Tutor Professional Development Handbook: B.Ed. in Initial Teacher Education - Mathematics Year 2 Semester 1

HANDBOOK FOR COORDINATORS



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The Government of Ghana







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Foreword

I am grateful that you are reading and using this Professional Development Handbook for the Bachelor of Education (B.Ed.) in Initial Teacher Education Year 2 Semester 1 courses.

These Professional Development Handbooks are at the heart of Ghana's ambitious teacher education reforms and have played a key role in the successes achieved to date. The Handbooks aim to ensure that tutors in Colleges of Education are reflecting critically on their methods of teaching and learning and supporting each other to implement the B.Ed. in line with the National Teacher Education Curriculum Framework and National Teacher Education Assessment Policy.

Tutors act as role models for student teachers. If tutors use the 'lecture-method' then this is what student teachers will imitate when they enter basic school classrooms. If tutors use a wide variety of interactive approaches, aligned with the National Teachers' Standards, then these approaches will become standard behaviour for beginning teachers when they graduate.

This latest set of Professional Development Handbooks, developed by four mentoring universities (Kwame Nkrumah University of Science and Technology, University of Education, Winneba, University for Development Studies and University of Ghana) and tutors from their affiliated Colleges of Education, are the first set of Handbooks which include specific cross cutting sessions in Gender, Equality and Social Inclusion (GESI) and Information and Communications Technology (ICT).

The introduction of GESI in these Handbooks is an important step forward in ensuring that our teacher education system is responsive and genuinely promotes equality and inclusion whilst the inclusion of ICT represents Ghana's aim of ensuring that all teachers and learners are digitally literate.

As with previous Handbooks I would like to take this opportunity to thank both the Ghana Tertiary Education Commission and Mastercard Foundation for their assistance and support in making this work possible.

Robin Todd Executive Director, T-TEL

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Year Two Semester One Writing the weekly PD sessions: Guidance for the Subject Writing Leads (SWL).

- The PD sessions are an important way to ensure effective implementation of the key principles and practices of the B.Ed. *It is critical that what SWL write provides direct subject and B.Ed. specific guidance, so SL/HoD can support and scaffold tutors learning and professional development.*
- The sessions need to provide *the PD* opportunity for tutors fully understand what they need to teach and to planning together to make sure the new B.Ed. courses are taught well
- Developments since the manuals were written require SWL to add additional detail to sessions. Specifically, this means a focus on:
- Integrating GESI to ensure the needs of females, males and students with special education needs are well catered for
- Integrating ICT and 21c skills to ensure students learn to use technology effectively to support their own and pupils' learning
- National Teacher Education Assessment Policy (NTEAP)
 - the three assessment components *for the semester* for **EACH** course: subject project (30%), subject portfolio (30%) and end of semester examination (40%). These need to be introduced in session 1. PD writers will need to provide an example portfolio and project assessment components if these are not written into the course manuals (See Appendix 2: Course Assessment Components at a Glance).
 - integrating the use of continuous assessment designed to support student teacher learning in each session
- The PD session template provides the frame for SWL to write the guidance for the Subject Leads (SL)/HoD on how to lead and support the professional development of tutors in the weekly sessions for student teachers
- Age level specialisms are introduced in Y2S1. To ensure appropriate subject and age level focus for the PD sessions:
 - there will be subject specialists writing for each subject
 - where subjects are grouped direct reference needs to be made to examples of activities in the course manuals for each subject
 - where there are different age levels direct reference needs to be made to the course manuals for activities for each age level
- STS is six days in year 2 Semester 1 and involves observation and working with small groups subjects should include STS activities
- SL/HoD need to have details of the resources needed for the activities

GENDER, EQUALITY AND SOCIAL INCLUSION (GESI)

Focus: the bullet points provide the frame for what is to be done in the session. The SWL should use the bullets to guide what they write for the SL/HoD and tutors to do and say during each session. Each bullet needs to be addressed and specific reference should be made to the course manual/s.	Guidance notes on Leading the session. What the SL/HoDs will have to say during each stage of the session	Guidance Notes on Tutor Activity during the PD Session. What PD Session participants (Tutors) will do during each stage of the session.	Time in session
1.0 Introduction to GESI	1.1 Task tutors to individually read the introduction (to GESI) and learning outcomes below and invite opinions from both male and female tutors and those with special needs where applicable.	1.1 Read and discuss the introduction to (to GESI) and the learning outcomes below and provide your opinion on same.	20 mins
	Introduction to GESI: a. Purpose of GESI in the specialisms Communities all over the world consist of diverse individuals and social groupings that have different needs, strengths, opportunities, and concerns as a result of differences in culture, gender, abilities, economic and social status. As teacher educators, it is important to understand	Introduction to GESI: a. Purpose of GESI in the specialisms Communities all over the world consist of diverse individuals and social groupings that have different needs, strengths, opportunities, and concerns as a result of differences in culture, gender, abilities, economic and social status. As teacher	

Tutor PD Session for Lesson 001 in the Course Manual

the uniqueness of the educator, it is important diverse groups in the that you understand the classroom and ensure that uniqueness of the diverse every individual is groups in the classroom supported to attain quality and ensure that every education. Towards individual is supported to promoting equal attain quality education. opportunity for females and Towards promoting equal males as well as all other opportunity for females disadvantaged groups in and males as well as all the classroom, GESI in other disadvantaged schools is being groups in the classroom, championed. Tutors need GESI in schools is being to have a clear championed. You need to understanding of GESI have a clear issues to be able to understanding of GESI integrate these in the issues to be able to teaching and learning integrate these in the process and other aspects teaching and learning of college life and to process and other aspects encourage student teacher of college life and to to do same during STS. encourage student teacher to do same during STS. b. Overview of GESI and b. Overview of GESI and related concepts related concepts This session seeks to expose This session seeks to tutors in all the specialisms expose you to the concept (EG, UP and JHS) to the GESI and related issues concept GESI and related such as Gender, Equality, issues such as Gender, Equity etc to enable you Equality, Equity etc to appreciate issues of enable them appreciate stereotypes and work issues of stereotypes and towards challenging work towards challenging traditional gender roles as traditional gender roles as well as dealing with your well as dealing with their own unconscious biases so own unconscious biases so you can attend to the they can attend to the diverse needs of all diverse needs of all learners learners in the classroom in the classroom and in the and in the College. College.

c. Session learning	c. Session learning	
outcomes	outcomes	
By the end of this session,	By the end of this session,	
tutors will be able to	you will be able to	
i. demonstrate	i. demonstrate	
understanding of	understanding of	
the concept GESI	the concept GESI	
and related issues.	and related issues.	
ii. apply these	ii. apply these	
concepts in their	concepts in your	
teaching and	teaching and	
general practices.	general practices.	
iii. support student	iii. support student	
teachers to	teachers to	
understand GESI	understand GESI	
issues and how to	issues and how to	
apply them during	apply them during	
STS.	STS.	
1.2 Task tutors to identify	1.2 Identify what the	
what the acronym GESI	acronym GESI stands	
stands for and explain	for and explain what it	
what it means.	means.	
Condor, Equality and Social		
Inclusion is a concept that		
addresses unequal power		
relations experienced by		
people on the grounds of		
gender, wealth, ability,		
location, ethnicity, language		
and agency or a		
combination of these		
dimensions.		
1.3 Using talk for learning	1.3 In your subject groups,	
strategies (concept	explain any <u>two</u>	
cartoons, storytelling,	<u>concepts</u> related to	
role play discussion etc),	GESI. (you may use	
ask tutors in their	your phones/laptops to	
subject groups to	search for now each	
explain any <u>two</u>	concept is related to	
<u>concepts</u> related to		
GESI. Allow Lutors to USE	<u>www.googie.com</u>	
coarch for how cash	Auapt unierentiated	
search for now each	approaches to explain	
concept is related to	nlaw story atc	
	piay, story etc).	
www.google.com		

Allow tutors to explain	
concepts using	
differentiated approaches	
(sketches, role play, story	
etc).	
Employ a creative	
approach, such as quizzes	
to capture attention.	
Gender is the relationship	
between men and women	
and the roles and	
responsibilities they have in	
the society. Example in	
Ghana it is socially accepted	
that cooking is the role of	
women and providing	
upkeeping money for the	
family is the role of men.	
Equality is the similarity of	
treatment as it is legally and	
constitutionally given.	
Example is providing all	
children (irrespective of	
ability, gender, socio-	
economic background etc.)	
with opportunities to	
achieve quality learning	
outcomes.	
fair or just in terms of	
provision of resources,	
support of opportunities	
base of individual learners	
in achievement	
Indusion is the process of	
valuing all individuals and	
leveraging their diverse	
talent not in snite of their	
differences but because of	
their differences Example	
Ensuring that all students	
(hove girls and SFN) are	
given equal opportunities	
Diren equal opportunities	

	to participate in the classroom.)		
	Gender Equality is a state where males and females		
	have equal rights, life		
	prospects and opportunities		
	to snape their own lives and		
	Social Inclusion is the		
	process of improving the		
	terms of participation for		
	people who are		
	disadvantaged, through		
	ennancing opportunities		
	1.2 Ask tutors to reflect on	1.2 Reflect on your	
	their understanding of	understanding of GESI	
	GESI and justify the need	and justify its	
	for GESI in education.	importance in education	
	For instance, the classroom		
	and school environment		
	have been skewed in ways		
	that condone gender bias		
	and promote exclusion.		
	Example 1: Male characters		
	are often represented than		
	females in TLMs and		
	textbooks.		
	Eg. 2 Persons with SEN are		
	often disadvantaged during		
	some classroom activities:		
	the blind learner loses out		
	when pictures are used. The		
	Deat lose out when only		
	Refer to Appendix 1.		
2. Identification and	2.1 Through questioning,	2.1 identify and discuss	15 mins
discussion of new	ask tutors to identify	how the new GESI	
iearning	and discuss how each	concepts you have	
	have acquired could be	useful in your teaching	
		and general school life.	

	useful in their teaching and general school life. Eg. a) Inclusion: mix ability/gender grouping; involving all categories of learners in every activity. Eg. b) Equity: provide support and resources in line with the needs of each learner. N/B: Encourage tutors to support student teachers identify how each concept could be used during STS.		
Potential barriers to	2.2 Using think-pair-share ask tutors to identify possible barriers to learning GESI for student teachers and how to address them.	2.2 Reflect individually, share with a colleague and then the entire group possible barriers to learning GESI for student teachers and how to address them.	
learning for student teachers	Examples may include: <i>Misconceptions:</i> those certain roles are for specific gender; boys are brave and can dissect a rabbit and girls are good cooks than boys. This can be addressed by citing instances where girls demonstrate bravery	Examples may include: <i>Misconceptions:</i> those certain roles are for specific gender; boys are brave and can dissect a rabbit and girls are good cooks than boys. This can be addressed by citing instances where girls	
	and boys have been better cooks. Negative attitudes : the perception that persons with SEN are low achievers. Address this by giving examples of persons with SEN who have excelled in	demonstrate bravery and boys have been better cooks. Negative attitudes : the perception that persons with SEN are low achievers. Address this by giving examples of persons with SEN who have	
	various aspects of life (Hellen Keller, Professor Danaah)	excelled in various aspects of life (Hellen Keller, Professor Danaah)	

30 mins
_

Noting opportunities for integrating: GESI responsiveness and ICT and 21 st C skills	 3.3 Task tutors to discuss in their subject groups and come out with strategies on how GESI, ICT, and 21st Century skills can be integrated in their specific subject areas. 3.4 Lead tutors to identify 	 3.3 Identify strategies on how GESI, ICT, and 21st Century skills can be integrated in their specific subject areas. 3.4 identify and discuss 	
GESI responsive assessment	and possible strategies to make subjects projects and subject portfolios GESI responsive.	possible strategies to make subjects projects and subject portfolios GESI responsive.	
	Eg. a) Equitable distribution of relevant resources for the subject projects	Eg. a) Equitable distribution of relevant resources for the subject projects	
	Eg. b) Ensure projects content do not portray GESI biases and stereotypes. In grouping students for subject projects ensure mix ability/gender groupings		
Resources: links to the existing PD Themes, for example, action research, questioning and to other external reference material: literature, on web,	Note Remind tutors to consciously ensure GESI responsiveness in conducting continuous assessment in their various disciplines.	Note: Make conscious efforts to ensure GESI responsiveness in conducting continuous assessment for student teachers (eg subject project)	
Utube, physical resources, power point; how they should be used. Consideration needs to be given to local availability	Eg a) ensure that leadership roles are assigned equally among females, males and students with special education needs (SEN) when assessments (subject projects) are done in groups.		
	Eg. b) Ensure equitable distribution of resources among males, female and (SEN).		

	3.5 Task tutors in their subject groups, to identify and discuss the links to existing GESI resources such as the Gender Handbook for CoEs	 3.5 identify and discuss the links to existing GESI resources such as the Gender Handbook for CoEs Read GESI resources for new ideas to improve your lesson preparation and classroom practice. 	
 4. Evaluation and review of session: Tutors need to identify critical friends to observe lessons and report at next session. Identifying and addressing any outstanding issues relating to the lesson/s for clarification 	 4.1 Invite critical friend (male/female) to observe a lesson using the observation checklist and give feedback on next PD session. <i>Example: equal</i> <i>involvement of both</i> <i>males, females and SEN</i> <i>learners.</i> 4.2 Write the concepts learned on pieces of paper and call tutors at random to pick one and explain to the whole group. Give further clarification where applicable. 	 4.2 Invite critical friend (male/female) to observe a lesson using the observation checklist and give feedback on next PD session. <i>Example: equal</i> <i>involvement of both</i> <i>males, females and SEN</i> <i>learners</i> 4.2 Pick and explain GESI concepts learnt giving examples in classroom and out of class situations. 	15 mins
	Advance Preparation for lessons 4.3 Encourage tutors to read GESI related resources for new ideas to improve their lesson preparation and classroom practices.	Advance Preparation for lessons 4.3 Read GESI related resources for new ideas to improve their lesson preparation and classroom practices.	

GESI Appendix 1 – UNDERSTANDING GENDER - TERMS AND CONCEPTS

Sex is aspect of one's biological makeup that depends on whether one is born with distinct male or female genitals and a genetic programme that releases either male or female hormones to stimulate the development of one's reproductive system. Sex is biologically defined. It is determined by birth. It is universal and unchanging.

Gender is simply the relationship between men and women and the roles and responsibilities they have in the society in which they live. It refers to the socially constructed differentiated roles assigned to both sexes, whereby both men and women are expected to conform to and perpetuate the roles and behaviors that have been assigned to them. Gender is socially constructed and differs between and within cultures. It is about the differences in roles, responsibilities, opportunities, needs and constraints of men and women.

Some Distinctive Features of Gender:

- Deals with the relationship between men and women
- Deals with the roles and responsibilities men and women are assigned by their society
- Both men and women are expected to conform to and perpetuate the roles and behaviors that have been assigned them
- It involves the ranking of traits and activities so that those associated with men are normally given greater value
- It is historical
- It is learned, and therefore can be unlearned
- It takes place within different macro and micro spheres such as the state, the labour market,
- schools, the media, the law, the family, household and interpersonal relations
- It interacts with race/ethnicity, age, disability, status, economic factors, etc. Meaning these factors may present different gender dynamics and expectations.

Gender Roles define what is considered appropriate for men and women within a given society. It also means socially assigned roles of men and women and informs the division of labour. It involves the relation to power (how it is used, by whom and how it is shared). It varies greatly from one culture to another and change over time. Gender roles may vary from one social group to another within the same culture.

Gender Relation refers to how men and women relate to each other, resulting in manifestations of gender based power. This arises from the roles men and women are expected to play and the impact of their interactions. The family is a good example, as men assume the earner and leader roles, women assume the domestic and care giving roles. These power relations are uneven because the male has more power in making decisions than females. If we do not conform to roles prescribed to us by society, we are seen to be deviant by society. Power relations always result in one party being worse off than the other

and create social imbalances. This means inequality between men and women that is acquired in the process of socialisation.

Gender Responsiveness refers to outcomes that reflect an understanding of gender roles and inequalities and which make an effort to encourage equal participation and equal and fair distribution of benefits.

Gender responsiveness is accomplished through gender analysis and gender inclusiveness. It means creating an environment that reflects an understanding of the realities of women and men's lives and address the issues accordingly. Being gender responsive means having the capacity to analyse a specific context from a gender perspective, to develop gender sensitive course outline, lesson notes, teaching learning materials and to allocate budgets in a gender-responsive way.

Gender Stereotyping refers to the practice of ascribing to an individual woman or man specific attributes, characteristics, or roles by reason only of her or his membership in the social group of women or men.

Gender Stereotype simply means the constant portrayal, such as in the media, conversation, jokes or books, of women and men occupying social roles according to a traditional gender role or division of labour. Gender stereotyping is wrongful when it results in a violation or violations of human rights and fundamental freedoms.

Equality refers to the equal rights, responsibilities and opportunities of men, women and persons with special education needs and disabilities. It pertains to equal distribution of resources and benefits and participation of women and men in all areas of society. It also means giving equal weight to the knowledge, experience and values of both women and men in society. Equality between men and women is a human rights issue and a precondition for sustainable development. It is based on the principle that, though men and women are not the same biologically, they are equal as human beings.

Equity is based on principle of fair share. It is a stage in the process of achieving equality. Equity refers to a fair sharing of resources, opportunities and benefits according to a given framework. It is one of the measures of equality, but not the only one. Equity is measurable and manifested in parity. Experience illustrates that equity is used instead of equality within institutions.

Equality vs Equity. Equality refers to similarity of treatment as it is legally, constitutionally and divinely given. It is a fundamental right. And it is often the goal. Equity is often viewed as a favour, whereas equality is a fundamental right.

Empowerment is a process through which women, men and persons with disability in disadvantaged positions increase their access to knowledge, resources, and decision-making power, and raise their awareness of participation in their communities, in order to reach a level of control over their own environment.

Gender Mainstreaming is the concept of bringing gender issues into the mainstream of society. It was established as a global strategy for promoting gender equality in the Platform

for Action adopted at the United Nations Fourth World Conference on Women held in Beijing in 1995. The conference highlighted the necessity to ensure that gender equality is a primary goal in all areas of societal development. In July 1997, the United Nations Economic and Social Council (ECOSOC) defined the concept of gender mainstreaming as follows: "Mainstreaming a gender perspective is the process of assessing the implications for women and men and persons with special education needs and disability of any planned action, including legislation, policies or programmes, in any area and at all levels. It is a strategy for making the concerns and experiences of women as well as of men an integral part of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres, so that women and men benefit equally, and inequality is not perpetuated. The ultimate goal of mainstreaming is to achieve gender equality".

Mainstreaming in education involves placing learners with special education needs and disability in a general education classroom with a special education teacher as a co-teacher giving them the same opportunities as other learners to access instruction, gain knowledge, and to participate in the academic and socializing environments that a school offer.

Inclusion is the process of valuing all individuals and leveraging their diverse talent, not despite their differences, but because of their differences. Inclusion requires a conscious effort to involve all human resources in the fabric and mission of the institution or school as a critical value addition.

Disempowerment is any action, policy development and/or relief program or process through which women's, men's and persons with disabilities priorities, needs and interests are further ignored, reducing their participation in decision- making and representing an obstacle to their economic, political and social improvement, or to their academic progress and growth attainment.

Patriarchy is an ideology and social system that propagates male supremacy or male power and superiority over women as natural. The operating premise is that men are biologically, intellectually and emotionally superior to women. Conversely, women are considered to be weak and dependent on men for protection, guidance, upkeep and general survival. The ideology is institutionalised through active formal and informal systems, backed up by ideas, beliefs, religion, practices and culture – and sometimes by force. A patriarchal ideology is the key factor in the structural gender inequality in most of our societies.

Gender Neutrality is the claim some people make when they want to present themselves as not practising gender-based discrimination. What it often masks, however, is the failure to take gender issues into consideration, and this can translate into discrimination against girls as it fails to pay attention to the distinct and special needs of girls and boys.

Gender blindness is the failure to recognise the differences between males and females and therefore leading to failure to provide for the differences.

Other concepts/ terminologies:

Marginalisation - exclusion in processes such as decision-making. This results in women's inability to articulate their needs and interests.

Discrimination - differential treatment based on factors over which an individual has no control, e.g. sex, disability, socio-economic status, tribe, nationality, race, etc.

Objectification - assignment of less than human status and treatment to women. Infantilisation - categorising women with children, i.e. having no legal decision making powers, voting rights or capacity to enter into contracts.

Dispossession - through patriarchal systems of property inheritance, where is some cultures women are not allowed to inherit wealth.

Segregation occurs when students with disabilities are educated in separate environments (classes or schools) designed for students with impairments or with a particular impairment.

Exclusion occurs when an individual or group is denied the right to access (facilities, education) or participate in educational or social activity on the bases of ability, gender, health or social status.

Value Assignment - determining a woman's value by the sex and number of children she bears.

Violence - physical, mental and emotional abuse, which is culturally accepted as correcting a wife or harmful practices such as female genital mutilation to subdue female sexual urge

Poor refers to households or persons who consume an average of less than 2,220 calories of food per person per day. (according to Nepal Living Standard Survey, 2010/11)

Vulnerable Groups refer to groups that experience a higher risk of poverty and social exclusion than the general population. Ethnic minorities, migrants, person with disabilities, the homeless, those struggling with substance abuse, isolated elderly people and children all often face difficulties that can lead to further social exclusion, such as low levels of education and unemployment or underemployment.

Gender Impact Analysis/Assessment examines policies and practices to ensure they have beneficial effects on women and men. It identifies the existence and extent of differences between women and men and the implications of these differences for specific policy areas.

Social Exclusion describes the experience of groups that are systematically and historically disadvantaged because of discrimination based on gender, ethnicity or religion.

Gender Responsive Budget refers to government planning, programming and budgeting that contributes to the advancement of gender equality and the fulfillment of women's rights. It entails identifying and reflecting interventions to address gender gaps in sector and local government policies, plans and budgets.

Disaggregated Data refers to distinguishing men and women, ethnic minorities, people with disability, people with HIV and other excluded people in the data to reveal quantitative differences between them.

Why the need for GESI in education?

The need to deliberately address gender and inclusion in the classroom arises because, over time, the classroom and school environment have been skewed in ways that condone gender bias and promote exclusion. Below are examples of practices in the classroom that reinforce traditional gender roles and stereotypes:

- a. Male characters are often represented than females in TLMs
- b. Textbooks have more males than females in illustrations
- c. Illustrations in TLMs often portray gender stereotypes (male CEO and decision makers, females in domestic roles etc.)
- d. Persons with disability are underrepresented
- e. When persons with disability are featured, they are portrayed with negative stereotypes
- f. (Cursed, beggars or burden on society)
- g. Use of male pronouns to represent everyone (ignoring the existence of females)
- h. Persons with disability are identified by their disability. Often their disability is put before them for example, deaf man, "handicapped" child, blind girl etc

Some misconceptions of GESI in Schools and out of Schools and how to address them

- a. GESI seeks to favour women
- b. GESI affects the learning outcomes of the "normal" learner
- c. Society thinks education is for men
- d. Concerns only persons with disabilities
- e. Quality inclusion is expensive
- f. Only schools are responsible for the implementation of GESI
- g. Persons with disability cannot cope in mainstream school.
- h. Disability is contagious

Ways the misconceptions can be addressed

These can be addressed through:

- Behavior change communication approaches
- Continued sensitization and advocacy of GESI
- Mainstreaming GESI responsiveness in school and community practices and activities

Barriers that hinder GESI and how to address them in and out of schools

- a. Infrastructural barriers such as inaccessible school facilities
- b. Curriculum barriers such as deficient resources and learning materials for learners
- c. attitudinal barriers such as insensitivity and discrimination by teachers, parents, peers and the society at large
- d. Pedagogical barriers such as teachers not having necessary knowledge and skills on GESI responsive pedagogy.
- e. Public misconception of what GESI seeks to achieve
- f. Large class size especially in the basic schools

- g. Unavailability of relevant teaching and learning resources
- h. Lack of expert support for the regular class teacher

Ways the barriers can be addressed

These can be addressed through:

- GESI responsive infrastructure
- GESI responsive teacher education curriculum (include basic braille and sign language)
- Continuous advocacy
- Training teachers on GESI responsive pedagogies
- Train and deploy more special education teachers to the regular schools
- Provide relevant TLR for use in schools

Appendix 2 – GESI Observation Tool

A. Silent Tears



- Tears always fill me, but I can't pour them because no one understands me
- My parents can't even understand me because my teachers make them believe I am good for nothing
- I thought my parents will tell them that I repair all the electrical appliances in the house without any training
- Who will hear me now because myself and many who are like me are being destroyed?
- Who will help tell them that even though we might not be able to get the certificate we have great talents?
- Who will help tell teachers that they should not force their dreams on us but guide us nurture our God given talents?
- Who will hear our cry? I am one of the voices of the many silent voices in the class
- I wish I can be bold to tell my teachers that I must be understood and not compared
- My maths teachers say I'm good for nothing because I'm not good in calculations
- My science teachers say am useless because I can't express myself fluently in the white man's language
- They seem to have forgotten that I'm the one who led the school soccer team to win that trophy
- I am the same person who plays the drums to the admiration of all
- Sometimes when I ask why they consider what I do as important, they tell me WAEC doesn't ask those in examinations
- My teachers always say I don't do well even though they teach me well but how can I tell them that the teaching method doesn't favour me even though it favours the majority
- How can I tell my teacher that I just need motivation not condemnation?

