners and gives constructive feedback</p> <p>3m) Identifies and remediates learners' difficulties or misconceptions, referring learners whose needs lie outside the competency the teacher.</p> <p><b>Advance Preparation</b></p> <p>Student teachers to read on the principles for the selection of objectives, concepts and learning activities or experiences, using variety of resources including ICT tools as a preparation for the next lesson.</p>
<b>Instructional Resources</b>	Posters; video clips; downloads; cardboards, models, PRIMARY SCHOOL curriculum, etc.
<b>Required Text (core)</b>	<p>Arthur, J., Grainger, T. &amp; Wray, D. (2006). Learning to Teach in the Primary School. Canada: Taylor &amp; Francis e-Library. <a href="https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html">https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html</a></p> <p>Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. <a href="https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html">https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html</a>.</p> <p>Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. <a href="https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html">https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html</a>.</p> <p>Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. <i>Issues in the Undergraduate Mathematics Preparation of School Teachers, 2</i>.</p>
<b>Additional Reading List</b>	<p>Lakoff, G. &amp; Núñez, R. E. (2000). <i>Where Mathematics comes from</i>. New York: Basic Books.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Tutor notes</i>. Accra: Unimax Publishers.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Students activities</i>. Accra: Unimax Publishers.</p>
<b>CPD Needs</b>	<p>How to design and/or use some innovative materials and ideas for teaching the concepts of place value taking into consideration the learning outcome.</p> <ul style="list-style-type: none"> <li>• Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals.</li> <li>• How to design tasks for assessment procedures for assessment of, as and for learning</li> </ul>

## Lesson 2

Year of B.Ed.	3	Semester	2	Place of lesson in semester	1 2 3 4 5 6 7 8 9 10 11 12
---------------	---	----------	---	-----------------------------	----------------------------

<b>Title of Lesson</b>	The four Basic Operations: (Teaching and Assessing)			<b>Lesson Duration</b>	<b>3 Hours</b>		
<b>Lesson description</b>	This is the second lesson which focuses on developing an understanding of Teaching and Assessing Primary School Mathematics and the four basic operations. The topics to be considered include the four basic operations and Dealing with operations on numbers up to 10,000,000.						
<b>Previous student teacher knowledge, prior learning (assumed)</b>	Student-teachers have been thought theories in the teaching and learning of mathematics, and are exposed to number and numeration systems as well as handling data; they have experienced some mathematics during their basic and secondary education period as well as their previous semester' mathematics courses.						
<b>Possible barriers to learning in the lesson</b>	Different entry behaviours, Socio-cultural issues, different learning needs, misconceptions about mathematics and methods of teaching mathematics. Conscious efforts should be made to address them before, during and after the lesson.						
<b>Lesson Delivery – chosen to support students in achieving the outcomes</b>	<b>Face-to-face</b> <input checked="" type="checkbox"/>	<b>Practical Activity</b> <input checked="" type="checkbox"/>	<b>Work-Based Learning</b> <input type="checkbox"/>	<b>Seminars</b> <input type="checkbox"/>	<b>Independent Study</b> <input checked="" type="checkbox"/>	<b>e-learning opportunities</b> <input checked="" type="checkbox"/>	<b>Practicum</b> <input type="checkbox"/>
<b>Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.</b>	<p><b>Face-to-face and e-learning opportunities</b></p> <ul style="list-style-type: none"> <li>The face-to-face mode will include lecturer/tutor-initiated class discussions, small group in class exploration, group presentations, think-pair-share moments, lecture, etc.,</li> <li>The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers</li> <li>Independent study would include writing self-assessment and presenting reflective papers or journals.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.</b></li> </ul>	<p>The purpose of the lesson is to;</p> <ul style="list-style-type: none"> <li>Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson.</li> <li>Develop student teachers' understanding of the four basic operations and dealing with operations on numbers up to 10,000,000.</li> <li>Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, School Mathematics curriculum to Primary School learners.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Learning Outcome for the lesson, picked and developed from the course specification</b></li> <li><b>Learning indicators for each learning outcome</b></li> </ul>	<p><b>Learning Outcomes</b></p> <p>Demonstrate knowledge and skills of observation and reporting on class teaching and wider school activities (<b>in School 1</b>) (College &amp; School induction by tutors, school heads, lead mentors and mentors)</p> <p>Carry out project work and classroom enquiry to improve practice in the four basic operations and</p>	<p><b>Learning Indicators</b></p> <ul style="list-style-type: none"> <li>Produce well-prepared induction schedule and procedures</li> <li>Provide records of group work activities and/or cooperative learning for student teachers during observations</li> <li>Make oral presentations of knowledge gained to apply to age appropriate TLMs from locally available materials in their groups to</li> </ul>	<p><b>Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?</b></p> <ul style="list-style-type: none"> <li>Inclusion and Equity: by supporting student teachers to recognize institutional and personal sources of barriers to leaning and making conscious efforts to address them.</li> <li>Characteristics and uniqueness of upper primary learners: By encouraging student teachers to develop awareness of how Knowledge and understanding of child growth, development and</li> </ul>				

	<p>reflect on their teaching practices for continuous professional development (CPD) (NTS 1a, pg.12,NTS 3b, pg.14)</p> <p>Develop and use age appropriate TLMs from locally available materials for upper primary (NTS 3j, pg. 14)</p>	teach the four basic operations of numbers	<p>maturation support young children's learning</p> <ul style="list-style-type: none"> <li>Communicative skills of student teachers: can be enhanced through the examination, interrogation and presentation to identify the specific literacy and language of the subject/s taught as well as supporting pupils in acquiring these and in their ability to use language for academic purposes</li> </ul>	
Topic	Sub-topic(s)	Stage/ Time	Teaching and learning to activities to achieve learning outcomes depending on delivery mode selected. <b>Teacher-lead collaborative group work or independent.</b>	
			Teacher Activity	Student Activity
The four basic operations on number and Number facts within 99	Review	10mins	Review the previous lesson by asking student teachers to present their reflective paper on the importance of mathematics to society; <b>(PD Theme 1)</b>	Participate in the discussion to review the previous lesson;
	The four basic operations on whole number within 999	30 mins	Engage student teachers in a discussion based on the interpretation of the four basic operations on numbers within 99; and then within 999 <b>(PD Themes 1 &amp;3)</b>	Engage in think-pair-share strategies to discuss the misconceptions of the learners with respect to place value.
		20 mins	Demonstrate the use of mental strategies in carrying out the four basic operations on numbers	Use interactive collaborative group work to explore mental strategies in carrying out the four basic operations on numbers and to engage in peer presentations
		30 mins	Develop and play mathematical games for consolidating number facts with student teachers	Participate in the playing of mathematical games for consolidating number facts with student teachers
Dealing with operations on numbers up to 10,000,000.	30 mins	Use manipulatives and/or technology to support the teaching and learning basic operations on whole numbers and to encourage the use of multiple of ways representing mathematical	Use manipulatives and/or technology related strategies in a variety of ways to establish the relationships between addition and subtraction, as well as multiplication and division	

		<p><b>30 mins</b></p> <p>ideas(<b>PD Themes 1 &amp; 3</b>)</p> <p>Assign student teachers to explore meaning of and relationship between operations; mental strategies and other problem solving strategies; <b>(PD Themes 3 &amp; 4)</b></p> <p><b>30 mins</b></p> <p>Engage student teachers to design appropriate manipulatives for dealing with operations on numbers up to 999(<b>PD Theme</b>)</p>	<p>Explore the meaning and relationship among the four operations, as well as, develop appropriate mental strategies and other problemsolving strategies for dealing with the operations on whole numbers</p> <p>Engage in a think-pair-share session to outline strategies for teaching and learning operations on whole numbers up to 999</p> <p>Design appropriate manipulatives for dealing with operations on numbers up to 999</p>
<p><b>Lesson assessments – evaluation of learning: of, for and as learning within the lesson</b></p>	<p><b>Subject Portfolio</b></p> <p>Assign student teachers to write short notes (about one page) on how to establish the relationship between fractions and decimal number to be presented their next lesson period. This will also serve as advance preparation for the next lesson (Assessment as learning)</p> <p><b>Related CLOs: 1, 3, 5</b></p> <p><b>NTS:</b></p> <p>2b) Has comprehensive knowledge of the official school curriculum, including learning outcomes.</p> <p>2f) Demonstrate value as well as respect for equity and inclusion in the mathematics classroom (knowledge)</p> <p>3k) Integrates a variety of assessment modes into teaching to support learning.</p> <p>1. <i>Note: The assessment procedures should make room for differentiation - gender, equity, SEN, and inclusivity.</i></p>		
<p><b>Instructional Resources</b></p>	<p>Posters; video clips; downloads; models, etc.</p>		
<p><b>Required Text (core)</b></p>	<p>Arthur, J., Grainger, T. &amp; Wray, D. (2006). Learning to Teach in the Primary School. Canada: Taylor &amp; Francis e-Library. <a href="https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html">https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html</a></p> <p>Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. <a href="https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html">https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html</a>.</p> <p>Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. <a href="https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html">https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html</a>.</p> <p>Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. <i>Issues in the Undergraduate Mathematics Preparation of School Teachers, 2</i>.</p>		
<p><b>Additional Reading List</b></p>	<p>Lakoff, G. &amp; Núñez, R. E. (2000). <i>Where Mathematics comes from</i>. New York: Basic Books.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Tutor notes</i>. Accra: Unimax Publishers.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Students activities</i>. Accra: Unimax Publishers.</p>		
<p><b>CPD Needs</b></p>	<ul style="list-style-type: none"> <li>• How to design and/or use some innovative materials and ideas for teaching selected concepts based on teaching and learning operations on whole numbers</li> <li>• How to manage transition of home to school.</li> <li>• Understand the various characteristics and uniqueness of Primary School learners.</li> <li>• How to design tasks for assessment procedures for assessment of, as and for learning</li> <li>• Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals.</li> </ul>		

