YEAR 3

SEMESTER 1

Four-Year B.Ed. Course Manual

Teaching and Assessing EG Maths

GOVERNMENT OF GHANA

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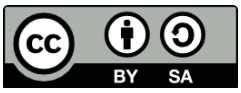

FOREWORD

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.

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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 ……

Mathematics Course Manual

Resources for Course Manual Writing

- Soft copies of the CWG, New Four-Year B.Ed. Curriculum introduction
- Soft and hard copies of the course specifications for the subject for year one and two
- Soft and hard Course Manual Writing Guide (CMWG)
- Relevant subject texts

Target Audience

- College of Education Tutors

Teacher Education University Lecturers

- Student Teachers
- Mentors

The purpose of course manuals

- To provide a lesson by lesson overview of the course, building on, adapting and developing the material in the course specifications
- 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
- To inform tutors /lecturers, student teachers and others working with student teachers about:
  - what is to be taught and why
  - how it can be taught
  - how it should be assessed
- To support consistency in the implementation of the New Four-Year B.Ed. across institutions who train teachers
- To ensure that all **training** information on skills, processes, and other information necessary to perform the teaching taskare together in one place.
- To operationalize the Teacher Education Reform Policy; the requirements of the NTS & NTECF and the Four-Year B.Ed.

Guiding principles of course manual writing

1. They are written with the learner, the student teacher, in mind: what they will *be able* to cope with and only include what student teachers need to know, understand, be able to do and be as a basic school teacher
2. They take in to consideration the learner's, the student teacher's, context and possible barriers to, and enablers for, learning
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
4. They are aligned to the key principles and practices of the Teacher Education Reform Policy: the NTS, the NTECF andthe New Four-Year B.Ed.
5. They are written to provide opportunities for student teachers to develop and apply knowledge during supported teaching in school
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.
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.
8. They are to be used as self-study tools.
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

What a teacher educator needs to know, understand and use to inform what they do

- The aims and structure of the education system and Education strategic Plan
- The Basic School Curriculum
- The Inclusion Policy
- 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.
- Andragogy, effective methods and practices for teaching adult learners
- Assessment Literacy. Assessment for, of and as learning -Educative Assessment

Guidance for completing the mathematics course manual writing

A. Course Information

Title Page

i. Course name: as in course specification unless important reason why not

ii. The vision for the New Four-Year B.Ed. Curriculum

''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 honesty, integrity, creativity and responsible citizenship and to achieve inclusive, equitable, high quality education for all learners. ''

iii. Course Details: as in course specification unless important reason why not

Pre-requisite/s	The programme / previous semester courses studied.		
Co-Requisites	Links to other courses being taught, support coherence in student experience and avoid duplication		
Course Level	Course Code	Credit Value	3

Table of contents

Each manual will include:

1. The goal for the subject or learning area
2. Course description
3. Key contextual factors
4. Core and cross cutting issues, including equity and inclusion
5. Course Learning outcomes
6. Course content
7. Teaching and learning strategies
8. Course Assessment components
9. Reading and reference list
10. Handouts, power points and other resources for lessons
11. Plans for each lesson in the semester

A. Course information

1. Goal for the Subject or Learning Area

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.

2. Key contextual factors

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 forstudent 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.

3. *Course Description*

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.

4. *Core and transferable skills and cross cutting issues, including equity and inclusion*

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.

5. Course Learning Outcomes

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 ***not*** what student teachers will do **on** the course. They must be

6. Learning indicators

- 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.

appropriate and realistic to the learner's abilities, experience, the identified level of the course and *content.* They must be measurable – allowing assessment of student teacher achievement

- 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)

7. Course content

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 *briefly* 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

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.

9. Teaching and learning strategies

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

10. Required Reading and reference list

e 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.

11. Teaching and Learning Resources

Instructional resources required to support learning during the course e.g.: TLMs, lab and workshop equipment, videos, projectors

Course related professional development for tutors/ lecturers

This is not included the course manual 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. Semester lesson plans

Guidance for Lesson planning

The expanded format is ddesigned 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 **Transitional Support Funding (TSF)**

Things to consider when writing and reviewing lessons:

- Will all student teachers be able to achieve the learning outcomes and demonstrate the indicators by undertaking the activities set out in the lesson?
- What might be barriers to learning? How can you address these barriers?
- How does the lesson support progress in and or consolidate student teacher learning; including building on prior learning and supporting progress to next lessons?
- How will you can address transition from school to CoE in the first semester?
- Are there explicit links between learning outcomes, learning indicators and assessments?
- Do all activities support student teachers in achieving the lesson learning outcomes?
- Is there an emphasis on interactive, learner focused approaches to training new teachers?
- Does it explicitly address cross cutting -issues: equity and inclusion, gender, SEN,ICT?
- Does it explicitly develop core skills, including: professional values and attitudes, classroom enquiry and reflection?
- Overall the lesson must be 'do-able' for the student teacher
    - in the time available
    - with the skills, knowledge and understanding they have

Title of Lesson **Lesson Duration**							
Lesson description	**It is essential that student teachers know what this lesson is about. The lesson description should be short, clear, and accessible to all students.**						
Previous student teacher knowledge, prior **learning (assumed)**	• What links to previous knowledge / prior learning need to be built in to the lesson? • 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 • 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.						
Possible barriers to learning in the lesson	• 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? • How will you address these? • Does this lesson require that student teachers examine their own bias? If so, you will need to plan to support and address this						
Points on equity, inclusivity (gender, SEN), and addressing diversity	• You need to represent and address diversity in your lesson-plan. Are there multiple diversity issues (see diversity wheel) ? • How would these issues be addressed with student teachers during activities for both their own learning and the learning of the students they will teach? • 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? • 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? • For example: gender stereotype issues related to: PE, literacy and language, science and mathematics.						
Lesson Delivery – chosen to support students in achieving the outcomes	**Face-to-face**	**Practical Activity**	**Work-Based Leaning**	**Seminars**	**Independent Study**	**e-learning opportunities**	**Practicum**
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning	**Face-to-face:** 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. **Practical Activity:** enabling experimentation and the analysis and discussion of issues, documents and materials, as well as physical activities. **Work based learning:** to allow students to undertake observation, enquiry and/or hands-on						

outcomes.	development work (mostly TVET) **Seminars:** to generate group and individual creativity, discussion and reflection: student and / or tutor led **Independent study:** 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 **E-learning *opportunities*** – 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. **Practicum (supported teaching in school):** support to enable student teachers toexperience 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.	
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.** • **Write in full aspects of the NTS addressed**	• What is the main thing you want student teachers to know, understand and be able to do as a result of this lesson? • 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? • This will relate back to the overall intention and learning outcomes for the course.	
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes** • The learning outcomes for the lesson will enable student teachers to achieve the purpose for the lesson. • 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. • 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….' • Learning outcomes may be developed and re-visited over a number of lessons • Be realistic in terms of what can be achieved in any one lesson • Some learning outcomes may address specific student teacher needs	**Learning Indicators** • 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. • 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)

<table>
<tr><td rowspan="3">Content of lesson picked and developed from the course specification

Unit/s covered from the course specification:</td><td rowspan="3">Time or stage
Identify how much time will be required for each part of the lesson</td><td rowspan="3">Topics and sub-topics (if any):</td><td colspan="2">Teaching and learning to achieve learning outcomes: depending on delivery mode selected. Teacher led, collaborative group work or independent study</td></tr>
<tr><td>Teacher Activity</td><td>Student Activity</td></tr>
<tr><td>• Plan to model what is expected of student teachers
• Plan for activities to support student teachers in working towards and / or demonstrating achieving the learning outcomes.
• Where possible set up activities with students as active participants
• Make links to other aspects of the New Four-Year B.Ed. programme or between subject and pedagogic knowledge
• State if team teaching involved or additional tutors contributing</td><td>For example: Interactive and collaborative group and pair work, e.g.,
• identifying, developing, presenting and evaluating suitable resources and materials
• picking out key points from education texts, raising questions and issues
• sharing practice and experience
• preparing for school visits
• self and peer assessment
Other examples
• Student teacher led seminars
• ICT e.g. discussion using VLE
• Video observation of and analysis of teaching
• Role-play</td></tr>
<tr><td>Which core or transferable skills will be used or developed and how</td><td colspan="4">e and transferable skills include: critical thinking, problem solving, social skills, creative thinking and communication skills, use of ICT</td></tr>
<tr><td>Which cross cutting issues will be addressed or developed and how</td><td colspan="4">ss cutting issues include: assessment literacy and assessing students' progress and professional values and attitudes, reflection and classroom enquiry</td></tr>
<tr><td>Lesson assessments – evaluation of learning:of, for and as learning within the lesson</td><td colspan="4">• Assessment as learning: ongoing self-assessment by student teachers reflecting on their own learning and making adjustments so that they achieve deeper understanding, occurs throughout the learning process. This needs to be planned for in the lesson.
• 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. This needs to be planned for in the lesson.
• 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
• Differentiation in lessons (UDL guidelines): the lesson needs to include a range of teaching and assessment strategies to motivate and reach all learners
• The approach to assessment in lessons must be appropriate to the teaching and learning strategies</td></tr>
<tr><td>Instructional Resources</td><td colspan="4">This may include: handouts, power points, examples of children's work, video, ICT activities, examples of previous student teachers' work</td></tr>
<tr><td>Required Text (core)</td><td colspan="4"></td></tr>
<tr><td>Additional Reading List</td><td colspan="4"></td></tr>
</table>