B. Integrating GESI in Teaching and Learning

Introduction: The need to deliberately address gender and inclusion in the classroom arises because, overtime, the classroom and school environment have been made to overlook gender biases and continue to promote exclusion. GESI responsive pedagogy involve teaching and learning processes that pay attention to the specific learning needs of girls, boys and members of marginalised groups.

Overview of GESI Responsive Pedagogy:

Classroom practices often reinforce traditional gender roles, gender and inclusion stereotypes that may disadvantage some learners resulting in poor quality learning outcomes. There is therefore the need to challenge these practices to ensure equal learning outcomes of all learners. This require teachers to be GESI responsive in lesson planning, selection and use of teaching and learning materials, methodologies, learning activities, classroom setup and interaction, management of gender stereotypes in the classroom and feedback and assessment.

Components of a GESI Responsive Lesson

1. GESI Responsive Lesson Planning

- Lesson planning involves a wide range of decisions:
- Content
- Choice of learning materials to use
- Methodologies
- Learning activities
- Language use
- Classroom setup
- Classroom interaction
- Assessment of the learning/ learner
- Fair knowledge of the background of learners to inform all the above
- For a lesson plan to take into account gender and inclusion considerations, the lesson planning process should involve the following:

2. Choice of Learning Materials

- Review the TLMs and identify if the material contains stereotypes?
- If so, what strategies can be used to address such stereotypes?
- If faced with a history textbook that portrays only heroes, it will be vital to draw up a list of "sheroes" (female heroes).
- If a chemistry textbook portrays only male scientists as inventors or abled bodied scientists, include discussing female scientists and scientists with disability.
- Carefully review the language used in the TLMs for gender responsiveness and inclusion.

3. Teaching Methodologies

- Select teaching methodologies that will ensure equal participation of girls, boys and students with special needs.
- Ensure that dominant individuals do not sideline less assertive ones. Employ differentiated teaching approaches suitable for all learners.
- Protect students with disability from abuse or bully by other students.

4. Learning Activities

The lesson plan should make allowance for all students to participate in the learning activity.

- When doing science experiments, ensure that girls, boys and students with disability have a chance to use the equipment and chemicals.
- There should also be equal participation in such activities as making presentations.
- When assigning projects, ensure that both females and males are given leadership positions and roles.
- Take into account how the learning materials will be distributed equally to both girls and boys, especially in case of shortage or limited supply.

5. Classroom Setup and Interaction

The lesson plan should consider the classroom setup.

- Consider how to arrange the classroom and interact with the students to promote equal participation of all students.
- Plan in advance to ask substantive questions to all students.
- Where do you stand or sit during the lesson? Ensure that your position or posture does not exclude or intimidate students.

Management of other gender and inclusive constraints to learning inside the classroom

- In the planning process, make provision for time to deal with gender-specific problems, if any, such as girls who have missed class due to menstruation, household chores or family responsibilities. Or support to students with learning disabilities.
- Watch for indications of bullying, sexual harassment, adolescent hormonal upheavals, the impact of HIV/ AIDS, Pregnancy, Peer pressure, among others.

Feedback and Assessment

Make time for adequate feedback from girls, boys and students with special needs to ensure that lesson is well understood. Ensure that assessment methods do not disadvantage any marginalised group or individual in the class.

GESI Responsive Teaching & Learning Resources (TLRs)

TLRs are fundamental to the pedagogical process and are critical for shaping young minds. However, TLRs and textbooks often communicate traditional and limited gender roles. They also reinforce stereotypes about disabilities. Usually, the message in some materials is that women and girls are weak and passive and that persons with disabilities are a burden or are cursed. Consequently, male and female students continue to follow the status quo and reinforce negative stereotypes about women. In effect, men are challenged to take up leadership roles, whereas women continue to occupy the backbench. To ensure equality and inclusion, TLRs and other learning resources must empower both female and male students and students with disabilities.

Choose materials that depict persons of minority groups in a positive light. For example, a child with a physical disability playing with other children; an albino student in class with other children, a female statistician etc

GESI Responsive TLRs:

GESI Responsive Language Use in the Classroom

Language is a tool of communication. Inappropriate language use can transmit negative messages and inhibit learning. A boy or girl whose teacher constantly tells them "you are stupid" may believe this to be true. A teacher's constant use of harsh, abusive and threatening language may instil fear in the students. Language can also reinforce gender differences and inequalities

- Gender biases are expressed through language that reveals the belief that girls cannot perform as well as boys or that boys should not allow themselves to be outperformed by girls academically – or in any other way.
- Teachers sometimes discourage girls from taking science-based subjects or courses by telling them that such subjects are for boys or are too difficult for girls.
- When a girl is assertive, she is told to stop behaving like a boy, and when a boy cries, he is cautioned to stop acting like a girl.

- Spoken language is only part of the equation. Much offensive communication is not verbal. – An indifferent shrug of the shoulders or rolling of the eyes suggests that the student is too foolish or bothersome to warrant attention.
- Other gestures and body language, such as winking, touching, brushing, grabbing, and other moves, may be overtly sexual.
- It is also difficult for the victim to take steps to stop the abuse because there is often no tangible evidence. Most sexual harassment occurs and escalates in this way.

GESI Responsive Classroom Setup

How the classroom is arranged can contribute positively or negatively to teaching and learning processes. This includes the layout of the furniture in the classroom or laboratory, the quality of chairs and desks, and the overall physical infrastructure of the school. The height of shelves in the classroom can contribute to an interactive classroom setup or exclude student of a certain height.

To ensure GESI responsiveness in the way a classroom is set up, the following needs to be considered:

- A classroom setup that mixes girls and boys and also considers disabilities Classroom setup that enhances the participation of all students
- Arrangement of the desks that allow students with disabilities to be comfortable Appropriate shelf heights in the libraries and laboratories.
- Stools in laboratories that are appropriate in size and shape thus enabling effective participation of both girls and boys.
- Fixtures and visual aids on the walls that send gender-responsive messages
- Appropriate size, shape and weight of desks and chairs.

GESI Responsive Classroom Interaction: Students are boys and girls with gender-specific needs. Especially as they mature, their gender roles can have an increasing impact on classroom interactions. An existing disability introduces different classroom dynamics. Sexual experimentation, sexual harassment, male domination, female passivity, and bullying come into play in the classroom. The following are essential steps towards building good classroom rapport:

Look for characteristics such as shyness, arrogance, distraction and low confidence.

- Take into account that some students are slow learners, some are gifted, and most are better in some areas than others.
- It is important to go beyond academic ability. Bear in mind that some learners come from disadvantaged situations.
- Orphans, displaced, the very poor or may have hidden disabilities
- Watch out for the gender-specific needs of students: girls who are having problems because they are going through their menstrual cycle.

Appendix 3 – GESI Observation Tool

Name of Tutor		Sex					
Course Title		Level					
Subject/Topic							
Gender and Inclusion Responsive competency	Some Strate	gies and Actio	ns to observe:	Not achieved	Partially achieved	Half achieved	Fully achieved
				0	1	2	3
1. The Tutor uses Gender and Inclusion responsive pedagogy in class	The Tutor: 1) gives equal to ask and a provides ex who may la	chance to fem answer questio tra encourager ck confidence)	ales and males ns in class (and nent to girls				
(aim for a score of 19-21)	 uses partici work, deba equal partic (giving extra needed) 	patory method tes and role pla ipation of fem a encourageme	s such as group ay; and ensures ales & males ent where				
	 pays attent females and assigns fem 	ion to the com d males during ales leadership	position of group work and proles				
	 ensures that teaching an books, desk are more as first 	t females have d learning resc s, etc.), particu ssertive and tak	equal access to ources (TLMs, Ilarly if males se resources				
	is patient w may be shy	ith females and or afraid to spe	d males who eak				
	 checks to se understand 	ee if both fema the lesson	les and males				
	 provides co feedback to class 	nstructive/pos both females	itive verbal and males in				
	Total s	core					
2. The Tutor uses	The Tutor:						
Gender and	1) does not us	se negative exp	ressions or				
Inclusion responsive language and interaction	language th gives femal as intellige as well as n	nat demeans, e les the impress nt or do not ne nales	xcludes, or ion that are not ed to perform				
	 does not us or actions t and males 	se harsh/threat hat instil fear i	ening language n both females				

(aim for a score of	3) does not say things that reinforce false			
19-21)	assumptions about females and males			
	(e.g., girls are bad at maths/science, girls			
	are always shy, boys are the first to			
	answer)			
	4) does not use body language that excludes			
	girls or shows preferential treatment to			
	boys (such as speaking mostly to boys of			
	E) sets ground rules that prohibit teasing or			
	bullying particularly from males towards			
	females			
	6) builds students' (especially females') skills			
	for self-confidence, speaking out and			
	leadership			
	7) knows the difference between 'being			
	friendly' with girls and being flirtatious.			
	Jokes and conversations should not have			
	sexual undertones, and Tutors should not			
	use terms like 'girlfriend' or 'sweetie'.			
	Total score		1	
3. The Tutor uses	The Tutor:			
Gender and	1) reviews all textbooks, pictures, posters,			
Inclusion	and materials before using them to see if			
responsive TLMs	they reinforce traditional Gender and			
	Inclusion roles (e.g., women			
	cooking/cleaning, men in professional			
(aim for a score of	roles)			
10-12)	2) identifies traditional Gender and			
	Inclusion roles that appear in			
	books/materials and makes a point to			
	alert students to these portrayais when			
	a) discusses with students how portravals of			
	traditional Gender and Inclusion roles			
	limit what female students think they can			
	do and achieve			
	4) ensures that books, materials, or			
	equipment are equally distributed			
	amongst females/males			
	Total score			
4. The Tutor	The Tutor:			
challenges	1) empowers males to be critical of and			
	challenge traditional views of masculinity			

traditional Gender	(e.g. men should be 'powerful', should not			
and Inclusion roles	be 'weak', should never cook/clean)			
	2) empowers females to be critical of and			
	challenge traditional views of femininity			
(aim for a score of	(e.g., women should be dependent on			
10-12)	men, should only be mothers/carers,			
	should not be assertive)			
	3) actively uses examples (e.g., exercises,			
	activities, role play, pictures) that			
	challenge or reverse traditional Gender			
	and Inclusion roles (such as having men			
	cook)			
	supports and encourages females to			
	achieve in maths and science and aspire			
	to professions traditionally taken by men			
	(such as engineering, police, medicine)			
	Total score			
5. The Tutor uses	The Tutor:			
Gender and	 plans classroom seating so that males 			
Inclusion	and females are mixed, and so that pupils			
responsive	who need more support sit at the front			
planning	reviews student attendance every 2-3			
	months (particularly for females) - if			
	there are problems with attendance, the			
(aim for a score of	Tutor should follow up with the head			
15-18)	Tutor and parents			
	3) reviews student assessments every 2-3			
	months - if there are large gaps between			
	females and males, the Tutor should			
	develop strategies to close the gaps			
	4) plans to use teaching strategies that			
	ensure equal participation of both			
	females and males			
	5) reviews I LIVIS for traditional Gender and			
	inclusion roles and ensures that materials			
	fomale and males			
	6) plans to use eversions (activities that do			
	not reinforce traditional Gender and			
	Inclusion roles and in some cases actively			
	challenges or reverses traditional Gender			
	and Inclusion roles			
	Total score	<u> </u>	<u> </u>	
Overall score				

Class size	
Number of Females	
Number of Males	

Name of Peer Tutor (Observer)

.....

Signature

.....

Thank you for completing this observation tool.

ICT AS CROSS-CUTTING TOOL FOR TEACHING AND LEARNING

Purpose

This manual is prepared to

- 1. help tutors plan and teach learner-centred lessons using ICT
- 2. provide tutors access to and use of ICT tools for assessment *of, for* and *as* learning
- 3. introduce tutors to the use ICT for the development of 21st century skills
- 4. guide tutor in their use of ICT software and hardware for teaching and learning.

Preamble

Teachers in the 21st century are facing new challenges because of the expanding possibilities of ICT integration in every aspect of the school curriculum. Research works have shown the potential of Tutor Professional Development (TPD) that is tailored to local conditions as well as global components and takes advantage of mutual support among tutors, as well as modelling of effective practices.

Welliver's Instructional Transformation Model sets goals and expectations for all teachers at whatever stage they are starting at. The five hierarchical stages start with familiarization, then utilization, integration, reorientation, and finally revolution.

- 1. **Familiarization:** is when teachers become aware of technology and its potential uses.
- 2. **Utilization:** teachers use technology, but minor problems will cause them to discontinue its use.
- 3. **Integration:** technology becomes essential for the educational process and teachers are constantly thinking of new ways to use technology in their classrooms
- 4. **Reorientation:** teachers begin to rethink the educational goals of the classroom with the use of technology.
- 5. **Revolution:** is the evolving classroom that becomes completely integrated with technology in all subject areas. Technology becomes an invisible tool that is seamlessly woven into the teaching and learning process.

ICTs have the capabilities to bring several benefits to teachers and students such as shared learning resources, shared learning spaces and promotion of cooperative and collaborative learning they also provide a base for autonomous learning. ICTs have enabled us to communicate one to one, one to many and many to many through communication channels and networking. They provide a means to organize institutions differently and lead to new ways of working together with virtualization. With implementation and integration of ICTs in teacher education, the society has been transformed into a knowledge society. During the International Conference on ICT and Post-2015 Education, the 2015 Qingdao Declaration stated the importance of the professional development of teachers to effectively integrate ICT into their work.

Successful integration of ICT into teaching and learning requires rethinking the role of teachers and reforming their preparation and professional development. It calls for promoting a culture of quality in all its aspects: staff support, student support, curricula design, course design, course delivery, strategic planning, and development. We will therefore ensure that teachertraining institutions are equipped and prepared to use ICT adequately to expand the benefits of training and professional development programmes to all teachers, and to act as the vanguard for technology-supported innovations in education. We also commit to providing teachers with system-wide support for the pedagogical use of ICT, to incentivize teacher innovation, and to develop networks and platforms that allow teachers to share experiences and approaches that may be of use to peers and other stakeholders. (UNESCO, 2015)

Mishra and Koehler (2006) expressed the fact that technology has changed the way we teach (pedagogy), what we teach (content), and the context in which teaching/learning happens. Thus, to say that technology gives us new opportunities to connect with the content and use new pedagogical strategies to pass the content to our students.

In the field of teacher education ICT-based applications and their integration with content, method and pedagogy are potential catalysts for meaningful learning of students. Professionals associated with teacher education institutions should equip them to design their educational system and prepare teachers for the future of the society (Singh, 2014). With implementation of ICTs and its effective integration with teaching and learning process, the approaches to learning and teaching has changed to reflect global competencies of the 21st century teacher. The basic approaches are as follows:

- Learner Centric: Explore the best in every student.
- Learning Centric: Learner learn by designing and preparing meaningful learning experience with the help of a teacher.
- Promoting Inquisitiveness: Develop questioning ability in learner. Teacher encourages learner to ask questions. It leads to critical thinking.
- Innovation Centric: Teacher promotes innovation, creativity, and team spirit in learner.
- Develop cooperative and collaborative learning environment: Learning occurs through discussion, interaction and debate called learning for development.

Teacher is expected to perform the role of a facilitator and moderator with different responsibilities in different situations in a technology-mediated learning environment, called networked society. There is the need for specialized training and orientation of teachers to enable the teacher to develop the classroom, school and society with new skills and competencies. For this reason, the expectation of the National Teacher Curriculum Framework (NTECF) is that student teachers should be equipped a set of competencies and skills so that they can in turn inculcate in their learners the competencies and skills. The set of skills and competencies provided by the NTECF, subsequently captured by the Pre-Tertiary Education Curriculum Framework are:

- critical thinking and problem-solving skills,
- creative and innovative skills,
- life-long learning/personal Life skills,
- collaborative/social skills,
- communication skills,
- literacy and numeracy skills,
- leadership skills,
- entrepreneurial skills,
- digital literacy/information, communication & technology (ICT) skills and,
- civic literacy.

ICT can be used to leverage the development of these skills and competencies if teachers are intentional about the ICTs use for skills and competencies development.

Learning Outcomes	Indicators
1. Demonstrate knowledge	1.1 Mention and describe some basic ICT tools and how to use
and understanding of the	them, including: Computers, and other hardware, software.
basic ICT tools and their	1.2 21 st century skills and ICT tools that can be used to
impact on 21 st century	integrate them in lessons.
skills	1.3 Analyse and evaluate the changes brought about by the
	introduction of ICT.
2. Demonstrate use of	2.1 Perform basic lesson planning tasks using an ICT tool, e.g.,
basic ICT tools for planning	using Google calendar.
lessons	2.2 Create, edit, format, save and print documents using
	various productivity tools.
	2.3 Use the internet to search for information
3. Demonstrate use of	3.1 Perform basic teaching tasks using an ICT tool, e.g., using
basic ICT tools for	PowerPoint, Google classroom, zoom, Google meet.
teaching, learning and	3.2 Perform basic lesson assessment tasks using an ICT tool,
assessment	e.g., using Google forms.
	3.3 Use the internet to search for activities for teaching,
	learning and assessment
4.Demonstrate use of	4.1 Perform basic research tasks using an ICT tool, e.g., using
basic ICT tools for research	survey monkey, Google forms.
	4.2 Use the internet for literature search including theoretical
	and conceptual frameworks

ICT TOOLS

ICT tools — both software and hardware — can be used for planning, teaching, learning, assessment, data management and for research, with some of them able to perform multiple functions. Some of these tools are stated below with a brief note on their usage.

ICT TOOLS FOR PLANNING LESSONS

AnswerGarden is a tool for online brainstorming and collaboration.

BrainPOP Lets you use pre-recorded videos on countless topics to shape your lesson plan, then use quizzes to see what stuck.

Buncee Helps students and teachers visualize, communicate, and engage with classroom concepts.

Class Dojo: This is a fun tool to gamify the classroom. Students make their own avatars, gain and lose points based on classroom behavior, discussion approaches, and other soft skills agreed upon by the teacher and the class. Teachers can also use Class Dojo to take attendance and create graphs that breakdown the information for teachers. Not only will this tool encourage students to uphold class values, but it will also provide key metrics to help teachers adjust their teaching tactics accordingly.

Coggle A mind-mapping tool designed to help you understand student thinking.

Conceptboard is a software that facilitates team collaboration in a visual format, similar to mind mapping but using visual and text inputs.

Dotstorming A whiteboard app that allows digital sticky notes to be posted and voted on. This tool is best for generating class discussion and brainstorming on different topics and questions.

Flipgrid: Flipgrid is the video discussion tool from Microsoft that opens-up the classroom. It is designed to allow students to speak to the group but without the same fear that might constrict responses in a real-world situation. Students can re-record responses, removing the pressure of answering in class, on the spot. Of course, it's also a great tool for use when learning remotely.

Google Calendar: With Google Calendar, you can quickly schedule meetings and events and get reminders about upcoming activities, so you always know what's next. Calendar is designed for teams, so it's easy to share your schedule with others — students and colleagues for example — and create multiple calendars that you and your team can use together.

Google Classroom: Google Classroom is a free web service, developed by Google for schools, that aims to simplify creating, distributing, and grading assignments in a paperless way. The primary purpose of Google Classroom is to streamline the process of sharing files between teachers and students. Google Classroom combines *Google Drive* for assignment creation, storage and distribution, Google Docs (equivalent of Microsoft Word), Sheets (equivalent of Microsoft Excel) and Slides (equivalent of Microsoft PowerPoint) for writing/word processing, calculation and graphing, and presentation respectively Gmail for communication, and Google Calendar for scheduling.

Google Meet: Google Meet is a google enterprise-grade video conferencing app. Now, anyone with a Google Account can create an online meeting with up to 100 participants and meet for up to 60 minutes per meeting.

PowerPoint Presentation: PowerPoint is a presentation programme developed by Microsoft. PowerPoint is often used to create business presentations but can also be used for educational or informal purposes. The presentations are comprised of slides, which may contain text, images, and other media, such as audio clips and movies. A good PowerPoint presentation enables teachers to make their lessons engaging, interactive and real.

Voov Meeting: VooV Meeting allows attendees to join meetings quickly on mobile phones, PCs, tablets, and webpages for a seamless conferencing experience across platforms

Zoom: Zoom Cloud Meetings is a proprietary video teleconferencing software program developed by Zoom Video Communications. It enables you to virtually interact with your students when in-person meetings are not possible, and it has been hugely successful for teaching and learning.

(Zoom, VooV Meeting and Google Meet are good for collaborative lesson planning with colleagues).

ICT TOOLS/APPS FOR TEACHING

AudioNote A combination of a voice recorder and notepad, it captures both audio and notes for student collaboration.

Edmodo is a free learning management platform that merges classroom content, safe communication, and assessment with social media savvy. Students and parents can get quick answers to questions as well as stay current on class assignments and happenings via the student planner and discussion threads. It provides a simple way for teachers to create and manage an online classroom community as well as enables students to connect and work with their classmates and teachers anywhere and anytime. The Ghana Library Authority as subscribed to this platform and available for teachers, students, and their parents to use. **Edpuzzle** helps you use video (your own, or one from Khan Academy, YouTube, and more) to track student understanding.

GeoGebra for Teaching and Learning Math. It is a free digital tool for class activities, graphing, geometry, collaborative whiteboard and more

Google Classroom: Google Classroom is a free web service, developed by Google for schools, that aims to simplify creating, distributing, and grading assignments in a paperless way. The primary purpose of Google Classroom is to streamline the process of sharing files between teachers and students. Google Classroom combines Google Drive for assignment creation and distribution, Google Docs, Sheets and Slides for writing, Gmail for communication, and Google Claendar for scheduling.

Jamboard is a digital interactive whiteboard in a collaborative whiteboard space with options to draw, add pictures, shapes, sticky notes, and text boxes. Jamboard is one smart display. Quickly pull in images from a Google search, save work to the cloud automatically, use the easy-to-read handwriting and shape recognition tool, and draw with a stylus but erase with your finger – just like a whiteboard.

Kasahorow is a vocabulary-enriching platform that helps to learn the English language and modernize African languages like a child. Kasahorow Keyboards for Android lets you type in Akan, English, Gbe, Ga-Dangme, Hausa and Yoruba conveniently. It is used as a normal keyboard by simply installing and selecting when you want to type an African language on any Android devices you have.

Kahoot is an online game-based learning platform. It allows teachers, organizations, and parents to set up fun web-based learning for others. Kahoot can be used as a fun trivia activity to do with students or teachers to have a series of fun questions at the same time learn.

Math Kids is a free learning game designed to teach young children numbers and mathematics. It features several mini games that toddlers and pre-K kids will love to play, and

the more they do the better their math skills will become. Adding Quiz will put your child's math and addition skills to the test.

Other mathematics applications are, inMaths, Geomaths

Moodle: Moodle stands for Modular Object-Oriented Dynamic Learning Environment. Moodle was designed to provide educators, administrators, and learners with an open, robust, secure, and free platform to create and deliver personalised learning environments. Moodle is a user-friendly Learning Management System (LMS) that supports learning and training needs for a wide range of institutions and organisations across the globe.

Photomath is a mobile application that utilizes a smartphone's camera to scan and recognize mathematical equations; the app then displays step-by-step explanations onscreen. It is available for free on both Android and iOS. It uses the camera on a user's smartphone or tablet to scan and recognize a math problem. Once the problem is recognized, the app will display solving steps, sometimes in a variety of methods or multiple approaches, to explain the scanned problem step-by-step and teach users the correct process.

Piazza Lets you upload lectures, assignments, and homework; pose and respond to student questions; and poll students about class content. This tool is better suited for older students as it mimics post-secondary class instructional formats.

QuickVoice Recorder Allows you to record classes, discussions, or audio for projects. Sync your recordings to your computer easily for use in presentations.

StudyGe: This is a geography for children. This learning game will help you to remember location of countries, their capitals and flags. You can train your memory and memorize information about countries. This offline platform will allow students to improve your knowledge of geography. Other geography platforms are LearnGeography, AP Human Geography

Telegram is a mobile application that allows users to communicate with them using mobile gadget and computer. Telegram can be used for teaching and learning for the following reasons:

Multiple platforms: smartphones (Operating system, Android), PC, Laptop, iPad, Tab, and Web., Compatible file format, large files transfer, Grouping facilities, better storage capacity and management, better memory system and management, better security with the encryption. Telegram can be used for teaching and learning in the following ways: announcement, forum i.e., whole class discussion, Quizzes, open ended question, group project report, listening practice, pronunciation practice, speaking practice, writing practice,

problem solving, Content/materials sharing, PowerPoint presentation.