## Lesson 3

Year of B.Ed.	3	Semester	2	Place of lesson in semester	1 2 <b>3</b> 4 5 6 7 8 9 10 11 12		
<b>Title of Lesson</b>	Fraction concepts1 (Teaching and Assessing)			<b>Lesson Duration</b>	<b>3 Hours</b>		
<b>Lesson description</b>	This is the third lesson which focuses on developing an understanding of fractional concepts. The topics to be considered includes, Meaning of fractions; Building an understanding of common fractions and Finding equivalent fraction. It also covers the relationship between common fractions, equivalent, decimal numbers, and percent.						
<b>Previous student teacher knowledge, prior learning (assumed)</b>	Student-teachers have been taught the four basic operations. They also have informal knowledge on the idea of part of a whole.						
<b>Possible barriers to learning in the lesson</b>	Different entry behaviours, Socio-cultural issues, different learning needs, misconceptions about mathematics and methods of teaching mathematics. Conscious efforts should be made to address them before, during and after the lesson.						
<b>Lesson Delivery – chosen to support students in achieving the outcomes</b>	<b>Face-to-face</b> <input checked="" type="checkbox"/>	<b>Practical Activity</b> <input checked="" type="checkbox"/>	<b>Work-Based Learning</b> <input type="checkbox"/>	<b>Seminars</b> <input type="checkbox"/>	<b>Independent Study</b> <input checked="" type="checkbox"/>	<b>e-learning opportunities</b> <input checked="" type="checkbox"/>	<b>Practicum</b> <input type="checkbox"/>
<b>Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.</b>	<p><b>Face-to-face and e-learning opportunities</b></p> <ul style="list-style-type: none"> <li>The face-to-face mode will include lecturer/tutor-initiated class discussions, small group in class exploration, group presentations, think-pair-share moments, lecture, etc.,</li> <li>The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers</li> <li>Independent study would include writing self-assessment and presenting reflective papers or journals.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.</b></li> </ul>	<p>The purpose of the lesson is to;</p> <ul style="list-style-type: none"> <li>Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson.</li> <li>develop student teachers' understanding of the nature and importance of mathematics, as well as, meaning of fractions; Building an understanding of common fractions and Finding equivalent fraction.</li> <li>It also introduce the student teachers to the relationship between common fractions, equivalent, decimal numbers, and percent.</li> <li>Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, School Mathematics curriculum to Primary School learners.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Learning Outcome for the lesson, picked and developed from the course specification</b></li> <li><b>Learning indicators for each learning outcome</b></li> </ul>	<b>Learning Outcomes</b>	<b>Learning Indicators</b>		<b>Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?</b>			
	Demonstrate knowledge and skills of observation and reporting on class teaching and wider school activities ( <b>in School 1</b> ) <i>(College &amp; School induction by tutors, school heads, lead mentors and mentors)</i>	<ul style="list-style-type: none"> <li>Produce well-prepared induction schedule and procedures.</li> <li>Provide records of group work activities and/or cooperative learning on the concept of fractions for student teachers during teaching and learning.</li> </ul>		<ul style="list-style-type: none"> <li>Inclusion and Equity: by supporting student teachers to recognize institutional and personal sources of barriers to leaning and making conscious efforts to address them.</li> <li>Communicative skills of student teachers: can be enhanced through the examination, interrogation</li> </ul>			

	<p>Use age appropriate subject knowledge, pedagogical knowledge and pedagogical content knowledge to teach fraction in a broad, balanced, relevant and creative manner (NTS 2c, pg. 13, 3e &amp; 3g, pg. 14) [NTECF P1 (3), pg. 20]</p> <p>Demonstrate knowledge and understanding of fraction; and specifically focusing on mathematics curriculum and their associated expected learning outcomes (NTS, 2a).</p>	<ul style="list-style-type: none"> <li>• Provide a write-up of the developing teacher's self-awareness, beliefs, and values of teaching and learning (personal teaching philosophy)</li> <li>• Make oral presentations of knowledge gained during teaching and observation by student teachers in their groups.</li> </ul>	<p>and presentation to identify the specific literacy and language of the subject/s taught as well as supporting pupils in acquiring these and in their ability to use language for academic purposes</p> <ul style="list-style-type: none"> <li>• Diversity: Support student teachers with the opportunities to explore diversity within the class/subject and potential barriers to inclusion (including personal bias, stereotypes and institutional discrimination).</li> </ul>	
Topic	Sub-topic(s)	Stage/ Time	Teaching and learning to activities to achieve learning outcomes depending on delivery mode selected. Teacher-lead collaborative group work or independent.	
			Teacher Activity	Student Activity
	<b>Review</b>	<b>10mins</b>	Review the previous lesson by asking student teachers questions on basic division facts <b>(PD Theme 1)</b>	Participate in the discussion to review the previous lesson;
Common fractions and decimal fractions Fractions: meaning of and relationship between common fractions and decimal fractions	Meaning of fractions;	<b>30 mins</b>	Engage student teachers in a discussion towards building an understanding of common fractions using variety of TLRs <b>(PD Themes 1 &amp; 3)</b>	Student-teachers explore the meaning and interpretations of fractions through small group activities and presentations. Eg. Fraction as equal shares or sized portions (Van de Walle, 2007) and represented as <ul style="list-style-type: none"> <li>• part of a unit or whole,</li> <li>• a sport on the number line,</li> <li>• part of a group, or comparing two sets, and</li> <li>• a ratio of two integers,</li> </ul>
	Finding equivalent fractions;	<b>40 mins</b>	Assign student teachers in groups to explore equivalent fractions <b>(PD Themes 3 &amp; 4)</b>	Use variety of activities such as paper folding, with appropriate manipulatives (e.g. Cuisenaire rods, linoleum, etc) to represent fractions as rational numbers, equivalent, and/or operator, Develop the concept of equivalent fractions using models and multi-purpose chart (multiplication table), fractional boards, sets, etc.
	Developing an understanding of decimal fractions and to build relationship between common fractions decimal fractions	<b>50 mins</b>	Engage student teachers in a discussion based on relationship between common fractions and decimal fractions and percent	Use area model or any appropriate model to explore the relationships among

	Developing conceptual understanding of multiplication and division of common and decimal fractions	<b>50 mins</b>	Group student teachers to brainstorm and outline strategies for teaching upper primary children multiplication and division of common and decimal fractions	common fractions and decimal fractions;  Engage in a think-pair-share session to outline the strategies and materials (TLMs) suitable for teaching multiplication and division of common and decimal fractions. They list real life activities that contribute to the understanding of fractions.
<b>Lesson assessments – evaluation of learning: of, for and as learning within the lesson</b>	<p><b>Subject Portfolio</b> Assign student teachers to develop equivalent fractions from locally available resources to be shared among colleagues in their small group presentation.</p> <p><b>Related CLOs:</b> 1, 2</p> <p><b>NTS:</b></p> <p>2b) Has comprehensive knowledge of the official school curriculum, including learning outcomes.</p> <p>3m) Identifies and remediates learners’ difficulties or misconceptions, referring learners whose needs lie outside the competency of the teacher.</p>			
<b>Instructional Resources</b>	Posters; video clips; downloads; models, etc.			
<b>Required Text (core)</b>	<p>Arthur, J., Grainger, T. &amp; Wray, D. (2006). Learning to Teach in the Primary School. Canada: Taylor &amp; Francis e-Library. <a href="https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html">https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html</a></p> <p>Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. <a href="https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html">https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html</a>.</p> <p>Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. <a href="https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html">https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html</a>.</p> <p>Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. <i>Issues in the Undergraduate Mathematics Preparation of School Teachers</i>, 2.</p>			
<b>Additional Reading List</b>	<p>Lakoff, G. &amp; Núñez, R. E. (2000). <i>Where Mathematics comes from</i>. New York: Basic Books.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Tutor notes</i>. Accra: Unimax Publishers.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Students activities</i>. Accra: Unimax Publishers.</p>			
<b>CPD Needs</b>	<ul style="list-style-type: none"> <li>• How to design and/or use some innovative materials and ideas for teaching the concepts of fraction based on the Primary School mathematics.</li> <li>• How to manage transition of home to school.</li> <li>• Understand the various characteristics and uniqueness of Primary School learners.</li> <li>• How to design tasks for assessment procedures for assessment of, as and for learning</li> <li>• Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.</li> </ul>			

## Lesson 4

Year of B.Ed.	3	Semester	2	Place of lesson in semester	1 2 3 <b>4</b> 5 6 7 8 9 10 11 12		
<b>Title of Lesson</b>	Fraction Concepts 2: (Teaching and Assessment)			<b>Lesson Duration</b>	<b>3 Hours</b>		
<b>Lesson description</b>	This the fourth lesson which focuses on developing an understanding of percent, ratio and proportion: (Teaching and Assessment) with respect to percent, ratio and proportion within the basic school curriculum. It also focuses on the relationship between percent, ratio and proportion and their application to real life. Areas such as mental strategies for adding, subtracting, multiplying and dividing by fractions; Basic applications of fractions to real life.						
<b>Previous student teacher knowledge, prior learning (assumed)</b>	Student-teachers have been exposed to basic concepts of sharing and operations of fractions; they have been exposed to equivalent fractions, decimal fractions and to build relationship between common fractions decimal fractions.						
<b>Possible barriers to learning in the lesson</b>	Different entry behaviours, Socio-cultural issues, different learning needs, misconceptions about mathematics and methods of teaching mathematics. Conscious efforts should be made to address them before, during and after the lesson.						
<b>Lesson Delivery – chosen to support students in achieving the outcomes</b>	<b>Face-to-face</b> <input checked="" type="checkbox"/>	<b>Practical Activity</b> <input checked="" type="checkbox"/>	<b>Work-Based Learning</b> <input type="checkbox"/>	<b>Seminars</b> <input type="checkbox"/>	<b>Independent Study</b> <input checked="" type="checkbox"/>	<b>e-learning opportunities</b> <input checked="" type="checkbox"/>	<b>Practicum</b> <input type="checkbox"/>
<b>Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.</b>	<p><b>Face-to-face and e-learning opportunities</b></p> <ul style="list-style-type: none"> <li>The face-to-face mode will include lecturer/tutor-initiated class discussions, small group in class exploration, group presentations, think-pair-share moments, lecture, etc.,</li> <li>The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers</li> <li>Independent study would include writing self-assessment and presenting reflective papers or journals.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.</b></li> </ul>	<p>The purpose of the lesson is to;</p> <ul style="list-style-type: none"> <li>Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson.</li> <li>Develop an understanding of percent, ratio and proportion: (Teaching and Assessment) with respect to percent, ratio and proportion within the basic school curriculum. It also focuses on the relationship between percent, ratio and proportion and their application to real life.</li> <li>Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, School Mathematics curriculum to Primary School learners.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Learning Outcome for the lesson, picked and developed from the course specification</b></li> <li><b>Learning indicators for each learning outcome</b></li> </ul>	<p><b>Learning Outcomes</b></p> <ul style="list-style-type: none"> <li>Demonstrate knowledge and understanding of ratios and proportion, percent and their relationships.</li> </ul>	<p><b>Learning Indicators</b></p> <ul style="list-style-type: none"> <li>Identify and explain the various forms of fractions within the basic school curriculum</li> <li>Produce well-prepared induction schedule and procedures</li> </ul>	<p><b>Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?</b></p> <ul style="list-style-type: none"> <li>Equity and inclusivity: Providing equitable learning opportunities for all learners</li> <li>Social and communication skills: consciously develop presentation skills during</li> </ul>				

	<ul style="list-style-type: none"> <li>Demonstrate knowledge and understanding of ratios proportion and their application to real life focusing on mathematics curriculum and their associated expected learning outcomes (NTS, 2a).</li> <li>Use differentiated instruction to cater for the needs of all children in the upper primary classroom, including those with special educational needs and creating a safe, secure, happy and stimulating learning environment (NTS 3c 3f, pg. 14)</li> </ul>	<ul style="list-style-type: none"> <li>Provide records of group work activities and/or cooperative learning for student teachers during and after teaching and learning interaction.</li> <li>Outline similarities and differences among ratios and proportion, percent and their implications for classroom practice and in real life.</li> <li>Involve those with special educational needs and creating a safe, secure, happy and stimulating in teaching and learning.</li> </ul>	<p>classroom instructions to support student teachers to develop mathematical language</p> <ul style="list-style-type: none"> <li>Personal development: Through presentation and developing of arguments</li> </ul>	
Topic	Sub-topic(s)	Stage/ Time	Teaching and learning to activities to achieve learning outcomes depending on delivery mode selected. Teacher-lead collaborative group work or independent.	
			Teacher Activity	Student Activity
Percent, ratio and proportion	Review	20mins	Review the previous lesson by asking student teachers relevant questions on operations on fractions( <i>PD Theme 1</i> )	Participate in the discussion on the operations on fractions
	Developing the concepts of percent, ratio and proportion	40 mins	Introduce the lesson through verbal exposition and discussion on purposes of different forms of assessment in mathematics learning in PRIMARY SCHOOL1-3; ( <i>PD Themes 1 &amp; 3</i> )	engage in verbal exposition and discussion on purposes of different forms of assessment in mathematics learning in PRIMARY SCHOOL1-3 <ul style="list-style-type: none"> <li>assessment for learning (AfL),</li> <li>assessment of learning (AoL) and</li> <li>assessment as learning (AaL) as well as</li> <li>syllabus guidelines for classroom assessment;</li> </ul>
	Building relationships among percent, ratio, and proportion	60 mins	Engage student teachers in a discussion to outline the various forms of assessment tool – observation guide, questionnaire, interview protocol, tests ( <i>PD Themes 1 &amp; 3</i> )	
	Exploring basic applications of fractions, percent, ratio, and proportion to real life.	60 mins	Assign student teachers to explore various test by working at each of the following steps: purpose, format, test blue-print, writing well-defined questions one after the other with answers. ( <i>PD Themes 3 &amp; 4</i> )	Discuss (supported with video clips where applicable) the various forms of assessment tool – observation guide, questionnaire, interview protocol, tests (e.g. BECE, performance assessment.) - one-on-one tests (viz.