LESSON 1

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

Title of Lesson	Counting, Patterns and Relationships (Teaching and Assessing)				**Lesson Duration**		**3 Hours**
Lesson description	This lesson focuses on developing an understanding of Teaching and Assessing EGMathematics and about how people think about mathematics and how an understanding of EG mathematics develops. It provides an in-depth knowledge of place value, fractions, Patterns and Relationships and explores student teachers' beliefs about mathematics and philosophies of mathematics implicit in the official mathematics curriculum and current classroom practice. It also covers children's developmental stages, how children learn mathematics with respect to the Basic School Mathematics curriculum, and other psychological factors influencing learning. Another area that is considered essential is developing awareness of equity and diversity issues. Here, student teachers are reminded that this is one of the courses that seek to prepare them to become well-groomed professional teachers in the Early Grade mathematics specialism. This first lesson introduces student teachers to the course learning outcomes in the three assessment components of the course.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers have been thought theories in the teaching and learning of mathematics, and are familiar with concepts based on child growth, development, and maturation; they are exposed to number and numeration systems as well as handling dada; they have experienced some mathematics during their basic and secondary education period as well as their previous semester's mathematics courses.						
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** ☒	**Practical Activity** ☒	**Work-Based Leaning** ☐	**Seminars** ☐	**Independent Study** ☒	**e-learning opportunities** ☒	**Practicum** ☐
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	***Face-to-face and e-learning opportunities*** • 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., • The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers • Independent study would include writing self-assessment and presenting reflective papers or journals.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.**	The purpose of the lesson is to; • Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson. • develop student teachers' understanding of the nature and importance of mathematics, as well as, how to teach mathematics to Early Grade learners. • Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially School Mathematics curriculum to Early Gradelearners. • Prepare the student teacher for a future mathematics classroom						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?**		
	Demonstrate knowledge and skills of observation and reporting on class teaching and wider school activities **(in**		• Produce well-prepared induction schedule and procedures		• Inclusion and Equity: by supporting student teachers to recognize institutional and personal sources of barriers to leaning and making conscious		

	School 1) *(College & School induction by tutors,school heads, lead mentors and mentors)* Demonstrate knowledge and Understanding of the key features of the basic school curriculum (BSC); and specifically focusing on mathematics curriculum and their associated expected learning outcomes (NTS, 2a). 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)	• Provide records of group workactivities and/or cooperativelearning for student teachers duringobservations • Show evidence of keepingrecords of specific observations from wider school environment and induction • Produce a report on small group discussions with mentors and peers on the key features of the official basic school curriculumand list identified key features in the BSC. • Submit a write-up of the developing teacher's knowledge of self-awareness, beliefs, and values of teaching and learning (personal teaching philosophy) • Make oral presentations ofknowledge gained during inductionand observation by studentteachers in their groups.	efforts to address them. • 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). • Managing transitions: by giving orientation to student teachers to have an ability to incorporate/ integrate subjects (Knowledge of the Early Grade curriculum) to approaches to T and L in SHSbetween subjects subject. • Collaboration:is fostered through assigning group projects and presentation of various topics across units. • Teaching:by giving support to the student teachers to grasp the understanding of the subject content and ability to teach this using teaching and assessment strategies appropriate for EARLY GRADE. • Communicative skillsof 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	
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	**40 mins**	Introduces student teachers to the Course Manual and discuss the various components including assessment procedures **(See** Course Assessment Components**),** ***(PD Theme 1)***	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.

WEEK 1 Counting, Patterns and Relationships (Teaching and Assessing)	Introduction Counting and representing numbers in multiple of ways and indifferent bases Number patterns and relationships; numerical and non-numerical patterns; Investigations with numbers; sets of numbers – odd, even, composite, prime, Multiples, factors, LCM, HCF, relatively prime numbers, etc. (e.g. 10 ones = 1 ten 10 tens = 1 hundred, etc.)	**20 mins** **30 mins** **30 mins** **30 mins**	Introduce theUpper Primary Mathematics curriculum, and relate it to Teaching and Assessing Early Grade Mathematics 1; ***(PD Themes 1 &3)*** Engage student teachers in counting and representing numbers in multiple of ways and indifferent bases ***(PD Themes 1 & 3)*** Assign student teachers to explore Number patterns and relationships; numerical and non-numerical patterns; ***(PD Themes 3 & 4)*** Monitor student teachers as they investigations with numbers; sets of numbers – odd, even, composite, prime; (***PD Theme 1)*** Engage student teachers in groups to explore multiples, factors, LCM, HCF, relatively prime numbers, etc. (e.g. 10 ones = 1 ten 10 tens = 1 hundred, etc.) ***(PD Themes 1 & 3)***	Listen attentively to the tutor or lecturer's verbal exposition and to supply responses to Teaching and Assessing Early Grade Mathematics 1 Engage in counting activities to represent numbers in multiple of ways and in different bases Engage in a think-pair-share session to explore Number patterns and relationships; numerical and non-numerical patterns such as triangular, square, calendar, figurative, etc  1 1+2 1+2+3 1+2+3+4 Use variety of tools and strategies to investigations with numbers; sets of numbers – odd, even, composite, prime eg use of pairing of objects and rectangular designs, sieve of Eratosthenes, etc. Engage in a group discussion to explore the multiples, factors, LCM, HCF, relatively prime numbers, etc. using Cuisenaire rods, counters (through repeated addition), Multibase Arithmetic Blocks. Use investigations to explore relationships among the properties of prime and composite numbers (by using divisibility rules);
Lesson assessments – evaluation of learning: of, for and as learning within the lesson	**Summary Assessment Method: reflective paper presentation** 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.*To be included in their portfolio* ***Related CLOs****: 1,* 3 and 6 **NTS**: 1a) Critically and collectively reflects to improve teaching and learning. 2 b) Has comprehensive knowledge of the official school curriculum, including learning outcomes. *2b) Has comprehensive knowledge of the official school curriculum, including*			

	learning outcomes *3l) Listens to learners and gives constructive feedback* 3m) Identifies and remediates learners' difficulties or misconceptions, referring learners whose needs lie outside the competency the teacher. Advance Preparation 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.
Instructional Resources	Posters; video clips; downloads; cardboards, models,EARLY GRADE curriculum, etc.
Required Text (core)	Arthur, J., Grainger, T. & Wray, D. (2006). Learning to Teach in the Early Grade. Canada: Taylor & Francis e-Library. https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html. Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html. Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. *Issues in the Undergraduate Mathematics Preparation of School Teachers*, *2*.
Additional Reading List	Lakoff, G. & Núñez, R. E. (2000). *Where Mathematics comes from*. New York: Basic Books. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Tutor notes*. Accra: Unimax Publishers. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Students activities*.Accra: Unimax Publishers.
CPD Needs	How to design and/or use some innovative materials and ideas for teaching selected concepts based on themeaning, aims and course learning outcomes of the mathematics curriculum. • Standards-based curriculum. • How to manage content and methods of teaching maths at the same time. • Understand the various characteristics and uniqueness of Early Grade curriculum. • How to design tasks for assessment procedures for assessment of, as and for learning. • Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports based on Learning Objectives of the EG curriculum.

LESSON 2

Year of B.Ed.	3	Semester	1	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**	
Lesson description	This lesson focuses on developing an understanding ofTeaching and Assessing Early Grade Mathematics and about how people think about mathematics and how an understanding of mathematics develops. It provides an overview of philosophies of mathematics and mathematics education and explores student teachers' beliefs about mathematics and philosophies of mathematics implicit in the official mathematics curriculum and current classroom practice. It also coversTeaching and Assessing Place value and outlined in the basic school curriculum. Another area that is considered is developing awareness of equity and diversity issues.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers have been thought theories in the teaching and learning of mathematics, and are familiar with concepts based on child growth, development, and maturation; they are exposed to number and numeration systems as well as handling dada; they have experienced some mathematics during their basic and secondary education period as well as their previous semester' mathematics courses.						
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** ☒	**Practical Activity** ☒	**Work-Based Leaning** ☐	**Seminars** ☐	**Independent Study** ☒	**e-learning opportunities** ☒	**Practicum** ☐
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	***Face-to-face and e-learning opportunities*** • 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., • The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers • Independent study would include writing self-assessment and presenting reflective papers or journals.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.**	The purpose of the lesson is to; • Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson. • develop student teachers' understanding of the nature and importance of mathematics, as well as, how to teach mathematics to Early Grade learners. • Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, School Mathematics curriculum to Early Grade learners. • Prepare the student teacher for a future mathematics classroom						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?**		
	Demonstrate knowledge and skills of observation and reporting on class teaching and wider school activities **(in School 1)** *(College & School induction by tutors, school heads, lead mentors and mentors)*		• Produce well-prepared induction schedule and procedures • Provide records of group work activities and/or cooperative		• Inclusion and Equity: by supporting student teachers to recognize institutional and personal sources of barriers to leaning and making conscious efforts to address them. • Digital literacy**:** can afford student teachers the opportunity to develop records		

	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) Develop and use age appropriate TLMs from locally available materials for upper primary (NTS 3j, pg. 14)	learning for student teachers during observations • Show records of specific observations from wider school environment and induction • Make oral presentations of knowledge gained to apply to age appropriate TLMs from locally available materials in their groups.	for reflective journals using digital tools. • Managing transitions: by giving orientation to student teachers to have an ability to incorporate/ integrate subjects (Knowledge of the EARLY GRADE curriculum) to approaches to T and L in SHSbetween subjects subject. • Characteristics and uniqueness of upper primary learners: By encouraging student teachers to develop awareness of how Knowledge and understanding of child growth, development and maturation support young children's learning • Communicative skillsof 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

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**
WEEK 2 Place Value (Teaching and Assessing)	**Review**	**10mins**	Review the previous lesson by asking student teachers to present their reflective paper on the importance of mathematics to society; ***(PD Theme 1)***	Participate in the discussion to review the previous lesson;
	Concept of place value;	**40 mins**	Introduce the lesson by reviewing children background knowledge on place value and use it to establish the concept of place value. ***(PD Themes 1 &3)***	respond to place value based enquiry and to ask questions where necessary *The value of a digit due its position in a number. eg. **Hundred** / **Ten** / **Unit** 3 / 4 / 5 4 / 5 / 3 5 / 3 / 4 3=300 3=30 3=3 4=400 4=40 4=4 5=500 5=50 5=5

	Children's knowledge of and misconceptions of place value; Meaning of and relationship between operations; mental strategies and other problem solving strategies; Dealing with operations on numbers up to 10,000,000.	**40 mins** **40 mins** **50 mins**	Engage student teachers in a discussion to unravel their knowledge of and misconceptions of place value; ***(PD Themes 1 & 3)*** Assign student teachers to explore Meaning of and relationship between operations; mental strategies and other problem solving strategies; ***(PD Themes 3 & 4)*** Engage student teachers to design appropriate manipulatives for dealing with operations on numbers up to 10,000,000 (***PD Theme 1***	Engage in think-pair-share strategies to discuss the misconceptions of the learners with respect to place value. Use interactive collaborative group work to explore the place value structure of the base ten number system, to represent and compare whole numbers 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 Explore the appropriate strategies for solving place value up to 10,000,000and to discuss their findings in groups of five or six. Engage in a think-pair-share session to outline strategies for teaching place value

Lesson assessments – evaluation of learning: of, for and as learning within the lesson	**Subject Portfolio** 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) **Related CLOs: 1,** 3, 5 **NTS:** 2b) Has comprehensive knowledge of the official school curriculum, including learning outcomes. 2f) Demonstrate value as well as respect for equity and inclusion in the mathematics classroom (knowledge) 3k) Integrates a variety of assessment modes into teaching to support learning. 1. *Note: The assessment procedures should make room for differentiation - gender, equity, SEN, and inclusivity.*
Instructional Resources	Posters; video clips; downloads; models, etc.
Required Text (core)	Arthur, J., Grainger, T. & Wray, D. (2006). Learning to Teach in the Early Grade. Canada: Taylor & Francis e-Library. https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html. Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html. Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. *Issues in the Undergraduate Mathematics Preparation of School Teachers*, *2*.