Vocaroo Is a quick and easy way to record and share voice massages over the interwebs. Vocaroo creates audio recordings without the need for additional software. The recordings are easy to be embedded into PowerPoint presentations and websites.

Whiteboard is an instant formative assessment tool for your classroom, providing you with live feedback and immediate overview over your students. Engage your whole class, include every student and let everybody answer - including the shy students or students who normally wouldn't bother to answer.

DIGITAL ASSESSMENT TOOLS FOR TEACHERS

Classmarker: Classmarker is an online testing software that offers a free version that is very complete providing teachers with interesting possibilities for formative and summative evaluations. A professional web-based Quiz maker is an easy-to-use, customizable online testing solution for business, training & educational assessments with Tests & Quizzes graded instantly, saving hours of paperwork

Edulastic Allows you to make standards-aligned assessments and get instant feedback.

Gimkit Lets you write real-time quizzes.

Google Forms: Google Forms is a tool that allows collecting information from users through a personalized survey or exam. Google Forms is a free tool from Google that allows you to do the following: Create forms, surveys, quizzes, and such. Share the forms with others. Allow others to complete the forms online.

Kahoot - game-based assessment tool.

Mentimeter - pre-built education templates.

Naiku Lets you write quizzes students can answer using their mobile devices.

Poll Everywhere - used by 300,000 teachers.

Quiz Bot - Create a quiz with several multiple-choice questions and test on telegram

Socrative - quizzes and questions with real-time grading.

World Geography – Quiz Games for Geography

World Map Quiz – quizzes and questions for Geography

ICT TOOLS/APPS FOR RESEARCH

Academia.edu: is a platform for academics to share research papers. The company's mission is to accelerate the world's research.

ai.google: Google periodically releases data of interest to researchers in a wide range of computer science disciplines.

Biohunter: A Portal with literature search, data statistics, reading, sorting, storing, field expert identification and journal finder.

Code Ocean is a Cloud-based computational platform which provides a way to share, discover and run published code.

DataBank: Is an analysis and visualization tool that contains collections of time series data on a variety of topics.

Datacatalogs.org offers open government data from US, EU, Canada, CKAN, and more.

Data.gov: The USA government's official data portal offers access to tens of thousands of data sets

Data.gov.in: An Open Government Data (OGD) Platform India - is a platform for supporting Open Data initiative of Government of India. The portal is intended to be used by Government of India Ministries/ Departments their organizations to publish datasets, documents, services, tools and applications collected by them for public use. It intends to increase transparency in the functioning of Government and also open avenues for many more innovative uses of Government Data to give different perspective.

Data.gov.uk: The British government's official data portal offers access to tens of thousands of data sets on topics such as crime, education, transportation, and health

DeepDyve: provides simple and affordable access to millions of articles across thousands of peer-reviewed journals. Content from the world's leading publishers including Reed Elsevier, Springer, Wiley-Blackwell, and more.

GitHub: An Online software project hosting using the Git revision control system. Open Science Framework: This gathers a network of research documents, a version control system, and a collaboration software.

Google Finance: it provides stock market data and give updates in real time.

Google Scholar is a freely accessible web search engine that indexes the full text or metadata of scholarly literature across an array of publishing formats and disciplines.

Microsoft Academic Search: Find information about academic papers, authors, conferences, journals, and organizations from multiple sources.

Peer Evaluation: is an Open repository for data, papers, media coupled with an open review and discussion platform.

QuillBot is a paraphrasing and summarizing tool that helps millions of students and professionals cut their writing time by more than half using state-of-the-art AI to rewrite any sentence, paragraph, or article.

ResearchGate is the professional network for scientists and researchers. Over 15 million members from all over the world use it to share, discover, and discuss research.

Sciencescape: An Innovation in the exploration of papers and authors.

SlideShare: Community for sharing presentations and other professional content
SSRN: Is Multi-disciplinary online repository of scholarly research and related materials in social sciences.

Turnitin is an originality checking and plagiarism prevention service that checks your writing for citation mistakes or inappropriate copying. When you submit your paper, Turnitin compares it to text in its massive database of student work, websites, books, articles, etc.

Tutor PD Session on ICT Integration & 21st Century Skills

Age Levels/s: EG,UP,JHS

Name of Subject/s: ICT Integration

Focus: the bullet points provide the frame for what is to be done in the session. The SWL should use the bullets to guide what they write for the SL/HoD and tutors to do and say during each session. Each bullet needs to be addressed and specific reference should be made to the course manual/s.	Guidance notes on Leading the session. What the SL/HoDs will have to say during each stage of the session	Guidance Notes on Tutor Activity during the PD Session. What PD Session participants (Tutors) will do during each stage of the session.	Time in session
Introduction to the session	 1.1 Self-introduction: Ask tutors to introduce themselves. 1.2 Ask tutors to share any successes and issues they had when using ICT tools in a previous semester <i>employing talk for learning strategies.</i> 	 1.1 Kindly introduce yourself to the group. 1.2 Tutors share any successes and issues they had when using ICT tools in a previous semester <i>employing</i> <i>talk for learning</i> <i>strategies.</i> 	20 mins
	1.3 Asks tutors who are conversant with and have utilized ICT tool(s) in Lessons in the previous semester(s) to share their practices and how these ICT tools and its integration has impacted on their teaching in any of the semester(s). It is important to identify the topic as well as the ICT tool(s) used in the discussion.	1.3 Tutors who are conversant with and have utilized ICT tool(s) in Lessons in the previous semester(s) to share their practices and how these ICT tools and its integration has impacted on their teaching in any of the semester(s). It is important to identify the topic as well as the ICT tool(s) used in the discussion.	

1.4. Ask tutors to road the	1.4. Road the nurnese the	
1.4. ASK tutors to read the	1.4. Keau the purpose, the	
purpose, the learning	learning outcomes and	
outcomes and learning	learning indicators of	
indicators of the manual	the manual and use the	
and use the think-pair-	think-pair-share	
share approach to share	approach to share your	
their views about how	views about how the	
the manual can help	manual can help you to	
them to integrate ICT	integrate ICT into their	
into their lessons.	lessons.	
Distinctive aspects	Distinctive aspects	
Lead tutors to discuss ICT	Tutors to discuss ICT	
tool(s) they are familiar	tool(s) they are familiar	
with and any unique	with and any unique	
qualities of these ICT tool(s)	gualities of these ICT	
as learning tools that they	tool(s) as learning tools	
can identify.	that they can identify.	
·····		
Note:	Note:	
The following are the	The following are the	
distinctive aspects that this	distinctive aspects that	
manual has considered.	this manual has	
Reading literacy writing	considered:	
literacy numeracy	Reading literacy writing	
information literacy, ICT	literacy, numeracy	
linformation and	information literacy, ICT	
communications	linformation and	
tochnologios] digital	communications	
	tochnologios] digital	
and can be described		
and can be described	interacy, communication	
broadly as learning	and can be described	
domains.	broadly as learning	
	domains.	
1.5 Ask tutors to pair with a	1.5 Pair with a colleague	
colleague and share	and share your views	
their views about the ICT	about the ICT tools	
tools that they have	that you have used in	
used in their everyday	your everyday life and	
life and how the unique	how the unique	
qualities of these tool(s)	gualities of these	
can be incorporated into	tool(s) can be	
their classroom	incorporated into your	
teaching	classroom teaching	
	sides com teaching.	

	1.6 In groups ask tutors to write on a flip chart using Concept Cartoons:	1.6 In groups, write on a flip chart using Concept Cartoons:	
	a. ICT tool (S) tutors are familiar with. e.g., email, mobile phones, computers, slides, animation, zoom, telegram, etc.	a. The distinctive features of ICT tool(s) you are familiar with	
	b. ICT tool(s) tutors use and integrate in their teaching at the College of Education	b. CT tools you use and integrate in your teaching at the College of Education.	
	1.7 Let tutors present their findings via <i>radio</i> <i>reporting.</i>	1.7 Present your findings via <i>radio reporting.</i>	
2. Concept	Concept Development	Concept Development	25 mins
 Development (New learning likely to arise in lesson/s): Identification and discussion of new learning, potential barriers to learning for student teachers or students, concepts or pedagogy being introduced in the lesson, which need to be explored with the SL/HoD 	2.1. Using the think, pair, share approach, assign tutors sub-topics of integrating ICT into teaching and learning (equity, health and safety issues relating to the use of ICT tools) to tutors to discuss and write points on a flip chart for presentation. Allow time for each presentation and whole group discussion.	2.1. Discuss the sub-topic, assigned to you with your partner and share your views with the larger group	
NB The guidance for SL/HoD should set out what they need to do to introduce and explain the issues/s with tutors	 2.2 Ask tutors to work in pairs and examine the misconceptions in teaching and learning with ICT tool(s) and share ideas on how to address them. E.g. computers can do everything a teacher can do 	 2.2 In pairs, discuss misconceptions in teaching and learning with ICT tool (s) and share possible ways of addressing them. E.g. computers can do everything a teacher can do 	

		2.3 Ask tutors to outline	2.3 Outline possible	
		possible challenging	challenging areas in	
		areas in teaching with	teaching with ICT	
		ICT tool(s) taking into	tool(s) taking into	
		consideration GESI (e. g.	consideration GESI (e.	
		identifying areas in the	g. identifying areas in	
		curriculum where	the curriculum where	
		stereotypes are	stereotypes are	
		reinforced and	reinforced and	
		addressing these)	addressing these)	
3.	Planning for	Teaching and learning	Teaching and learning	40 mins
5.	teaching learning	activities.	activities.	40 11113
	and assessment			
	activities for the	3.1 Discuss with tutors	3 1 Discuss general ICT	
	lesson/s	general ICT tools for	tools for teaching and	
•	Reading and	teaching and learning	learning	
•	discussion of the		learning	
	teaching and	Deskton and lantons	Deskton and lantons	
	loarning activitios	computers Projector	computers Projector	
	Noting and	Digital camoras Brintor	Digital camoras Printor	
•	addrossing aroas	Photocopior tablats	Photocopior tablets	
	whore tutors may	Popplet Rep Drive Inede	Popplet Bop Drive Ineds	
	roquiro	Inade Webboards	Inada Wabbaarda	
	darification	Scappors Microphonos	Scappors Microphonos	
_	Noting	interactive white board	interactive white board	
•	noting	DVDs and CDs Elash dises	DVDs and CDs Elash dises	
	opportunities for making links to the	DVDS and CDS Flash discs,	DVDS and CDS Flash discs,	
	making links to the	video Games	video Games	
	Basic School		5 ~	
	Noting	E.g.,	E.g.,	
•	Noting	Geomaths	Geomaths	
	opportunities for	Natins Kits	Waths Kits	
	Integrating: GESI	Nicrosoft maths solver	Nicrosoft maths solver	
	responsiveness	Photomaths	Photomaths	
		Scratch	Scratch	
	SKIIIS	kasanorow	kasanorow	
•	Reading,			
	discussion, and	Software	• Software	
	identification of	Office Professional	Office Professional	
	continuous	– E.g. XP.	– E.g. XP.	
	assessment	Good photo	Good photo	
	opportunities in	software e.g.	software e.g.	
	the lesson. Each	Microsoft Digital	Microsoft Digital	
	lesson should	Photo Suite	Photo Suite	
	include at least	"Photostory 2	"Photostory 2	
	two opportunities	comes with service	comes with service	
	to use continuous	pack 2.	pack 2.	

assessment to	 Inspiration 	Inspiration
support student	<u>Smart Notebook</u>	<u>Smart Notebook</u>
teacher learning	o <u>United</u>	o <u>United</u>
Resources:	Streaming	Streaming
\circ links to the	subscription	subscription -
existing PD	Hardware	Hardware
Themes, for	Flat Screen monitor	Flat Screen monitor
example, action	Good quality printer	Good quality printer
research,	preferably a laser	preferably a laser
questioning and	black and color	black and color
to other	photo. E.g. HP	photo. E.g. HP
external	CD/DVD RW	CD/DVD RW
reference	drive(s)	drive(s)
material:	USB ports	USB ports
literature, on	• Scanner – e.g.	• Scanner – e.g.
web, YouTube,	Epson brand	Epson brand
physical	• Digital camera – e.g.	 Digital camera –
resources,	of Canon	e.g. of Canon
power point;	External storage -	External storage -
how they	an <u>external hard</u>	an <u>external hard</u>
should be used.	drive to back up	drive to back up
Consideration	data	data
needs to be	Portable storage -	Portable storage -
given to local	USB flash drive, 2 GB	USB flash drive, 2
availability	minimum.	GB minimum.
 guidance on any 	• <u>Paim</u> or other	Paim or other
power point	nandneid device to	
TIM or other	detec reminders	datas, romindars
rosourcos which	and store pictures	and store pictures
need to be	and store pictures	and store pictures
developed to	Tungsten Palm	Tungsten Palm
sunnort	• Smart hoard or	Smart hoard or
learning	Smart Airliner with	Smart Airliner
Tutors should be	projection unit for	with projection
expected to have a	classroom	unit for classroom
plan for the next	use.	use.
lesson for student	CPS (classroom	CPS (classroom
teachers	performance	performance
	system) also for	system) also for
	classroom use.	classroom use.
	Teaching 21st Century	Teaching 21st Century
	Skills with ICT	Skills with ICT
	Collaborative Problem	Collaborative Problem
	Solving	Solving

https://youtu.be/cnkKHL d	https://youtu.be/cnkKHL	
yGE	dyGE	
Creativity	Creativity	
https://www.youtube.com/	https://www.youtube.co	
watch?v=qV7DiTFdtvw	m/watch?v=qV7DiTFdtvw	
Hands-On Learning	Hands-On Learning	
https://youtu.be/vYUNfJ9IK	https://youtu.be/vYUNfJ9I	
<u>zs</u>	<u>Kzs</u>	
Effective Written and Oral	Effective Written and Oral	
Communication	Communication	
https://www.youtube.com/	https://www.youtube.com/	
watch?v=D5hMN XkPQA	watch?v=D5hMN XkPQA	
Ethical Decision Making	Ethical Decision Making	
https://youtu.be/lwk8dGFn	https://youtu.be/Iwk8dGF	
<u>1tY</u>	<u>n1tY</u>	
Information and Media	Information and Media	
Literacy	Literacy	
https://youtu.be/bjYhmTC3	<u>https://youtu.be/bjYhmTC</u>	
lrc	<u>3lrc</u>	
Critical Thinking	Critical Thinking	
https://youtu.be/y7iMEH7j	https://youtu.be/y7iMEH7	
<u>GFk</u>	<u>jGFk</u>	
https://youtu.be/88DoGrqE	https://youtu.be/88DoGrq	
<u>uJk</u>	<u>EuJk</u>	
Lasdauchin	Lee develoire	
Leadership	Leadership	
https://youtu.be/-	https://youtu.be/-	
NF10F6bX g	NF10F6bX g	
Devenuel Deevenuelhility and	Demonal Demonsthility	
reisonai Responsibility and	and Initiativo	
https://voutu.bo/pDE121Er	https://voutu.bo/pDE121E	
	rclM	
3.2 Lead tutors to discuss	3 2 Discuss Special	
Special Education Needs	Education Needs (SEN)	
(SEN) ICT tools for	ICT tools for teaching	
teaching learning and	learning and	
accessment	accoccmont	
	assessinent.	
F a Teachers dealing with	F a Teachers dealing with	
the SEN will require special	the SFN will require	
ICT tools like text	special ICT tools like text	
magnifier bood wonds	magnifier head words	
magniner, neau wanus,	magniner, neau wanus,	

keyboard for cerebral Palsy,	keyboard for cerebral
braille, typing aids, large	Palsy, braille, typing aids,
prints, audio books.	large prints, audio books.
3.3 Lead tutors to discuss	3.3 Discuss some useful
some useful Education	Education Technology
Technology Resources	Resources for teaching,
for teaching, learning	learning and
and assessment.	assessment.
E.g., Office 365 vs G-Suite	E.g. Office 365 vs G-Suite
for Education	for Education
Google Meet for Online	Google Meet for Online
Teaching	Teaching
Google Classroom for	Google Classroom
Online	for Online
Assignment submissions	Assignment submissions
Plagiarism checking	Plagiarism checking
Softwares	Softwares. Tools
Tools for Checking	for Checking Grammar
Grammar errors Online	errors Online
Assessment tools	Assessment tools
include: grading rubrics,	include: grading rubrics,
Canvas Assignments,	Canvas Assignments,
plagiarism detection, self-	plagiarism detection, self-
assessment, and peer	assessment, and peer
assessment, surveys, and	assessment, surveys, and
classroom polling. Quiz bot	classroom polling. Quiz bot
Digital Assessment Tools for	Digital Assessment Tools
Teachers:	for Teachers:
Socrative - guizzes and	Socrative - guizzes and
questions with real-time	questions with real-time
grading.	grading.
Classmarker- guizzes and	Classmarker- guizzes and
guestions with real-time	guestions with real-time
grading	grading
Google Forms - easy to use.	Google Forms - easy to use.
Mentimeter - pre-built	Mentimeter - pre-built
education templates.	education templates.
Poll Everywhere - used by	Poll Everywhere - used by
300,000 teachers.	300,000 teachers.
Kahoot - game-based	Kahoot - game-based
assessment tool.	assessment tool.
Further links to videos	Further links to videos
for further application	for further application
of ICT tools in the	of ICT tools in the
teaching and learning	teaching and learning
process	process

		 <u>https://www.youtube.com/</u> <u>watch?v=k8nMh71ky4Y</u> 3.4 Ask tutors to suggest ICT-mediated teaching, learning and assessment activities in their respective subjects taking into account GESI. E.g., Making reasonable adjustments using ICT for physically challenged learners. E.g. Both male and female learners playing leading roles in ICT-based group tasks. 	 <u>https://www.youtube.co</u> <u>m/watch?v=k8nMh71ky4Y</u> 3.4 Suggest ICT-mediated teaching, learning and assessment activities in your respective subjects. aking into account GESI. E.g., Making reasonable adjustments for physically challenged learners. Both male and female learners playing leading roles in a group task. 	
		3.5 Let tutors present their findings to the larger group	3.5 Present your findings to the larger group	
 Evalua review session Tutors identifi friends lessons at next Identifi address outstan relating lesson, clarific 	tion and of n: need to y critical to observe s and report t session ying and sing any nding issues g to the /s for ation	 4.1 Ask tutors to identifying any outstanding issues relating to the lesson/s for clarification 4.2 Ask tutors to identify a critical friend who will observe their first lesson and give them feedback on how they integrated ICT in the lesson. 	 4.1 Identifying any outstanding issues relating to the lesson/s for clarification. 4.2 Identify a critical friend who will observe your first lesson and give you feedback on how you integrated ICT in the lesson. 	5 mins



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-1

MATHEMATICS

Age Levels/s:

Name of Subject/s:

- a. Theories in the Learning of Numeracy in Early Grade
- a. Early Gradeb. Upper Grade
- c. JHS (Core)
- d. JHS (Elective)
- b. Theories in Learning upper primary mathematics
- c. Theories in Learning of Jnr High School Math.
- d. Further Algebra

Tutor PD Session for Lesson 1 in the Course Manual

Lesson Tittle:

- a. Early Grade Why do we teach mathematics in school?
- b. Upper Grade Why do we teach mathematics in school?
- c. JHS (CORE) Why do we teach mathematics in school?
- d. JHS (Elective) Binary Operation: Learning, teaching and applying

Focus: the bullet points provide the frame for what is to be done in the session. The SWL should use the bullets to guide what they write for the SL/HoD and tutors to do and say during each session. Each bullet needs to be addressed and specific reference should be made to the course manual/s.	Guidance notes on Leading the session. What the SL/HoDs will have to say during each stage of the session	Guidance Notes on Tutor Activity during the PD Session. What PD Session participants (Tutors) will do during each stage of the session.	Time in session
 1a Introduction to the semester – in session one Introduction to the purpose of the specialisms: EG, UP and JHS Overview of subject/s age level/s to be covered in the PD 	 Introduction 1.1 Ice breaker activity: Begin with an investigational activity by asking tutors to mention any everyday life situation that is related to mathematics 1.2 Lead tutors to discuss the overview of the phases to be covered in 	 Introduction 1.1 Ice breaker: Mention any one everyday activity/situation and its related mathematical concept. 1.2 Discuss the overview of the phases to be covered in this PD 	20 mins

	sessions and	this PD session and how		
	guidance on	it will be organized.		
	grouping tutors	Early Grade: Theories in the	Early Grade: Theories in the	
	according to the	Learning of Numeracy in	Learning of Numeracy in	
	subject/s, age	Early Grade	Early Grade	
	levels/s.	Upper Prim-Theories in	Upper Prim-Theories in	
•	Introduction to the	Learning upper primary	Learning upper primary	
	course manual/s	mathematics	mathematics	
•	Overview of course	JHS (Core)-Theories in	JHS (Core)-Theories in	
	learning outcomes	Learning of Jnr High School	Learning of Jnr High School	
•	Introduction to the	Math.	Math.	
	two continuous	JHS (Elective) - Further	JHS (Elective) - Further	
	assessment	Algebra	Algebra	
	components to be			
	undertaken in each	NB:	NB:	
	subject during the	Remember to put members	Please work in your phase	
	semester (See	into groups according to the	group and contribute in the	
	Course Assessment	phases to be taught in the	whole group.	
	Components at a	semester.		
	Glance Appendix 2)			
	NB: in subjects	1.3 Guide tutors to scan	1.3 Individually, scan	
	where there are no	through the course	through the course	
	assessment	manual and indicate the	manual, identify the	
	components in the	purpose of the	purpose of the	
	course manuals	specialisms: EG, UP and	specialisms (EG, UP and	
	examples will need	JHS	JHS) and share with the	
	to be provided for		whole group.	
	SL/HoD.	I. Early, Upper Prim & JHS		
		(Core) Grade: The course		
		considers now an		
		understanding of		
		mathematics develops		
		and the unique		
		characteristics of learners		
		also looks at now student		
		teachers will develop		
		awareness of equity and		
		II. JHS (Elective):		
		ine course considers now:		
		a) student teachers Will		
		develop mathematical		
		models that can be used		

to make a number of predictions including weather forecast, how much or less resources are needed to increase production in order to yield maximum or minimum profits and b) to explore the uses of algebraic concepts in real life situations (B.Ed JHS Revised Curriculum, PP. 944)		
PP. 944)		
NB:	NB:	
Draw tutors' attention to all	Pay attention to all NTS	
NIS references and salient	references and salient points	
points necessary for the	necessary for the	
development of their	development of their	
projornia.	projorma.	
1.4 Ask tutors to read the introduction of the various course manuals (of the various phases named above) and discuss the course Learning Outcomes (CLOs) in groups as appropriate.	1.4 Read the introduction of your course manual (of the appropriate phase) and discuss the course Learning Outcomes (CLOs) in groups as appropriate.	
1.5 Ask tutors to discuss the two continuous assessment components to be undertaken during the course in line with the NTEAP making reference to the appendix 2 of this PD Manual to be abreast with: The scope of the subject project and subject portfolio	1.5 Discuss the two continuous assessment components to be undertaken during the course in line with the NTEAP to be abreast with: The scope of the subject project and subject portfolio ii. The percentage/weight distributions and ii. Alternative tools for CA.	
ii. The percentage/		

	weight distributions and iii. Alternative tools for		
 1b Introduction to the session Review prior learning Reading and discussion of the introductory sections of the lesson up to and including learning outcomes and indicators Overview of content and 	 CA. 1.6 Ask tutors to tell how useful the previous semester's PD session was and how it influenced their teaching in year 1 semester 2. Lead tutors to mention how students were well placed to employ the various strategies and skills during the Basic School classroom work including STS Field Experience. 	1.6 Tell how useful the previous semester's PD session was and how it influenced your teaching in year 1 semester 2. Mention how students were well placed to employ the various strategies and skills during the Basic School classroom work including STS Field Experience.	
identification of any distinctive aspects of the lesson/s, NB: The guidance for SL/HoD should identify and address any areas where tutors might require clarification on any aspect of the lesson. NB: SL/HoD should ask tutors to plan for their teaching as they go	 1.7 Ask tutors to read and discuss the introductory section of lesson 1 in the course manual including the learning outcomes (LOs) in phase groups. 1.8 Ask tutors in phase groups to discuss the important or distinctive aspects of the first lesson including vocabulary and fundamental accents. 	 1.7 Read and discuss the introductory section of lesson 1 in the course manual including the learning outcomes (LOs) in phase groups. 1.8 In phase groups, discuss the important or distinctive aspects of the first lesson including vocabulary and fundamental connects. 	
through the PD session	Distinctive aspects include the interactive nature of the activities, emphasis on connecting concepts: a. Early, Upper Prim & JHS (Core) Grade: – eg. How Mathematics relate to society and what it means to learn and teach Mathematics. b. JHS; Further Algebra – eg. Misconceptions, barriers,	Distinctive aspects include the interactive nature of the activities, emphasis on connecting concepts: a. Early, Upper Prim & JHS (Core) Grade: – eg. How Mathematics relate to society and what it means to learn and teach Mathematics. b. JHS; Further Algebra – eg. Misconceptions, barriers,	

		concepts and p	properties of	concepts and properties of	
		binary operation	on	binary operation	
		NB:			
		Be ready for p	ossible		
		questions from	n tutors for		
		clarification.			
		Anticipated qu	vestions:		
		i. Which meth	ods of		
		teaching Mo	athematics at		
		the EG/UP/	IHS are aood?		
		ii. Which meth	ods of		
		teachina Mi	athematics at		
		the FG/UP/	IHS are?		
		iii How hest de	nes one		
		introduce th	ne concent of		
		hingry oper	ation to 149		
		students?			
		Guide tutors to	o discuss the		
		possible answe	ers to the		
		anticipated qu	estions,		
		bearing in min	d pedagogy,		
		GESI, ICT – E.g.	, the most		
		appropriate m	ethods depend		
		on age and pre	evious		
		knowledae of l	earners.		
		obiective of les	son. etc.		
		Binary operatio	on can be		
		introduced thr	ough the		
		onerations lea	rners are		
		familiar with -	en + - v etc		
			cg. , , , . cic		
2.	Concept	Concept Deve	lopment	Concept Development	15 mins
	Development (New	2.1 Ask tutors	to identify	2.1 Ask tutors to identify	
	learning likely to	familiar an	d unfamiliar	familiar and unfamiliar	
	arise in lesson/s):	concepts ir	n their lessons	concepts in their lessons	
•	Identification and	and discus	s with the	and discuss with the	
	discussion of new	larger grou	ıp.	larger group.	
	learning, potential	_			
	barriers to learning	Familiar	Unfamiliar		
	for student teachers	Concepts	concepts		
	or students.	Commutative	Inverse		
	concepts or	property	property		
	pedagogy being	of			
l			dovolons		

lesson, which need to be explored with the SL/HoD NB: The guidance for SL/HoD should set out what they need to do to introduce and explain the issues/s with tutors	2.2 Lead tutors to draw connections among concepts in the various lessons in line with the basic school curriculum. Example: The connection between addition and subtraction is that one is the inverse of the other.	2.2 In your phase groups, draw connections among concepts in the lesson and in line with the basic school curriculum.	
	2.3 Ask tutors to use Think- Pair-Share to outline possible challenging areas in teaching and assessing 'Why do we teach mathematics in school?' and 'Binary Operation.' (Example: In Early, Upper Primary and JHS (Core) Grades, there is the challenge of presenting the lesson in a practical form without the relevant resources)	2.3 Individually, outline the challenging areas in your lesson, share with a member of the same phase group and then with the whole group.	
	 2.4 Lead tutors to discuss misconceptions and barriers in teaching and learning of the lesson. Example: a. Early, Upper Prim & JHS (Core) Grade: – i) Mathematics is just about numbers and operations. ii) Some mathematics topics are not related to real life. b. JHS (Further Algebra) – Closure property is determined without considering the inverses of all the numbers in the numbers in the number system used. 	 2.4 In whole group, discuss misconceptions and barriers in teaching and learning of the lesson. Example: a. Early, Upper Prim & JHS (Core) Grade: (i) Mathematics is just about numbers and operations. (Ii) Some mathematics topics are not related to real life. b. JHS (Further Algebra) Closure property is determined without considering the inverses of all the numbers in the number system used. 	