			<p>Monitor student teachers to evaluate some teacher made tests to see if they meet the following five criteria of a good test <b>(PD Theme 1</b></p>	<p>multiple choice, constructed response), group tests, focus group interview protocol, etc.) as well as how they are administered.</p> <p>Design a test by working at each of the following steps: purpose, format, test blueprint, writing well-defined questions one after the other with answers.</p> <p>Use interactive and collaborative group work to develop strategies for adding and subtracting fractions. Student-teachers are engaged in using manipulatives and other models to develop strategies for multiplication and division of fractions.</p> <p>Evaluate some teacher made tests to see if they meet the following five criteria of a good test: clarity, validity, practicality, efficiency and fairness</p>
<p><b>Lesson assessments – evaluation of learning: of, for and as learning within the lesson</b></p>	<p><b>Subject Project</b></p> <p>Student teachers are assigned a project on place value, equivalent fractions, decimal number and their applications. The various forms of assessment procedures and practices and its responsiveness to equity and inclusivity and to produce reports (in groups)</p> <ul style="list-style-type: none"> <li>○ review past BECE mathematics questions for clarity, correctness, and completeness, as well as, write assessment tasks based on</li> </ul> <p><b>Related CLOs:</b> 1, 4</p> <p><b>NTS:</b></p> <p>2f) Demonstrate value as well as respect for equity and inclusion in the mathematics classroom (knowledge)</p> <p>3j) <i>Produces and uses a variety of teaching and learning resources including ICT, to enhance learning</i></p> <p><b>N/B: To be submitted in the 7<sup>th</sup> week of the semester.</b></p>			
<p><b>Instructional Resources</b></p>	<p>Posters; video clips; downloads; models, etc.</p>			
<p><b>Required Text (core)</b></p>	<p>Arthur, J., Grainger, T. &amp; Wray, D. (2006). Learning to Teach in the Primary School. Canada: Taylor &amp; Francis e-Library. <a href="https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html">https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html</a></p> <p>Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. <a href="https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html">https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html</a>.</p> <p>Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. <a href="https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html">https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html</a>.</p> <p>Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. <i>Issues in the Undergraduate Mathematics Preparation of School Teachers, 2</i>.</p>			
<p><b>Additional Reading List</b></p>	<p>Lakoff, G. &amp; Núñez, R. E. (2000). <i>Where Mathematics comes from</i>. New York: Basic Books.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Tutor notes</i>. Accra: Unimax Publishers.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Students activities</i>. Accra: Unimax Publishers.</p>			

<b>CPD Needs</b>	<ul style="list-style-type: none"><li>• How to design and/or use some innovative materials and ideas for teaching selected concepts based on Classroom assessment in mathematics in PRIMARY SCHOOL1-3.</li><li>• How to manage transition of home to school.</li><li>• Understand the various characteristics and uniqueness of Primary School learners.</li><li>• How to design tasks for assessment procedures for assessment of, as and for learning</li><li>• Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.</li></ul>
------------------	---

## Lesson 5

Year of B.Ed.	3	Semester	2	Place of lesson in semester	1 2 3 4 <b>5</b> 6 7 8 9 10 11 12		
<b>Title of Lesson</b>	Micro Lessons and use of technology across Primary school numeracy: (Teaching and Assessing)			<b>Lesson Duration</b>	<b>3 Hours</b>		
<b>Lesson description</b>	This is the fifth lesson which focuses on developing an understanding of Micro Lessons and use of technology across Primary school numeracy: (Teaching and Assessing) and how an understanding of mathematics develops from creative activities. The topics to be considered include; Misconception of diagnosis, Classroom assessment resources and records, Interpreting data/reports on performance and providing feedback and Evaluating performance and monitoring progress.						
<b>Previous student teacher knowledge, prior learning (assumed)</b>	Student-teachers have informal knowledge of classroom assessment resources and records.						
<b>Possible barriers to learning in the lesson</b>	Different entry behaviours, Socio-cultural issues, different learning needs, misconceptions about mathematics and methods of teaching mathematics. Conscious efforts should be made to address them before, during and after the lesson.						
<b>Lesson Delivery – chosen to support students in achieving the outcomes</b>	<b>Face-to-face</b> <input checked="" type="checkbox"/>	<b>Practical Activity</b> <input checked="" type="checkbox"/>	<b>Work-Based Learning</b> <input type="checkbox"/>	<b>Seminars</b> <input type="checkbox"/>	<b>Independent Study</b> <input checked="" type="checkbox"/>	<b>e-learning opportunities</b> <input checked="" type="checkbox"/>	<b>Practicum</b> <input type="checkbox"/>
<b>Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.</b>	<p><b>Face-to-face and e-learning opportunities</b></p> <ul style="list-style-type: none"> <li>The face-to-face mode will include lecturer/tutor-initiated class discussions, small group in class exploration, group presentations, think-pair-share moments, lecture, etc.,</li> <li>The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers</li> <li>Independent study would include writing self-assessment and presenting reflective papers or journals.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.</b></li> </ul>	<p>The purpose of the lesson is to;</p> <ul style="list-style-type: none"> <li>Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson.</li> <li>Expose student teachers to strategies to overcome misconception of diagnosis, classroom assessment resources and records, interpreting data/reports on performance and providing feedback and evaluating performance and monitoring progress.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Learning Outcome for the lesson, picked and developed from the course specification</b></li> <li><b>Learning indicators for each learning outcome</b></li> </ul>	<p><b>Learning Outcomes</b></p> <p>Demonstrate knowledge and skills of observation and reporting on class teaching and wider school activities <b>(in School 1)</b> <i>(College &amp; School induction by tutors, school heads, lead mentors and mentors)</i></p> <p>Demonstrate knowledge and understanding of the key features of the</p>	<p><b>Learning Indicators</b></p> <ul style="list-style-type: none"> <li>Design and produce well-prepared induction schedule and procedures</li> <li>Show evidence of keeping records of group work activities and/or cooperative learning for student teachers during observations</li> <li>Report on small group discussions with mentors and peers on the key features of the official basic school curriculum</li> </ul>	<p><b>Identify Which cross-cutting issues-core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?</b></p> <ul style="list-style-type: none"> <li>Equity and inclusivity: Providing equitable learning opportunities for all learners</li> <li>Assessment literacy: through modelling of effective record keeping</li> <li>Communication skills: through critiquing and presentations</li> <li>Personal development: Through developing and presentation of records</li> </ul>				

	basic school curriculum (BSC); and specifically focusing on mathematics curriculum and their associated expected learning outcomes (NTS, 2a).  Demonstrate skills in preparing and writing a personal teaching philosophy statement (NTS, 1f)	<ul style="list-style-type: none"> <li>List identified key features in the BSC.</li> <li>Provide a write-up of the developing teacher's self-awareness, beliefs, and values of teaching and learning (personal teaching philosophy)</li> <li>Make oral presentations of knowledge gained during induction and observation by studentteachers in their groups.</li> </ul>	<ul style="list-style-type: none"> <li>Social and communication skills: consciously develop presentation skills during classroom instructions to support student teachers to develop mathematical language</li> </ul>	
Topic	Sub-topic(s)	Stage/Time	Teaching and learning to activities to achieve learning outcomes depending on delivery mode selected. Teacher-lead collaborative group work or independent.	
			Teacher Activity	Student Activity
Diagnosis and remediation; assessment resources/records, and monitoring progress	<b>Review</b>	<b>20mins</b>	Review the previous lesson by asking student teachers relevant questions on the need for exploring upper primary students' errors and misconceptions with respect to percent, ratio, and proportion <b>(PD Theme 1)</b>	Participate in the discussion on the need for exploring upper primary students' errors and misconceptions with respect to percent, ratio, and proportion
	Misconception of diagnosis,	30 mins	Engage student teachers in designing tools to diagnose misconceptions and to outline strategies for remediation	Design tools to diagnose misconceptions and to outline strategies for remediation
	Classroom assessment resources and records	40 mins	Lead student teachers in a discussion to identify resources that should be available in the classroom for effective assessment in specialism-including examples of standardised tests (NEA), teacher made tests, record sheets, cumulative records forms, reports forms, etc.,	Participate in a discussion to identify resources that should be available in the classroom for effective assessment in specialism-including examples of standardised tests (NEA), teacher made tests, record sheets, cumulative records forms, reports forms, etc.,
	Interpreting data/reports on performance and providing feedback.	30 mins	Have student teachers study how to complete student's cumulative Upper Primary students' record form	Study how to complete student's cumulative Upper Primary students' record form
	Evaluating performance and monitoring progress	30 mins	Engage student teachers in analysing Upper Primary learners' performance (or assessment data) to provide feedback to stakeholders-students, colleagues and parents,	Analyse Upper Primary learners' performance (or assessment data) to provide feedback to stakeholders-students, colleagues and parents,