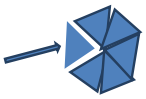
Additional Reading List	Lakoff, G. & Núñez, R. E. (2000). *Where Mathematics comes from*. New York: Basic Books. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Tutor notes*. Accra: Unimax Publishers. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Students activities*.Accra: Unimax Publishers.
CPD Needs	• How to design and/or use some innovative materials and ideas for teaching selected concepts based on theories of learning in Early Grade mathematics. • How to manage transition of home to school. • Understand the various characteristics and uniqueness of Early Grade learners. • How to design tasks for assessment procedures for assessment of, as and for learning. • Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.

LESSON 3

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

Title of Lesson	Fraction concepts (Teaching and Assessing)				**Lesson Duration**	**3 Hours**	
Lesson description	This lesson focuses on developing an understanding offractional concepts and about how people think about mathematics and how an understanding of mathematics develops. It provides an overview of philosophies of mathematics and mathematics education and explores student teachers' beliefs about mathematics and philosophies of mathematics implicit in the official mathematics curriculum and current classroom practice. It also covers common fractions, equivalent, decimal numbers, and percent and how they are related, and other psychological factors influencing learning of fractions in the upper Early Grade. Another area that is considered is developing awareness of equity and diversity issues.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers have been thought theories in the teaching and learning of mathematics, and are familiar with concepts based on child growth, development, and maturation; they are exposed to number and numeration systems as well as handling dada; they have experienced some mathematics during their basic and secondary education period as well as their previous semester mathematics courses.						
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** ☒	**Practical Activity** ☒	**Work-BasedLeaning** ☐	**Seminars** ☐	**Independent Study** ☒	**e-learning opportunities** ☒	**Practicum** ☐
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	***Face-to-face and e-learning opportunities*** • 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., • The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers • Independent study would include writing self-assessment and presenting reflective papers or journals.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.**	The purpose of the lesson is to; • Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson. • develop student teachers' understanding of the nature and importance of mathematics, as well as, how to teach mathematics to Early Grade learners. • Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, School Mathematics curriculum to Early Grade learners. • Prepare the student teacher for a future mathematics classroom						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?**		
	Demonstrate knowledge and skills of observation and reporting on class teaching and wider school activities **(in School 1)** *(College & School induction by tutors, school heads, lead mentors and mentors)*		• Produce well-prepared induction schedule and procedures • Provide records of group work activities and/or cooperative learning for student teachers duringobservations		• Inclusion and Equity: by supporting student teachers to recognize institutional and personal sources of barriers to leaning and making conscious efforts to address them.		

	Use age appropriate subject knowledge, pedagogical knowledge and pedagogical content knowledge to teach the Basic School Curriculum in a broad, balanced, relevant and creative manner (NTS 2c, pg. 13, 3e & 3g, pg. 14) [NTECF P1 (3), pg. 20] Demonstrate knowledge and understanding of the key features of the basic school curriculum (BSC); and specifically focusing on mathematics curriculum and their associated expected learning outcomes (NTS, 2a).	• Provide a write-up of the developing teacher's self-awareness, beliefs, and values of teaching and learning (personal teaching philosophy) • Make oral presentations of knowledge gained during induction and observation by student teachers in their groups.	• Characteristics and uniqueness of upper primary learners: By encouraging student teachers to develop awareness of how knowledge and understanding of child growth, development and maturation support young children's learning • 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 • 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).	

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	**10mins**	Review the previous lesson by asking student teachers questions on basic fractional concepts ***(PD Theme 1)***	Participate in the discussion to review the previous lesson; $\frac{1}{6}$ (One-sixth) 
WEEK 3 Fraction concepts (Teaching and Assessing)	Meaning of fractions; Building an understanding of common fractions, Finding equivalent fractions;	**20 mins** **40 mins**	Engage student teachers in a discussion towards building an understanding of common fractions using variety of TLRs ***(PD Themes 1 & 3)*** Assign student teachers in groups to explore equivalent fractions ***(PD Themes 3 & 4)***	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 • part of a unit or whole, • a sport on the number line, • part of a group, or comparing two sets, and • a ration of two integers, using variety of manipulatives such as paper folding, Cuisenaire rods, linoleum, etc to represent

	Comparing and ordering fractions. Decimal fractions and percent Application of fractions in real life situations.	**40 mins** **30 mins** **20 mins**	Engage student teachers in a discussion to develop and order common fractions Engage student teachers in a discussion based on decimal fractions and percent Group student teachers to brainstorm and outline real life situations.	fractions as rational numbers, equivalent, and/or operator, Engage student-teachers to develop the concept of equivalent fractions using models and multi-purpose chart (multiplication table), fractional boards, sets, etc. Use area model or any similar manipulative to explore the relationships among common fractions, decimal fractions, and percent. Use knowledge of equivalent fractions to compare and order fractions. Engage in a think-pair-share session to outline the strategies and materials (TLMs) suitable for teaching fractions. They list real life activities that contribute to the understanding of fractions.
Lesson assessments – evaluation of learning:of, for and as learning within the lesson	• **Subject Portfolio** Assign student teachers to develop equivalent fractions from locally available resources to be shared among colleagues in their small group presentation. **Related CLOs**: 1, 2 **NTS**: 2b) Has comprehensive knowledge of the official school curriculum, including learning outcomes. 3m) Identifies and remediates learners' difficulties or misconceptions, referring learners whose needs lie outside the competency of the teacher.			
Instructional Resources	Posters; video clips; downloads; models, etc.			
Required Text (core)	Arthur, J., Grainger, T. & Wray, D. (2006). Learning to Teach in the Early Grade. Canada: Taylor & Francis e-Library. https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html. Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html. Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. *Issues in the Undergraduate Mathematics Preparation of School Teachers*, *2*.			
Additional Reading List	Lakoff, G. & Núñez, R. E. (2000). *Where Mathematics comes from*. New York: Basic Books. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Tutor notes*. Accra: Unimax Publishers. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Students activities*.Accra: Unimax Publishers.			
CPD Needs	• How to design and/or use some innovative materials and ideas for teaching selected concepts based on theories of learning in Early Grade mathematics. • How to manage transition of home to school. • Understand the various characteristics and uniqueness of Early Grade learners. • How to design tasks for assessment procedures for assessment of, as and for learning. • Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.			

LESSON 4

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

Title of Lesson	Operations on fractions: (Teaching and Assessment)				**Lesson Duration**	**3 Hours**	
Lesson description	This lesson focuses on developing an understanding ofOperations on fractions: (Teaching and Assessment)with respect to operations on fraction within the basic school curriculum. It provides an overview of philosophies of mathematics and mathematics education and explores student teachers' beliefs about fractions in real life implicit in the official mathematics curriculum and current classroom practice. It also areas such as mental strategies for adding, subtracting, multiplying and dividing by fractions; Basic applications of fractions to real life. Another area that is considered is developing awareness of equity and diversity issues.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers have been thought theories in the teaching and learning of mathematics, in relation to common concepts of fractions. They are exposed to basic concepts of sharing; they have experienced some mathematics during their basic and secondary education period and the previous semester of the B. Ed. Programme.						
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** ☒	**Practical Activity** ☒	**Work-Based Leaning** ☐	**Seminars** ☐	**Independent Study** ☒	**e-learning opportunities** ☒	**Practicum** ☐
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	***Face-to-face and e-learning opportunities*** • 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., • The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers • Independent study would include writing self-assessment and presenting reflective papers or journals.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.**	The purpose of the lesson is to; • Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson. • develop student teachers' understanding of the nature and importance of mathematics, as well as, how to teach mathematics to Early Grade learners. • Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, School Mathematics curriculum to Early Grade learners. • Prepare the student teacher for a future mathematics classroom						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify Which cross-cutting issues-core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?**		
	• Demonstrate knowledge and understanding of forms and features of assessment; • Demonstrate knowledge and understanding of the key features of the basic school curriculum (BSC); and specifically focusing		• Identify and explain the various forms of fractions and within the basic school curriculum • Produce well-prepared induction schedule and procedures		• Assessment literacy: through modelling the use of assessment for, as, and of learning to help student teachers engage in peer and self-assessment • Equity and inclusivity: Providing equitable learning opportunities for all learners		

	on mathematics curriculum and their associated expected learning outcomes (NTS, 2a). • Demonstrate knowledge and understanding of the changing face of educational assessment • 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)	• Provide records of group work activities and/or cooperative learning for student teachers during observations • Outline similarities and differences among the forms of assessment and their implications for classroom practice; • Involve those with special educational needs and creating a safe, secure, happy and stimulating in teaching and learning.	• Social and communication skills: consciously develop presentation skills during classroom instructions to support student teachers to develop mathematical language • Personal development: Through presentation and developing of arguments • Prepare and present STS observation activities to peers in their groups.