		Barriers may include weak	Barriers may include weak	
		prior knowledge, lack of	prior knowledge, lack of	
		appropriate resources. lack	appropriate resources. lack	
		of opportunity to use ICT due	of opportunity to use ICT due	
		to failure of electric power	to failure of electric power	
		(lights-out), bad/interrupted	(liahts-out). interrupted	
		network, unavailability of	network, unavailability of	
		internet bundle for students.	internet bundle for students.	
		inadequate contact time due	inadequate contact time due	
		to staff meetings.	to staff meetings.	
3.	Planning for	Planning for Teaching and	Planning for Teaching and	40 mins
	teaching, learning	learning Activities for the	learning activities	
	and assessment	Lesson		
	activities for the			
	lesson/s	3.1 In their phase groups,	3.1 In your phase groups,	
•	Reading and	ask tutors to suggest	ask tutors to suggest	
	discussion of the	teaching and learning	teaching and learning	
	teaching and	activities for the lesson	activities for teaching	
	learning activities	ensuring;	the lesson	
•	Noting and	i. Provision is made for SEN	ensuring;	
	addressing areas	ii. Both genders take leading	i. Provision is made for SEN	
	where tutors may	roles in group task	ii. Both genders take leading	
	require clarification	iii. Even distribution of	roles in group task, etc	
•	Noting opportunities	questions to different	referring to NTS 1a, b, c, d,	
	for making links to	categories of learners based	2b, e, f, 3b, c	
	the Basic School	on gender, ability, previous		
	Curriculum	experience, etc. referring to		
•	Noting opportunities	NTS 1a, b, c, d, 2b, e, f, 3b, c		
	for integrating: GESI			
	responsiveness and	3.2 Ask tutors to read the	3.2 Read the activities	
	ICT and 21 st C skills	activities outlined in their	outlined in your course	
•	Reading, discussion.	course manuals and	manuals and identify	
	and identification of	identify areas that	areas that require	
	continuous	require clarification.	clarification.	
	assessment			
	opportunities in the	NB: Refer to the Basic School	NB: Refer to the Basic	
	lesson. Fach lesson	Curriculum (BSC pp. xv – xvii)	School Curriculum?" (BSC	
	should include at	and http://uk.sagepub.com	pp. xv – xvii) and	
	least two	for explanations on "Why do	https://uk.sagepub.com for	
	opportunities to use	we teach mathematics in	information on "Why do we	
	continuous	school?" and search through	teach mathematics in	
	assessment to	"IXL Math" and GeoGebra to	schools? Use internet	
		clarify the otherwise dark	search such as "IXL Math",	

support student	spots in "Further Algebra".	GeoGebra to clarify the	
teacher learning	, 5	otherwise dark spots in	
Resources:		"Further Alaebra".	
\circ links to the			
existing PD	3.3 Lead tutors to	3.3 Brainstorm to come up	
Themes for	brainstorm to come up	with some pedagogical	
example action	with some nedagogical	approaches that can be	
research	approaches and their	employed during the	
questioning and	impact on learning of the	lesson and their	
to other external	concepts taking into	effectiveness towards	
reference	consideration inclusivity	learning of the concents	
material	Example:	Mention any GESL issues	
literature on web	i) The use of inquiry to	that need consideration	
vou tube physical	explore how Mathematics	while using those	
resources, power	relate to society	annroaches	
point; how they	(ii) The use of differentiation	approactics	
should be used.	and scaffolding to ensure		
Consideration	that no learner is left hehind		
needs to be given	(BSC nn vy)		
to local availability	(DSC pp. xv) iii) Being natient with		
 guidance on any 	stutterers using tactile or		
power point	braille for visually		
presentations,	challenged providing peer		
TLM or other	support for those who might		
resources which	need while you pay		
need to be	attention to all Phases		
developed to			
support learning	3.4 Ask tutors to explain	3 4 Suggest teaching	
 Tutors should be 	some suggested teaching	strategies to be used in	
expected to have a	stratogies that can help	achieving the LOs of the	
plan for the next	inculcate core	losson and ovplain how	
lesson for student		they can help inculcate	
teachers	toochars and for that	citey can help incuicate	
	matter Pasis School	core competencies in	
		that matter Desig School	
	Evample: Using al Crown		
	Example. Using a) Group	learners.	
	Mathematics relate to		
	sociaty Social and		
	Londership Skills h)		
	Investigation to identify		
	to consider when		
	investigation desure of		
	investigating closure of		

number systems using Binary Operation – Critical Thinking		
3.5 Ask tutors to mention some GESI responsive resources that can be used with the suggested approaches and strategies in achieving the LOs.	3.5 Mention some GESI responsive resources that can be used with the suggested approaches and strategies in achieving the LOs.	
E.g. Resources may include supporting staff with experts in sign language as well as resources such teacher and learner resource packs, textbooks, course manual, projectors, flip charts, sticky notes, braille, tactile materials, audio and audio- visuals that can be used in the teaching and learning of the concepts mentioned above (NTS 3j)	E.g. Resources may include supporting staff with experts in sign language as well as resources such teacher and learner resource packs, textbooks.	
3.6 Using discussion, lead tutors to come out with assessment strategies ('as' and 'for') to be used during teaching of the lesson.	3.6 Using discussion, lead tutors to come out with assessment strategies ('as' and 'for') to be used during teaching of the lesson.	
NB: Continuous assessment activities (assignments, quizzes, group presentations, etc. should be used to create subject projects and build subject portfolios). Example: A project on how children learn using the Piagetian stages. (EG, UP)	NB: Continuous assessment activities (assignments, quizzes, group presentations, etc. should be used to create subject projects and build subject portfolios). Example: A project on how children learn using the Piagetian stages. (EG, UP)	
A project on investigation of closure of different number	Make reference to assessment in the course	

systems under various binary operations (JHS)	manual and NTEAP	
Make reference to assessment in the course manual and NTEAP		
3.7 Ask each tutor to develop a sample of assessment item based on the LOs and share with the whole group.	3.7 Develop a sample of assessment items based on the LOs and share with the whole group.	
Example: Early, Upper Primary and JHS (Core) Grades – Interview 10 basic school teachers during the STS activity on mathematics that basic school learners are exposed to a) at home & b) during play. JHS Grade – In groups of four, develop any game for teaching any concept within your course outline on Binary Operation.	Example: Early, Upper Primary and JHS (Core) Grades – Interview 10 basic school teachers during the STS activity on mathematics that basic school learners are exposed to a) at home & b) during play	
3.8 Lead tutors to discuss the various ways they can support student teachers to build their subject portfolio.	3.8 Discuss the various ways you can support student teachers to build their subject portfolio.	
Example: Encouraging student teachers to file all their assignments with feedback in their folders.	Example: Encouraging student teachers to file all their assignments with feedback in their folders.	
Taking notes in class and filing them.		
3.9 Ask a tutor to model a	3.9 Prepare and model a	
presentation of an	presentation of an	
activity using projector,	activity using projector,	
internet search and	internet search and	
taking into	taking into consideration	

	consideration GESI	GESLissues (eg. Both	
	issues (eg. Both genders	genders taking the	
	taking the loading roles	loading roles in their	
	in their groups) NTS 12	groupe) NTS 12 h 2h o	
	h 2h a 2h a h DCC an		
	b, 2b, e, 3b, c, J; BSC pp.	3b, c, J; BSC pp. III)	
4. Evaluation and	Evaluation and review of	Evaluation and review of	15 mins
review of session:	session:	session:	
Tutors need to	4.1 Engage tutors in	4.1 Reflect and provide	
identify critical	providing feedback of	feedback on this PD	
friends to observe	the PD session taking	session taking into	
lessons and report	into consideration –	consideration – Clarity	
at next session	Clarity of content, ICT	of content, pedagogical	
 Identifying and 	integration, GESI, Twenty	approaches employed,	
addressing any	First Century Skills (NTS	ICT integration, GESI,	
outstanding issues	1a, 3i, BSC pp. x-xvi) and	Twenty First Century	
relating to the	make notes that will help	Skills (NTS 1a, 3i, BSC pp.	
lesson/s for	them to teach Lesson 1	x-xvi)? and make notes	
clarification		that will help you to	
clarification		teach Lesson 1	
	4.2 Engage tutors to identify	4.2 Identify unresolved	
		issues relating to this	
	rolating to this losson for	losson for clarification	
	clarification		
	NB: Take pate of all	NP: But your uproceived	
	NB: Take note of all	INB: Put your unresolved	
	unresolved issues that may	issues unto the	
	need further research or	department's whatsApp/	
	consultation and use any of	Telegram platform and	
	following strategies to	research into the issues	
	address them.	raised.	
	i. put on SL/SWL WhatsApp/		
	Telegram platform for		
	discussion		
	ii. tutors to research for the		
	next PD session for		
	discussion		
	4.3 Ask tutors to identify a	4.3 Identify a critical friend	
	critical friend from the	from the same or	
	same or related	related discipline to	
	discipline to observe the	observe the enactment	
	enactment of their	of your lesson and to	
	enactment of their	or your lesson and to	

lesson and provide	provide feedback during	
feedback during the next	the next PD Session (NTS	
PD Session (NTS 1a).	1a).	
Advance Preparation	Advance Preparation	
4.4 Ask tutors to remember	4.4 Remember to prepare	
to prepare proforma for	proforma for the lesson	
Lesson 1 taking note of	1 taking note of	
important or distinctive	important or distinctive	
aspects of the lesson and	aspects of the lesson	
crosscutting issues and	and crosscutting issues	
read Lesson 2 of the	and read Lesson 2 of the	
Course Manual on:	Course Manual on:	
Early Grade – Teacher beliefs	<u>Early Grade</u> – Teacher	
about mathematics and their	beliefs about mathematics	
relation to teaching	and their relation to	
<u> Upper Primary</u> - Teacher	teaching	
beliefs about mathematics	<u>Upper Primary</u> - Teacher	
and their relation to	beliefs about mathematics	
teaching	and their relation to	
<u>JHS(Core)</u> - Teacher beliefs	teaching	
about mathematics and their	JHS (Core) - Teacher beliefs	
relation to teaching	about mathematics and	
<u>JHS (Elective.)</u> – Sequence	their relation to teaching	
and series; learning teaching	<u>JHS (Elective)</u> – Sequence	
and applying.	and series; learning teaching	
	and applying.	
NB:	NB:	
i. Read the course manual	i. Read the course manual	
the PD session guide, the	the PD session guide, the	
NTEAP, and the NTS ahead	NTEAP, and the NTS ahead	
of time to identify any	of time to identify any	
outstanding issues relating	outstanding issues relating	
to the lesson for	to the lesson for	
clarification.	clarification.	
ii. Collect all-inclusive		
resources (such as projector,		
flip chart and sticky notes)		
you need ahead of time,		
prepare samples of TLMs you		
may need and rehearse how		
these may be used to support		
the achievement of your goals		

Age Levels/s:

Name of Subject/s:

- a. Early Grade
- a. Theories in the Learning of Numeracy in Early Grade
- b. Upper Grade

c. JHS (Core)

- b. Theories in Learning upper primary mathematics
- c. Theories in Learning of Jnr High School Math.
- d. JHS (Elective)
- d. Further Algebra

Tutor PD Session for Lesson 2 in the Course Manual

Lesson Tittle:

- a. Early Grade Teacher beliefs about mathematics and their relation to teaching
- b. Upper Grade Teacher beliefs about mathematics and their relation to teaching
- c. JHS Teacher beliefs about mathematics and their relation to teaching
- d. JHS Sequences and Series: Teaching, Learning and applying

Focus: the bullet points provide the frame for what is to be done in the session. The SWL should use the bullets to guide what they write for the SL/HoD and tutors to do and say during each session. Each bullet needs to be addressed and specific reference should be made to the course manual/s.	Guidance notes on Leading the session. What the SL/HoDs will have to say during each stage of the session	Guidance Notes on Tutor Activity during the PD Session. What PD Session participants (Tutors) will do during each stage of the session.	Time in session
 Introduction to the session Review prior learning A critical friend to share findings for a short discussion and lessons learned Reading and discussion of the 	 Introduction 1.1 Ice breaker activity: Begin with an investigational activity for the lessons. <i>Example: What are best ways students learn Mathematics?</i> 1.2 Ask tutors to tell how useful the previous 	 Introduction 1.1 Mention some of the best ways students can learn mathematics best. 1.2 Tell how useful the previous semester's PD 	20 mins

sections of the	was and how it influenced	influenced your teaching	
lesson up to and	their teaching in year 1	in year 1 semester 2	
including learning	semester 2.		
outcomes and			
indicators	1.3 Ask a critical friend to	1.3 As a critical friend share	
Overview of	give feedback on	his/her observation on	
content and	observation during	the first lesson.	
identification of	enactment of lesson first		
any distinctive	lesson.		
aspects of the			
lesson/s.	NB: Thinas that a critical		
NB The guidance for	friend might have		
SI /HoD should identify	observed: tutor's choice		
and address any areas	of words, pedagogical		
where tutors might	content knowledge.		
require clarification on	content knowledge		
any aspect of the	subiect matter. ICT tools.		
lesson.	GESI and the use of		
NB SL/HoD should ask	NTEAP		
tutors to plan for their			
teaching as they go	1.4 Ask tutors to read and	1.4 Read and discuss the	
through the PD session	discuss the introductory	introductory section of	
	section of the lesson	the lesson (up to	
	including the learning	learning outcomes).	
	outcomes (LOs) in phase	Suggest relevant	
	groups.	previous knowledge of	
		students that will	
		support effective	
		teaching and learning of	
		the lesson.	
	1.5 Ask tutors to identify the	1.5 Identify the purpose of	
	purpose of the lesson	the lesson from the	
	from the course manual	course manual and state	
	and state their	your expectations of the	
	expectations of the PD	PD Session.	
	Session		
	Purpose of the Lesson		
	EG/UP/JHS (core): To		
	develop student teachers'		
	awareness of how teachers'		
	beliefs about mathematics		
	can influence their teaching.		

JHS (Elective): Develop student teachers' understanding of sequences and series and how to apply these concepts in other fields of mathematics (Refer to PD Manual)		
 1.6 Ask tutors in phase groups to discuss the important or distinctive aspects of the second lesson including vocabulary and fundamental concepts. Distinctive Aspect a. EG/UP/JHS (core) - Teacher beliefs about mathematics and their relation to teaching b. JHS (Elective) - Sequences and Series: Learning, teaching and applying. Vocabulary EG/UP/JHS (core): Examples: concept, Exposition, Implication Beliefs, Attitude Values Endamental Concepts a. EG/UP/JHS (core Teachers' beliefs about the teaching of mathematics teachers' Attitude towards the teaching of mathematics Values of teaching mathematics JHS (Elective) Meaning and types of arithmetic sequences and series Finding the general (nth)	 1.6 In phase groups, discuss the distinctive aspects of the second lesson including vocabulary and fundamental concepts related to the components of the front matters. <i>NB: Possible questions from</i> <i>tutors to be addressed</i> (<i>Anticipated questions</i>): <i>I</i>) How does teacher beliefs, <i>teacher attitude and</i> <i>Teacher practices connect to</i> <i>influence effective teaching</i> <i>of Mathematics.</i> <i>II</i>) How ways can sequence be explored? 	

	term of arithmetic sequences and series NB: Possible questions from tutors to be addressed (Anticipated questions): I) How does teacher beliefs, teacher attitude and Teacher practices connect to influence effective teaching of mathematics. II) How ways can sequence be explored?		
 2. Concept Development (New learning likely to arise in lesson/s): Identification and discussion of new learning, potential barriers to learning for student teachers or students, concepts or pedagogy being introduced in the lesson, which need to be explored with the SL/HoD NB The guidance for SL/HoD should set out what they need to do to introduce and explain the issues/s with tutors 	 2.1 Ask tutors to identify familiar and unfamiliar concepts in their lessons and discuss with the larger group. Familiar Concept a.EG/UP/JHS (core): Beliefs Attitudes Values JHS (Elective); Counting Sequence Unfamiliar Concepts a. EG/UP/JHS (core): e.g. How teachers' attitudes influence the learning of Mathematics Concepts b. JHS (Elective): e.g. Series Finding the sum of the first <i>n</i> terms of arithmetic progression. 2.2 Lead tutors to draw connections among concepts in the various lessons in line with the Basic School Curriculum. 	 2.1 Identify familiar and unfamiliar concepts in their lessons and discuss with the larger group. 2.2 Draw connections among concepts in the various lessons in line with the basic school curriculum. 	15 mins

 2.3 Ask tutors to outline possible challenging areas in (a) Teacher beliefs about mathematics and their relation to teaching. (b) Sequences and Series: Learning, teaching and applying. <u>Challenges</u> Some possible challenges for all Specialisms. Example JHS Specialism; The challenge involves in identifying the pattern 1, 8, 27, 48 has no pattern. <i>NB: Guide teachers to know the challenge involve in identifying pattern of some</i> 	2.3 Outline possible challenging areas in Teaching and Assessing, measurement of shape and space and in calculus taking into consideration GESI. (eg teacher makes sure to factor students learning styles in the teaching of the lesson)	
 <i>numbers.</i> 2.4 Lead tutors to discuss misconceptions and barriers in teaching and learning of the lesson. Misconceptions Example: EG/UP/JHS (core) Mathematics is not learnt but born with d. JHS(Elective) -Sequences and Series: Learning, teaching and applying-Triangular numbers and Sequence and Series follow the same rule or pattern. Barriers Time Learning Resources Teacher Competence 	2.4 Participate actively in the discussion on misconceptions and barriers in teaching and learning of the lesson	

	NB: Guide tutors to discuss	NB: Discuss how learning	
	how learning resource could	resource could be barrier to	
	how rearring resource could	teaching and logrning	
	learning.		
	2.5 Support tutors to identify GESI responsive resources such as supporting staff with experts in sign language as well as resources such teacher and learner resource packs, textbooks, course manual, Globe, mathematical set, manila cards, permanent markers, oranges and a knife. (NTS 3j, PD Manual	2.5 Identify as many GESI responsive resources such as supporting staff with experts in sign language as well as resources such teacher and learner resource packs, textbooks, course manual, Globe, mathematical set, manila cards, permanent markers, oranges and a knife. (NTS 3j, PD Manual pp.21)	
	pp.21)	pp)	
2 Diamaing for	Teaching and learning	Teeching and learning	10 mins
3. Planning for		l leaching and learning	
teaching. learning	activities	activities	40 111113
teaching, learning	activities	activities	40 111113
teaching, learning and assessment	activities	activities	40 111113
teaching, learning and assessment activities for the	3.1 Ask tutors to suggest	3.1 Suggest teaching and	40 111113
and assessment activities for the lesson/s	3.1 Ask tutors to suggest teaching and learning	3.1 Suggest teaching and learning activities for the	40 111113
 and assessment activities for the lesson/s Reading and 	 activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson 	 3.1 Suggest teaching and learning activities 3.2 Suggest teaching and learning activities for the lesson taking into someidantian CEC 	
 and assessment activities for the lesson/s Reading and discussion of the 	activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI	 activities 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 	+0 111113
 a. Planning for teaching, learning and assessment activities for the lesson/s Reading and discussion of the teaching and 	activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues.	 activities 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 	+0 111113
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities 	activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg.	 3.1 Suggest teaching and learning activities 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 	
 a. Planning for teaching, learning and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and 	activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for	 3.1 Suggest teaching and learning activities 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 	
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas 	activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for physically challenged	 3.1 Suggest teaching and learning activities 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 	
 a. Planning for teaching, learning and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may 	activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for physically challenged ii. Both genders take leading	 3.1 Suggest teaching and learning activities 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 	
 a. Planning for teaching, learning and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification 	activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for physically challenged ii. Both genders take leading roles in group task	 3.1 Suggest teaching and learning activities 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 	
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting 	activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for physically challenged ii. Both genders take leading roles in group task iii. Even distribution of	 activities 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 	
 a. Planning for teaching, learning and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for 	 activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for physically challenged ii. Both genders take leading roles in group task iii. Even distribution of questions to different 	 activities 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 	
 a. Planning for teaching, learning and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for making links to the 	 activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. Provision made for physically challenged Both genders take leading roles in group task Even distribution of questions to different categories of learners based 	 3.1 Suggest teaching and learning activities 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 	
 a. Planning for teaching, learning and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for making links to the Basic School 	 activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for physically challenged ii. Both genders take leading roles in group task iii. Even distribution of questions to different categories of learners based on gender, ability, previous 	 activities 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 	
 a. Planning for teaching, learning and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for making links to the Basic School Curriculum 	 activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for physically challenged ii. Both genders take leading roles in group task iii. Even distribution of questions to different categories of learners based on gender, ability, previous experience, etc 	 activities 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 	
 3. Planning for teaching, learning and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for making links to the Basic School Curriculum Noting 	 activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. Provision made for physically challenged Both genders take leading roles in group task Even distribution of questions to different categories of learners based on gender, ability, previous experience, etc 	 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 	
 3. Planning for teaching, learning and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for making links to the Basic School Curriculum Noting opportunities for 	 activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. Provision made for physically challenged Both genders take leading roles in group task Even distribution of questions to different categories of learners based on gender, ability, previous experience, etc NTS 1a, b, c, d, 2b, e, f, 3b, c 	 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 	
 3. Planning for teaching, learning and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for making links to the Basic School Curriculum Noting opportunities for integrating: GESI 	 activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. Provision made for physically challenged Both genders take leading roles in group task Even distribution of questions to different categories of learners based on gender, ability, previous experience, etc NTS 1a, b, c, d, 2b, e, f, 3b, c 3.2 Let tutors read the 	 3.1 Suggest teaching and learning activities 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 3.2 Read the activities 	
 3. Planning for teaching, learning and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for making links to the Basic School Curriculum Noting opportunities for integrating: GESI responsiveness and 	 activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. Provision made for physically challenged Both genders take leading roles in group task Even distribution of questions to different categories of learners based on gender, ability, previous experience, etc NTS 1a, b, c, d, 2b, e, f, 3b, c 3.2 Let tutors read the activities outlined in their 	 3.1 Suggest teaching and learning activities 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 3.2 Read the activities outlined in your course 	