		30 mins	Have student teachers dramatize a School Performance Appraisal Meeting (SPAM)	Participate in dramatizing a School Performance Appraisal Meeting (SPAM)
<b>Lesson assessments – evaluation of learning: of, for and as learning within the lesson</b>	<p><b>Subject Portfolio</b></p> <ul style="list-style-type: none"> <li>Assign student teachers to plan, design, and prepare manipulatives and other models to teach selected concepts in Primary School mathematics using locally available and/or IT resources</li> <li>Prepare and model interactive, and innovative ways of teaching mathematics, including, micro-teaching to Primary School learners, with emphasis on multiple teaching strategies that promote equity and inclusivity.</li> </ul> <p><b>Related CLOs:</b> 1, 3, 4</p> <p><b>NTS:</b></p> <p>2 b) Has comprehensive knowledge of the official school curriculum, including learning outcomes.  <i>2b) Has comprehensive knowledge of the official school curriculum, including learning outcomes</i></p> <p>3m) Identifies and remediates learners' difficulties or misconceptions, referring learners whose needs lie outside the competency of the teacher.</p>			
<b>Instructional Resources</b>	Posters; video clips; downloads; models, etc.			
<b>Required Text (core)</b>	<p>Arthur, J., Grainger, T. &amp; Wray, D. (2006). Learning to Teach in the Primary School. Canada: Taylor &amp; Francis e-Library. <a href="https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html">https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html</a></p> <p>Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. <a href="https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html">https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html</a>.</p> <p>Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. <a href="https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html">https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html</a>.</p> <p>Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. <i>Issues in the Undergraduate Mathematics Preparation of School Teachers, 2</i>.</p>			
<b>Additional Reading List</b>	<p>Lakoff, G. &amp; Núñez, R. E. (2000). <i>Where Mathematics comes from</i>. New York: Basic Books.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Tutor notes</i>. Accra: Unimax Publishers.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Students activities</i>. Accra: Unimax Publishers.</p>			
<b>CPD Needs</b>	<ul style="list-style-type: none"> <li>How to design and/or use some innovative materials and ideas for teaching the concept of ratio and proportion, percent and application to real life.</li> <li>How to manage transition of home to school.</li> <li>Understand the various characteristics and uniqueness of Primary School learners.</li> <li>Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals.</li> </ul>			

## Lesson 6

Year of B.Ed.	3	Semester	2	Place of lesson in semester	1 2 3 4 5 <b>6</b> 7 8 9 10 11 12		
<b>Title of Lesson</b>	Diagnosis and remediation; assessment resources/records, and monitoring progress: (Teaching and Assessing)			<b>Lesson Duration</b>	<b>3 Hours</b>		
<b>Lesson description</b>	This is the sixth lesson which focuses on developing an understanding of Diagnosis and remediation; assessment resources/records, and monitoring progress: (Teaching and Assessing) and how an understanding of mathematics develops. The topics to be considered include; Importance of lesson planning, Micro lesson planning formats, Design of micro lessons. It also covers Micro Lessons and use of technology across Primary school numeracy and associated theories.						
<b>Previous student teacher knowledge, prior learning (assumed)</b>	Student-teachers have been thought theories in the teaching and learning of mathematics, and are familiar with some assessment resources. They are exposed to informal ways of lesson planning.						
<b>Possible barriers to learning in the lesson</b>	Different entry behaviours, Socio-cultural issues, different learning needs, misconceptions about mathematics and methods of teaching mathematics. Conscious efforts should be made to address them before, during and after the lesson.						
<b>Lesson Delivery – chosen to support students in achieving the outcomes</b>	<b>Face-to-face</b> <input checked="" type="checkbox"/>	<b>Practical Activity</b> <input checked="" type="checkbox"/>	<b>Work-Based Learning</b> <input type="checkbox"/>	<b>Seminars</b> <input type="checkbox"/>	<b>Independent Study</b> <input checked="" type="checkbox"/>	<b>e-learning opportunities</b> <input checked="" type="checkbox"/>	<b>Practicum</b> <input type="checkbox"/>
<b>Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.</b>	<p><b>Face-to-face and e-learning opportunities</b></p> <ul style="list-style-type: none"> <li>The face-to-face mode will include lecturer/tutor-initiated class discussions, small group in class exploration, group presentations, think-pair-share moments, lecture, etc.,</li> <li>The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers</li> <li>Independent study would include writing self-assessment and presenting reflective papers or journals.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.</b></li> </ul>	<p>The purpose of the lesson is to;</p> <ul style="list-style-type: none"> <li>Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson.</li> <li>Expose student teachers to the importance of lesson planning, Micro lesson planning formats, Design of micro lessons.</li> <li>Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, micro-teaching to Primary School learners.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Learning Outcome for the lesson, picked and developed from the course specification</b></li> <li><b>Learning indicators for each learning outcome</b></li> </ul>	<b>Learning Outcomes</b>	<b>Learning Indicators</b>		<b>Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?</b>			
	<ul style="list-style-type: none"> <li>Demonstrate knowledge and understanding of how to plan, design, and develop appropriate plan for a micro lesson</li> <li>Demonstrate competencies in using differentiated instructional strategies, with a focus on a thematic approach and which promotes learner-centred to cater for</li> </ul>	<ul style="list-style-type: none"> <li>Exhibit knowledge and application of learning theory, content knowledge, young children’s developmental needs, and how to use these to plan a lesson to meet the early grade curriculum goals</li> <li>Plan a lesson using strategies that match the level of thinking needed by PRIMARY SCHOOL pupils</li> </ul>	<ul style="list-style-type: none"> <li>Needs of the student teachers: Consciously identify and address the needs of student teachers and to inspire them for effective transfer of knowledge</li> <li>Respect and diversity: designing lesson for diverse learners with different learning styles</li> <li>Social and communication skills: consciously develop observation and presentation skills during classroom instructions to support</li> </ul>				

	the needs of all learners, including those with SEN ( <b>NTS 3f, pg. 14</b> )	<ul style="list-style-type: none"> <li>Show records of specific observations from wider school environment and induction</li> <li>Report on small group discussions with mentors and peers on the key features of the official basic school curriculum.</li> </ul>	<p>student teachers to transfer this to STS</p> <ul style="list-style-type: none"> <li>Respect and diversity: designing lesson for diverse learners with different learning styles</li> <li>Communication skills: through critiquing and presentations</li> </ul>	
Topic	Sub-topic(s)	Stage/ Time	Teaching and learning to activities to achieve learning outcomes depending on delivery mode selected. Teacher-lead collaborative group work or independent.	
			Teacher Activity	Student Activity
Micro lessons and use of technology across upper primary numeracy	<b>Review</b>	<b>10mins</b>	Review the previous lesson by asking student teachers relevant questions on how to diagnose a student's error in a given concept <b>(PD Theme 1)</b>	Participate in the discussion on identifying students' errors based on given mathematics concepts
	Importance of lesson planning	<b>20 mins</b>	Have student teachers explain the need for organizing micro lessons (or teaching) in the training of prospective teachers <b>(PD Themes 1 &amp; 3)</b>	Discuss the need for organizing micro lessons (or teaching) in the training of prospective teachers
	Micro lesson planning formats	<b>20mins</b>	Engage student teachers in a discussion to outline the various forms of lesson planning in mathematics <b>(PD Themes 1 &amp; 3)</b>	Discuss and outline the various forms of lesson plans in mathematics, including micro lesson planning formats
	Design of micro lessons	<b>30 mins</b>	Guide student teachers in planning micro lessons based on using mathematical learning Assign student teachers in groups to prepare lesson plans, discuss and model micro teaching in the class <b>(PD Themes 3 &amp; 4)</b>	Participate in the discussion based on planning micro lessons and to carry out micro teaching with peers
	Engagement in micro teaching with peers	<b>40 mins</b>	Assign student teachers to read teaching scenarios (and/or watch video clips) on teaching numeracy in the upper primary and doing a critic based on using mathematical learning theory	Engage in small group preparation using variety of locally available TLMs (observing and/or watching video clips) on teaching mathematics in the Primary School and doing a critic based on using verbal exposition and discussions on lesson planning, micro lesson planning formats and technology use in teaching mathematics across upper primary
	Exploring of technology use primary mathematics.	30 mins	Monitor student teachers teaching skills <b>(PD Theme 1)</b>	Read teaching scenarios (and/or watch video clips) on teaching numeracy in the upper primary and
		30 mins	Engage student teachers in post-lesson discussions using prepared guidelines for micro teaching.	

				doing a critic based on using mathematical learning theory Engage in post-lesson discussion with colleagues to establish good practices in teaching mathematics in the Primary School.
<b>Lesson assessments – evaluation of learning: of, for and as learning within the lesson</b>	<p><b>Subject Portfolio</b></p> <p>Assign student teachers to critique the new lesson format and use it to prepare a sample lesson plan meant for teaching selected mathematics topics in the PRIMARY SCHOOL mathematics curriculum through small group activity for peer review</p> <p><b>Related CLOs:</b> 1, 2, 3</p> <p><b>NTS:</b></p> <p>2 b) Has comprehensive knowledge of the official school curriculum, including learning outcomes. <i>2b) Has comprehensive knowledge of the official school curriculum, including learning outcomes</i></p> <p>3m) Identifies and remediates learners’ difficulties or misconceptions, referring learners whose needs lie outside the competency of the teacher. <i>Note: The assessment procedures should make room for differentiation - gender, equity, SEN, and inclusivity.</i></p>			
<b>Instructional Resources</b>	Posters; video clips; downloads; models, etc.			
<b>Required Text (core)</b>	<p>Arthur, J., Grainger, T. &amp; Wray, D. (2006). Learning to Teach in the Primary School. Canada: Taylor &amp; Francis e-Library. <a href="https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html">https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html</a></p> <p>Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. <a href="https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html">https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html</a>.</p> <p>Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. <a href="https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html">https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html</a>.</p> <p>Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. <i>Issues in the Undergraduate Mathematics Preparation of School Teachers, 2</i>.</p>			
<b>Additional Reading List</b>	<p>Lakoff, G. &amp; Núñez, R. E. (2000). <i>Where Mathematics comes from</i>. New York: Basic Books.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Tutor notes</i>. Accra: Unimax Publishers.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Students activities</i>. Accra: Unimax Publishers.</p>			
<b>CPD Needs</b>	<ul style="list-style-type: none"> <li>• How to design and teach mathematics using the new B. ED. Curriculum, NTS, NTECF, etc</li> <li>• How to design and/or use some innovative materials and ideas for teaching selected concepts based on Classroom assessment in mathematics in PRIMARY SCHOOL1-3.</li> <li>• How to manage transition of home to school.</li> <li>• Understand the various characteristics and uniqueness of Primary School learners.</li> <li>• How to design tasks for assessment procedures for assessment of, as and for learning.</li> <li>• Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.</li> </ul>			