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 by asking student teachers relevant questions on operations on fractions***(PD Theme 1)***	Participate in the discussion on the operations on fractions
WEEK 4 Operations on fractions: (Teaching and Assessment)	Mental strategies for adding, subtracting, multiplying and dividing by fractions; Basic applications of fractions to real life.	**40 mins** **60 mins** **60 mins**	Introduce the lesson through verbal exposition and discussion on purposes of different forms of assessment in mathematics learning in EARLY GRADE1-3; ***(PD Themes 1 &3)*** Engage student teachers in a discussion to outline the various forms of assessment tool – observation guide, questionnaire, interview protocol, tests ***(PD Themes 1 & 3)*** Assign student teachers to explore various test by working at each of the following steps: purpose, format, test blue-print, writing well-defined	engage in verbal exposition and discussion on purposes of different forms of assessment in mathematics learning in EARLY GRADE1-3 • assessment for learning (AfL), • assessment of learning (AoL) and • assessment as learning (AaL) as well as • syllabus guidelines for classroom assessment; 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.

			questions one after the other with answers. ***(PD Themes 3 & 4)*** Monitor student teachers to evaluate some teacher made tests to see if they meet the following five criteria of a good test (***PD Theme 1***	multiple choice, constructed response), group tests, focus group interview protocol, etc.) as well as how they are administered. Design a test by working at each of the following steps: purpose, format, test blue-print, writing well-defined questions one after the other with answers. 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. Evaluate some teacher made tests to see if they meet the following five criteria of a good test: clarity, validity, practicality, efficiency and fairness
Lesson assessments – evaluation of learning: of, for and as learning within the lesson	**Subject Project** 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) ○ review past BECE mathematics questions for clarity, correctness, and completeness, as well as, write assessment tasks based on **Related CLOs**: 1, 4 **NTS:** 2f) Demonstrate value as well as respect for equity and inclusion in the mathematics classroom (knowledge) *3j) Produces and uses a variety of teaching and learning resources including ICT, to enhance learning* ***N/B: To be submitted in the 7th week of the semester.***			
Instructional Resources	Posters; video clips; downloads; models, etc.			
Required Text (core)	Arthur, J., Grainger, T. & Wray, D. (2006). Learning to Teach in the Early Grade. Canada: Taylor & Francis e-Library. https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html. Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html. Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. *Issues in the Undergraduate Mathematics Preparation of School Teachers*, *2*.			
Additional Reading List	Lakoff, G. & Núñez, R. E. (2000). *Where Mathematics comes from*. New York: Basic Books. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Tutor notes*. Accra: Unimax Publishers.			

	Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Students activities*.Accra: Unimax Publishers.
CPD Needs	• How to design and/or use some innovative materials and ideas for teaching selected concepts based on Classroom assessment in mathematics in EARLY GRADE1-3. • How to manage transition of home to school. • Understand the various characteristics and uniqueness of Early Grade learners. • How to design tasks for assessment procedures for assessment of, as and for learning. • Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.

LESSON 5

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

Title of Lesson	Micro Lessons and use of technology across Early Grade numeracy: (Teaching and Assessing)				**Lesson Duration**	**3 Hours**	
Lesson description	This lesson focuses on developing an understanding ofMicro Lessons and use of technology across Early Grade numeracy: (Teaching and Assessing) and how an understanding of mathematics develops from creative activities. It provides an overview of philosophies of mathematics and mathematics education and explores student teachers' beliefs about mathematics and philosophies of mathematics implicit in the official mathematics curriculum and current classroom practice. It also covers Micro Lessons and use of technology across Early Grade numeracy, and associated theories, and other psychological factors influencing learning. Another area that is considered is developing awareness of equity and diversity issues.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers have been thought theories in the teaching and learning of mathematics, and are familiar with concepts based on child growth, development, and maturation; they are exposed to number and numeration systems as well as handling dada; they have experienced some mathematics during their basic and secondary education period.						
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** ☒	**Practical Activity** ☒	**Work-Based Leaning** ☐	**Seminars** ☐	**Independent Study** ☒	**e-learning opportunities** ☒	**Practicum** ☐
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	***Face-to-face and e-learning opportunities*** • 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., • The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers • Independent study would include writing self-assessment and presenting reflective papers or journals.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.**	The purpose of the lesson is to; • Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson. • develop student teachers' understanding of the nature and importance of mathematics, as well as, how to teach mathematics to Early Grade learners. • Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, micro-teaching to Early Grade learners. • Prepare the student teacher for a future mathematics classroom						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?**		
	Demonstrate knowledge and skills of observation and reporting on class teaching and wider school activities **(in School 1)** *(College & School induction by tutors, school heads, lead mentors and mentors)*		• Design and produce well-prepared induction schedule and procedures • Show evidence of keeping records of group work activities and/or cooperative learning for student teachers during observations		• Equity and inclusivity: Providing equitable learning opportunities for all learners • Assessment literacy: through modelling of effective record keeping		

	Demonstrate knowledge and understanding of the key features of the 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)	• Report on small group discussions with mentors and peers on the key features of the official basic school curriculum List identified key features in the BSC. • Provide a write-up of the developing teacher's self-awareness, beliefs, and values of teaching and learning (personal teaching philosophy) • Make oral presentations of knowledge gained during induction and observation by student teachers in their groups.	• Communication skills: through critiquing and presentations • Personal development: Through developing and presentation of records • Social and communication skills: consciously develop presentation skills during classroom instructions to support student teachers to develop mathematical language

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	**10mins**	Review the previous lesson by asking student teachers relevant questions on the need for planning micro lessons. ***(PD Theme 1)***	Participate in the discussion on the need for classroom assessment in mathematics during micro planning and teaching.
WEEK 5 Micro Lessons and use of technology across Early Grade numeracy 1	Importance of lesson planning Micro lesson planning formats Design of micro lessons	**40 mins** **40 mins** **40 mins** **30 mins**	Introduce the lesson on verbal exposition and discussion on purposes of different forms of assessment in mathematics learning in EARLY GRADE1-3; ***(PD Themes 1 &3)*** Micro lesson planning formats Engage student teachers in planning and carrying out micro teaching with peers. Guide student teachers in planning micro lessons based on using mathematical learning pedagogy and resources to critique a mathematics lesson ***(PD Themes 1 & 3)*** Engage students in post-lesson discussions using prepared guidelines for micro teaching.	Initiate verbal exposition and discussions on importance of lesson planning, micro lesson planning formats and technology use in teaching mathematics at the Early Grade level. Engage in small group preparation using variety of locally available TLMs (observing and/or watching video clips} on teaching mathematics in the Early Gradeand 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 Read teaching scenarios (and/or watching video clips} on teaching numeracy in the EG and 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 Early Grade.
Lesson assessments – evaluation of learning: of, for and as learning within the lesson	**Subject Portfolio** • Assign student teachers to plan, design, and prepare manipulatives and other models to teach selected concepts in Early Grademathematics using locally available and/or IT resources • Prepare and model interactive, and innovative ways of teaching mathematics, including, micro-teaching to Early Grade learners, with emphasis on multiple teaching strategies that promote equity and inclusivity. **Related CLOs**: 1, 3, 4 **NTS**: 2 b) Has comprehensive knowledge of the official school curriculum, including learning outcomes. *2b) Has comprehensive knowledge of the official school curriculum, including learning outcomes*3m) Identifies and remediates learners' difficulties or misconceptions, referring learners whose needs lie outside the competency of the teacher.			
Instructional Resources	Posters; video clips; downloads; models, etc.			
Required Text (core)	Arthur, J., Grainger, T. & Wray, D. (2006). Learning to Teach in the Early Grade. Canada: Taylor & Francis e-Library. https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html. Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html. Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. *Issues in the Undergraduate Mathematics Preparation of School Teachers*, *2*.			
Additional Reading List	Lakoff, G. & Núñez, R. E. (2000). *Where Mathematics comes from*. New York: Basic Books. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Tutor notes*. Accra: Unimax Publishers. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Students activities*.Accra: Unimax Publishers.			
CPD Needs	• How to design and/or use some innovative materials and ideas for teaching selected concepts based on Classroom assessment in mathematics in EARLY GRADE1-3. • How to manage transition of home to school. • Understand the various characteristics and uniqueness of Early Grade learners. • How to design tasks for assessment procedures for assessment of, as and for learning. • Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.			

LESSON 6

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

Title of Lesson	Diagnosis and remediation; assessment resources/records, and monitoring progress: (Teaching and Assessing)				**Lesson Duration**	**3 Hours**	
Lesson description	This lesson focuses on developing an understanding ofDiagnosis and remediation; assessment resources/records, and monitoring progress: (Teaching and Assessing) and how an understanding of mathematics develops. It provides an overview of philosophies of mathematics and mathematics education and explores student teachers' beliefs about mathematics and philosophies of mathematics implicit in the official mathematics curriculum and current classroom practice. It also covers Micro Lessons and use of technology across Early Grade numeracy and associated theories, and other psychological factors influencing learning. Another area that is considered is developing awareness of equity and diversity issues.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers have been thought theories in the teaching and learning of mathematics, and are familiar with concepts based on child growth, development, and maturation; they are exposed to number and numeration systems as well as handling dada; they have experienced some mathematics during their basic and secondary education period.						
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** ☒	**Practical Activity** ☒	**Work-Based Leaning** ☐	**Seminars** ☐	**Independent Study** ☒	**e-learning opportunities** ☒	**Practicum** ☐
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	***Face-to-face and e-learning opportunities*** • 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., • The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers • Independent study would include writing self-assessment and presenting reflective papers or journals.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.**	The purpose of the lesson is to; • Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson. • develop student teachers' understanding of the nature and importance of mathematics, as well as, how to teach mathematics to Early Grade learners. • Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, micro-teaching to Early Grade learners. • Prepare the student teacher for a future mathematics classroom						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?**		
	• Demonstrate knowledge and understanding of how to plan, design, and develop appropriate plan for a micro lesson		• 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		• Needs of the student teachers: Consciously identify and address the needs of student teachers and to inspire them for effective transfer of knowledge		

	• Demonstrate competencies in using differentiated instructional strategies, with a focus on a thematic approach and which promotes learner-centred to cater for the needs of all learners, including those with SEN **(NTS 3f, pg. 14)** • Demonstrate knowledge and understanding of the key features of the 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)	• Plan a lesson using strategies that match the level of thinking needed by EARLY GRADEpupils • Show records of specific observations from wider school environment and induction • Report on small group discussions with mentors and peers on the key features of the official basic school curriculum • List identified key features in the BSC. • Provide a write-up of the developing teacher's self-awareness, beliefs, and values of teaching and learning (personal teaching philosophy)	• Respect and diversity: designing lesson for diverse learners with different learning styles • Social and communication skills: consciously develop observation and presentation skills during classroom instructions to support student teachers to transfer this to STS • Respect and diversity: designing lesson for diverse learners with different learning styles • Communication skills: through critiquing and presentations	
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	**10mins**	Review the previous lesson by asking student teachers relevant questions on lesson planning ***(PD Theme 1)***	Participate in the discussion on micro lesson planning
WEEK 6 Diagnosis and remediation; assessment resources/records, and monitoring progress: (Teaching and Assessing)	Introduction Misconception diagnosis, Classroom assessment resources and records Interpreting data/reports on performance and providing feedback Evaluating performance and monitoring Progress,	**20 mins** **50 mins** **60 mins**	Introduce the lesson on verbal exposition and discussion on micro lessons ***(PD Themes 1 &3)*** Engage student teachers in a discussion to outline the various forms of lessons planning in mathematics ***(PD Themes 1 & 3)*** Assign student teachers in groups to prepare lesson plans, discuss and model	Discusses feedback of previous micro lesson for feedback and application. Design tools to diagnose misconceptions and designing/ implementing remediation from the discussion of the various forms of lessons planning in mathematics 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,