	ICT and 21 st C skills	identify areas that require	areas that require	
•	Reading, discussion,	clarification.	clarification.	
	and identification of	Strategies to clarify the		
	continuous	otherwise dark spots may		
	assessment	include investigation,		
	opportunities in the	internet search, etc.		
	lesson. Each lesson			
	should include at	3.3 Lead tutors to brainstorm	3.3 Brainstorm to come up	
	least two	to come up with some	with some pedagogical	
	opportunities to use	pedagogical approaches	approaches and their	
	continuous	and their related core	related core	
	assessment to	competencies likely to be	competencies likely to	
	support student	inculcated in students	be inculcated in	
	teacher learning	and for that matter Basic	students and for that	
•	Resources:	School learners. eg.	matter Basic School	
	\circ links to the	(a)EG/UP/JHS (core):	learners.	
	existing PD	Strategy: Expository and		
	Themes, for	Discussion		
	example, action	Core Competencies:		
	research,	Problem solving, critical and		
	questioning and	creative thinking and		
	to other external	communication		
	reference			
	material:	(b) JHS (Elective)		
	literature, on web,	Strategy: interactive and		
	Utube, physical	Collaborative group work		
	resources, power	(with the aid of ICT tools and		
	point; how they	other manipulatives explore		
	snould be used.	the nth term of arithmetic		
	needs to be given	progression. (ie. Un =(,		
	to local availability	where "a" is the first term, n		
	 guidance on any 	is number of terms, d		
	power point	common difference and Un		
	presentations.	the general or indicated		
	TLM or other	term).		
	resources which	Core Competencies: Critical		
	need to be	thinking skills and		
	developed to	Collaborative learning		
	support learning			
•	Tutors should be	3.4 Ask tutors to discuss the	3.4 Discuss the assessment	
	expected to have a	assessment strategies to	strategies to be used	
	plan for the next	be used during teaching	during teaching of the	
	lesson for student	of the lessons	lesson – 'Assessment as'	
1			(NTS 3k).	

teachers	NB: The assessment must		
	involve Subject Project and		
	Subject Portfolio		
	(Teacher heliefs about		
	mathematics and their		
	relation to teaching (EG_UP		
	IHS (core) and		
	Saguances and Series:		
	Sequences und series.		
	Learning, leaching and		
	applying)-JHS (Elective)		
	Assessment must be ungried		
	to the NTEAP and required		
	course. Continuous		
	assessment activities		
	(assignments, quizzes, group		
	presentations, etc, should be		
	used to create subject		
	projects and build subject		
	portfolios		
	(NTS 3k).		
	2 E Load tutors to discuss the	2 E Disques the verieus ways	
	S.5 Lead tutors to discuss the	they can support	
	various ways they can		
	support student teachers	student teachers to	
	to build their project and	build their project and	
	subject portfolio.	subject portfollos	
	3.6 Let a tutor model a	3.6 Model a presentation of	
	presentation of an	an activity using ICT	
	activity using ICT tools	tools and taking into	
	and taking into	consideration GESI	
	consideration GESLissues	issues in the lessons	
	(ag Both gender taking	INTS 1a h 2h a 2h a l	
	the loading relac in their	(1113 1a, b, 2b, c, 3b, c, J, BSC nn 22)	
	around and in the	вэс µµ. 25)	
	groups and in the		
	of ICT tools) to tooch		
	their losses		
	EG, UP JHS(COTE)-		
	similarities and		
	differences among		
	values, attitudes, and		
	beliefs and how these		
	impact learning		

	JHS (Elective)- Finding the sum of the first <i>n</i> terms of arithmetic progression. <i>Example</i> : The sum of n and (n – 1) terms of an AP is 441 and 356 respectively. If the first term of the AP is 13 and the common difference is equal to the number of terms, find the common difference of the AP. (NTS 1a, b, 2b, e, 3b, c, J; BSC pp. 23 PD manual 21) NB: Guide tutors to use the internet to find the formular for finding the sum of the first <i>n</i> terms of arithmetic progression		
 4. Evaluation and review of session: Tutors should Identifying critical friends to observe lessons and report at next session. Identifying and addressing any outstanding issues relating to the lesson/s for clarification 	 Reflective Activity 4.1 Engage tutors in self- evaluation as well as encourage tutors to provide feedback of the PD session taking into consideration inclusivity – how to be patient with Stammerers, using tactile and audio devices for visually challenged, paying attention to all courses, etc. Ask tutors to show by fingers/nods their level of satisfaction with the session. (NTS 1a, 3i). 	Reflective Activity 4.1 Show by fingers/nods of 5 or 3 or 1 as to those who "really got it", "got some of it" or "didn't get it" respectively. Explain if you really got the lesson	15 mins

4.2 Engage tutors to iden	tify 4.2 Reflect on the activities
	in the session and
relating to this lesson	for outline upresolved
clarification	issues relating to the
Claimcation	
Taka nata of all	lesson.
Take note of all	
unresolved issues and	use
any of following	
strategies	
 put on SL/SWL Whats 	Арр
platform for discussio	n
 tutors to research for 	the
next PD session for	
discussion	
4.3 Ask a critical friend to	4.3 Identify a critical friend
observe your teachin	g observes teaching and
and record his/her	record his/her findings
findings to be presen	ted to be presented after
after delivery or in th	e delivery or in the Next
Next PD session.	PD session.
NB: Remind tutors to ide	ntify NB: Identify a critical friend
a critical friend from the	from the same or related
same or related discipline	e to discipline to observe during
observe during teaching	and teaching and provide
provide feedback (NTS 1c). feedback (NTS 1a).
Advance Preparation	Advance Preparation
4.4 Ask tutors to read Les	son 4.4 Read Lesson 3 of the
3 of the Course Manu	al Course Manual on:
on:	
Early Grade – Beliefs	Early Grade – Beliefs
underlying the current Ea	arly underlying the current Early
Grade Official curriculum	and Grade Official curriculum
inclusive Classroom prac	tice: and inclusive Classroom
Upper Primary - Beliefs	practice:
underlying the current U	oper Upper Primary - Beliefs
Primary Official curriculu	m underlying the current
and inclusive Classroom	Upper Primary Official
practice	curriculum and inclusive
JHS(Core)- Beliefs underl	ying Classroom practice
the current JHS Official	JHS(Core)- Beliefs

curriculum and inclusive Classroom practice JHS(Specialism) – Sequence and Series-Teaching,	underlying the current JHS Official curriculum and inclusive Classroom practice JHS(Specialism) – Sequence and Series-Teaching,	
Learning and applying. N/B Read the course manual, the PD session guide ahead of time to identify any outstanding issues relating to the lesson for clarification. Collect all-inclusive resources (such as projector, flip chart and sticky notes) you need ahead of time, prepare samples of TLMs you may need and	Learning and applying.	

Age Levels/s:

Name of Subject/s:

a. Early Grade b. Upper Grade c. JHS (Core) d. JHS (Elective)

- a. Theories in the learning of Numeracyb. Theories in the Learning of Mathematics Upper Primary
- c. Theories in the learning of JHS Mathematics

d. Maths (JHS) – Further Algebra

Tutor PD Session for Lesson 3 in the Course Manual

Lesson Tittle:

a. Early Grade - Beliefs underlying the current Early Grade Official Curriculum and Inclusive Classroom Practice

- b. Upper Grade -Beliefs underlying the current Upper Primary Official Curriculum and Inclusive Classroom Practice
- c. JHS (CORE)-Beliefs Underlying the Current Junior High School Official Curriculum and Inclusive Classroom practice.
- d. JHS (Elective) Sequences and Series: Learning, Teaching and Applying 2

Focus: the bullet points provide the frame for what is to be done in the session. The SWL should use the bullets to guide what they write for the SL/HoD and tutors to do and say during each session. Each bullet needs to be addressed and specific reference should be made to the course manual/s.	Guidance notes on Leading the session. What the SL/HoDs will have to say during each stage of the session	Guidance Notes on Tutor Activity during the PD Session. What PD Session participants (Tutors) will do during each stage of the session.	Time in session
1. Introduction to the	Introduction	Introduction	20 mins
session	1.1 Ice breaker activity:	1.1. Continue the patterns	
 Review prior learning 	begin an activity that	with the next term: example 2 4 6 8	
 A critical friend to 	asking tutors to start	c, a = 2, -2, 0, 0.	
share findings for a	with any number.		
short discussion and	-		
lessons learned	1.2 Ask tutors to tell in their	1.2 Discuss in your phase	
 Reading and 	phase group how useful	group with your friend	
discussion of the	the previous PD session	how useful the previous	

	1	
introductory sections of the	was and how it influenced their teaching	PD session was and how it influenced your
lesson up to and	and learning. For	teaching and learning.
including learning	example:	For example:
indicators	FG UP IHS	FG UP IHS
Overview of content	(Core)	(Core)
and identification of	Beliefs underlying	Beliefs underlying
any distinctive	the current Grade	the current Grade
aspects of the	Official Curriculum	Official Curriculum
lesson/s,	and Inclusive	and Inclusive
NB The guidance for	Classroom Practice	Classroom Practice
SL/HoD should identify	JHS (Elective)	JHS (Elective)
and address any areas	Sequences and	Sequences and
where tutors might	Series: Learning,	Series: Learning,
require clarification on	Teaching and	Teaching and
lesson	Applying 2	Applying 2
NB SI /HoD should ask	1 3 Ask a critical friend to	1 3 As a critical friend share
tutors to plan for their	give a feedback on	observation on the
teaching as they go	observation during	second (2 nd) lesson.
through the PD session	enactment of the second	
	(2 nd) lesson.	
	NB: Things tutor might	NB: Your observation
	have observed; tutor's	should inclusion choice
	choice of words,	of words, pedagogical
	pedagogical content	content knowledge,
	knowledge, content	content knowledge
	Knowledge subject	Subject matter, ICT tools,
	and the use of NTEAP	GEST UND LITE USE OJ
	1.4 Ask tutors to read and	1.4 Read and Discuss the
	discuss the introductory	introductory section of
	section of the lesson	the lesson (up to
	including the learning	learning outcomes).
	outcomes (LOs) in phase	Suggest relevant
	groups.	previous knowledge of
		students that will
	NB: Make reference to the	support effective
	Course Manual, NTS and	teaching and learning of
	salient points necessary for	the lesson.

the development of their	NB : refer to Course Manual,	l		
proforma.	NTS and salient points	1		
	necessary for the	1		
	development of your	l		
	proforma.	1		
		1		
1.5 Ask tutors to scan	1.5 Identify the purpose of	1		
through the course	the lesson from the	l		
manual in their phase	course manual in your	l		
group and identify the	phase group and state	l		
purpose of the lesson	your expectations of the	l		
and state their	PD Session.	1		
expectations of the PD		1		
Session.		l		
		l		
1.6 Lead tutors to mention	1.6 Mention how students	1		
how students were well	were well placed to	1		
placed to employ the	employ the various	l		
various strategies and	strategies and skills	l		
skills during the Basic	during the Basic School	l		
School classroom work	classroom work	l		
including STS Field	including STS Field	1		
Experience.	Experience	1		
17 Ack tutors in their phase	1.7 In your phase groups	1		
groups to discuss the	discuss the distinctive	1		
important or distinctive	aspects of the third	1		
aspects of the third	lesson including	1		
lesson including	vocabulary and	1		
vocabulary and	fundamental concents	1		
fundamental concents	rundamental concepts.	1		
For example:	For example:	l		
a. Teacher's heliefs	a. Teacher's heliefs	l		
underlying the current	underlying the	l		
official arade level (Early	current official arade	1		
Grade, Upper Grade, JHS)	level (Early Grade.	1		
curriculum and inclusive	Upper Grade. JHS)	1		
classroom practice.	curriculum and	l		
	inclusive classroom	l		
	practice.	1		
b. JHS- Learning, teachina	b. JHS- Learning, teachina	l		
and applying Sequences	and applying Sequences	1		
and Series	and Series	l		
Distinctive aspects include	Distinctive aspects include			
				1
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		the interactive nature of the	the interactive nature of the	
		activities, emphasis on	activities, emphasis on	
		connecting concepts:	connecting concepts:	
		a. Early, Upper Prim & JHS	a. Early, Upper Prim & JHS	
		(Core) Grade: – eg. Teacher's	(Core) Grade: – eg.	
		Beliefs, Teacher's Attitude	Teacher's Beliefs, Teacher's	
		and Teacher's Practices	Attitude and Teacher's	
		b. JHS; Further Algebra – eg.	Practices	
		Misconceptions, barriers.	b. JHS: Further Alaebra – ea.	
		meaning and types of	Misconceptions, barriers.	
		aeometric sequences and	meaning and types of	
		series:	acometric sequences and	
		501103,	corios	
			series	
		NB: Possible questions from		
		tutors to be addressed		
		(Anticipated questions):		
		i. Anticipated questions:		
		ii. Which methods of		
		teachina Mathematics at		
		the EG/UP/JHS is good?		
		iii. How do we integrate ICT		
		teaching Mathematics at		
		the FG/UP/IHS?		
		iv How best does one		
		introduce the connect		
		(Elective)?		
		NB: Guide tutors to discuss		
		the possible answers to the		
		anticipated questions,		
		bearing in mind pedagogy,		
		GESI, ICT – E.g. the most		
		appropriate methods		
		depend on age and previous		
		knowledge of learners.		
		objective of lesson. etc.		
		,,,		
2.	Concept	Concept Development	Concept Development	15 mins
	Development (New	2.1 Ask tutors to identify	2.1 Identify familiar and	
	learning likely to	familiar and unfamiliar	unfamiliar concepts in	
	arise in lesson/s):	concepts in their lessons	your lesson(s) and	
•	Identification and	and discuss with the	discuss with the larger	
	discussion of new	larger group.	group.	

learning, potential	Familiar concepts: addition,		
barriers to learning	number, numeracy, shapes,		
for student teachers	sequence, series, limit		
or students,	Unfamiliar Concept:		
concepts or	divergence		
pedagogy being			
introduced in the	2.2 Lead tutors to draw	2.2 Draw connection(s)	
lesson, which need	connection(s) among	among concepts in the	
to be explored with	concepts in the various	various lessons in line	
the SL/HoD	lessons in line with the	with the Basic School	
NB The guidance for	Basic School Curriculum	Curriculum (<i>BSC</i>).	
SL/HoD should set out	(<i>BSC</i>).		
what they need to do	Example: The connection		
to introduce and	between addition and		
explain the issues/s	subtraction is that one is the		
with tutors	inverse of the other,		
	sequence and series.		
	-		
	2.3 Ask tutors to outline	2.3 Outline possible	
	possible challenging	challenging areas in	
	areas in:	teaching of beliefs about	
	(c) Teacher beliefs about	current basic school	
	current basic school	mathematics curriculum	
	mathematics curriculum	and classroom inclusion	
	and classroom inclusion	practice and Learning,	
	practice.	teaching and applying	
	(d) Learning, teaching and	sequences and series:	
	applying sequences and	taking into consideration	
	series: Taking GESI	GESI. (eg. Teacher makes	
	consideration (eg.	sure to factor students	
	Teacher ensure learning	learning and teaching	
	styles of students are	styles in the teaching of	
	inculcated in the teaching	the lesson and	
	of the lesson and	differentiated approach	
	experience from STS).	as experienced from	
	. , ,	STS).	
	2.4 Lead tutors in their	2.4 Discuss in your phase	
	phase group to discuss	group some	
	misconceptions and	misconceptions and	
	barriers in teaching and	barriers to teaching and	
	learning of the lesson.	learning the lesson and	
	Example of misconception:	share them with the	
	Mathematics is not learnt	larger group.	

	Sequences and Series: Learning, teaching and applying Example of challenge : identifying the pattern 2, 16, 54, 96 has no pattern. Barriers may include poor previous knowledge, lack of adequate resources, lack of opportunities to use ICTs due to power failure (lighting), uninterrupted network, unavailability of Internet package for students, insufficient contact time due to staff meetings. NB: Guide teachers through the challenge of identifying trends in some numbers.		
	2.5 Support tutors to identify GESI responsive resources such as supporting staff with experts in sign language as well as resources such as teacher and learner resource packs, textbooks, course manual, recorded video, Globe, mathematical set, manila cards, permanent markers, oranges and a knife. (NTS 3j, PD Manual pp.21)	2.5 Identify as many GESI responsive resources such as supporting staff with experts in sign language as well as resources such as teacher and learner resource packs, textbooks, course manual, recorded video, Globe, mathematical set, manila cards, permanent markers, oranges and a knife. (NTS 3j, PD Manual pp.21)	
3. Planning for	Teaching and learning	Teaching and learning	40 mins
teaching, learning	activities	activities	
and assessment			
activities for the	3.1 Have tutors suggest	3.1 Suggest teaching and	
lesson/s	teaching and learning	learning activities for the	
 Reading and 	activities for the lesson	lesson taking into	
discussion of the	taking into account GESI	consideration GESI	
teaching and	issues.		

	learning activities	Example:		
•	Noting and	i. Provision made for		
	addressing areas	learners with learning		
	where tutors may	needs and physical		
	require clarification	handicaps.		
•	Noting	ii. Both genders take a		
	opportunities for	leading role in group tasks.		
	making links to the	iii. Even the distribution of		
	Basic School	questions to different		
	Curriculum	classes of learners based on		
•	Noting	gender, capacity, past		
	opportunities for	experience, etc.		
	integrating: GESI	NTS 1a, b, c, d, 2b, e, f, 3b, c		
	responsiveness and			
	ICT and 21 st C skills	3.2 Let tutors read the	3.2 Read the activities	
•	Reading, discussion,	activities outlined in their	described in the course	
	and identification of	course manuals and	manual and identify	
	continuous	identify areas that	areas for clarification.	
	assessment	require clarification.		
	opportunities in the	Strategies for clarifying		
	lesson. Each lesson	otherwise gloomy points		
	should include at	can include investigation,		
	least two	internet search, etc.		
	opportunities to use	NB: Ask tutors to refer to the	NB : Refer to the Basic School	
	continuous	Basic School Curriculum (BSC	Curriculum (BSC pp. xv – xvii)	
	assessment to	pp. xv – xvii) and	and http://uk.sagepub.com	
	support student	http://uk.sagepub.com for	for explanations on "Why do	
	teacher learning	explanations on "Why do we	we teach mathematics in	
٠	Resources:	teach mathematics in	school?" and search	
	 links to the 	school?" and search through	through "IXL Math" and	
	existing PD	"IXL Math" and GeoGebra to	GeoGebra to clarify the	
	Themes, for	clarify the otherwise dark	otherwise dark spots in	
	example, action	spots in "Further Algebra".	"Further Algebra.	
	research,			
	questioning and	3.3Lead tutors to brainstorm	3.3 Brainstorm to come up	
	to other external	to come up with some	with some pedagogical	
	reference	pedagogical approaches	approaches and their	
	material:	and their related core	related core	
	literature, on	competencies likely to be	competencies likely to	
	web, Utube,	inculcated in students	be inculcated in students	
	physical	and for that matter Basic	and for that matter Basic	
	resources, power	School learners. eg.	School learners.	
	point; how they	(a)Early Grade, Upper		
1		primary and JHS (Core)		

should be used.	Strategy: Expository and		
Consideration	Discussion		
needs to be	Core Competencies:		
given to local	Problem solving, critical and		
availability	creative thinking and		
$\circ~$ guidance on any	communication		
power point	(b) JHS Specialism		
presentations,	Strategy: Use interactive		
TLM or other	and Collaborative group		
resources which	work (with the aid of ICT		
need to be	tools and other		
developed to	manipulatives to explore the		
support learning	nth term of Geometric		
• Tutors should be	progression.		
expected to have a	(ie. $a_n = a_1 r^{n-1}$, where		
plan for the next	"a" is the first term, n is		
lesson for student	number of terms, r is		
teachers	common ratio and a_n the		
	general or indicated term).		
	Core Competencies: Critical		
	thinking skills and		
	Collaborative learning		
	3.4 Ask tutors to discuss the assessment strategies to be used during teaching of the lessons (assessment 'as' and 'for').	3.4 Discuss the assessment strategies to be used during teaching of the lesson (assessment 'as' and 'for' -NTS 3k).	
	NB: Continuous assessment	NB: Continuous assessment	
	activities (assignments,	activities (assignments,	
	quizzes, group presentations,	quizzes, group	
	etc. should be used to create	presentations, etc. should be	
	subject projects and build	used to create subject	
	subject portfolios).	projects and build subject	
	E.g. A project on how	portfolios).	
	children learn using the	E.g. A project on how	
	behaviourist, cognitivist and	children learn using the	
	constructivist approach. (EG,	behaviourist, cognitivist and	
	UP, JHS-Core)	constructivist approach. (EG,	
		UP, JHS-Core)	
	A project on investigation of		
	limit of sequences and series		

and its application to real life (IHS-Elective).A project on investigation of limit of sequences and series and its application to real life (IHS-Elective).3.5 Lead tutors to discuss the various ways they can support student teachers to build their project and subject portfolio.3.5 Discuss the various ways they can support student teachers to build their subject project and subject portfolios3.6 Let a tutor model a presentation of an activity using ICT tools and taking into consideration GESI issues (eg. Both gender taking the leading roles in their groups and in the demonstration of the use of ICT tools) to teach their lessons EG, UP IHS(Core)- similarities and differences among values, attitudes, and beliefs and how these impact learning JHS (SP)- Finding the sum of the first n terms of geometric progression. Example: The sum of n and (n-1) terms of and 270 respectively. If the first term of the GP is 10 and the for Al 270, find the common ratio of the GP. (INTS 1a, b, 2b, e, 3b, c, J; BSC pp. 23 PD manual 21)A project on investigation of limit at the sum of nond (n-1) terms of and (n-1) terms of and 270			
 3.5 Lead tutors to discuss the various ways they can support student teachers to build their project and subject portfolio. 3.6 Let a tutor model a presentation of an activity using ICT tools and taking into consideration GESI issues (eg. Both gender taking the leading roles in their groups and in the demonstration of the use of ICT tools) to teach their lessons EG, UP JHS(Core)- similarities and differences among values, attitudes, and beliefs and how these impact learning JHS (SP)- Finding the sum of the first n terms of geometric progression. Example: The sum of n and (n-1) terms of an GP is 10 and 270 respectively. If the first term of the GP is 10 and the fourth term is 270, find the common ratio of the GP. (NTS 1a, b, 2b, e, 3b, c, J; BSC pp. 23 PD manual 21) 3.5 Discuss the various ways they can support student teachers to build their subject project and subject project and subje	and its application to real life (JHS-Elective).	A project on investigation of limit of sequences and series and its application to real life (JHS-Elective).	
 3.6 Let a tutor model a presentation of an activity using ICT tools and taking into consideration GESI issues (eg. Both gender taking the leading roles in their groups and in the demonstration of the use of ICT tools) to teach their lessons EG, UP JHS(Core)-similarities and differences among values, attitudes, and beliefs and how these impact learning JHS (SP)- Finding the sum of the first <i>n</i> terms of <i>n</i> and (<i>n</i>-1) terms of <i>n</i> and (<i>n</i>-1) terms of <i>n</i> and (<i>n</i>-2) term of <i>n</i> and (<i>n</i>-2) terms of <i>n</i>	3.5 Lead tutors to discuss the various ways they can support student teachers to build their project and subject portfolio.	3.5 Discuss the various ways they can support student teachers to build their subject project and subject portfolios	
	 3.6 Let a tutor model a presentation of an activity using ICT tools and taking into consideration GESI issues (eg. Both gender taking the leading roles in their groups and in the demonstration of the use of ICT tools) to teach their lessons EG, UP JHS(Core)-similarities and differences among values, attitudes, and beliefs and how these impact learning JHS (SP)- Finding the sum of the first <i>n</i> terms of geometric progression. <i>Example: The sum of n and (n-1) terms of an GP is 10 and 270 respectively. If the first term of the GP is 10 and the fourth term is 270, find the common ratio of the GP. (NTS 1a, b, 2b, e, 3b, c, J; BSC pp. 23 PD manual 21)</i> 	3.6 Model a presentation of an activity using ICT tools and taking into consideration GESI issues in the lessons (NTS 1a, b, 2b, e, 3b, c, J; BSC pp. 23)	