## Lesson 7

Year of B.Ed.	3	Semester	2	Place of lesson in semester	1 2 3 4 5 6 <b>7</b> 8 9 10 11 12		
Title of Lesson	Shape and Space: (Teaching and Assessment)			Lesson Duration	3 Hours		
Lesson description	This is the seventh lesson which focuses on developing an understanding of Teaching and Assessing Primary School Mathematics especially, Shape and Space: (Teaching and Assessment). The topics to be considered includes. Spatial visualization; the concept of space; line segments, angles and shapes; 3-D (faces, vertices, edges and their relationships) and 2-D shapes (types and properties).						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers informal knowledge of shape and space. Student teachers make use of 2D and 3D objects at home.						
Possible barriers to learning in the lesson	Different entry behaviours, Socio-cultural issues, different learning needs, misconceptions about mathematics and methods of teaching mathematics. Conscious efforts should be made to address them before, during and after the lesson.						
Lesson Delivery – chosen to support students in achieving the outcomes	Face-to-face <input checked="" type="checkbox"/>	Practical Activity <input checked="" type="checkbox"/>	Work-Based Learning <input type="checkbox"/>	Seminars <input type="checkbox"/>	Independent Study <input checked="" type="checkbox"/>	e-learning opportunities <input checked="" type="checkbox"/>	Practicum <input type="checkbox"/>
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	<p><b>Face-to-face and e-learning opportunities</b></p> <ul style="list-style-type: none"> <li>The face-to-face mode will include lecturer/tutor-initiated class discussions, small group in class exploration, group presentations, think-pair-share moments, lecture, etc.,</li> <li>The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers</li> <li>Independent study would include writing self-assessment and presenting reflective papers or journals.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.</b></li> </ul>	<p>The purpose of the lesson is to;</p> <ul style="list-style-type: none"> <li>Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson.</li> <li>Develop student teachers' understanding of spatial visualization; the concept of space; line segments, angles and shapes; 3-D (faces, vertices, edges and their relationships) and 2-D shapes (types and properties).</li> <li>Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, Teaching shapes and space in the Basic School to Primary School learners.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Learning Outcome for the lesson, picked and developed from the course specification</b></li> <li><b>Learning indicators for each learning outcome</b></li> </ul>	<b>Learning Outcomes</b>		<b>Learning Indicators</b>		<b>Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?</b>		
	<p>Demonstrate knowledge and understanding of concepts of shape and space and how these can be taught to PRIMARY SCHOOL pupils (professional values, knowledge &amp; practice) <b>(NTS, 2b)</b></p> <p>Demonstrate competencies in devising and using differentiated</p>		<ul style="list-style-type: none"> <li>Select and use developmentally appropriate models and strategies for teaching shape and space that emphasize the physical, cognitive, emotional and social development of the early adolescent learner</li> <li>Outline and analyse strategies early adolescent learners use in developing concepts in shape and space such as 2D and 3D shapes.</li> </ul>		<ul style="list-style-type: none"> <li>Ethics and values of teaching: through supporting student teachers to understand and demonstrate the ethics of the profession bearing in mind the unique characteristics of the early adolescent learner</li> <li>Problem solving, critical and creative thinking: through objective analysis of facts and concept that will lead to creative thinking</li> </ul>		

	instructional strategies, with a focus on a thematic approach and which promotes practical-based learning to cater for the needs of all children in the PRIMARY SCHOOL classroom, including those with SEN ( <b>NTS 3f, pg. 14</b> )	<ul style="list-style-type: none"> <li>Use knowledge gained from learning theories in mathematics to design appropriate problem-solving tasks.</li> <li>Recognise and use developmentally appropriate and positive behaviour management skills</li> </ul>	<ul style="list-style-type: none"> <li>Ethics and values of teaching: through supporting student teachers to understand and demonstrate the ethics of the profession bearing in mind the unique characteristics of young children</li> <li>Respect and diversity: designing lesson for diverse learners with different learning styles</li> </ul>	
Topic	Sub-topic(s)	Stage/Time	Teaching and learning to activities to achieve learning outcomes depending on delivery mode selected. Teacher-lead collaborative group work or independent.	
			Teacher Activity	Student Activity
Shape and Space: (Teaching and Assessment)	<b>Review</b>	<b>10mins</b>	Review the previous lesson by asking student teachers relevant questions lesson planning <b>(PD Theme 1)</b>	Participate in the discussion on micro lesson planning
	Informal geometry and spatial sense;	<b>20 mins</b>	Introduce the lesson on integers as shape and space. <b>(PD Themes 1 &amp;3)</b>	Initiate verbal exposition and discussions on integers and technology use in teaching of shape and space.
		<b>40 mins</b>	Lead discussions on the concept of shape and space. <b>(PD Themes 1 &amp; 3)</b>	Provide student-teachers with e-learning opportunities to explore the concept of shape and space.
		<b>40 mins</b>	Provide student-teachers with e-learning opportunities to explore the concept of shape and space.	Use e-learning opportunities to explore the concept of shape and space.
	Shapes and their properties;	<b>70 mins</b>	Engage student teachers to explore shapes and their properties	
	Hand sketching of common solids		Assign student teachers to hand sketch some common solids	Use ICT tools and other manipulatives to investigate properties of 2D and 3D shapes
	Spatial visualization;		Assign student teachers to use models of 3-D shapes for practical investigation to explore the relationship among the number of faces, edges, and vertices of given shapes.	Hand sketch some common solids with the aid of their nets Use models of 3-D shapes for practical investigation to explore the relationship among the number of faces, edges, and vertices of given shapes.
	concept of space;			
	Nets of 3-D shapes			Through interactive and

	Relationship among faces, edges and vertices;			collaborative group work, student-teachers explore 2D shapes and their properties;  Construct 3-D shapes from the nets; Investigate the properties of 2D and 3D shapes- congruencies, similarities, diagonals, parallel, symmetries, etc.
<b>Lesson assessments – evaluation of learning: of, for and as learning within the lesson</b>	<p align="center"><b>Subject Portfolio</b></p> <p>Assign student teachers to complete teacher-made worksheets on length, angle, area, volume and capacity, mass, weight, time and money (<i>provide immediate feedback</i>)</p> <p><b>Related CLOs:</b> 1, 2, 3</p> <p><b>NTS:</b></p> <p>2 b) Has comprehensive knowledge of the official school curriculum, including learning outcomes. <i>2b) Has comprehensive knowledge of the official school curriculum, including learning outcomes</i></p> <p>3m) Identifies and remediates learners’ difficulties or misconceptions, referring learners whose needs lie outside the competency of the teacher.</p> <p><b>Subject Project 1</b></p> <p>Collection and discussion of Project 1 to be graded later</p> <p><i>Note: The assessment procedures should make room for differentiation - gender, equity, SEN, and inclusivity.</i></p>			
<b>Instructional Resources</b>	Posters; video clips; downloads; models, etc.			
<b>Required Text (core)</b>	<p>Arthur, J., Grainger, T. &amp; Wray, D. (2006). Learning to Teach in the Primary School. Canada: Taylor &amp; Francis e-Library. <a href="https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html">https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html</a></p> <p>Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. <a href="https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html">https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html</a>.</p> <p>Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. <a href="https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html">https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html</a>.</p> <p>Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. <i>Issues in the Undergraduate Mathematics Preparation of School Teachers, 2</i>.</p>			
<b>Additional Reading List</b>	<p>Lakoff, G. &amp; Núñez, R. E. (2000). <i>Where Mathematics comes from</i>. New York: Basic Books.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Tutor notes</i>. Accra: Unimax Publishers.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Students activities</i>. Accra: Unimax Publishers.</p>			
<b>CPD Needs</b>	<ul style="list-style-type: none"> <li>• How to design and teach mathematics using the new B. ED. Curriculum, NTS, NTECF, etc</li> <li>• How to design and/or use some innovative materials and ideas for teaching shape and space based on Classroom assessment in mathematics in PRIMARY SCHOOL1-3.</li> <li>• Understand the various characteristics and uniqueness of Primary School learners.</li> <li>• How to design tasks for assessment procedures for assessment of, as and for learning.</li> <li>• Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.</li> </ul>			

## Lesson 8

Year of B.Ed.	3	Semester	2	Place of lesson in semester	1 2 3 4 5 6 7 <b>8</b> 9 10 11 12
---------------	---	----------	---	-----------------------------	-----------------------------------

<b>Title of Lesson</b>	Measurement: <i>(Teaching and Assessing)</i>			<b>Lesson Duration</b>	<b>3 Hours</b>		
<b>Lesson description</b>	This is the eighth lesson which focuses on developing an understanding of Teaching and Assessing Primary School Mathematics about the concept of measurement. The topics to be considered include the Concept of measurement; using non-standard and standard units of measurement; Measurement of angles.						
<b>Previous student teacher knowledge, prior learning (assumed)</b>	Student-teachers have informal knowledge of measurement of items/objects both at home and school using non-standard units.						
<b>Possible barriers to learning in the lesson</b>	Different entry behaviours, Socio-cultural issues, different learning needs, misconceptions about mathematics and methods of teaching mathematics. Conscious efforts should be made to address them before, during and after the lesson.						
<b>Lesson Delivery – chosen to support students in achieving the outcomes</b>	<b>Face-to-face</b> <input checked="" type="checkbox"/>	<b>Practical Activity</b> <input checked="" type="checkbox"/>	<b>Work-Based Learning</b> <input type="checkbox"/>	<b>Seminars</b> <input type="checkbox"/>	<b>Independent Study</b> <input checked="" type="checkbox"/>	<b>e-learning opportunities</b> <input checked="" type="checkbox"/>	<b>Practicum</b> <input type="checkbox"/>
<b>Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.</b>	<p><b><i>Face-to-face and e-learning opportunities</i></b></p> <ul style="list-style-type: none"> <li>The face-to-face mode will include lecturer/tutor-initiated class discussions, small group in class exploration, group presentations, think-pair-share moments, lecture, etc.,</li> <li>The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers             <ul style="list-style-type: none"> <li>Independent study would include writing self-assessment and presenting reflective papers or journals.</li> </ul> </li> </ul>						
<ul style="list-style-type: none"> <li><b>Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.</b></li> </ul>	<p>The purpose of the lesson is to;</p> <ul style="list-style-type: none"> <li>Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson.</li> <li>develop student teachers' understanding Concept of measurement; using non-standard and standard units of measurement; Measurement of angles.</li> <li>Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, Teaching measurement in the Basic School to Primary School learners.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Learning Outcome for the lesson, picked and developed from the course specification</b></li> <li><b>Learning indicators for each learning outcome</b></li> </ul>	<b>Learning Outcomes</b>		<b>Learning Indicators</b>		<b>Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?</b>		
	<p>Demonstrate a comprehensive knowledge of the official PRIMARY SCHOOL mathematics curriculum and learning outcomes covering measurement of objects or items using both standard and nonstandard units and the measurement of angles(NTS 2b)</p> <p>Demonstrate knowledge of instructional practices for teaching</p>		<ul style="list-style-type: none"> <li>Show a good understanding of measurement of objects or items and angles, as well as using techniques for practical mathematics as a means of promoting a deeper number sense within the context of measurement.</li> <li>Can make children mathematically proficient using multiple strategies that are appropriate for concepts of measurement.</li> </ul>		<ul style="list-style-type: none"> <li>Problem solving, critical and creative thinking: through objective analysis of facts and concept that will lead to creative thinking</li> <li>Problem solving, critical and creative thinking: through objective analysis of facts and concept that will lead to creative thinking</li> <li>Personal development: Through planning, teaching, and assessing both individually and in small groups, and sharing their experiences with peers</li> </ul>		

	measurement using the PRIMARY SCHOOL mathematics curriculum(NTS 3e)	<ul style="list-style-type: none"> <li>• Show evidence of enjoying mathematics and have confidence in their abilities to do mathematics</li> <li>• Carry out basic mathematics instructional routines for PRIMARY SCHOOL pupils, including drill and practice, reinforcement activities and engage learners in mathematical discourse</li> <li>• plan effective instruction and solve problems that arise during instruction involving application of measurement in real life</li> </ul>	<ul style="list-style-type: none"> <li>• Social and communication skills: consciously develop observation and presentation skills during classroom instructions to support student teachers to transfer this to STS</li> <li>• Respect and diversity: designing lesson for diverse learners with different learning styles</li> </ul>	
Topic	Sub-topic(s)	Stage/ Time	Teaching and learning to activities to achieve learning outcomes depending on delivery mode selected. Teacher-lead collaborative group work or independent.	
			Teacher Activity	Student Activity
Measurement;	<b>Review</b>	10mins	Review student teachers knowledge of sets of objects ( <i>PD Theme 1</i> )	Explore how student-teachers perceive children’s understanding of the concept of measurement;
		20 mins	Assign student teachers in groups to outline how to	Using manipulatives and other TLMs through mathematical discourse identify referent non-standard units for measuring length, mass and capacity
		40 mins	Initiate verbal exposition and discussions	
	60 mins	Use games and practical activities to introduce the concept of		
	Measurement of angles	30 mins	Lead student teachers to explore the concepts of Use group and individual projects to Engage student-teachers through group work to explore the concepts	Use group and individual presentations to discuss how to.
20 mins				
<b>Lesson assessments – evaluation of learning: of, for and as learning within the lesson</b>	<p><b>Subject Project</b></p> <ul style="list-style-type: none"> <li>• Student teachers are assigned to design appropriate teaching and learning materials for Collecting, interpreting and presenting data and chance 10<sup>th</sup> week</li> </ul> <p><b>Related CLOs:</b> 3, 5, 6</p> <p><b>NTS:</b></p> <p>2 b) Has comprehensive knowledge of the official school curriculum, including learning outcomes.  <i>2b) Has comprehensive knowledge of the official school curriculum, including learning outcomes</i></p> <p>3m) Identifies and remediates learners’ difficulties or misconceptions, referring learners whose needs lie outside the competency of the teacher.</p> <p><i>Note: The assessment procedures should make room for differentiation - gender, equity, SEN, and inclusivity.</i></p>			