		40 mins	micro teaching in the class. ***(PD Themes 3 & 4)*** Monitor student teachers teaching skills (***PD Theme 1***	cumulative records forms, report forms, etc., Study and complete student's cumulative record form Analyse learners' performance (or assessment data) to provide feedback to stakeholders – students, colleagues and parents, PTA and role playing a School Performance Appraisal Meeting (SPAM)
Lesson assessments – evaluation of learning: of, for and as learning within the lesson	**Subject Portfolio** 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 EARLY GRADE mathematics curriculum through small group activity for peer review **Related CLOs**: 1, 2, 3 **NTS**: 2 b) Has comprehensive knowledge of the official school curriculum, including learning outcomes. *2b) Has comprehensive knowledge of the official school curriculum, including learning outcomes* 3m) Identifies and remediates learners' difficulties or misconceptions, referring learners whose needs lie outside the competency of the teacher. *Note: The assessment procedures should make room for differentiation - gender, equity, SEN, and inclusivity.*			
Instructional Resources	Posters; video clips; downloads; models, etc.			
Required Text (core)	Arthur, J., Grainger, T. & Wray, D. (2006). Learning to Teach in the Early Grade. Canada: Taylor & Francis e-Library. https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html. Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html. Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. *Issues in the Undergraduate Mathematics Preparation of School Teachers*, *2*.			
Additional Reading List	Lakoff, G. & Núñez, R. E. (2000). *Where Mathematics comes from*. New York: Basic Books. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Tutor notes*. Accra: Unimax Publishers. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Students activities*.Accra: Unimax Publishers.			
CPD Needs	• How to design and teach mathematics using the new B. ED. Curriculum, NTS, NTECF, etc • How to design and/or use some innovative materials and ideas for teaching selected concepts based on Classroom assessment in mathematics in EARLY GRADE1-3. • How to manage transition of home to school. • Understand the various characteristics and uniqueness of Early Grade learners. • How to design tasks for assessment procedures for assessment of, as and for learning. • Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.			

LESSON 7

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

Title of Lesson	Shape, Space and Measurement: (Teaching and Assessment)				**Lesson Duration**	**3 Hours**	
Lesson description	This lesson focuses on developing an understanding ofTeaching and Assessing Early Grade Mathematicsespecially, Shape, Space and Measurement: (Teaching and Assessment) and how an understanding of mathematics develops. It provides an overview of philosophies of mathematics and mathematics education and explores student teachers' beliefs about mathematics and philosophies of mathematics implicit in the official mathematics curriculum and current classroom practice. It also covers 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). Another area that is considered is developing awareness of equity and diversity issues.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers have been thought theories in the teaching and learning of mathematics, and are familiar with concepts based on child growth, development, and maturation; they are exposed to number and numeration systems as well as handling dada; they have experienced some mathematics during their basic and secondary education period, as well as the previous semester's course						
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** ☒	**Practical Activity** ☒	**Work-Based Leaning** ☐	**Seminars** ☐	**Independent Study** ☒	**e-learning opportunities** ☒	**Practicum** ☐
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	***Face-to-face and e-learning opportunities*** • 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., • The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers • Independent study would include writing self-assessment and presenting reflective papers or journals.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.**	The purpose of the lesson is to; • Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson. • develop student teachers' understanding of the nature and importance of mathematics, as well as, how to teach mathematics to Early Grade learners. • Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, Teaching Integers in the Basic School to Early Grade learners. • Prepare the student teacher for a future mathematics classroom						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?**		
	Demonstrate knowledge and understanding of concepts of integers and how these can be taught to EARLY GRADE pupils (professional values, knowledge & practice) **(NTS, 2b)**		• Select and use developmentally appropriate models and strategies for teaching integers that emphasize the physical, cognitive, emotional and social development of the early adolescent learner		• 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		

	Demonstrate competencies in devising and using differentiated 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 EARLY GRADE classroom, including those with SEN **(NTS 3f, pg. 14)**	• Outline and analyse strategies early adolescent learners use in developing concepts in integers such as operations on integers • Use knowledge gained from earning theories in mathematics to design appropriate problem-solving tasks. • Recognise and use developmentally appropriate and positive behaviour management skills	• Problem solving, critical and creative thinking: through objective analysis of facts and concept that will lead to creative thinking • 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 • Respect and diversity: designing lesson for diverse learners with different learning styles

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	**10mins**	Review the previous lesson by asking student teachers relevant questions lesson planning ***(PD Theme 1)***	Participate in the discussion on micro lesson planning
WEEK 7 Shape, Space and Measurement: (Teaching and Assessment)	Spatial visualization; concept of space; line segments, angles and shapes; 3-D (faces, vertices, edges and their relationships) and 2-D shapes (types and properties); Measurable attributes of objects including length, angle, area, volume and capacity, mass, weight, time and money	**20 mins** **40 mins** **40 mins** **70 mins**	Introduce the lesson on integers as shape and space. ***(PD Themes 1 &3)*** Lead discussions on concept of shape and space. ***(PD Themes 1 & 3)*** Assign student teachers in groups to determine perimeters and areas of 2-D shapes Establish individual/ group project work to help student teachers develop understanding of such attributes as length, angle, area, volume and capacity, time, and money	Initiate verbal exposition and discussions on integers and technology use in teaching of shape and space. Provide student-teachers with e-learning opportunities to explore the concept of shape and space. Use models of 3-D shapes for practical investigation to explore the relationship among the number of faces, edges, and vertices of given shapes. Use guided independent study, student-teachers find areas and perimeters of 2-D shapes. Use individual/group project work to develop understanding of such attributes as length, angle, area, volume and capacity, time, and money.

Lesson assessments – evaluation of learning: of, for and as learning within the lesson	**Subject Portfolio** Assign student teachers to complete teacher-made worksheets on length, angle, area, volume and capacity, mass, weight, time and money(*provide immediate feedback*) **Related CLOs**: 1, 2, 3 **NTS**: 2 b) Has comprehensive knowledge of the official school curriculum, including learning outcomes. *2b) Has comprehensive knowledge of the official school curriculum, including learning outcome*3m) Identifies and remediates learners' difficulties or misconceptions, referring learners whose needs lie outside the competency of the teacher. **SubjectProject** Collection and discussion of Projectto be graded later *Note: The assessment procedures should make room for differentiation - gender, equity, SEN, and inclusivity.*
Instructional Resources	Posters; video clips; downloads; models, etc.
Required Text (core)	Arthur, J., Grainger, T. & Wray, D. (2006). Learning to Teach in the Early Grade. Canada: Taylor & Francis e-Library. https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html. Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html. Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. *Issues in the Undergraduate Mathematics Preparation of School Teachers*, *2*.
Additional Reading List	Lakoff, G. & Núñez, R. E. (2000). *Where Mathematics comes from*. New York: Basic Books. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Tutor notes*. Accra: Unimax Publishers. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Students activities*.Accra: Unimax Publishers.
CPD Needs	• How to design and teach mathematics using the new B. ED. Curriculum, NTS, NTECF, etc • How to design and/or use some innovative materials and ideas for teaching selected concepts based on Classroom assessment in mathematics in EARLY GRADE1-3. • How to manage transition of home to school. • Understand the various characteristics and uniqueness of Early Grade learners. • How to design tasks for assessment procedures for assessment of, as and for learning. • Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.

LESSON 8

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

Title of Lesson	Handling Data and Chance: *(Teaching and Assessing)*				**Lesson Duration**	**3 Hours**	
Lesson description	This lesson focuses on developing an understanding ofTeaching and Assessing Early Grade Mathematics and about how people think about mathematics and how an understanding of mathematics develops. It provides an overview of philosophies of mathematics and mathematics education and explores student teachers' beliefs about mathematics and philosophies of mathematics implicit in the official mathematics curriculum and current classroom practice. It also covers Handling Data and Chance*(Teaching and Assessing)*, and other psychological factors influencing learning. Another area that is considered is developing awareness of equity and diversity issues.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers have been thought theories in the teaching and learning of mathematics, and are familiar with concepts based on child growth, development, and maturation; they are exposed to number and numeration systems as well as handling dada; they have experienced some mathematics during their basic and secondary education period.						
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** ☒	**Practical Activity** ☒	**Work-Based Leaning** ☐	**Seminars** ☐	**Independent Study** ☒	**e-learning opportunities** ☒	**Practicum** ☐
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	***Face-to-face and e-learning opportunities*** • 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., • The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers • Independent study would include writing self-assessment and presenting reflective papers or journals.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.**	The purpose of the lesson is to; • Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson. • develop student teachers' understanding of the nature and importance of mathematics, as well as, how to teach mathematics to Early Grade learners. • Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, Teaching Integers in the Basic School to Early Grade learners. • Prepare the student teacher for a future mathematics classroom						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?**		
	Demonstrate a comprehensive knowledge of the official EARLY GRADE mathematics curriculum and learning outcomes covering number and their relationships, within operations on integers(NTS 2b)		• show a good understanding of number relationships and place value, as well as using techniques for practical mathematics and estimation as a means of promoting a deeper number sense within the context of multiplication and division of integers		• Problem solving, critical and creative thinking: through objective analysis of facts and concept that will lead to creative thinking		

	Demonstrate knowledge of instructional practices for teaching the EARLY GRADE mathematics curriculum(NTS 3e)	• can make children mathematically proficient using multiple strategies that are appropriate for concepts of integers • show evidence of enjoying mathematics and have confidence in their abilities to do mathematics • carry out basic mathematics instructional routines for EARLY GRADE pupils, including drill and practice, reinforcement activities and engage learners in mathematical discourse • justify and explain one's instructional practices and reflect on those practices for improvementwithin the context of properties of integers • plan effective instruction and solve problems that arise during instructioninvolving application of integers in real life	• Problem solving, critical and creative thinking: through objective analysis of facts and concept that will lead to creative thinking • Personal development: Through planning, teaching, and assessing both individually and in small groups, and sharing their experiences with peers • Social and communication skills: consciously develop observation and presentation skills during classroom instructions to support student teachers to transfer this to STS • Respect and diversity: designing lesson for diverse learners with different learning styles	