	NB: Guide tutors to use the internet to find the formular for finding the sum of the first <i>n</i> terms of arithmetic progression		
 4. Evaluation and review of session: Tutors should Identifying critical friends to observe lessons and report at next session. Identifying and addressing any outstanding issues relating to the lesson/s for clarification 	Reflective Activity 4.1 Engage tutors in providing feedback of the PD session taking into consideration – Clarity of concepts, ICT integration, GESI, Twenty First Century Skills (NTS 1a, 3i, BSC pp. x-xvi) and make notes that will help them to teach Lesson 4.	Reflective Activity 4.1 Reflect and provide feedback on this PD session taking into consideration – Clarity of concepts, pedagogical approaches employed, ICT integration, GESI, Twenty First Century Skills (NTS 1a, 3i, BSC pp. x-xvi)? and make notes that will help you to teach Lesson 4.	15 mins
	 4.2 Engage tutors to identify unresolved issues relating to this lesson for clarification. NB: Take note of all unresolved issues that may need further research or consultation and use any of following strategies to address them. i. put on SL/SWL WhatsApp platform for discussion ii. tutors to research for the next PD session for discussion 4.3 Ask tutors to identify a critical friend from the same or related 	 4.2 Reflect and identify unresolved issues relating to this lesson for clarification. NB: Put your unresolved issues unto the department's WhatsApp/ Telegram platform and research into the issues raised. 4.3 Identify a critical friend in the same or related discipline to observe 	
	discipline to observe the enactment of their lesson and provide	your lesson and give feedback during the next PD session (NTS 1a).	

feedback during the next		
PD Session (NTS 1a).		
NB: take note of all		
unresolved issues and use		
anv of followina strategies		
i nut on SI/SWI WhatsAnn		
nlatform for discussion		
ii tutors to research for the		
novt PD cossion for		
diaguasian		
uscussion		
Advance Preparation	Advance Preparation	
4.4 Ask tutors to remember	4.4 Remember to prepare	
to prepare proforma for	proforma for the Lesson	
Lesson 4 taking note of	A taking note of	
important or distinctivo	important or distinctivo	
aspects of the losson and	aspects of the lesson	
aspects of the lesson and	aspects of the lesson	
	and crosscutting issues	
read Lesson 4 of the	and read Lesson 4 of the	
Course Manual on:	Course Manual on:	
Early Grade – Beliefs	Early Grade – Beliefs	
Early Grade – Beliefs underlying the current Early	Early Grade – Beliefs underlying the current Early	
Early Grade – Beliefs underlying the current Early Grade Official curriculum	Early Grade – Beliefs underlying the current Early Grade Official curriculum	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2:	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2;	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2;	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2;	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2;	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and inclusive	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and inclusive Classroom practice 2;	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and inclusive Classroom practice	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and inclusive Classroom practice 2; JHS(Specialism) – Quadratic	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and inclusive Classroom practice 2;	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and inclusive Classroom practice 2; JHS(Specialism) – Quadratic Functions -Teaching,	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and inclusive Classroom practice 2; JHS(Specialism) – Quadratic	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and inclusive Classroom practice 2; JHS(Specialism) – Quadratic Functions -Teaching, Learning and applying.	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and inclusive Classroom practice 2; JHS(Specialism) – Quadratic Functions -Teaching,	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and inclusive Classroom practice 2; JHS(Specialism) – Quadratic Functions -Teaching, Learning and applying.	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and inclusive Classroom practice 2; JHS(Specialism) – Quadratic Functions -Teaching, Learning and applying.	
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Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and inclusive Classroom practice 2; JHS(Specialism) – Quadratic Functions -Teaching, Learning and applying. <i>NB:</i> <i>i. Read the course manual</i>	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and inclusive Classroom practice 2; JHS(Specialism) – Quadratic Functions -Teaching, Learning and applying. <i>NB:</i> <i>i. Take note of the PD session</i>	
Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and inclusive Classroom practice 2; JHS(Specialism) – Quadratic Functions -Teaching, Learning and applying. <i>NB:</i> <i>i. Read the course manual</i> <i>the PD session guide, NTS,</i>	Early Grade – Beliefs underlying the current Early Grade Official curriculum and inclusive Classroom practice 2; Upper Primary - Beliefs underlying the current Upper Primary Official curriculum and inclusive Classroom practice 2; JHS(Core)- Beliefs underlying the current JHS Official curriculum and inclusive Classroom practice 2; JHS(Specialism) – Quadratic Functions -Teaching, Learning and applying. <i>NB:</i> <i>i. Take note of the PD session</i> <i>guide, NTEAP, and NTS</i>	

to identify any outstanding issues relating to the lesson for clarification. ii. Collect all-inclusive resources (such as projector, flip chart and sticky notes) you need ahead of time, prepare samples of TLMs you may need and rehearse how these may be used to support the achievement of	any outstanding issues relating to the lesson for clarification.	
your goals.		

Age Levels/s:

Name of Subject/s:

- a. Early Grade
- b. Upper Grade
- c. JHS (Core)d. JHS (Elective)
- c. Theories in Learning of Jnr High School Math. d. Further Algebra

Tutor PD Session for Lesson 4 in the Course Manual

a. Theories in the Learning of Numeracy in Early Grade

b. Theories in Learning upper primary mathematics

Lesson Title:

- a. Early Grade -Beliefs underlying the current Early Grade official curriculum and inclusive classroom practice 2
- b. Upper Grade-Beliefs underlying the current Upper primary official curriculum and inclusive classroom practice 2
- c. JHS (**Core)**-Beliefs underlying the current JHS official curriculum and inclusive classroom practice 2
- d. JHS(**Specialism**) -Quadratic functions: *Learning, teaching and applying*

Focus: the bullet	Guidance notes on Leading	Guidance Notes on Tutor	Time in
points provide the	the session. What the	Activity during the PD	session
frame for what is to be	SL/HoDs will have to say	Session. What PD Session	
done in the session.	during each stage of the	participants (Tutors) will do	
The SWL should use	session	during each stage of the	
the bullets to guide		session.	
what they write for			
the SL/HoD and tutors			
to do and say during			
each session. Each			
bullet needs to be			
addressed and specific			
reference should be			
made to the course			
manual/s.			
1 Introduction to the	1 1 Icobroakor activity: Bogin	1 1 Ico broakor activity: Bogin	20 mins
session	with an investigational	with an investigational	20 111113
Boyiow prior	activity according to the	activity according to the	
 Review prior learning 	subjects and age phases	subjects and age phases	
 Pooding and 	Fø	Fø	
 Reduing and discussion of the 	-8	-8.	
introductory	i An exposition on how	i An exposition on how	
sections of the	one's belief system can	one's belief system can	
lesson un to and	affect the teaching of	affect the teaching of an	
including learning	and established scientific	established scientific fact	

outcomes and	fact in inclusive	in inclusive classroom	
indicators	classroom		
Overview of content	ii. Demonstrate how	ii. Demonstrate how	
and identification of	everyday activity could	everyday activity could be	
any distinctive	be reduce to a guadratic	reduce to a guadratic	
aspects of the	function	function	
lesson/s.			
NB The guidance for	1.2 Ask tutors to tell how	1.2 Discuss how useful the	
SL/HoD should identify	useful the previous PD	previous PD session	
and address any areas	session was and how it	influenced their teaching	
where tutors might	influenced their	over the week.	
require clarification on	teaching in lesson 3.		
any aspect of the	5		
lesson.	1.3 Expose tutors to the	1.3 Participate in the	
NB SL/HoD should ask	overview of the subject	discussion on the	
tutors to plan for their	age phases to be	overview of the subject	
teaching as they go	covered in this PD	age phases to be covered	
through the PD session	session and how it will	in this PD session and	
	be organised.	how it will be organised.	
	5	6	
	i. Early and upper grade		
	and JHS (Core) lessons		
	focus on		
	Philosophies of		
	mathematics and		
	mathematics education and		
	explores trainee teachers'		
	beliefs about mathematics		
	and philosophies of		
	mathematics implicit the		
	official mathematics		
	curriculum and current		
	classroom practice. It also		
	covers children's		
	developmental levels, how		
	children learn mathematics		
	and associated theories,		
	and other psychological		
	factors influencing learning		
	ii. JHS (Maths Specialism)		
	lesson seeks to develop		
	student teachers'		
	conceptual understanding		
	of quadratic equations in		

order to prepare them to handle future mathematics classroom with respect to quadratic equations, their applications and other related concepts.		
1.4 Ask a critical friend to give feedback on observation during the enactment of lesson 3.	1.4 Participate in the critiquing of the feedback on observation during the enactment of lesson 3.	
1.5 Ask tutors to suggest the purpose of the lesson and state their expectations of the PD Session.	1.5 Engage tutors to suggest the purpose of the lesson and state your expectations of the PD Session.	
1.6 Guide tutors to establish the linkage between CLOs and the LOs of the lesson for each of the Phases	1.6 Participate in the linkage of the CLOs and the LOs of the lesson for each of the phases	
1.7 Ask tutors in phase groups to discuss the important or distinctive aspects of the lesson including vocabulary and fundamental concepts.	1.7 In pairs discuss the distinctive aspects of the lesson including vocabulary and fundamental concepts related to the components of the front matters.	
Distinctive aspects includes the interactive nature of the activities, emphasis on connecting concepts: a. Early, Upper Prim & JHS (Core) Grade: – eg. Exploration of trainee teachers' beliefs about mathematics and philosophies of		

	mathematics as indicated in the official mathematics curriculum and current classroom practice. b. JHS (Further Algebra): – eg. Linking sequence obtained from everyday activities to the construction of quadratic equation.		
	 N/B Be ready for likely questions from tutors for clarification. Anticipated questions: Why the need to rewrite quadratic equation in other forms? How can a tutor control or positively influence the beliefs of learning mathematics? 		
2. Concept Development (New learning likely to arise in lesson/s):	Concept Development (New learning likely to arise in lesson/s)	Concept Development (New learning likely to arise in lesson/s)	15 mins
 2. Concept Development (New learning likely to arise in lesson/s): Identification and discussion of new learning, potential barriers to learning for student teachers or students, concepts or pedagogy being 	Concept Development (New learning likely to arise in lesson/s) 2.1 Ask tutors to identify familiar and unfamiliar concepts in the lesson and discuss with the larger group 2.2 Lead tutors to draw connections among	Concept Development (New learning likely to arise in lesson/s) 2.1 Participate in the identification of familiar and unfamiliar concepts in the lesson and discuss with the larger group. 2.2 Draw connections among concepts in the various	15 mins
 2. Concept Development (New learning likely to arise in lesson/s): Identification and discussion of new learning, potential barriers to learning for student teachers or students, concepts or pedagogy being introduced in the lesson, which need to be explored with the SL/HoD 	 Concept Development (New learning likely to arise in lesson/s) 2.1 Ask tutors to identify familiar and unfamiliar concepts in the lesson and discuss with the larger group 2.2 Lead tutors to draw connections among concepts in the various lessons in line with the basic school curriculum 	 Concept Development (New learning likely to arise in lesson/s) 2.1 Participate in the identification of familiar and unfamiliar concepts in the lesson and discuss with the larger group. 2.2 Draw connections among concepts in the various lessons in line with the basic school curriculum. 	15 mins
 2. Concept Development (New learning likely to arise in lesson/s): Identification and discussion of new learning, potential barriers to learning for student teachers or students, concepts or pedagogy being introduced in the lesson, which need to be explored with the SL/HoD NB The guidance for 	 Concept Development (New learning likely to arise in lesson/s) 2.1 Ask tutors to identify familiar and unfamiliar concepts in the lesson and discuss with the larger group 2.2 Lead tutors to draw connections among concepts in the various lessons in line with the basic school curriculum Example: 	 Concept Development (New learning likely to arise in lesson/s) 2.1 Participate in the identification of familiar and unfamiliar concepts in the lesson and discuss with the larger group. 2.2 Draw connections among concepts in the various lessons in line with the basic school curriculum. Example: 	15 mins
 2. Concept Development (New learning likely to arise in lesson/s): Identification and discussion of new learning, potential barriers to learning for student teachers or students, concepts or pedagogy being introduced in the lesson, which need to be explored with the SL/HoD NB The guidance for SL/HoD should set out 	 Concept Development (New learning likely to arise in lesson/s) 2.1 Ask tutors to identify familiar and unfamiliar concepts in the lesson and discuss with the larger group 2.2 Lead tutors to draw connections among concepts in the various lessons in line with the basic school curriculum Example: Early, Upper Prim & JHS 	 Concept Development (New learning likely to arise in lesson/s) 2.1 Participate in the identification of familiar and unfamiliar concepts in the lesson and discuss with the larger group. 2.2 Draw connections among concepts in the various lessons in line with the basic school curriculum. Example: Early, Upper Prim & JHS 	15 mins
 2. Concept Development (New learning likely to arise in lesson/s): Identification and discussion of new learning, potential barriers to learning for student teachers or students, concepts or pedagogy being introduced in the lesson, which need to be explored with the SL/HoD NB The guidance for SL/HoD should set out what they need to do 	Concept Development (New learning likely to arise in lesson/s) 2.1 Ask tutors to identify familiar and unfamiliar concepts in the lesson and discuss with the larger group 2.2 Lead tutors to draw connections among concepts in the various lessons in line with the basic school curriculum Example: Early, Upper Prim & JHS (Core) Grade:-	Concept Development (New learning likely to arise in lesson/s) 2.1 Participate in the identification of familiar and unfamiliar concepts in the lesson and discuss with the larger group. 2.2 Draw connections among concepts in the various lessons in line with the basic school curriculum. Example: Early, Upper Prim & JHS (Core) Grade:-	15 mins
 2. Concept Development (New learning likely to arise in lesson/s): Identification and discussion of new learning, potential barriers to learning for student teachers or students, concepts or pedagogy being introduced in the lesson, which need to be explored with the SL/HoD NB The guidance for SL/HoD should set out what they need to do to introduce and 	Concept Development (New learning likely to arise in lesson/s) 2.1 Ask tutors to identify familiar and unfamiliar concepts in the lesson and discuss with the larger group 2.2 Lead tutors to draw connections among concepts in the various lessons in line with the basic school curriculum Example: Early, Upper Prim & JHS (Core) Grade:- Implications for classroom	 Concept Development (New learning likely to arise in lesson/s) 2.1 Participate in the identification of familiar and unfamiliar concepts in the lesson and discuss with the larger group. 2.2 Draw connections among concepts in the various lessons in line with the basic school curriculum. Example: Early, Upper Prim & JHS (Core) Grade:- Implications for classroom 	15 mins
 2. Concept Development (New learning likely to arise in lesson/s): Identification and discussion of new learning, potential barriers to learning for student teachers or students, concepts or pedagogy being introduced in the lesson, which need to be explored with the SL/HoD NB The guidance for SL/HoD should set out what they need to do to introduce and explain the issues/s 	 Concept Development (New learning likely to arise in lesson/s) 2.1 Ask tutors to identify familiar and unfamiliar concepts in the lesson and discuss with the larger group 2.2 Lead tutors to draw connections among concepts in the various lessons in line with the basic school curriculum Example: Early, Upper Prim & JHS (Core) Grade:- Implications for classroom practice relative to 	Concept Development (New learning likely to arise in lesson/s) 2.1 Participate in the identification of familiar and unfamiliar concepts in the lesson and discuss with the larger group. 2.2 Draw connections among concepts in the various lessons in line with the basic school curriculum. Example: Early, Upper Prim & JHS (Core) Grade:- Implications for classroom practice relative to	15 mins

difficulties in mathematics	difficulties in mathematics	
JHS (Further Algebra): – connections between algebraic, tabular, and graphical representations of quadratic functions	JHS (Further Algebra): – connections between algebraic, tabular, and graphical representations of quadratic functions	
2.3 Ask tutors to use Think- Pair-Share to outline possible challenging areas in teaching and assessing of;	2.3 Individually, outline the challenging areas in your lesson, share with a member of the same phase group and then with the whole group.	
 a. Early, Upper Prim & JHS (Core) Grade: – Beliefs underlying the current official curriculum and inclusive classroom practice. b. JHS; Further Algebra Quadratic functions: Learning, teaching and applying. 	 a. Early, Upper Prim & JHS (Core) Grade: – Beliefs underlying the current official curriculum and inclusive classroom practice. b. JHS; Further Algebra Quadratic functions: Learning, teaching and applying. 	
N/B Eg. The use of differentiated instruction to cater for the needs of all children in the early and upper grade and JHS classrooms, including those with special educational needs (SEN) and creating a safe, secure, happy and stimulating learning environment (NTS 3c 3f, pg. 14)		
2.4 Lead tutors to discuss misconceptions and barriers in teaching and learning of the lesson Example: <u>Misconceptions</u>	2.4 Participate in the discussion on misconceptions and barriers in teaching and learning of the lesson	

		a Farly Unner Prim & IUS		
		a. <i>Early, Upper Prim & JHS</i> (<i>Core</i>) <i>Grade:</i> – i) Mathematics is meant for people with high spiritual linkage ii) mathematics are for boys not girls. b. <i>JHS</i> (<i>Sp</i>) : letters/variables in an equation are not related to real life. <u>Barriers</u> may include weak prior knowledge, lack of appropriate resources, lack of opportunity to use ICT due to failure of electric power (lights-out), bad/weak network, unavailability of internet bundle for students, inadequate contact time due to staff meetings, Different entry behaviours, Socio-cultural issues, different learning needs, misconceptions about the lesson.		
3. Pl	anning for	Planning for teaching,	Planning for teaching,	
te	aching, learning	learning and assessment	learning and assessment	
ar	nd assessment	activities for the lesson/s	activities for the lesson/s	
ac ما	ctivities for the	3.1 In their phase groups,	3.1 Suggest teaching and	
• Re	eading and	ask tutors to suggest	learning activities for the	
di	scussion of the	teaching and learning	lesson.	
te	aching and	i. Provision is made for		
le	arning activities	physically challenged		
• No	oung and Idressing areas	persons and persons		
W	here tutors may	with other forms of disability		
re	quire clarification	ii. Both genders take		
• No	oting	leading roles in group		
op	oportunities for	task		

	making links to the	III. Even distribution of		
	Basic School	questions to different		
	Curriculum	categories of learners		
•	Noting	based on gender, ability,		
	opportunities for	previous experience,		
	integrating: GESI	etc. referring to NTS 1a,		
	responsiveness and	b, c, d, 2b, e, f, 3b, c		
	ICT and 21 st C skills			
•	Reading. discussion.	3.2 Ask tutors to go through	3.2 Read the activities	
	and identification of	the lesson in the course	outlined in your course	
	continuous	manual and identify	manual and identify areas	
	assessment	areas that require	, that require clarification	
	opportunities in the	clarification		
	lesson Each lesson	Fa		
	chould include at	Strategies to clarify the		
	loast two	otherwise dark spots may		
	apportunitios to uso	include investigation		
	opportunities to use	internet search atc		
	continuous			
	assessment to	2.2 Ack tutors to brainstorm	2.2 Prainctorm and ovalain	
	support student	and explain how	bow	
	teacher learning	and explain now	now	
•	Resources:	a. Dellers underlying the	a. Deners underlying the	
	o links to the			
	existing PD	curriculum and inclusive	and inclusive classroom	
	Themes, for	classroom practice		
	example, action	b. relating real life problem	b relating real life problem to	
	research,	to quadratic functions,	quadratic functions, can	
	questioning and	can improve on the	improve on the learners	
	to other external	learners understanding	understanding of the	
	reference	of the lesson. Refer to	lesson. Refer to Basic	
	material:	Basic School Curriculum	School Curriculum (BSC	
	literature, on web,	(BSC pp. xv – xvii)	pp. xv – xvii)	
	Utube, physical			
	resources, power			
	point; how they	3.4 Lead tutors to come up	3.4 Suggest some	
	Snould be used.	with some pedagogical	pedagogical approaches	
		approaches and their	and their related core	
	to local availability	related core	competencies likely to be	
	\circ guidance on any	competencies likely to	inculcated in students and	
	nower noint	be inculcated in	for that matter Basic	
	nrecentations	students and for that	School learners.	
	TIM or other	matter Basic School		
	resources which	learners. eg.		
		(a)EG/UP/JHS (core):		

need to be	Strategy: Expository,		
developed to	inquiry and discussion: to		
support learning	explore the effect of		
Tutors should be	teachers' attitudes on the		
expected to have a	learning and teaching of		
plan for the next	mathematics		
lesson for student			
teachers	Core Competencies:		
	problem formulation and		
	identification. Problem		
	solving, critical and creative		
	thinking and		
	communication		
	communication		
	(b) IHS Specialism		
	Strategy: interactive and		
	Collaborative group work		
	(with the aid of ICT tools		
	and other manipulatives to		
	examine nature and types of		
	guadratic functions and		
	investigate quadratic		
	functions and its graphs.		
	Core Competencies: Critical		
	thinking skills and		
	Collaborative learning		
	3.5 Ask tutors to mention	3.5 Mention some GESI	
	some GESI responsive	responsive resources that	
	resources that can be	can be used with the	
	used with the suggested	suggested approaches and	
	approaches and	strategies in achieving the	
	strategies in achieving		
	the LOs.	200.	
	E.g. Resources may include	E.a Resources may include	
	supporting staff with	supporting staff with	
	experts in sign language as	experts in sian language	
	well as resources such	as well as resources such	
	teacher and learner	teacher and learner	
	resource packs, textbooks.	resource packs textbooks	
	course manual, prisms,	etc	
	pyramids, projectors, flip		
	charts, sticky notes, braille.		
	tactile materials, audio and		

audio-visuals that can be		
used in the teaching and		
learning of the concepts		
mentioned above (NTS 3i)		
2 6 Ack tutors to identify	2.6 Identify and discuss	
5.6 Ask tutors to identify	5.6 Identity and discuss	
and discuss continuous	continues assessment	
assessment for the	strategies for the lesson to	
lesson to support	support student teacher	
student teacher learning	learning (NTS 3k).	
(NTS 3k).		
N/B:		
Assessment must be aligned		
to the NTEAP and required		
course Assessment to		
include subject project		
subject nortfolio and end of		
samester examination		
	_	
Eg.	Eg.	
Example: Early, Upper	Example: Early, Upper	
Primary and JHS (Core)	Primary and JHS (Core)	
Grades – Interview about	Grades – Interview about 10	
10 basic school teachers	basic school teachers during	
during the STS activity on	the STS activity on	
mathematics that basic	mathematics that basic	
school learners are exposed	school learners are exposed	
to a) at home & b) during	to a) at home & b) during	
play	nlav	
IHS Grade – In groups of	IHE Grade - In groups of	
four dovelon any game for	four doubles and groups of	
four, develop any game for	four, develop any game for	
teaching any concept within	teaching any concept within	
your course outline on	your course outline on	
quadratic functions.	quadratic functions.	
3.7 Lead tutors to discuss	3.7 Lead tutors to discuss the	
the various ways they	various ways they can	
can support student	support student teachers	
teachers to build their	to build their subject	
subject portfolio.	portfolio	
E.g. encouraging student	E.g. encouraging student	
teachers to file all their	teachers to file all their	
assignments with feedback	assianments with feedback in	
in their folders.	their folders.	
Taking notes in class and		

	filing them		
	3.8 Ask a tutor to model a presentation of an activity using projector, internet search and taking into consideration GESI issues (eg. Both gender taking the leading roles in their groups) NTS 1a, b, 2b, e, 3b, c, J; BSC pp. iii	3.8 Model a presentation of an activity using projector, internet search and taking into consideration GESI issues (eg. Both gender taking the leading roles in their groups) NTS 1a, b, 2b, e, 3b, c, J; BSC pp. iii	
4. Evaluation and	Evaluation and review of	Evaluation and review of	15 mins
 review of session: Tutors need to identify critical friends to observe lessons and report at next session Identifying and addressing any outstanding issues relating to the lesson/s for clarification 	 session: 4.1 Engage tutors in providing feedback of the PD session taking into consideration – Clarity of concepts, ICT integration, GESI, Twenty First Century Skills (NTS 1a, 3i, BSC pp. x-xvi) and make notes that will help them to teach Lesson 4 	 session: 4.1 Reflect and provide feedback on this PD session taking into consideration – Clarity of concepts, pedagogical approaches employed, ICT integration, GESI, Twenty First Century Skills (NTS 1a, 3i, BSC pp. x-xvi)? and make notes that will help you to teach Lesson 4 	
	4.2 Engage tutors to identify unresolved issues relating to this lesson for clarification.	4.2 Identify unresolved issues relating to this lesson for clarification.	
	N/B: Take note of all unresolved issues that may need further research or consultation and use any of following strategies to address them. i. put on SL/SWL WhatsApp platform for discussion ii. tutors to research for the next PD session for discussion	N/B: Put your unresolved issues unto the department's WhatsApp/ Telegram platform and research into the issues raised.	