<b>Instructional Resources</b>	Posters; video clips; downloads; models, etc.
<b>Required Text (core)</b>	<p>Arthur, J., Grainger, T. &amp; Wray, D. (2006). Learning to Teach in the Primary School. Canada: Taylor &amp; Francis e-Library. <a href="https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html">https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html</a></p> <p>Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. <a href="https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html">https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html</a>.</p> <p>Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. <a href="https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html">https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html</a>.</p> <p>Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. <i>Issues in the Undergraduate Mathematics Preparation of School Teachers, 2</i>.</p>
<b>Additional Reading List</b>	<p>Lakoff, G. &amp; Núñez, R. E. (2000). <i>Where Mathematics comes from</i>. New York: Basic Books.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Tutor notes</i>. Accra: Unimax Publishers.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Students activities</i>. Accra: Unimax Publishers.</p>
<b>CPD Needs</b>	<ul style="list-style-type: none"> <li>• How to design and teach mathematics using the new B. ED. Curriculum, NTS, NTECF, etc</li> <li>• How to design and/or use some innovative materials and ideas for teaching measurement based on Classroom assessment in mathematics in PRIMARY SCHOOL 1-3.</li> <li>• How to manage transition of home to school.</li> <li>• Understand the various characteristics and uniqueness of Primary School learners.</li> <li>• How to design tasks for assessment procedures for assessment of, as and for learning.</li> <li>• Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.</li> </ul>

## Lesson 9

Year of B.Ed.	3	Semester	2	Place of lesson in semester	1 2 3 4 5 6 7 8 <b>9</b> 10 11 12		
<b>Title of Lesson</b>	Measurement 2			<b>Lesson Duration</b>	<b>3 Hours</b>		
<b>Lesson description</b>	This is the ninth lesson which focuses on developing an understanding of Teaching and Assessing Primary School Mathematics about the concept of measurement. The topics to be considered include, Perimeter and areas of triangle, Circumference and areas of circular regions; Surface area and volumes of prisms and pyramids.						
<b>Previous student teacher knowledge, prior learning (assumed)</b>	Student-teachers have developed the use of non-standard and standard units of measurement; Measurement of angles.						
<b>Possible barriers to learning in the lesson</b>	Different entry behaviours, Socio-cultural issues, different learning needs, misconceptions about mathematics and methods of teaching mathematics. Conscious efforts should be made to address them before, during and after the lesson.						
<b>Lesson Delivery – chosen to support students in achieving the outcomes</b>	<b>Face-to-face</b> <input checked="" type="checkbox"/>	<b>Practical Activity</b> <input checked="" type="checkbox"/>	<b>Work-Based Learning</b> <input type="checkbox"/>	<b>Seminars</b> <input type="checkbox"/>	<b>Independent Study</b> <input checked="" type="checkbox"/>	<b>e-learning opportunities</b> <input checked="" type="checkbox"/>	<b>Practicum</b> <input type="checkbox"/>
<b>Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.</b>	<p><b>Face-to-face and e-learning opportunities</b></p> <ul style="list-style-type: none"> <li>The face-to-face mode will include lecturer/tutor-initiated class discussions, small group in class exploration, group presentations, think-pair-share moments, lecture, etc.,</li> <li>The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers</li> <li>Independent study would include writing self-assessment and presenting reflective papers or journals.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.</b></li> </ul>	<p>The purpose of the lesson is to;</p> <ul style="list-style-type: none"> <li>Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson.</li> <li>Develop student teachers' understanding of Perimeter and areas of triangle, Circumference and areas of circular regions; Surface area and volumes of prisms and pyramids.</li> <li>Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, measurement of Perimeter and areas of triangle, Circumference and areas of circular regions; Surface area and volumes of prisms and pyramids.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Learning Outcome for the lesson, picked and developed from the course specification</b></li> <li><b>Learning indicators for each learning outcome</b></li> </ul>	<p><b>Learning Outcomes</b></p> <p>Demonstrate knowledge and understanding of the key features of the basic school curriculum (BSC); and specifically focusing on measurement of perimeter and area of triangle, circumference and areas of circular regions; Surface area and volumes of prisms and pyramids.(NTS, 2a).</p> <p>Demonstrate awareness of socio-cultural issues in teaching and learning</p>	<p><b>Learning Indicators</b></p> <ul style="list-style-type: none"> <li>Participate in planning and executing instructional activities that can make early adolescents become mathematically proficient; that is, understand mathematical ideas, and engage in logical reasoning based on relationships among perimeter and area of triangle, circumference and areas of circular regions; Surface area and volumes of prisms and pyramids.</li> </ul>	<p><b>Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?</b></p> <ul style="list-style-type: none"> <li>Personal development: Through planning, teaching, and assessing both individually and in small groups, and sharing their experiences with peers</li> <li>Problem solving, critical and creative thinking: through objective analysis of facts and concept that will lead to creative thinking</li> <li>Personal development: Through presentation and developing of arguments</li> </ul>				

	<p>perimeter and area of triangle, circumference and areas of circular regions; Surface area and volumes of prisms and pyramids.(NTS 2f)</p> <p>Demonstrate competencies in using manipulatives and TLMs in a variety of ways in teaching measurement concepts (NTS 3j)</p> <p>Value as well as respect equity and inclusivity in the mathematics classroom (NTS 2f; NTECF 39)</p>	<ul style="list-style-type: none"> <li>• identify and design tasks for teaching important mathematical ideas in perimeter and area of triangle, circumference and areas of circular regions; Surface area and volumes of prisms and pyramids to PRIMARY SCHOOL pupils</li> <li>• Identify a variety of manipulatives and TLMs for teaching important mathematical ideas such as perimeter and area of triangle, circumference and areas of circular regions; Surface area and volumes of prisms and pyramids.</li> <li>• Cooperate with colleagues in carrying out mathematical tasks in a variety of ways</li> <li>• Engage in reflective thinking about how mathematics was taught in their basic school days.</li> </ul>	<ul style="list-style-type: none"> <li>• Respect and diversity: designing lesson for diverse learners with different learning styles</li> <li>• Social and communication skills: consciously develop observation and presentation skills during classroom instructions to support student teachers to transfer this to STS</li> </ul>	
Topic	Sub-topic(s)	Stage/ Time	Teaching and learning to activities to achieve learning outcomes depending on delivery mode selected. Teacher-lead collaborative group work or independent.	
			Teacher Activity	Student Activity
Measurement	Review	10mins	Review student teachers' previous knowledge on shape and space. <b>(PD Theme 1)</b>	Participate in the discussion on shape and space
	Perimeter and areas of triangles	20 mins	Introduce the lesson on perimeter and areas of triangles; <b>(PD Themes 1 &amp;3)</b>	Participate in the discussion based on the perimeter and area of triangles.
		20 mins	Lead discussions on how to connect the perimeter and areas of various triangles <b>(PD Themes 1 &amp; 3)</b>	Explore strategies for connecting the perimeter and areas of various triangles
		30 mins	Demonstrate with cut-out shapes and supported with video clip the process of deriving the formula for $\pi$ ,	Participate in the activity to derive the formula for $\pi$ Use this relation to solve related problems
Circumference and areas of circular regions;	20 mins	Lead student teachers to explore with models and other materials to develop the formula for finding the circumference and area of a circle	Explore with models and other materials to develop the formula for finding the circumference and area of a circle	
Surface area and volumes of prisms and pyramids				

		30 mins	Demonstrate strategies for finding the surface area and volumes of prisms and pyramids	Find the surface areas and volumes of prisms and pyramids through interactive group work
		30 mins	Lead discussions on the relationship between the volume of a cylinder and a cone (with same base areas and height)	Work in groups to explore the relationship between the volume of a cylinder and a cone (with same base areas and height)
		20 mins	Assign student teachers in groups to outline strategies for finding the volumes of given solids including the sphere	Outline strategies for finding the volumes of given solids including the sphere
<b>Lesson assessments – evaluation of learning: of, for and as learning within the lesson</b>	<p><b>Subject Portfolio</b> Assign student teachers to complete teacher-made worksheets on operations and properties of rational and irrational numbers as found in the Primary School Mathematics Curriculum (<i>provide immediate feedback</i>)</p> <p><b>Related CLOs:</b> 1, 2, 3</p> <p><b>NTS:</b></p> <p>2 b) Has comprehensive knowledge of the official school curriculum, including learning outcomes. <i>2b) Has comprehensive knowledge of the official school curriculum, including learning outcomes</i></p> <p>3m) Identifies and remediates learners’ difficulties or misconceptions, referring learners whose needs lie outside the competency of the teacher. <i>Note: The assessment procedures should make room for differentiation - gender, equity, SEN, and inclusivity.</i></p>			
<b>Instructional Resources</b>	Posters; video clips; downloads; models, etc.			
<b>Required Text (core)</b>	<p>Arthur, J., Grainger, T. &amp; Wray, D. (2006). Learning to Teach in the Primary School. Canada: Taylor &amp; Francis e-Library. <a href="https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html">https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html</a></p> <p>Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. <a href="https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html">https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html</a>.</p> <p>Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. <a href="https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html">https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html</a>.</p> <p>Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. <i>Issues in the Undergraduate Mathematics Preparation of School Teachers, 2</i>.</p>			
<b>Additional Reading List</b>	<p>Lakoff, G. &amp; Núñez, R. E. (2000). <i>Where Mathematics comes from</i>. New York: Basic Books.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Tutor notes</i>. Accra: Unimax Publishers.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Students activities</i>. Accra: Unimax Publishers.</p>			
<b>CPD Needs</b>	<ul style="list-style-type: none"> <li>• How to design and teach mathematics using the new B. ED. Curriculum, NTS, NTECF, etc</li> <li>• How to design and/or use some innovative materials and ideas for teaching measurement concepts based on Classroom assessment in mathematics in PRIMARY SCHOOL1-3.</li> <li>• How to manage transition of home to school.</li> <li>• Understand the various characteristics and uniqueness of Primary School learners.</li> <li>• How to design tasks for assessment procedures for assessment of, as and for learning.</li> <li>• Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.</li> </ul>			