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	**10mins**	Review student teachers knowledge of sets of objects ***(PD Theme 1)***	Participate in the discussion on Data and Chance
WEEK 8 Handling Data and Chance *(Teaching and Assessing)*	Introduction Collecting, interpreting and presenting data in multiple ways; Measures of central tendencies, Graphical or pictorial, representation (including stem and leaf plots, five number summary, box plots). Chance: sample space; events; basic properties of chance.	**20 mins** **60 mins** **60 mins**	Introduce student teachers to what Data and Chance are ***(PD Themes 1 &3)*** lead discussions on operation on integers, especially, multiplication and division of integers ***(PD Themes 1 & 3)*** Assign student teachers in groups to outline how to Collect, interpret and present data in multiple ways Lead student	Initiate verbal exposition and discussions what Data and Chance are Use group and individual projects to collect data based on events happening within and out of the school organization. Use group and individual presentations to discuss how to organize, present, and interpret the data collected. Use games and practical activities to introduce the concept of chance. Engage student-teachers through group work to explore the

		50 mins	teachers to explore the concepts of sample space, events, and basic properties of chance through group activities	concepts of sample space, events, and basic properties of chance
Lesson assessments – evaluation of learning: of, for and as learning within the lesson	**SubjectProject** Student teachers are assigned to design appropriate teaching and learning materials for Collecting, interpreting and presenting data and chance10th week **Related CLOs**: 3, 5, 6 **NTS**: 2 b) Has comprehensive knowledge of the official school curriculum, including learning outcomes. *2b) Has comprehensive knowledge of the official school curriculum, including learning outcomes* 3m) Identifies and remediates learners' difficulties or misconceptions, referring learners whose needs lie outside the competencyof the eacher. *Note: The assessment procedures should make room for differentiation - gender, equity, SEN, and inclusivity.*			
Instructional Resources	Posters; video clips; downloads; models, etc.			
Required Text (core)	Arthur, J., Grainger, T. & Wray, D. (2006). Learning to Teach in the Early Grade. Canada: Taylor & Francis e-Library. https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html. Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html. Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. *Issues in the Undergraduate Mathematics Preparation of School Teachers*, *2*.			
Additional Reading List	Lakoff, G. & Núñez, R. E. (2000). *Where Mathematics comes from*. New York: Basic Books. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Tutor notes*. Accra: Unimax Publishers. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Students activities*.Accra: Unimax Publishers.			
CPD Needs	• How to design and teach mathematics using the new B. ED. Curriculum, NTS, NTECF, etc • How to design and/or use some innovative materials and ideas for teaching selected concepts based on Classroom assessment in mathematics in EARLY GRADE1-3. • How to manage transition of home to school. • Understand the various characteristics and uniqueness of Early Grade learners. • How to design tasks for assessment procedures for assessment of, as and for learning. • Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.			

LESSON 9

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

Title of Lesson	Rational and Irrational Number 1				**Lesson Duration**	**3 Hours**	
Lesson description	This lesson focuses on developing an understanding ofTeaching and Assessing Early Grade Mathematics and about how people think about mathematics and how an understanding of mathematics develops. It provides an overview of philosophies of mathematics and mathematics education and explores student teachers' beliefs about mathematics and philosophies of mathematics implicit in the official mathematics curriculum and current classroom practice. It also covers Rational and Irrational numbers and associated theories, and other psychological factors influencing learning. Another area that is considered is developing awareness of equity and diversity issues.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers have been thought theories in the teaching and learning of mathematics, and are familiar with concepts based on child growth, development, and maturation; they are exposed to number and numeration systems as well as handling dada; they have experienced some mathematics during their basic and secondary education period.						
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** ☒	**Practical Activity** ☒	**Work-Based Leaning** ☐	**Seminars** ☐	**Independent Study** ☒	**e-learning opportunities** ☒	**Practicum** ☐
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	***Face-to-face and e-learning opportunities*** • 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., • The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers • Independent study would include writing self-assessment and presenting reflective papers or journals.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.**	The purpose of the lesson is to; • Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson. • develop student teachers' understanding of the nature and importance of mathematics, as well as, how to teach mathematics to Early Grade learners. • Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, Rational and Irrational numbers to Early Grade learners. • Prepare the student teacher for a future mathematics classroom						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?**		
	Demonstrate knowledge and understanding of the key features of the basic school curriculum (BSC); and specifically focusing on rational and irrational numbers (NTS, 2a). Demonstrate awareness of socio-cultural issues in teaching and learning number concepts (NTS 2f)		• 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 the various aspects of the real number system		• Personal development: Through planning, teaching, and assessing both individually and in small groups, and sharing their experiences with peers • Problem solving, critical and creative thinking: through objective analysis of facts and concept that will lead to creative thinking		

	Demonstrate knowledge and conceptual understanding of number with focus on rational and irrational numbers Demonstrate competencies in using manipulative and TLMs including ICT in a variety of ways in teaching fractions and decimal concepts (NTS 3j) Value as well as respect equity and inclusivity in the mathematics classroom (NTS 2f; NTECF 39)	• identify and design tasks for teaching important mathematical ideas in number to EARLY GRADE pupils • identify a variety of manipulative and TLMs for teaching important mathematical ideas such as operations and properties of rational and irrational numbers • Use ICT as a tool in supporting EARLY GRADE pupils in learning number • Appreciate the contributions of, and support, colleagues in the mathematics classroom • Cooperate with colleagues in carrying out mathematical tasks in a variety of ways • Engage in reflective thinking about how mathematics was taught in their basic school days.	• Personal development: Through presentation and developing of arguments • Use of ICT: Integrate ICT in developing number and in the mathematics classroom • Use of ICT: Integrate ICT in developing number and in the mathematics classroom • Respect and diversity: designing lesson for diverse learners with different learning styles • Social and communication skills: consciously develop observation and presentation skills during classroom instructions to support student teachers to transfer this to STS	
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	**10mins**	Review the previous lesson on rational numbers as related to real number system. ***(PD Theme 1)***	Participate in the discussion on various aspects of the real number system.
WEEK 9 Rational and Irrational numbers 1	The Real number system relationships among the various aspects of real number system Operations and properties of rational numbers application of real number system to real life	**50 mins** **60 mins** **60 mins**	Introduce the lesson on Real number system; ***(PD Themes 1 &3)*** Lead discussions on how to connect the various real number systems ***(PD Themes 1 & 3)*** Lead discussions on properties and operations of the real numbers ***(PD Themes 1 & 3)*** Assign student teachers in groups to	Initiate verbal exposition and discussions on integers and technology use in Real number system across the EARLY GRADE curriculum. Use manipulatives to establish the relationship between and among the various real number systems. Use manipulatives such as number line, Cuisenaire rods, fractional charts, paper folding to explore properties and operations of the real numbers Explore possible further

			outline real number system.	application of rational numbers in real life.
Lesson assessments – evaluation of learning: of, for and as learning within the lesson	**Subject Portfolio** Assign student teachers to complete teacher-made worksheets on operations and properties of rational and irrational numbers as found in the EARLY GRADE mathematics curriculum (*provide immediate feedback*) **Related CLOs**: 1, 2, 3 **NTS**: 2 b) Has comprehensive knowledge of the official school curriculum, including learning outcomes. *2b) Has comprehensive knowledge of the official school curriculum, including learning outcomes* 3m) Identifies and remediates learners' difficulties or misconceptions, referring learners whose needs lieoutside the competency of the teacher. *Note: The assessment procedures should make room for differentiation - gender, equity, SEN, and inclusivity.*			
Instructional Resources	Posters; video clips; downloads; models, etc.			
Required Text (core)	Arthur, J., Grainger, T. & Wray, D. (2006). Learning to Teach in the Early Grade. Canada: Taylor & Francis e-Library. https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html. Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html. Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. *Issues in the Undergraduate Mathematics Preparation of School Teachers*, *2*.			
Additional Reading List	Lakoff, G. & Núñez, R. E. (2000). *Where Mathematics comes from*. New York: Basic Books. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Tutor notes*. Accra: Unimax Publishers. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Students activities*.Accra: Unimax Publishers.			
CPD Needs	• How to design and teach mathematics using the new B. ED. Curriculum, NTS, NTECF, etc • How to design and/or use some innovative materials and ideas for teaching selected concepts based on Classroom assessment in mathematics in EARLY GRADE1-3. • How to manage transition of home to school. • Understand the various characteristics and uniqueness of Early Grade learners. • How to design tasks for assessment procedures for assessment of, as and for learning. • Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.			