4.3 Ask tutors to identify a critical friend from the same or related discipline to observe the enactment of their lesson and provide feedback during the next PD Session (NTS 1a).	4.3 Identify a critical friend from the same or related discipline to observe the enactment of your lesson and to provide feedback during the next PD Session (NTS 1a).	
4.4 Ask tutors to remember to prepare proforma for Lesson 5 taking note of important or distinctive aspects of the lesson and crosscutting issues and read Lesson 5 of the Course Manual on: Early Grade – Major	4.4 Remember to prepare proforma for the Lesson 5 taking note of important or distinctive aspects of the lesson and crosscutting issues and read Lesson 5 of the Course Manual on: Early Grade – Major theories	
theories of learning in Early Grade mathematics in inclusive classrooms <u>Upper Primary</u> - Major theories of learning in Upper primary mathematics in inclusive classrooms <u>JHS(Core)</u> - Major theories of learning in Junior High School mathematics in inclusive classrooms <u>JHS(Sp.)</u> –	of learning in Early Grade mathematics in inclusive classrooms <u>Upper Primary</u> - Major theories of learning in Early Grade mathematics in inclusive classrooms <u>JHS(Core)</u> - Major theories of learning in Early Grade mathematics in inclusive classrooms <u>JHS(Sp.)</u> – Quadratic functions: <i>Learning, teaching</i>	
Quadratic functions: Learning, teaching and applying 2 N/B i. Read the course manual and the PD session guide ahead of time to identify any outstanding issues relating to the lesson for	and applying 2 N/B i. Take note of the PD session guide ahead of time to identify any outstanding issues relating to the lesson for clarification.	

clarification. ii. Collect needed resources (such as projector, flip chart and sticky notes) you need ahead of time, prepare samples of TLRs you may need and rehearse how	
need and rehearse how these may be used to	
support the achievement of your goals	

Age Levels/s:

Name of Subject/s:

- a. Early Grade
- b. Upper Grade
- c. JHS (Core)
- d. JHS (Elective)
- a. Theories in the Learning of Numeracy in Early Grade
- b. Theories in Learning upper primary mathematics
- c. Theories in Learning of Jnr High School Math.
- d. Further Algebra

Tutor PD Session for Lesson 5

Lesson Tittle:

- a. Early Grade Major theories of learning and teaching of Early Grade mathematics in inclusive classrooms
- b. Upper Grade Major theories of learning and teaching of Upper primary mathematics in inclusive classrooms
- c. JHS (CORE) Major theories of learning and teaching of Junior High School mathematics in inclusive classrooms
- d. JHS (Elective) Quadratic functions: Learning, teaching and applying 2

Focus: the bullet points provide the frame for what is to be done in the session. The SWL should use the bullets to guide what they write for the SL/HoD and tutors to do and say during each session. Each bullet needs to be addressed and specific reference should be made to the course manual/s.	Guidance notes on Leading the session. What the SL/HoDs will have to say during each stage of the session	Guidance Notes on Tutor Activity during the PD Session. What PD Session participants (Tutors) will do during each stage of the session.	Time in session
1. Introduction to the	Introduction	Introduction	20 mins
Session Poviow prior	1.1 Ice breaker activity: Ask	1.1 Share your experience	
 Review prior learning 	experience they have	mathematics teacher	
 A critical friend to 	had with a mathematics	during their early school	
share findings for a	teacher during their	days which has	
short discussion and	early school days which	influences their	
lessons learned	has influences their	perception of the	
Reading and	perception of the	subject	
discussion of the	subject		

introductory	1.2 Ack tutors to tall how	1.2 Toll how us of ul the	
sections of the	useful the lesson 1 PD	nrevious PD session was	
lesson un to and	session was and how it	and how it influenced	
including learning	influenced their teaching	your teaching over the	
	over the wook Load	week Explain how	
indicators	them to montion how	students were well placed	
	ctudents were well	to employ the strategies	
Overview of	students were well	to employ the strategies	
content and	placed to employ the	and skills during Basic	
identification of	Various strategies and	School classroom work	
any distinctive	skills during the Basic	Including STS Field	
aspects of the	School classroom work	Experience.	
lesson/s,	including STS Field		
NB: The guidance for	Experience.		
SL/HoD should identify			
and address any areas	N/B: Draw tutors' attention	N/B: Pay attention to NTS	
where tutors might	to all NTS references and	references and salient points	
require clarification on	salient points necessary for	necessary for the	
any aspect of the	the development of their	development of their	
lesson.	proforma.	proforma.	
NB: SL/HoD should ask			
tutors to plan for their	1.3 Ask the critical friend to	1.3 As a critical friend,	
teaching as they go	give feedback on his/her	describe how the	
through the PD session	observation of the last	previous lesson observed	
	enacted lesson laying	went laying emphasis on	
	emphasis on clarity of	clarity of concepts	
	concepts explained,	explained, assessment	
	assessment strategies,	strategies, ICT integration,	
	ICT integration, GESI,	GESI, Twenty First	
	Twenty First Century	Century Skills.	
	Skills.		
	1.4 Lead tutors to discuss	1.4 Discuss any challenges	
	any challenges that	that arose during the	
	arose during the	enactment.	
	enactment. Eg In what		
	ways did explanations		
	obtained by students		
	through internet search		
	complicate		
	understanding of		
	conconts?		
	1 5 Ask tutors to road	1.5 Read individually and	
	individually and discuss	discuss the introductory	
	individually and discuss	discuss the introductory	

in pairs the introducto sections of the lesson up to Learning Outcomes.	ory sections of the lesson up to Learning Outcomes.
1.6 Lead tutors in pairs to discuss the distinctive aspects of lesson 5 sur as fundamental concepts and developing awareness of equity and diversity issues and issues on 10	 1.6 In pairs, discuss the distinctive aspects of lesson 5 such as fundamental concepts and developing awareness of equity and diversity issues and issues CT. on ICT.
<i>Distinctive aspects</i> inclua the interactive nature of	le Distinctive aspects include the interactive nature of the
the activities, emphasizin on connecting concepts:	g activities, emphasizing on connecting concepts:
a. Early Grade- eg.	a. Early Grade– eg.
theoretical perspectives	theoretical perspectives and
and learning of	learning of mathematics in
mathematics in early grad	de early grade
b. Upper Grade – eg.	b. Upper Grade – eg.
Connections between the	Connections between the
theoretical perspectives	theoretical perspectives and
and learning of	learning of mathematics in
mathematics in upper	upper primary
primary	c. JHS;(Core)– eg. connections
c. JHS (Core) – eg.	between the theoretical
Connections between the	perspectives and learning of
lineuretical perspectives a	nu mumemunus in jumor High
luniar High School	d. IHS (Specialism) – ea
d. JHS (Specialism) – ea.	solving quadratic equations.
solving quadratic	graphing quadratic
equations, graphing	equations, roots of quadratic
quadratic equations, root	s equations and quadratic
of quadratic equations ar	nd inequalities.
quadratic inequalities	
N/B	
Be ready for likely questio	ns
from tutors for clarificatio	on.
Anticipated questions:	

	 i. What are the weakness of the theories of learning of basic school mathematics? ii. What are the likely RPK to for solving quadratic equations? NB: Guide tutors to discuss the possible responses to the anticipated questions, bearing in mind pedagogy, GESI, ICT 		
 2. Concept Development (New learning likely to arise in lesson/s): Identification and discussion of new learning, potential barriers to learning for student teachers or students, concepts or pedagogy being introduced in the lesson, which need to be explored with the SL/HoD NB The guidance for SL/HoD should set out what they need to do to introduce and explain the issues/s with tutors 	Concept Development2.1 Ask tutors to identify familiar and unfamiliar concepts in their lessons and discuss with the larger group.FamiliarUnfamiliar conceptsQuadratic equationsRoots of quadratic equationInformation about J. Piaget and J. BrunerInformation about J. H. Pestalozzi2.2 Lead tutors to draw concepts in the various lessons in line with the basic school curriculum.Example: Early/Upper Primary/JHS core - Activity theory perspectives and SBC pp. xv-xvi JHS (Specialism) - Linking Distributive property / factorization in JHS and factorizing quadratic	 Concept Development 2.1 Ask tutors to identify familiar and unfamiliar concepts in their lessons and discuss with the larger group. 2.2 In your phase groups, draw connections among concepts in the lesson and in line with the basic school curriculum. 	15 mins
	expressions. 2.3 Ask tutors to use Think- Pair-Share to outline possible challenging	2.3 Individually, outline the challenging areas in your lesson, share with a	

			1
	areas in teaching and	member of the same	
	assessing the lesson.	phase group and then	
		with the whole group.	
	2.4 Lead tutors to discuss	2.4 In whole group, discuss	
	misconceptions and	any misconceptions and	
	barriers in teaching and	barriers in teaching and	
	learning of the lesson.	learning of the lesson.	
	Example:		
	a. Early, Upper Prim & JHS		
	(Core) Grade: –		
	Some people are born with		
	Mathematics and so they		
	easily understand lessons.		
	b. JHS (Elective) –		
	Quadratic expressions		
	always have 3 terms.		
	Barriers:		
	Poor foundational		
	knowledge about guadratic		
	equations while in SHS. Lack		
	of appropriate resources,		
	lack of opportunity to use		
	ICT due to failure of electric		
	power (lights-out).		
	bad/weak network.		
	unavailability of internet		
	bundle for students and		
	emergency academic staff		
	meetings		
3. Planning for	Planning for teaching,	Planning for teaching,	40 mins
teaching, learning	learning and assessment	learning and assessment	
and assessment	activities	activities	
activities for the			
lesson/s	3.1 In their phase groups,	3.1 In your phase groups, ask	
 Reading and 	ask tutors to suggest	tutors to suggest teaching	
discussion of the	teaching and learning	and learning activities for	
teaching and	activities for the lesson	teaching the lesson	
learning activities	ensuring;	ensuring;	
 Noting and 	i. Provision is made for SEN	i. Provision is made for SEN	
addressing areas	ii. Both genders take	ii. Both genders take leading	
where tutors may	leading roles in group task	roles in group task, etc	

	require clarification	iii. Even distribution of	referring to NTS 1a, b, c, d,	
•	Noting	questions to different	2b, e, f, 3b, c	
	opportunities for	categories of learners based		
	making links to the	on gender, ability, previous		
	Basic School	experience, etc. referring		
	Curriculum	to NTS 1a, b, c, d, 2b, e, f,		
•	Noting	3b, c		
	opportunities for			
	integrating: GESI	3.2 Ask tutors to read the	3.2 Read the activities	
	responsiveness and	activities outlined in	outlined in your course	
	ICT and 21 st C skills	their course manuals	manuals and identify	
•	Reading discussion	and identify areas that	areas that require	
	and identification of	require clarification.	clarification.	
	continuous			
	assessment	NB: Refer to	NB: Refer to	
	onnortunities in the	https://www.21caf.org and	https://www.21caf.ora &	
	lesson Fach lesson	https://www.researchgate.	https://www.researchgate.n	
	should include at	net for explanations on	et for explanations on	
	least two	"Connections between the	"Connections between the	
	onnortunities to use	theoretical perspectives and	theoretical perspectives and	
	continuous	learning of mathematics"	learning of mathematics"	
	assessment to	and search through	and search through	
	support student	https://www.mathsisfun.co	https://www.mathsisfun.com	
	teacher learning	m to clarify the otherwise	to clarify the otherwise dark	
	Resources:	dark spots in "Ouadratic	spots in "Ouadratic	
•	\sim links to the	Equations".	Equations", dark spots in	
	evisting PD		"Ouadratic Equations".	
	Themes for		200000000000000000000000000000000000000	
	evample action	3.3 Lead tutors to	3.3 Brainstorm to come up	
	research	brainstorm to come up	with some pedagogical	
	questioning and	with some pedagogical	approaches that can be	
	to other external	approaches and their	employed during the	
	reference	impact on learning of	lesson and their	
	material	the concepts taking into	effectiveness towards	
	literature on web	consideration inclusivity.	learning of the concepts.	
	Utube. physical	Example: i) The use of	Mention any GESI issues	
	resources, power	inquiry to explore	that need consideration	
	point; how they	Connections between the	while using those	
	should be used.	theoretical perspectives and	approaches	
	Consideration	learning of mathematics.		
	needs to be given	(ii) The use of differentiation		
	to local availability	and scaffolding to ensure		
	 guidance on any 	that no learner is left behind		
	power point	(SBC pp. xv)		
	power point	(SBC pp. xv)		

 presentations, TLM or other resources which need to be developed to support learning Tutors should be expected to have a plan for the next lesson for student teachers 	Engage students in meaningful "hands-on" activities to explore roots of Quadratic Equations iii) Being patient with stutterers, using tactile or braille for visually challenged, providing peer support for those who might need, while you pay attention to all Phases.		
	 3.4 Ask tutors to explain some suggested teaching strategies that can help inculcate core competencies in student teachers and for that matter Basic School learners. eg. Using a) Internet Search to identify the Connections between the theoretical perspectives and learning of Mathematics –use of ICT Skills b) Exploring quadratic roots by graphing quadratic equations – Critical Thinking 	3.4 Suggest teaching strategies to be used in achieving the LOs of the lesson and explain how they can help inculcate core competencies in student teachers and for that matter Basic School learners.	
	 3.5 Ask tutors to mention some GESI responsive resources that can be used with the suggested approaches and strategies in achieving the LOs. E.g. Resources may include 	 3.5 Mention some GESI responsive resources that can be used with the suggested approaches and strategies in achieving the LOs. E.g. Resources may include 	
	supporting staff with experts in sign language as well as resources such teacher and learner resource packs, textbooks, course manual, projectors,	supporting staff with experts in sign language as well as resources such teacher and learner resource packs, textbooks, etc	

flip charts, sticky notes, braille, tactile materials, audio and audio-visuals that can be used in the teaching and learning of the concepts mentioned above (NTS 3j)		
3.6 Using discussion, lead tutors to come out with assessment strategies ('as' and 'for') to be used during teaching of the lesson.	3.6 Using discussion, lead tutors to come out with assessment strategies ('as' and 'for') to be used during teaching of the lesson.	
NB: Continuous assessment activities (assignments, quizzes, group presentations, etc. should be used to create subject projects and build subject portfolios). E.g. A project on how children learn using the Piagetian stages. (EG, UP) A project on investigation of	NB: Continuous assessment activities (assignments, quizzes, group presentations, etc. should be used to create subject projects and build subject portfolios). E.g. A project on how children learn using the Piagetian stages. (EG, UP)	
quadratic inequalities (JHS) Make reference to assessment in the course manual and NTEAP	Make reference to assessment in the course manual and NTEAP	
3.7 Ask each tutor to develop a sample of assessment item based on the LOs and share with the whole group.	3.7 Develop a sample of assessment items based on the LOs and share with the whole group.	
Example: Early, Upper Primary and JHS (Core) Grades – Interview 5 basic school teachers during the STS activity on which theory	Example: Early, Upper Primary and JHS (Core) Grades – Interview 10 basic school teachers during the STS activity on mathematics	

	support their philosophy of teaching. JHS Grade – In groups of four, draw three different quadratic graphs and write a report on the difference and similarities in the graphs.	that basic school learners are exposed to a) at home & b) during play	
	 3.8 Lead tutors to discuss the various ways they can support student teachers to build their subject portfolio. E.g. Encouraging student teachers to i) file all their assignments with feedback in their folders. ii) 	 3.8 Discuss the various ways you can support student teachers to build their subject portfolio. E.g. Encouraging student teachers to file all their assignments with feedback in their folders and to take notes in class and filing them 	
	3.9 Ask a tutor to model a presentation of an activity using projector, internet search and ensuring both gender take leading roles in the groups. NTS 1a, b, 2b, e, 3b, c, J; BSC pp. iii)	3.9 Prepare and model a presentation of an activity using projector, internet search and ensuring both gender take leading roles in the groups. NTS 1a, b, 2b, e, 3b, c, J; BSC pp. iii)	
 4. Evaluation and review of session: Tutors should Identifying critical friends to observe lessons and report at next session Identifying and addressing any outstanding issues relating to the lesson/s for 	Evaluation and review of session 4.1 Engage tutors in providing feedback of the PD session taking into consideration – Clarity of content, ICT integration, GESI, Twenty First Century Skills (NTS 1a, 3i, BSC pp. x-xvi) and make notes that will help	Evaluation and review of session 4.1 Reflect and provide feedback on this PD session taking into consideration – Clarity of content, pedagogical approaches employed, ICT integration, GESI, Twenty First Century Skills (NTS 1a, 3i, BSC pp. x-xvi)? and make notes	15 mins
 Intends to observe lessons and report at next session Identifying and addressing any outstanding issues relating to the lesson/s for clarification 	into consideration – Clarity of content, ICT integration, GESI, Twenty First Century Skills (NTS 1a, 3i, BSC pp. x-xvi) and make notes that will help them to teach Lesson 5	consideration – Clarity of content, pedagogical approaches employed, ICT integration, GESI, Twenty First Century Skills (NTS 1a, 3i, BSC pp. x-xvi)? and make notes that will help you to teach Lesson 5	

4.2 Engage tutors to	4.2 Identify unresolved issues	
identify unresolved	relating to this lesson for	
issues relating to this	clarification.	
lesson for clarification.		
NB: Take note of all	NB: Put your unresolved	
unresolved issues that may	issues unto the department's	
need further research or	WhatsApp/ Telegram	
consultation and use any of	platform and research into	
following strategies to	the issues raised.	
address them.		
i. put on SL/SWL WhatsApp/		
Telegram platform for		
discussion		
ii. tutors to research for the		
next PD session for		
discussion		
4.3 Ask tutors to identify a	4.3 Identify a critical friend	
critical friend from the	from the same or related	
same or related	discipline to observe the	
discipline to observe the	enactment of your lesson	
enactment of their	and to provide feedback	
lesson and provide	during the next PD	
foodback during the	Sossion (NTS 1a)	
novt PD Sossion (NTS	Session (NTS 18).	
14).		
Advance Preparation	Advance Preparation	
4.4 Ask tutors to remember	4.4 Remember to prepare	
to prepare proforma for	proforma for the lesson 5	
Lesson 5 taking note of	taking note of important	
important or distinctive	or distinctive aspects of	
aspects of the lesson	the lesson and	
and crosscutting issues	crosscutting issues and	
and read Lesson 6 of the	read Lesson 6 of the	
Course Manual on:	Course Manual on:	
<u>Early Grade</u> – Major	Early Grade – Major theories	
theories of learning and	of learning and teaching of	
teaching of Early Grade	Early Grade mathematics in	
mathematics in inclusive	inclusive classrooms 2	
classrooms 2	<u>Upper Primary</u> - Major	
<u>Upper Primary</u> - Major	theories of learning and	
theories of learning and	teaching of Upper primary	
teaching of Upper primary	mathematics in inclusive	

mathematics in inclusive	classrooms	
classrooms	JHS (Core) - Major theories of	
<u>JHS(Core)</u> - Major theories	learning and teaching of	
of learning and teaching of	Junior High School	
Junior High School	mathematics in inclusive	
mathematics in inclusive	classrooms 2	
classrooms 2	JHS (Elective) – Polynomials:	
<u>JHS (Elective.)</u> –	Learning, teaching and	
Polynomials: Learning,	applying	
teaching and applying		
NB:	NB:	
 i. Read the course manual and the PD session guide ahead of time to identify any outstanding issues relating to the lesson for clarification. ii. Collect all-inclusive resources (such as projector, flip chart and sticky notes) you need ahead of time, prepare samples of TLMs you may need and rehearse how 	Take note of the PD session guide ahead of time to identify any outstanding issues relating to the lesson for clarification.	
these may be used to		
support the achievement of		
your goals		

Age Levels/s:

Name of Subject/s:

- a. Early Grade
- b. Upper Grade b. Theories in Learning upper primary mathematics
- c. JHS (Core)
- c. Theories in Learning of Jnr High School Math.

a. Theories in the Learning of Numeracy in Early Grade

d. JHS (Elective) d. Further Algebra

Tutor PD Session for Lesson 6 in the Course Manual

Lesson Tittle:

a. Early Grade - Major theories of learning and teaching of Early Grade Mathematics in inclusive classrooms 2.

- b. Upper Grade -Major theories of learning and teaching of Upper Primary Mathematics in inclusive classrooms 2.
- c. JHS (Core)- Major theories of learning and teaching of Junior High School Mathematics in inclusive classrooms 2.
- d. JHS (Elective) Polynomials: Learning, Teaching and Applying

Focus: the bullet	Guidance notes on Leading	Guidance Notes on Tutor	Time in
points provide the	the session. What the SL/HoDs	Activity during the PD	Session
frame for what is to	will have to say during each	Session. What PD Session	
be done in the	stage of the session	participants (Tutors) will	
session. The SWL		do during each stage of	
should use the bullets		the session.	
to guide what they			
write for the SL/HoD			
and tutors to do and			
say during each			
session. Each bullet			
needs to be addressed			
and specific reference			
should be made to the			
course manual/s.			
1. Introduction to the	Introduction	Introduction	20mins
session	1.1. Icebreaker activity: Begin	1.1. I am a number; my	
 Review prior 	with an investigational	numerator is the	
learning	activity such as a riddle.	square of the even-	
 A critical friend to 	eg. I am a number; my	prime number and	
share findings for a	numerator is the square	my denominator is	
short discussion and	of the even-prime	half the 2nd power of	
lessons learned	number and my	ten. Who am I?	
 Reading and 	denominator is half the		
discussion of the	2nd power of ten. Who		
introductory	am I?		
sections of the			

 lesson up to and including learning outcomes and indicators Overview of content and identification of any distinctive aspects of the lesson/s. 	1.2. Ask tutors to tell in their phase group how useful the previous PD session was and how it influenced their teaching and learning.	1.2. Discuss in your phase group with your friend how useful the previous PD session was and how it influenced your teaching and learning.
NB The guidance for SL/HoD should identify and address any areas where tutors might require clarification on any aspect of the lesson. NB SL/HoD should ask tutors to plan for their teaching as they go through the PD session	 1.3. Ask a critical friend to give feedback on observation during presentation of the fifth lesson. NB: issues tutor might have observed; tutor's choice of words, pedagogical content knowledge, content knowledge subject matter, ICT tools, GESI and the use of NTEAP 	 1.3. As a critical friend share his/her observation on the fifth lesson. (eg. <i>Teacher's choice of</i> words for delivery, pedagogy used, etc).
	1.4. Ask tutors in their phase group to read and discuss the introductory section of the lesson including the learning outcomes (LOs) in phase groups.	 1.4. Read and discuss the introductory section of the lesson (up to learning outcomes). Suggest relevant previous knowledge of students that will support effective teaching and learning of the lesson.
	 1.5. Ask tutors to identify the purpose of the lesson from the course manual and state their expectations of the PD Session. PURPOSE OF THE LESSON Early Upper JHS(CORE) Grade Primary e.g., to develop student teachers' understanding of nature and importance of 	1.5. Identify the purpose of the lesson from the course manual and state your expectations of the PD Session.

1			
	Mathematics, understanding of theories of learning e.g., cognitive, constructivist and behaviourist perspectives and their implications for practice. JHS (PECIALISM) e.g., to develop student teachers' conceptual		
	knowledge in order to		
	prepare them well enough		
	to be able to handle		
	concepts in indices and		
	the IHS curriculum		
	NB: Discuss children		
	development of Mathematics		
	across the developmental		
	levels, identify some		
	psychological factors		
	influencing teaching and develop pedagogical approach to teach and address misconception of polynomial functions.		
	1.6. Ask tutors in their phase groups to discuss the important or distinctive aspects of the third lesson including vocabulary and concepts fundamental.	1.6 In your phase groups, discuss the distinctive aspects of the sixth lesson including vocabulary and fundamental concepts.	
	 Major theories of learning and teaching across the Grades Mathematics (Early Grade, Upper Grade, JHS- core) in inclusive classrooms 2. JHS (Specialism) Learning, teaching and applying Polynomial Functions. 		

	1		1
	Distinctive aspects include the interactive nature of the activities, emphasis on connecting concepts: a. Early, Upper Prim & JHS (Core) Grade: – eg. A cognitive perspective, constructivism, behaviourism and Implications for practice. b. JHS; Further Algebra – eg. Misconceptions, barriers, Meaning of polynomials functions and factorization of polynomials; types of polynomials; the Remainder and Factor theorems and applications of polynomial functions; N/B Likely question from tutors to be addressed (Anticipated questions): <i>i</i> . How does a cognitive perspective, constructivism, behaviourism theory of learning connect to influence effective teaching of mathematics or specific topic? <i>ii</i> . What ways can unfactorized polynomials be explored?		
2 Concent	2 1 Ask tutors to identify	2.1 Identify familiar and	40 mins
Development (New	familiar and unfamiliar	unfamiliar concepts in	
learning likely to	concepts in their lessons	their lessons and	
arise in lesson/s):	and discuss with the larger	discuss with the larger	
 Identification and 	group.	group.	
discussion of new	Familiar Concept:		
learning, potential	factorization, remainder		
barriers to learning	theorem, stages of		
for student teachers	learning, non-negative		
or students, concepts or pedagogy being introduced in the lesson, which need to be explored with the SL/HoD NB The guidance for SL/HoD should set out what they need to do to introduce and explain the issues/s	 integer powers, Unfamiliar Concept: zero as a polynomial, many variables in polynomials 2.2 Lead tutors to draw connections among concepts in the various lessons in line with the Basic School Curriculum. NB: distributing property in Integer, etc 	2.2 Draw connections among concepts in the various lessons in line with the basic school curriculum.	
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with tutors	 2.3 Ask tutors to outline possible challenging areas in: (e) Teacher's alignment of theories in Mathematics with current basic school mathematics curriculum and classroom inclusion practice. (f) Learning, teaching and applying polynomials functions: Taking GESI consideration (eg. Teacher makes sure learning styles of students inculcate in the teaching of the lesson) 	2.3 Outline possible challenging areas in Teaching of theories in Mathematics with current basic school mathematics curriculum and classroom inclusion practice and Learning, teaching and applying polynomials functions: taking into consideration GESI. (eg teacher makes sure to factor students learning and teaching styles in the teaching of the lesson and differentiated approach)	
	 2.4 Lead tutors in their phase group to discuss misconceptions and barriers in teaching and learning of the lesson. Example: Mathematics is not learnt but born with JHS(Specialism) Polynomial functions: Learning, teaching and applying 	2.4 Participate actively in the discussion of misconceptions and barriers in teaching and learning of the lesson.	