# Lesson 10

Year of B.Ed.	3	Semester	2	Place of lesson in semester	1 2 3 4 5 6 7 8 9 <b>10</b> 11 12
---------------	---	----------	---	-----------------------------	-----------------------------------

<b>Title of Lesson</b>	Handling Data 1 (Teaching and Assessing)			<b>Lesson Duration</b>	<b>3 Hours</b>		
<b>Lesson description</b>	This is the tenth lesson which focuses on developing an understanding of Teaching and Assessing Primary School Mathematics about Handling data. The topics to be considered include Collecting, interpreting and presenting data.						
<b>Previous student teacher knowledge, prior learning (assumed)</b>	Student-teachers have informal knowledge of collecting and handling data. They have been introduced to counting and record keeping.						
<b>Possible barriers to learning in the lesson</b>	Different entry behaviours, Socio-cultural issues, different learning needs, misconceptions about mathematics and methods of teaching mathematics. Conscious efforts should be made to address them before, during and after the lesson.						
<b>Lesson Delivery – chosen to support students in achieving the outcomes</b>	<b>Face-to-face</b> <input checked="" type="checkbox"/>	<b>Practical Activity</b> <input checked="" type="checkbox"/>	<b>Work-Based Learning</b> <input type="checkbox"/>	<b>Seminars</b> <input type="checkbox"/>	<b>Independent Study</b> <input checked="" type="checkbox"/>	<b>e-learning opportunities</b> <input checked="" type="checkbox"/>	<b>Practicum</b> <input type="checkbox"/>
<b>Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.</b>	<p><b>Face-to-face and e-learning opportunities</b></p> <ul style="list-style-type: none"> <li>The face-to-face mode will include lecturer/tutor-initiated class discussions, small group in class exploration, group presentations, think-pair-share moments, lecture, etc.,</li> <li>The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers</li> <li>Independent study would include writing self-assessment and presenting reflective papers or journals.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.</b></li> </ul>	<p>The purpose of the lesson is to;</p> <ul style="list-style-type: none"> <li>Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson.</li> <li>Develop student teachers' understanding of include collecting, interpreting and presenting data to Primary School learners.</li> <li>Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, collecting and handling data.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Learning Outcome for the lesson, picked and developed from the course specification</b></li> <li><b>Learning indicators for each learning outcome</b></li> </ul>	<b>Learning Outcomes</b>	<b>Learning Indicators</b>		<b>Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?</b>			
	<ul style="list-style-type: none"> <li>Demonstrate a comprehensive knowledge of the official PRIMARY SCHOOL mathematics curriculum and learning outcomes covering handling data 1as well as the principles behind these concepts (NTS 2b)</li> <li>Demonstrate knowledge and</li> </ul>	<ul style="list-style-type: none"> <li>Show a good understanding of number relationships and place value, as well as using techniques for practical activities involving the development of handling data concepts to promote mathematical thinking</li> <li>Plan lesson based on addition and subtraction that seeks provide equitable learning opportunities for all learner</li> <li>Outline activities that make children mathematically</li> </ul>	<ul style="list-style-type: none"> <li>Respect and diversity: designing lesson for diverse learners with different learning styles</li> <li>Personal development: through planning, teaching, and assessing both individually and in small groups, and sharing their experiences with peers</li> <li>Equity and inclusivity: Providing equitable learning opportunities for all learners</li> <li>Problem solving, critical and creative thinking: through objective analysis of facts and</li> </ul>				

	<p>understanding of the concept of collecting and handling data with emphasis on Interpreting.</p> <ul style="list-style-type: none"> <li>Demonstrate competencies in using manipulatives and TLMs including ICT in a variety of ways in teaching operations on common and decimal fractions concepts (NTS 3j)</li> </ul>	<p>proficient by considering the developmental level of the learners</p> <ul style="list-style-type: none"> <li>Use manipulatives, ICT tools, and other TLMs to establish mathematical principles based on handling and collecting data.</li> </ul>	<p>concept that will lead to creative thinking</p> <ul style="list-style-type: none"> <li>Personal development: through conscious modelling of planning, presentation and assessment</li> <li>Use of ICT: Integrate ICT in developing fraction concepts in the mathematics classroom</li> </ul>	
Topic	Sub-topic(s)	Stage/ Time	Teaching and learning to activities to achieve learning outcomes depending on delivery mode selected. Teacher-lead collaborative group work or independent.	
			Teacher Activity	Student Activity
Handling Data (Teaching and Assessing)	Introduction	10mins	Review student teachers' previous knowledge lesson on collecting and handling data <b>(PD Theme 1)</b>	Participate in the discussion by answering questions and giving comments to enhance participation.
	Collecting, interpreting and presenting data	20mins	Introduce the concept of data and engage student teachers in a discussion based on how data is related to information <b>(PD Themes 1 &amp;3)</b>	Participate in the discussion based on how data is related to information
		20 mins	Assign student teachers to look for examples of graphs in print and electronic media such as newspapers, magazines, and the internet and interpret ...	Find examples of graphs in print and electronic media such as newspapers, magazines, and the internet and interpreting it.  Systematically collect, organize and describe data
		30 mins	Use verbal exposition to introduce student teachers to strategies for creating, labelling, and interpreting line graphs and other graphs to draw conclusions	Construct, read, and interpret tables, charts, and graphs  Engage in micro lesson design on problem solving involving handling data, teaching with peers and doing critics
		20 mins	Make a presentation on collecting, interpreting and presenting data	
30 mins	Engage student teachers to collect, display, and analyse data to solve problems	Pay attention to the presentation based on collection, presentation, and interpretation of data		

		30 mins	Assign student teachers to make inferences and convincing arguments based on data analysis	Collect, display, and analyse data to solve problems
		20 mins	Have student teachers evaluate arguments that are based on data analysis	Make inferences and convincing arguments based on data analysis  Evaluate arguments that are based on data analysis
<b>Lesson assessments – evaluation of learning: of, for and as learning within the lesson</b>	<b>Subject Portfolio:</b> Collection and discussion of Cumulative Learning Portfolio for grading later.			
<b>Instructional Resources</b>	Posters; video clips; downloads; models, etc.			
<b>Required Text (core)</b>	<p>Arthur, J., Grainger, T. &amp; Wray, D. (2006). Learning to Teach in the Primary School. Canada: Taylor &amp; Francis e-Library. <a href="https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html">https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html</a></p> <p>Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. <a href="https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html">https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html</a>.</p> <p>Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. <a href="https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html">https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html</a>.</p> <p>Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. <i>Issues in the Undergraduate Mathematics Preparation of School Teachers, 2</i>.</p>			
<b>Additional Reading List</b>	<p>Lakoff, G. &amp; Núñez, R. E. (2000). <i>Where Mathematics comes from</i>. New York: Basic Books.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Tutor notes</i>. Accra: Unimax Publishers.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Students activities</i>. Accra: Unimax Publishers.</p>			
<b>CPD Needs</b>	<ul style="list-style-type: none"> <li>• How to design and teach mathematics using the new B. ED. Curriculum, NTS, NTECF, etc</li> <li>• How to design and/or use some innovative materials and ideas for teaching collecting and handling data concepts based on Classroom instruction and assessment of mathematics in PRIMARY SCHOOL1-3.</li> <li>• How to manage transition of home to school.</li> <li>• Understand the various characteristics and uniqueness of Primary School learners.</li> <li>• How to design tasks for assessment procedures for assessment of, as and for learning.</li> <li>• Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.</li> </ul>			

# Lesson 11

Year of B.Ed.	3	Semester	2	Place of lesson in semester	1 2 3 4 5 6 7 8 9 10 <b>11</b> 12
---------------	---	----------	---	-----------------------------	-----------------------------------

<b>Title of Lesson</b>	Handling Data 2			<b>Lesson Duration</b>	<b>3 Hours</b>		
<b>Lesson description</b>	This the eleventh lesson which focuses on developing an understanding of Teaching and Assessing Primary School Mathematics about Ideas of chance and uncertainty.						
<b>Previous student teacher knowledge, prior learning (assumed)</b>	Student-teachers have been taught collecting, interpreting and presenting data, and are familiar with tossing a dice of coin.						
<b>Possible barriers to learning in the lesson</b>	Different entry behaviours, Socio-cultural issues, different learning needs, misconceptions about mathematics and methods of teaching mathematics. Conscious efforts should be made to address them before, during and after the lesson.						
<b>Lesson Delivery – chosen to support students in achieving the outcomes</b>	<b>Face-to-face</b> <input checked="" type="checkbox"/>	<b>Practical Activity</b> <input checked="" type="checkbox"/>	<b>Work-Based Learning</b> <input type="checkbox"/>	<b>Seminars</b> <input type="checkbox"/>	<b>Independent Study</b> <input checked="" type="checkbox"/>	<b>e-learning opportunities</b> <input checked="" type="checkbox"/>	<b>Practicum</b> <input type="checkbox"/>
<b>Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.</b>	<p><b>Face-to-face and e-learning opportunities</b></p> <ul style="list-style-type: none"> <li>The face-to-face mode will include lecturer/tutor-initiated class discussions, small group in class exploration, group presentations, think-pair-share moments, lecture, etc.,</li> <li>The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers</li> <li>Independent study would include writing self-assessment and presenting reflective papers or journals.</li> </ul>						
<b>Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.</b>	<p>The purpose of the lesson is to;</p> <ul style="list-style-type: none"> <li>Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson.</li> <li>Develop student teachers' understanding of ideas of chance and uncertainty.</li> <li>Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, ideas of chance and uncertainty. Prepare the student teacher for a future mathematics classroom</li> </ul>						
<ul style="list-style-type: none"> <li><b>Learning Outcome for the lesson, picked and developed from the course specification</b></li> <li><b>Learning indicators for each learning outcome</b></li> </ul>	<b>Learning Outcomes</b>		<b>Learning Indicators</b>		<b>Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?</b>		
	<ul style="list-style-type: none"> <li>Demonstrate knowledge and understanding of experimental and theoretical probability and how to use them to determine the probability of an event or outcome</li> <li>Demonstrate knowledge of instructional practices</li> </ul>		<ul style="list-style-type: none"> <li>participate in activities that can make student-teachers mathematically proficient; that is, understand mathematical ideas, compute fluently, solve problems, and engage in logical reasoning</li> <li>use mathematically proficient multiple strategies that are appropriate for developing experiments meant for teaching the concept of probability</li> </ul>		<ul style="list-style-type: none"> <li>Problem solving, critical and creative thinking: through objective analysis of facts and concept that will lead to creative thinking</li> <li>Social and communication skills: consciously develop observation and presentation skills during classroom instructions to support student teachers to transfer this to STS</li> </ul>		

	for teaching the Upper Primary School mathematics curriculum with emphasis on chance(NTS 3e)	<ul style="list-style-type: none"> <li>carry out basic mathematics instructional routines for Upper Primary School pupils, including reinforcement activities and engaging learners in mathematical discourse</li> <li>explain the steps and strategies involved in designing a good assessment tool and design an assessment tool with the rubrics for assessing mathematics learning in PRIMARY SCHOOL1-3</li> <li>explain syllabus guidelines for classroom assessment for learning (AfL), assessment of learning (AoL) and assessment as learning (AaL)[NTS 2b, 3l, 3m]</li> </ul>	<ul style="list-style-type: none"> <li>Communication skills: by critiquing assignments and presentations using rubrics co-designed by tutors and student teachers</li> <li>Assessment literacy: through modelling of comprehensive strategies embedded with instruction</li> </ul>	
Topic	Sub-topic(s)	Stage/ Time	Teaching and learning to activities to achieve learning outcomes depending on delivery mode selected. Teacher-lead collaborative group work or independent.	
			Teacher Activity	Student Activity
	Review	20mins	Review the previous lesson on handling data <b>(PD Theme 1)</b>	Participate in the discussion by answering questions and giving comments to enhance participation.
Handling Data2	Ideas of chance and uncertainty	40 mins	Engage student teachers in discussing the use of manipulative materials and other resources (including ICT tools) in modeling situations by constructing a sample space to determine probabilities <b>(PD Themes 1 &amp;3)</b>	Participate in the discussions based on the use of manipulative materials and other resources (including ICT tools) in modeling situations by constructing a sample space to determine probabilities
		40 mins	Assign student teachers to in collaborative groups to outline strategies for determining experimental and theoretical probabilities	Model situations by devising and carrying out experiments or simulations to determine probabilities
		40 mins	Engage student teachers in an interactive group to make predictions based on experimental or theoretical probabilities	Determine experimental and theoretical probabilities through collaborative group discussions
		40 mins	Assign student teachers to investigate probabilities for the possible outcomes of a simple experiment	Make predictions based on experimental or theoretical probabilities  Investigate probabilities for the possible outcomes of a simple experiment