LESSON 10

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

Title of Lesson	Fractions 1				**Lesson Duration**	**3 Hours**	
Lesson description	This lesson focuses on developing an understanding of Teaching and Assessing Early Grade Mathematics and about how people think about mathematics and how an understanding of mathematics develops. It provides an overview of philosophies of mathematics and mathematics education and explores student teachers' beliefs about mathematics and philosophies of mathematics implicit in the official mathematics curriculum and current classroom practice. It also covers children's developmental stages, how children learn mathematics and associated theories, and other psychological factors influencing learning of fractions. Another area that is considered is developing awareness of equity and diversity issues.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers have been thought theories in the teaching and learning of mathematics, and are familiar with concepts based on child growth, development, and maturation; they are exposed to number and numeration systems as well as handling dada; they have experienced some mathematics during their basic and secondary education period.						
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** ☒	**Practical Activity** ☒	**Work-Based Leaning** ☐	**Seminars** ☐	**Independent Study** ☒	**e-learning opportunities** ☒	**Practicum** ☐
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	***Face-to-face and e-learning opportunities*** • 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., • The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers • Independent study would include writing self-assessment and presenting reflective papers or journals.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.**	The purpose of the lesson is to; • Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson. • develop student teachers' understanding of the nature and importance of mathematics, as well as, how to teach mathematics to Early Grade learners. • Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, fractions to Early Grade learners. • Prepare the student teacher for a future mathematics classroom						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**		**Identify Which cross-cutting issues-core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?**		
	nstrate a comprehensive knowledge of the official EARLY GRADE mathematics curriculum and learning outcomes covering number and numeration, their relationships, place value,fractionsas well as the principles behind these concepts (NTS 2b)		• show a good understanding of number relationships and place value, as well as using techniques for practical activities involving the development of fraction concepts to promote mathematical thinking		• Respect and diversity: designing lesson for diverse learners with different learning styles • Personal development: through planning, teaching, and assessing both individually and in small groups, and sharing their experiences with peers		

	Demonstrate knowledge and understanding of the key features of the basic schoolmathematics curriculumwith emphasis on Interpreting fractions and Operation of fractions (addition and subtraction) 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)	• plan lesson based on addition and subtraction that seeks provide equitable learning opportunities for all learner • outline activities that make children mathematically proficient by considering the developmental level of the learners • Use manipulatives, ICT tools, and other TLMs to establish mathematical principles based on addition and subtraction of fractions	• Equity and inclusivity: Providing equitable learning opportunities for all learners • Problem solving, critical and creative thinking: through objective analysis of facts and concept that will lead to creative thinking • Personal development: through conscious modelling of planning, presentation and assessment • Use of ICT: Integrate ICT in developing fraction concepts in the mathematics classroom

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**
WEEK 11 Fractions 1 (Teaching and Assessing)	**Introduction**	**10mins**	Review the previous lesson by reviewing student teachers knowledge on rational and irrational numbers ***(PD Theme 1)***	Participate in the discussion by answering questions and giving comments to enhance participation.
	Developing fraction concept, fractional parts, and naming fractions Interpreting fractions (e.g. part-whole,	**50 mins** **60 mins** **60 mins**	Introduce the concept of fractions by assessing the student teachers background on fractions. ***(PD Themes 1 &3)*** Give exposition on the correct naming of fractions such as one-half for $\frac{1}{2}$, two-fifths for $\frac{2}{5}$ and seven-third for , $\frac{7}{3}$	Engage in the discussions of concept of fractions by defining and giving examples of fractions such as $\frac{1}{2}, \frac{2}{5}, \frac{7}{3}$ Pay attention to the exposition for the correct naming of fractions such as one-half for $\frac{1}{2}$, two-fifths for $\frac{2}{5}$ and seven-third for , $\frac{7}{3}$ instead of one-over-two, three-over-five, and seven-over-three respectively. Engage in a collaborative group work to explore how fractions are represented and interpreted through ICT tools and other manipulatives. Fractions as part-whole, ratio, linear, etc. Part of unit/whole, part of a group, ratio

	ratio), models of fractions, equivalent fractions. Operation of fractions: (Addition and subtractions) Whole number with a fraction, fraction with whole number and fraction with another fraction.		instead of one-over-two, three-over-five, and seven-over-three respectively. ***(PD Themes 1 & 3)*** Assign student to explore how fractions are represented and interpreted through ICT tools and other manipulatives . Include; Fractions as part-whole, ratio, linear, etc) Use the multi-purpose multiplication chart to explore equivalent fraction concepts ***(PD Themes 1 & 3)*** Connect how knowledge of equivalent fractions can be used to introduce operations on fractions (eg. Addition and subtraction of fractions). Assign student	Participate in the exploratory activity using the multi-purpose chart and other manipulatives to explore the concepts of equivalent fractions 1 2 3 4 5 2 4 6 8 10 3 6 9 12 15 4 8 12 16 20 5 10 15 20 25 Using the first two rows for an illustration, we can generate the equivalence fractions of $\frac{1}{2}$ as follows: $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8}$, … Use the knowledge of equivalent fractions to explore operations on fractions (eg. Addition and subtraction of fractions). Example, Solve $\frac{1}{2} + \frac{1}{3}$ Using the multi-purpose chart above, we can write $\frac{1}{2} + \frac{1}{3}$ as $\frac{3}{6} + \frac{2}{6} = \frac{2+3}{6} = \frac{5}{6}$ 1 2 3 2 4 6 3 6 9 4 8 12 5 10 15 6 12 18 1 2 2 4 3 6 4 8 5 10 6 12 Work more examples on common fractions groups 1 2 2 4 3 6 4 8 5 10 6 12 Solve problems on fractions and also plan lessons on fractions in groups for peer review

			teachers in groups to outline properties of Integers initiate collaborative group activity identify areas where integers are applied in real life Assign student teachers to work more examples on common fractions Have student teachers solve problems on fractions and also plan lessons on fractions in groups for peer review	
Lesson assessments – evaluation of learning: of, for and as learning within the lesson	**Subject Portfolio:** Collection and discussion of Cumulative Learning Portfolio for grading later.			
Instructional Resources	Posters; video clips; downloads; models, etc.			
Required Text (core)	Arthur, J., Grainger, T. & Wray, D. (2006). Learning to Teach in the Early Grade. Canada: Taylor & Francis e-Library. https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html. Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html. Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. *Issues in the Undergraduate Mathematics Preparation of School Teachers*, *2*.			
Additional Reading List	Lakoff, G. & Núñez, R. E. (2000). *Where Mathematics comes from*. New York: Basic Books. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Tutor notes*. Accra: Unimax Publishers. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Students activities*.Accra: Unimax Publishers.			
CPD Needs	• How to design and teach mathematics using the new B. ED. Curriculum, NTS, NTECF, etc • How to design and/or use some innovative materials and ideas for teaching selected concepts based on Classroom instruction and assessment of mathematics in EARLY			

	GRADE1-3. • How to manage transition of home to school. • Understand the various characteristics and uniqueness of Early Grade learners. • How to design tasks for assessment procedures for assessment of, as and for learning. • Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.

LESSON 11

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

Title of Lesson	Fractions 2					**Lesson Duration**	**3 Hours**
Lesson description	This lesson focuses on developing an understanding ofTeaching and Assessing Early Grade Mathematics and about how people think about mathematics and how an understanding of mathematics develops. It provides an overview of philosophies of mathematics and mathematics education and explores student teachers' beliefs about mathematics and philosophies of mathematics implicit in the official mathematics curriculum and current classroom practice. It also covers children's developmental stages, how children learn mathematics and associated theories, and other psychological factors influencing learning of fractions. Another area that is considered is developing awareness of equity and diversity issues.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers have been thought theories in the teaching and learning of mathematics, and are familiar with concepts based on child growth, development, and maturation; they are exposed to number and numeration systems as well as handling dada; they have experienced some mathematics during their basic and secondary education period.						
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** ☒	**Practical Activity** ☒	**Work-Based Leaning** ☐	**Seminars** ☐	**Independent Study** ☒	**e-learning opportunities** ☒	**Practicum** ☐
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	***Face-to-face and e-learning opportunities*** • 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., • The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers • Independent study would include writing self-assessment and presenting reflective papers or journals.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.**	The purpose of the lesson is to; • Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson. • develop student teachers' understanding of the nature and importance of mathematics, as well as, how to teach mathematics to Early Grade learners. • Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, fractions to Early Grade learners. • Prepare the student teacher for a future mathematics classroom						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**			**Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?**	
	Demonstrate knowledge and understanding of the key features of the basic school mathematics curriculum with emphasis on Interpreting fractions and Operation of fractions (multiplication and division) through practical-based creative approaches		• participate in activities that can make student-teachers mathematicallyproficient; that is, understand mathematical ideas, compute fluently, solve problems, and engage in logical reasoning • use mathematically proficient multiple			• Problem solving, critical and creative thinking: through objective analysis of facts and concept that will lead to creative thinking	

	Demonstrate knowledge of instructional practices for teaching the EARLY GRADE mathematics curriculum(NTS 3e) Demonstrate understanding of syllabus guidelines for classroom assessment and skills of effective assessment for teaching mathematics in the EARLY GRADEspecialism including designing an assessment tools with the rubrics and design assessment tool with the rubrics	strategies that are appropriate for a developing multiplication and division of fractions • carry out basic mathematics instructional routines for EARLY GRADE pupils, including reinforcement activities and engaging learners in mathematical discourse • explain the steps and strategies involved in designing a good assessment tool • design an assessment tool with the rubrics for assessing mathematics learning in EARLY GRADE1-3 • explain syllabus guidelines for classroom assessment for learning (AfL), assessment of learning (AoL) and assessment as learning (AaL)[NTS 2b, 3l, 3m]		• Social and communication skills: consciously develop observation and presentation skills during classroom instructions to support student teachers to transfer this to STS • Communication skills: by critiquing assignments and presentations using rubrics co-designed by tutors and student teachers • Assessment literacy: through modelling of comprehensive strategies embedded with instruction
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	**10mins**	Review the previous lesson on addition and subtraction of fractions ***(PD Theme 1)***	Participate in the discussion by answering questions and giving comments to enhance participation.
WEEK 12 Fractions 2	**Operations on fractions (**Multiplication and Division of fractions): Whole number with a fraction, fraction with whole number and fraction with another fraction. Connecting common and decimal fractions and percent	**50 mins** **60 mins** **60 mins**	Engage student teachers in discussingthe use of manipulative materials and other resources (including ICT tools) in modeling multiplication of fractions ***(PD Themes 1 &3)*** Assign student teachers to in collaborative groups to outline strategies for planning and teaching multiplication of fractions Engage student	Participate in the discussions based on the use of manipulative materials and other resources (including ICT tools) in modeling multiplication of fractions Outline strategies for planning and teaching multiplication of fractions in groups Discuss the use of models and manipulatives to develop the concepts involving division of fractions Work more examples on division of fractions

	Applications and review		teachers in an interactive group discussion to develop the concepts involving division of fractions using variety of models and manipulatives (e.g fractional charts/boards, strips of paper, grids,Cuisenaire rods, etc.,) Give exposition on the need for connecting common and decimal fractions and percent Engage student teachers in an interactive group activity to connect common and decimal fractions and percent ***(PD Themes 1 & 3)*** Engage student teachers to connect common fractions, decimal fractions, and percent using knowledge of equivalent fractions Lead a discussion to establish the fact that to decimal fractions are common fractions whose equivalences have denominators (or fractional parts) which are 10 or powers of 10 Use interactive group activity to identify and outline potential applications of the concepts discussed in this course to	Pay attention to the exposition on the need for connecting common and decimal fractions and percent Participate in the group activity to connect common and decimal fractions and percent using a variety of models, manipulatives and other resources, including draught board, grids, the multi-purpose charts Engage in a collaborative group work to connect common fractions, decimal fractions, and percent using knowledge of equivalent fractions For example, when converting the common fraction $\frac{1}{2}$ to a decimal fraction, we can use the chart above (in an extended form) to generate the equivalent fractions of the given fraction, that is, $\frac{1}{2}=\frac{2}{4}=\frac{3}{6}=\frac{4}{8}=\frac{5}{10}$. This shows that $\frac{1}{2}=\frac{5}{10}=0.5$, because the denominator of $\frac{5}{10}$ is 10. Similarly, since $\frac{1}{2}=\frac{5}{10}$, we can represent $\frac{1}{4}$ as follows $\frac{1}{4}=\frac{1}{2}.\frac{1}{2}=\frac{5}{10}.\frac{5}{10}=\frac{25}{100}$. This shows that $\frac{25}{100}=\frac{25}{100}=0.25$. Participate in the interactive group activity to identify and outline potential applications of the concepts discussed in this course to EARLY GRADE curriculum.

1	2	3	4	5
2	4	6	8	10
3	6	9	12	15
4	8	12	16	20
5	10	15	20	25

			EARLY GRADE curriculum. Engage student teachers in a review of the various lessons within the course to ensure mathematical connection	Review of the various lessons within the course to ensure mathematical connection
Lesson assessments – evaluation of learning: of, for and as learning within the lesson	Provide feedback on Subject Portfolio Provide feedback on Subject Projects			
Instructional Resources	Posters; video clips; downloads; models, etc.			
Required Text (core)	Arthur, J., Grainger, T. & Wray, D. (2006). Learning to Teach in the Early Grade. Canada: Taylor & Francis e-Library. https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html. Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html. Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. *Issues in the Undergraduate Mathematics Preparation of School Teachers*, *2*.			
Additional Reading List	Lakoff, G. & Núñez, R. E. (2000). *Where Mathematics comes from*. New York: Basic Books. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Tutor notes*. Accra: Unimax Publishers. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Students activities*.Accra: Unimax Publishers.			
CPD Needs	• How to design and teach mathematics using the new B. ED. Curriculum, NTS, NTECF, etc • How to design and/or use some innovative materials and ideas for teaching selected concepts based on Classroom assessment in mathematics in EARLY GRADE1-3. • How to manage transition of home to school. • Understand the various characteristics and uniqueness of Early Grade learners. • How to design tasks for assessment procedures for assessment of, as and for learning. • Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.			

LESSON 11

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

Title of Lesson	End of Semester Review (Lessons 1-11)					Lesson Duration	3 Hours
Lesson description	This lesson focuses much on the overview of the whole semester mathematics course: Teaching and Assessing Upper Early Grade 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.						
Previous student teacher knowledge, prior learning (assumed)	Student-teachers have studied Teaching and Assessing upper Early Grade mathematics and can apply various mathematical concepts learnt, throughout the semester, in their assessment.						
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** ☒	**Practical Activity** ☒	**Work-Based Leaning** ☐	**Seminars** ☐	**Independent Study** ☐	**e-learning opportunities** ☒	**Practicum** ☐
Lesson Delivery – main mode of delivery chosen to support student teachers in achieving the learning outcomes.	***Face-to-face and e-learning opportunities*** • 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., • The e-learning opportunities will include exploring number games and activities to develop properties of numbers and relationships between and among sets of numbers • Independent study would include writing self-assessment and presenting reflective papers or journals.						
• **Purpose for the lesson, what you want the students to achieve, serves as basis for the learning outcomes. An expanded version of the description.**	The purpose of the lesson is to; • Introduce student teachers to the course manual to enable them develop awareness of what they are expected of in this lesson. • develop student teachers' understanding of the nature and importance of mathematics, as well as, how to teach mathematics to Early Grade learners. • Introduce the student teachers to prepare and model interactive, and innovative ways of teaching mathematics, especially, Rational and Irrational numbers to Early Grade learners. • Prepare the student teacher for a future mathematics classroom						
• **Learning Outcome for the lesson, picked and developed from the course specification** • **Learning indicators for each learning outcome**	**Learning Outcomes**		**Learning Indicators**			**Identify Which cross-cutting issues- core and transferable skills, inclusivity, equity and addressing diversity. How will these be addressed or developed?**	
	Demonstrate knowledge and understanding of the key features of the basic school curriculum (BSC); and specifically focusing on rational and irrational numbers (NTS, 2a). Demonstrate awareness of socio-cultural issues in teaching and learning number concepts (NTS 2f) Demonstrate knowledge and conceptual understanding of number		• participate in planning and executing instructional activities that can make early adolescents become mathematicallyproficient; that is, understand mathematical ideas, and engage in logical reasoning based on relationships among the various aspects of the real number system • identify and design tasks for teaching important			• Personal development: Through planning, teaching, and assessing both individually and in small groups, and sharing their experiences with peers • Problem solving, critical and creative thinking: through objective analysis of facts and concept that will lead to creative thinking	

	with focus on rational and irrational numbers Demonstrate competencies in using manipulatives and TLMs including ICT in a variety of ways in teaching fractions and decimal concepts (NTS 3j) Value as well as respect equity and inclusivity in the mathematics classroom (NTS 2f; NTECF 39)		mathematical ideas in number to EARLY GRADE pupils • identify a variety of manipulatives and TLMs for teaching important mathematical ideas such as operations and properties ofrational and irrational numbers • Use ICT as a tool in supporting EARLY GRADE pupils in learning number • Appreciate the contributions of, and support, colleagues in the mathematics classroom • Cooperate with colleagues in carrying out mathematical tasks in a variety of ways • Engage in reflective thinking about how mathematics was taught in their basic school days.	• Personal development: Through presentation and developing of arguments • Use of ICT: Integrate ICT in developing number and in the mathematics classroom • Use of ICT: Integrate ICT in developing number and in the mathematics classroom • Respect and diversity: designing lesson for diverse learners with different learning styles • Social and communication skills: consciously develop observation and presentation skills during classroom instructions to support student teachers to transfer this to STS

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	**10mins**	Review the previous lesson on rational numbers as related to real number system. ***(PD Theme 1)***	Participate in the discussion on various aspects of the real number system.
WEEK 9 Rational and Irrational numbers 1	The Real number system relationships among the various aspects of real number system Operations and properties of rational numbers application of real number system to real life	**50 mins** **60 mins** **60 mins**	Introduce the lesson on Real number system; ***(PD Themes 1 &3)*** Lead discussions on how to connect the various real number systems ***(PD Themes 1 & 3)*** Lead discussions on properties and operations of the real numbers ***(PD Themes 1 & 3)***	Initiate verbal exposition and discussions on integers and technology use in Real number system across the EARLY GRADE curriculum. Use manipulatives to establish the relationship between and among the various real number systems.

			Assign student teachers in groups to outline real number system.	Use manipulatives such as number line, Cuisenaire rods, fractional charts, paper folding to explore properties and operations of the real numbers Explore possible further application of rational numbers in real life.
Lesson assessments – evaluation of learning:of, for and as learning within the lesson	**Subject Portfolio** Collection of final portfolio for grading **Subject Project** Submission of final project for assessing and grading **NTS**: 2 b) Has comprehensive knowledge of the official school curriculum, including learning outcomes. *2b) Has comprehensive knowledge of the official school curriculum, including learning outcomes* 3m) Identifies and remediates learners' difficulties or misconceptions, referring learners whose needs lie outside the competency of the teacher. *Note: The assessment procedures should make room for differentiation - gender, equity, SEN, and inclusivity.*			
Instructional Resources	Posters; video clips; downloads; models, etc.			
Required Text (core)	Arthur, J., Grainger, T. & Wray, D. (2006). Learning to Teach in the Early Grade. Canada: Taylor & Francis e-Library. https://www.pdfdrive.com/learning-to-teach-in-the-primary-school-d20209294.html Confer, C. (2005). Teaching Number Sense. Sausalito: Math Solutions Publications. https://www.pdfdrive.com/teaching-number-sense-grade-1-d184198309.html. Manitoba Education, Citizenship and Youth (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. https://www.pdfdrive.com/assessment-for-learning-assessment-as-learning-assessment-of-learning-d6259529.html. Roy, G. J. (2014). Developing Prospective Teachers' Understanding of Addition and Subtraction with Whole Numbers. *Issues in the Undergraduate Mathematics Preparation of School Teachers*, *2*.			
Additional Reading List	Lakoff, G. & Núñez, R. E. (2000). *Where Mathematics comes from*. New York: Basic Books. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Tutor notes*. Accra: Unimax Publishers. Martin, J. et. al. (1994). *Mathematics for teacher training in Ghana: Students activities*.Accra: Unimax Publishers.			
CPD Needs	• How to design and teach mathematics using the new B. ED. Curriculum, NTS, NTECF, etc • How to design and/or use some innovative materials and ideas for teaching selected concepts based on Classroom assessment in mathematics in EARLY GRADE1-3. • How to manage transition of home to school. • Understand the various characteristics and uniqueness of Early Grade learners. • How to design tasks for assessment procedures for assessment of, as and for learning. • Instructional strategies needed to consciously engage student teachers on how to design and produce portfolios, journals and STS reports.			
	mponent 1: Subject Portfolio Assessment (30% overall) • Selected items of students work(2 of them 10% each)-30% • Midterm assessment -20% • Reflective journal 40% • Organization of the subject portfolio-10% (how it is presented /organized			

[1] See rubrics on Subject Portfolio Assessment in Annex 6 of NTEAP

	[2]**Component 2: Subject Project Assessment (30% overall score)** • Introduction; a clear statement of aim and purpose of the project-10% • Methodology; what the student teacher has done and how achieve the purpose of the project-20% • Substantive or main section-40% • Conclusion – 30% **Component 3: End of Semester Examination- (40% overall)**

NOTE
IT APPEARS EACH LESSON IN THE MANUAL WILL BE ASSESSED AND WEIGHTED 60%. PLEASE REVIEW. THERE SHOULD BE ONLY 3 ASSESSMENT COMPONENTS ACROSS THE SEMESTER. INDICATE WEEKS WITHIN WHICH THE 2 FORMATIVE ASSESSMENTS SHOULD OCCUR AND TOPICS TO BE COVERED AND WEIGHTED 30% EACH. END OF SEMESTER WILL BE 40%.

[2] See rubrics on Subject Project Assessment in Annex 6 of NTEAP