<b>Lesson assessments – evaluation of learning: of, for and as learning within the lesson</b>	<p>Provide feedback on Subject Portfolio</p> <p>Provide feedback on Subject Projects</p>
<b>Instructional Resources</b>	Posters; video clips; downloads; models, etc.
<b>Required Text (core)</b>	<p>Arthur, J., Grainger, T. &amp; Wray, D. (2006). Learning to Teach in the Primary School. Canada: Taylor &amp; Francis e-Library. <a href="https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html">https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html</a></p> <p>Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. <a href="https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html">https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html</a>.</p> <p>Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. <a href="https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html">https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html</a>.</p> <p>Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. <i>Issues in the Undergraduate Mathematics Preparation of School Teachers, 2</i>.</p>
<b>Additional Reading List</b>	<p>Lakoff, G. &amp; Núñez, R. E. (2000). <i>Where Mathematics comes from</i>. New York: Basic Books.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Tutor notes</i>. Accra: Unimax Publishers.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Students activities</i>. Accra: Unimax Publishers.</p>
<b>CPD Needs</b>	<ul style="list-style-type: none"> <li>• How to design and teach mathematics using the new B. ED. Curriculum, NTS, NTECF, etc</li> <li>• How to design and/or use some innovative materials and ideas for teaching selected concepts based on Classroom assessment in mathematics in PRIMARY SCHOOL1-3.</li> <li>• How to manage transition of home to school.</li> <li>• Understand the various characteristics and uniqueness of Primary School learners.</li> <li>• How to design tasks for assessment procedures for assessment of, as and for learning.</li> <li>• Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.</li> </ul>

## Lesson 12

Year of B.Ed.	3	Semester	2	Place of lesson in semester	1 2 3 4 5 6 7 8 9 10 11 <b>12</b>
---------------	---	----------	---	-----------------------------	-----------------------------------

Title of Lesson	End of Semester Review (Lessons 1-11)				Lesson Duration	3 Hours	
<b>Lesson description</b>	This is the twelfth lesson which focuses much on the review of the whole semester mathematics course: Teaching and Assessing Upper Primary School mathematics. It serves as buffer to contain any unresolved conceptual issues that occurred within the semester. Here issues of how end of semester examination are to be conducted and to prepare the student teachers psychologically enough for incident-free end of semester examinations.						
<b>Previous student teacher knowledge, prior learning (assumed)</b>	Student-teachers have studied Teaching and Assessing upper primary school mathematics and can apply various mathematical concepts learnt, throughout the semester, in their teaching and assessment of related concepts.						
<b>Possible barriers to learning in the lesson</b>	Different entry behaviours, Socio-cultural issues, different learning needs, misconceptions about mathematics and methods of teaching mathematics. Conscious efforts should be made to address them before, during and after the lesson.						
<b>Lesson Delivery – chosen to support students in achieving the outcomes</b>	<b>Face-to-face</b> <input checked="" type="checkbox"/>	<b>Practical Activity</b> <input checked="" type="checkbox"/>	<b>Work-Based Learning</b> <input type="checkbox"/>	<b>Seminars</b> <input type="checkbox"/>	<b>Independent Study</b> <input type="checkbox"/>	<b>e-learning opportunities</b> <input checked="" type="checkbox"/>	<b>Practicum</b> <input type="checkbox"/>
<b>Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.</b>	<b>Face-to-face and e-learning opportunities</b> <ul style="list-style-type: none"> <li>The face-to-face mode will include lecturer/tutor-initiated class discussions, small group in class exploration, group presentations, think-pair-share moments, lecture, etc.,</li> <li>The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers</li> <li>Independent study would include writing self-assessment and presenting reflective papers or journals.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.</b></li> </ul>	The purpose of the lesson is to; <ul style="list-style-type: none"> <li>Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson.</li> <li>Develop student teachers' understanding of the nature and importance of mathematics, as well as, how to teach mathematics to Primary School learners.</li> <li>Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, with emphasis on using developmentally appropriate strategies for teaching Upper Primary School learners.</li> </ul>						
<ul style="list-style-type: none"> <li><b>Learning Outcome for the lesson, picked and developed from the course specification</b></li> <li><b>Learning indicators for each learning outcome</b></li> </ul>	<b>Learning Outcomes</b>	<b>Learning Indicators</b>		<b>Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?</b>			
	Demonstrate understanding of syllabus guidelines for classroom assessment and skills of effective assessment for teaching mathematics in the Upper Primary School specialism including designing an assessment tools with the rubrics and design assessment tool with	<ul style="list-style-type: none"> <li>identify and design tasks for teaching and assessing important mathematical ideas in number and other concepts including place value, fractions, as well as handling data to Upper Primary School pupils</li> <li>Use ICT as a tool in supporting PRIMARY SCHOOL pupils in learning selected concepts</li> </ul>		<ul style="list-style-type: none"> <li>Personal development: Through planning, teaching, and assessing both individually and in small groups, and sharing their experiences with peers</li> <li>Problem solving, critical and creative thinking: through objective analysis of facts and concept that will lead to creative thinking</li> </ul>			

	the rubrics Value as well as respect equity and inclusivity in the mathematics classroom (NTS 2f; NTECF 39)		<ul style="list-style-type: none"> <li>• Use of ICT: Integrate ICT in developing number and other concepts in the mathematics classroom</li> <li>• Use of ICT: Integrate ICT in developing number and in the mathematics classroom</li> </ul>	
Topic	Sub-topic(s)	Stage/ Time	Teaching and learning to activities to achieve learning outcomes depending on delivery mode selected. Teacher-lead collaborative group work or independent.	
			Teacher Activity	Student Activity
Review of concepts taught in the previous lessons	Review	10mins	Introduce the review of the previous lessons on place value and other concepts taught in the previous lessons <b>(PD Theme 1)</b>	Participate in the discussion on the previous lessons on place value and other concepts taught in the previous lessons
		50 mins	Lead discussions on how to connect the various concepts that are related to fractions <b>(PD Themes 1 &amp; 3)</b>	Use manipulatives such as number line, Cuisenaire rods, fractional charts, paper folding to explore operations of relationship among common fractions, decimal fractions, percent, ratio, proportion, probability, and others Explore possible further application of rational numbers in real life.
		60 mins	Highlight important ideas that have been developed in the previous lessons and have student teachers outline how these ideas can be used in teaching Upper Primary School students <b>(PD Themes 1 &amp; 3)</b>	Participate in the discussion of the ideas highlighted and outline how these ideas can be used in teaching Upper Primary School students
		60 mins	Discuss the nature of the End of Semester Examination with student teachers	Participate in the discussion based on the nature of the End of Semester Examination with student teachers
Lesson assessments – evaluation of learning: of, for and as learning within the lesson	<b>Subject Portfolio</b> Assign student teachers to complete teacher-made worksheets on operations and properties of rational and irrational numbers as found in the PRIMARY SCHOOL mathematics curriculum ( <i>provide immediate feedback</i> ) <b>Related CLOs:</b> 1, 2, 3 <b>NTS:</b> 2 b) Has comprehensive knowledge of the official school curriculum, including learning outcomes. 2b) <i>Has comprehensive knowledge of the official school curriculum, including learning outcomes</i> 3m) Identifies and remediates learners' difficulties or misconceptions, referring learners whose needs lie outside the competency of the teacher. <i>Note: The assessment procedures should make room for differentiation - gender, equity, SEN, and inclusivity.</i>			

<b>Instructional Resources</b>	Posters; video clips; downloads; models, etc.
<b>Required Text (core)</b>	<p>Arthur, J., Grainger, T. &amp; Wray, D. (2006). Learning to Teach in the Primary School. Canada: Taylor &amp; Francis e-Library. <a href="https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html">https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html</a></p> <p>Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. <a href="https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html">https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html</a>.</p> <p>Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. <a href="https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html">https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html</a>.</p> <p>Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. <i>Issues in the Undergraduate Mathematics Preparation of School Teachers</i>, 2.</p>
<b>Additional Reading List</b>	<p>Lakoff, G. &amp; Núñez, R. E. (2000). <i>Where Mathematics comes from</i>. New York: Basic Books.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Tutor notes</i>. Accra: Unimax Publishers.</p> <p>Martin, J. et. al. (1994). <i>Mathematics for teacher training in Ghana: Students activities</i>. Accra: Unimax Publishers.</p>
<b>CPD Needs</b>	<ul style="list-style-type: none"> <li>• How to design and teach mathematics using the new B. ED. Curriculum, NTS, NTECF, etc</li> <li>• How to design and/or use some innovative materials and ideas for teaching selected concepts based on Classroom assessment in mathematics in PRIMARY SCHOOL1-3.</li> <li>• How to manage transition of home to school.</li> <li>• Understand the various characteristics and uniqueness of Primary School learners.</li> <li>• How to design tasks for assessment procedures for assessment of, as and for learning.</li> <li>• Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.</li> </ul>
	<p><b>Component 1: Subject Portfolio Assessment (30% overall)</b></p> <ul style="list-style-type: none"> <li>• Selected items of students work(2 of them 10% each)-30%</li> <li>• Midterm assessment -20%</li> <li>• Reflective journal 40%</li> <li>• Organization of the subject portfolio-10% (how it is presented /organized)</li> </ul> <p><sup>2</sup><b>Component 2: Subject Project Assessment (30% overall score)</b></p> <ul style="list-style-type: none"> <li>• Introduction; a clear statement of aim and purpose of the project-10%</li> <li>• Methodology; what the student teacher has done and how achieve the purpose of the project-20%</li> <li>• Substantive or main section-40%</li> <li>• Conclusion – 30%</li> </ul> <p><b>Component 3: End of Semester Examination- (40% overall)</b></p>

<sup>1</sup> See rubrics on Subject Portfolio Assessment in Annex 6 of NTEAP

<sup>2</sup> See rubrics on Subject Project Assessment in Annex 6 of NTEAP





[www.t-tel.org](http://www.t-tel.org)