	 Example: The challenge involves considering zero as a polynomial. NB: Guide teachers to know the challenge involve in identifying pattern of some numbers. 2.5 Support tutors to identify GESI responsive resources such as supporting staff with experts in sign language as well as resources such as teacher and learner resource packs, textbooks, course manual, recorded video, Globe, mathematical set, manila cards, permanent markers, graph sheet, etc (NTS 3j, PD Manual pp.21) 	2.5 Identify as many GESI responsive resources such as supporting staff with experts in sign language as well as resources such as teacher and learner resource packs, textbooks, course manual, recorded video, Globe, mathematical set, manila cards, permanent markers, oranges and a knife.	
		(NTS 3j, PD Manual pp.21)	
 3. Planning for teaching, learning and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for making links to the Basic School Curriculum 	Teaching and learning activities 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI (involving everybody, female take leading role presentation in their discussion group) issues. Example: i. Provision made for physically challenged ii. Both genders take leading roles in group task iii. Even distribution of questions to different	Teaching and learning activities 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI	

	Noting	categories of learners based on		
•	opportunition for	gondor ability provious		
	opportunities for	gender, ability, previous		
	Integrating: GESI	experience, etc		
	responsiveness and	NTS 1a, b, c, d, 2b, e, f, 3b, c		
	ICT and 21 st C skills			
٠	Reading, discussion,	3.2 Let tutors read the	3.2 Read the activities	
	and identification of	activities outlined in their	outlined in your course	
	continuous	course manuals and	manual and identify	
	assessment	identify areas that require	areas that require	
	onnortunities in the	clarification.	clarification.	
	losson Each losson	Strategies to clarify the		
	chould include at	otherwise dark spots may		
	should include at	include investigation internet		
	least two	menude investigation, internet		
	opportunities to use	searcn, etc.		
	continuous			
	assessment to	3.3 Lead tutors to brainstorm	3.3 Brainstorm to come up	
	support student	to come up with some	with some pedagogical	
	teacher learning	pedagogical approaches	approaches and their	
•	Resources:	and their related core	related core	
	 links to the 	competencies likely to be	competencies likely to	
	existing PD	inculcated in students and	be inculcated in	
	Themes for	for that matter Basic	students and for that	
	example action	School learners. eg.	matter Basic School	
	research	(a)Farly Grade, Upper primary	learners.	
	auestioning and	and IHS (Core)		
	questioning and	Strategy: Expository and		
		Discussion		
	reference	Care Competencies: Droblem		
	material:	core competencies: Problem		
	literature, on	solving, critical and creative		
	web, Utube,	thinking and communication		
	physical	(b) JHS Elective		
	resources,	Strategy: Use interactive and		
	power point;	Collaborative group work (with		
	how they should	the aid of ICT tools and other		
	be used.	manipulatives to explore the		
	Consideration	remainder factor theorem and		
	needs to be	model area of entire rectangle.		
	given to local	Core Competencies: Critical		
	availability	thinking skills and		
	\circ guidance on any	Collaborative learning		
	o guiuance on any			
		3.4 Ask tutors to discuss the	3.4 Discuss the assessment	
	presentations,	assessment strategies to be	strategies to be used	
	I LIVI or other	used during teaching of the	during teaching of the	
	resources which	_	_	

nood to bo			
developed to	(Tooching of theories of	resson = Assessment	
uevelopeu to	(Teaching of theories of	as (NTSSK).	
	Nath and teaching of		
Iutors should be	Mathematics in across the		
expected to have a	grade and inclusive classrooms		
plan for the next	(EG, UP, JHS) and Learning,		
lesson for student	teaching and applying		
teachers	polynomial function-JHS		
	Specialism)		
	 - 'Assessment as' (NTS 3k). 		
	Assessment must be aligned to		
	the NTEAP and required		
	course. Continuous assessment		
	activities (assignments,		
	quizzes, group presentations,		
	etc, should be used to create		
	subject projects and build		
	subject portfolios		
		2 5 Discuss the verieus	
	3.5 Lead tutors to discuss the	3.5 Discuss the various	
	various ways they can	ways they can support	
	support student teachers	student teachers to	
	to build their subject	build their subject	
	project and subject	project and subject	
	portfolio.	portfolios	
	3.6 Let a tutor model a	3.6 Model a presentation	
	presentation of an activity	of an activity using ICT	
	using ICT tools and taking	tools and taking into	
	into consideration GESI	consideration GESI	
	issues (eg. Both gender	issues in the lessons	
	taking the leading roles in	(NTS 1a, b, 2b, e, 3b, c,	
	their groups and in the	J: BSC pp. 23)	
	demonstration of the use	, 500 pp. 20)	
	of ICT tools) to teach their		
	lessons		
	EG LID IHS(Coro)		
	similarities and differences		
	among theories in		
	Mathematics and have		
	those impact togehing and		
	linese impact teaching and		
	JHS (SP)- Arithmetic		
	operations on polynomial		

	functions. Example: divide $x^3 + 4x^2 - 7x - 10$ by $x + 1$. (NTS 1a, b, 2b, e, 3b, c, J; BSC pp. 23 PD manual 21) NB: Guide tutors to use the internet to search various expression of polynomial function and application and how various theorist of Mathematics is applied.		
4. Evaluation and review of session:	Evaluation and review of session:	Evaluation and review of session:	20 mins
 Tutors should Identifying critical friends to observe lessons and report at next session. Identifying and addressing any outstanding issues relating to the lesson/s for clarification 	 4.1 Engage tutors in providing feedback of the PD session taking into consideration – Clarity of concepts, ICT integration, GESI, Twenty First Century Skills (NTS 1a, 3i, BSC pp. x-xvi) and make notes that will help them to teach Lesson 1 	4.1 Reflect and provide feedback on this PD session taking into consideration – Clarity of concepts, pedagogical approaches employed, ICT integration, GESI, Twenty First Century Skills (NTS 1a, 3i, BSC pp. x-xvi)? and make notes that will help you to teach Lesson 1	
	 4.2 Engage tutors to identify unresolved issues relating to this lesson for clarification. <i>N/B:</i> Take note of all unresolved issues that may need further research or consultation and use any of following strategies to address them. i. put on SL/SWL WhatsApp platform for discussion ii. tutors to research for the next PD session for discussion 	 4.2 Identify unresolved issues relating to this lesson for clarification. N/B: Put your unresolved issues unto the department's WhatsApp/ Telegram platform and research into the issues raised. 	

4.3 Ask t critic same to ob of th feed PD S	cutors to identify a al friend from the e or related discipline oserve the enactment eir lesson and provide back during the next ession (NTS 1a).	4.3 Identify a critical friend from the same or related discipline to observe the enactment of your lesson and to provide feedback during the next PD Session (NTS 1a).	
Advance	Proparation	Advance Bronaration	
Advance 4.4 Ask t prepa Lesso impor aspec crosso Lesso Manu <u>EG, UP a</u> Teacher theorist their rel JHS(Elec function and app	Preparation sutors to remember to re proforma for in 7 taking note of tant or distinctive ts of the lesson and cutting issues and read in 7 of the Course al on: <u>ind JHS (Core)</u> – understanding of in mathematics and ation to teaching. <u>tive)</u> – Polynomial s; learning, teaching lying.	Advance Preparation 4.4 Remember to prepare proforma for the Lesson 7 taking note of important or distinctive aspects of the lesson and crosscutting issues and read Lesson 7 of the Course Manual on: <u>EG, UP and JHS (Core)</u> – Teacher understanding of theorist in mathematics and their relation to teaching. <u>JHS(Elective)</u> – Polynomial functions; learning,	
		teaching and applying.	
N/B		N/B	
i. Reda t the PD of time outsta the les ii. Collec resource	session guide ahead session guide ahead to identify any nding issues relating to son for clarification. t all-inclusive s (such as projector,	session guide ahead of time to identify any outstanding issues relating to the lesson for clarification.	
flip char	t and sticky notes) you		
need ah	ead of time, prepare		
samples	of ILIVIS you may need		
and refe	earse now these may		
be used	io support the		
uchiever	nent oj your gouis		

Age Levels/s:

Name of Subject/s:

- a. Early Grade
- a. Theories in the Learning of Numeracy in Early Grade b. Theories in Learning upper primary mathematics
- b. Upper Grade c. JHS (Core)
- c. Theories in Learning of Jnr High School Math.
- d. JHS (Elective) d. Further Algebra

Tutor PD Session for Lesson 7 in the Course Manual

Lesson Title:

- a. Early Grade- Children and Mathematics
- b. Upper Grade- Children and Mathematics
- c. JHS (Core)- Children and Mathematics
- d. JHS(**Specialism**) Indices and Logarithm: *Learning, teaching and applying*

Focus: the bullet	Guidance notes on Leading	Guidance Notes on Tutor	Time in
points provide the	the session. What the	Activity during the PD	session
frame for what is to be	SL/HoDs will have to say	Session. What PD Session	
done in the session.	during each stage of the	participants (Tutors) will	
The SWL should use	session	do during each stage of	
the bullets to guide		the session.	
what they write for			
the SL/HoD and tutors			
to do and say during			
each session. Each			
bullet needs to be			
addressed and specific			
reference should be			
made to the course			
manual/s.			
1. Introduction to the	1.1 Icebreaker activity: Begin	1.1 Ice breaker activity:	20 mins
1. Introduction to the session	1.1 Icebreaker activity: Begin with an investigational	1.1 Ice breaker activity: Begin with an	20 mins
 Introduction to the session Review prior 	 1.1 Icebreaker activity: Begin with an investigational activity according to the 	 1.1 Ice breaker activity: Begin with an investigational activity 	20 mins
 Introduction to the session Review prior learning 	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. 	 1.1 Ice breaker activity: Begin with an investigational activity according to the 	20 mins
 Introduction to the session Review prior learning Reading and 	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. 	 1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age 	20 mins
 Introduction to the session Review prior learning Reading and discussion of the 	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. 	 1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases 	20 mins
 Introduction to the session Review prior learning Reading and discussion of the introductory 	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. Eg 	 1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases Eg. 	20 mins
 Introduction to the session Review prior learning Reading and discussion of the introductory sections of the 	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. Eg i. A riddle to identify 	 1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases Eg. i. A riddle to identify 	20 mins
 Introduction to the session Review prior learning Reading and discussion of the introductory sections of the lesson up to and 	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. Eg A riddle to identify pattern(s) in the list 	 1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases Eg. A riddle to identify pattern(s) in the list 	20 mins
 Introduction to the session Review prior learning Reading and discussion of the introductory sections of the lesson up to and including learning 	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. Eg A riddle to identify pattern(s) in the list 1,3,5,7,14, 15,17,19, 21, 	 1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases Eg. A riddle to identify pattern(s) in the list 1,3,5,7,14, 15,17,19, 	20 mins
 Introduction to the session Review prior learning Reading and discussion of the introductory sections of the lesson up to and including learning outcomes and 	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. Eg A riddle to identify pattern(s) in the list 1,3,5,7,14, 15,17,19, 21, 42, 43,, 	 1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases Eg. A riddle to identify pattern(s) in the list 1,3,5,7,14, 15,17,19, 21, 42, 43, 	20 mins
 Introduction to the session Review prior learning Reading and discussion of the introductory sections of the lesson up to and including learning outcomes and indicators 	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. Eg A riddle to identify pattern(s) in the list 1,3,5,7,14, 15,17,19, 21, 42, 43,, Construct a table of 	 1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases Eg. A riddle to identify pattern(s) in the list 1,3,5,7,14, 15,17,19, 21, 42, 43, Gonstruct a table of 	20 mins

and identification of any distinctive aspects of the lesson/s, NB The guidance for SL/HoD should identify and address any areas where tutors might require clarification on	 with base 10 (ie 10, 100, 1000, 10000, etc) the log of base 10 and compare both results. 1.2 Ask tutors to tell how useful the previous PD 	numbers (ie 10, 100, 1000, 10000, etc) using base 10 and the logarithm of base 10 and compare both results. 1.2 Discuss how useful the previous PD
any aspect of the lesson. NB SL/HoD should ask tutors to plan for their	session was and how it influenced their teaching in lesson 6.	session influenced their teaching over the week.
teaching as they go through the PD session	1.3 Expose tutors to the overview of the subject age phases to be covered in this PD session and how it will be organised.	1.3 Participate in the discussion on the overview of the subject age phases to be covered in this PD session and how it will
	<i>i.</i> Early and upper grade and JHS (Core) lessons focus on children's developmental levels, how children learn mathematics and associated theories, and other psychological factors influencing learning	be organised.
	<i>ii. JHS (Maths Specialism)</i> <i>lesson seeks to develop</i> <i>student teachers'</i> <i>conceptual</i> <i>understanding of indices</i> <i>and logarithms and how</i> <i>these concepts can be</i> <i>applied in other areas, as</i> <i>well as, plan micro</i> <i>lessons based on related</i> <i>concepts in the JHS</i> <i>mathematics curriculum</i>	
	1.4 Ask a critical friend to give feedback on	1.4 Participate in the critiquing of the

Г Г Г				
e e	bservation during the nactment of lesson 6.		feedback on observation during the enactment of lesson 6.	
1.5 A p a e S	ask tutors to suggest the purpose of the lesson nd state their expectations of the PD ession.	1.5	Engage tutors to suggest the purpose of the lesson and state your expectations of the PD Session.	
1.6 C tl C le P	Guide tutors to establish he linkage between CLOs and the LOs of the esson for each of the hases	1.6	Participate in the linkage of the CLOs and the LOs of the lesson for each of the phases	
1.7 A g ir a ir f	ask tutors in phase roups to discuss the mportant or distinctive spects of the lesson ncluding vocabulary and undamental concepts.	1.7	In pairs discuss the distinctive aspects of the lesson including vocabulary and fundamental concepts related to the components of the	
Distin ti o	nctive aspects includes he interactive nature of he activities, emphasis on connecting concepts:		front matters.	
a. E a	rly, Upper Prim & JHS			
	Core) Grade: – eg.			
Inves	stigation on			
theor	ies unu theoretical principles that are			
μ Γ	elevant to the learning			
a	ind teaching of			
	nathematics			
b. JH 5	S (Further Algebra): –			
е	g. The exploration of			
d	lifferent ways of			
u	nderstanding of			
re	elevant theories and			
p	rinciples of learning and			
t t	heir implications for			
te	eaching indices and			

	logarithm		
	Do roady for likely avertions		
	Be ready for likely questions		
	from tutors for		
	clarification.		
	Anticipated questions:		
	iii. Is it not enough for		
	students to mentally		
	count and readily identify		
	them?		
	iv. Why do we have to worry		
	students with logarithm		
	with different bases in		
	mathematics?		
	N/B: Guide tutors to discuss		
	the possible answers to		
	the anticipated		
	auestions bearing in		
	mind nedagoay GESLICT		
	- E a the most		
	- L.g. the most		
	depend on and		
	aepena on age ana		
	previous knowledge of		
	learners, objective of		
	lesson.		
		-	
2. Concept	Concept Development (New	Concept Development	15 mins
Development (New	learning likely to arise in	(New learning likely to	
learning likely to	lesson/s)	arise in lesson/s)	
arise in lesson/s):			
 Identification and 	2.1 Ask tutors to identify	2.1 Participate in the	
discussion of new	familiar and unfamiliar	identification of	
learning, potential	concepts in the lesson	familiar and unfamiliar	
barriers to learning	and discuss with the	concepts in the lesson	
for student teachers	larger group	and discuss with the	
or students.		larger group.	
concepts or			
pedagogy being	2.2 Lead tutors to draw	2.2 Draw connections	
introduced in the	connections among	among concepts in the	
lesson which need	concepts in the various	various lessons in line	
to be evplored with			
	lessons in line with the	with the basic school	
the SI /HoD	lessons in line with the	with the basic school	
the SL/HoD	lessons in line with the basic school curriculum	with the basic school curriculum.	
the SL/HoD NB The guidance for	lessons in line with the basic school curriculum Example:	with the basic school curriculum. Example:	
the SL/HoD NB The guidance for SL/HoD should set out	lessons in line with the basic school curriculum Example: <i>Early, Upper Prim & JHS</i>	with the basic school curriculum. Example: Early, Upper Prim & JHS	

F		
to introduce and explain the issues/s with tutors	Connecting logical and psychological approaches to learning mathematics in Understanding size, shape and patterns; Ability to count verbally; Recognizing numerals; Understanding one-to-one correspondence (PD Theme 3)	Connecting logical and psychological approaches to learning mathematics in Understanding size, shape and patterns; Ability to count verbally; Recognizing numerals; Understanding one-to-one correspondence (PD Theme 3)
	JHS (Further Algebra): – establish and analyse the relationship between the concepts; logarithm and indices and how this can be used to plan a micro lesson based on similar concepts	JHS (Further Algebra): – establish and analyse the relationship between the concepts; logarithm and indices and how this can be used to plan a micro lesson based on similar concepts
	2.3 Ask tutors to use Think- Pair-Share to outline possible challenging areas in teaching and assessing of;	2.3 Individually, outline the challenging areas in your lesson, share with a member of the same phase group and then with the whole group.
	a. Early, Upper Prim & JHS (Core) Grade: – Theoretical principles that explains children's learning of mathematics b. JHS (Further Algebra) Understanding the notation that the inverse exponent function $y = a^x$ is $y = \log_a x$.	a. Early, Upper Prim & JHS (Core) Grade: – Theoretical principles that explains children's learning of mathematics. b. JHS (Further Algebra) Understanding the notation that the inverse exponent function $y = a^x$ is $y = \log_a x$.
	N/B Eg. The use of differentiated instruction to cater for the needs of all children in the early and upper grade and JHS classrooms, including	

those with special		
educational needs (SEN) and		
creating a safe, secure, happy		
and stimulating learning		
environment (NTS 3c 3f, pg.		
14).		
2.4 Lead tutors to discuss	2.4 Participate in the	
misconceptions and	discussion on	
barriers in teaching and	misconceptions and	
learning of the lesson	barriers in teaching	
Example:	and learning of the	
Misconceptions	lesson	
a. Early, Upper Prim & JHS		
(Core) Grade: –		
Some mathematics topics		
are not related to real life		
b. JHS (Sp) : Students		
inappropriate use of		
factoring common factors in		
an algebraic expression to		
$\log 12 - \log 3 + \log 2$ as $\log (12 - \log 3)$		
3+2)		
(not understanding concepts		
of properties of logarithm)		
Barriers		
may include weak prior		
knowledge lack of		
annronriate resources lack		
of opportunity to use ICT due		
to failure of electric power		
(lights-out) had/woak		
notwork upavailability of		
internet hundle for students		
indequate contact time due		
to staff mostings		
Different entry behaviours		
Different entry benaviours,		
Socio-cultural Issues,		
unierent learning needs,		
misconceptions about the		
lesson		

3. Planning for	Planning for teaching,	Planning for teaching,	
teaching, learning	learning and assessment	learning and assessment	
and assessment	activities for the lesson/s	activities for the lesson/s	
activities for the		·	
lesson/s	3.1 In their phase groups.	3.1 Suggest teaching and	
Reading and	ask tutors to suggest	learning activities for	
discussion of the	teaching and learning	the lesson.	
teaching and	activities for the lesson		
	i Provision is made for		
icarining activities	nhysically challenged		
• Noting and	nersons and persons with		
	other forms of disability		
addressing areas	ii Both gondors take loading		
where tutors may	ii. Both genders take leading		
require clarification	roles in group task		
Noting	III. Even distribution of		
opportunities for	questions to different		
making links to the	categories of learners		
Basic School	based on gender, ability,		
Curriculum	previous experience, etc.		
Noting	reterring to NTS 1a, b, c,		
opportunities for	d, 2b, e, t, 3b, c		
integrating: GESI	3.2 Ask tutors to go through	3.2 Read the activition	
responsiveness and	the lesson in the course	outlined in your course	
ICT and 21 st C skills	manual and identify areas	manual and identify	
Reading,	that require clarification	aroas that require	
discussion, and		dieds that require	
identification of	Ly. Stratagies to clarify the		
continuous	athorwise dark spats may		
assessment	include investigation internet		
opportunities in	soarch atc		
the lesson. Each			
lesson should	3.3 Ask tutors to brainstorm	3.3 Brainstorm and explain	
include at least two	and explain how	how	
opportunities to	a. theoretical perspectives	a. theoretical perspectives	
use continuous	and principles of learning are	and principles of learning	
assessment to	relevant to children's	that are relevant to	
support student	learning b. relating real life	children's learning	
teacher learning	problem to indices and	b relating real life problem	
Resources:	logarithm can improve on the	to indices and logarithm,	
\circ links to the	learners understanding of the	can improve on the	
evicting DD	lesson. Refer to Basic School	learners understanding of	
Themes for	Curriculum (BSC pp. xv – xvii)	the lesson. Refer to Basic	
evample action		School Curriculum (BSC	
example, action		pp. xv – xvii)	

research,	3.4 Lead tutors to come up	3.4 Suggest some	
questioning and	with some pedagogical	pedagogical	
to other external	approaches and their	approaches and their	
reference	related core	related core	
material:	competencies likely to be	competencies likely to	
literature, on web.	inculcated in students	be inculcated in	
Utube, physical	and for that matter Basic	students and for that	
resources, power	School loarnors, og	matter Basic School	
point; how they	$(a) \in C/UD/UES (coro);$		
should be used.	(d)EG/OF/JHS (COTE).	learners.	
Consideration	Strategy: Expository, inquiry		
needs to be given	and Discussion: to explore		
to local availability	the effectiveness of		
\circ guidance on any	children's learning of		
power point	mathematics through games		
presentations,	and understanding size,		
TLM or other	shape and patterns.		
resources which			
need to be	Core Competencies: problem		
developed to	formulation and		
support learning	identification, Problem		
• Tutors should be	solving, critical and creative		
expected to have a	thinking and communication		
nlan for the nevt			
lesson for student	(b) JHS Specialism		
toochors	Strategy: interactive and		
leachers	Collaborative group work		
	(with the aid of ICT tools and		
	other manipulatives to		
	examine exponential and		
	logarithmic functions.		
	Core Competencies: Critical		
	thinking skills and		
	Collaborative learning		
	3.5 Ask tutors to mention	3.5 Mention some GESI	
	some GESI responsive	responsive resources	
	resources that can be	that can be used with	
	used with the suggested	the suggested	
	annroaches and	annroaches and	
	strategies in achieving	strategies in achieving	
	the LOs	the LOs	
	LITE LUS.	LITE LUS.	
	E.g. Resources may include	E.y Resources may include	
	supporting stajj with experts	supporting stajj with	
	in sign language as well as	experts in sign language	

resources such teacher and learner resource packs, textbooks, course manual, prisms, pyramids, projectors, flip charts, sticky notes, braille, tactile materials, audio and audio-visuals that can be used in the teaching and learning of the concepts mentioned above (NTS 3j)	as well as resources such teacher and learner resource packs, textbooks, etc	
3.6 Ask tutors to identify and discuss Continuous Assessment for the lesson to support student teacher learning (NTS 3k). N/B: Assessment must be aligned to the NTEAP and required course Assessment to include subject project, subject portfolio and end of semester examination	3.6 Identify and discuss continues assessment strategies for the lesson to support student teacher learning (NTS 3k).	
Fø.	Fø.	
Example: Early, Upper Primary and JHS (Core) Grades – Interview about 8 basic school teachers during the STS activity on mathematics that basic school learners are exposed to a) at home & b) during play JHS Grade – In groups of four, develop any game for teaching any concept within your course outline.	Example: Early, Upper Primary and JHS (Core) Grades – Interview about 8 basic school teachers during the STS activity on mathematics that basic school learners are exposed to a) at home & b) during play JHS Grade – In groups of four, develop any game for teaching any concept within your course outline.	
3.7 Lead tutors to discuss the various ways they can support student teachers to build their subject portfolio.	3.7 Lead tutors to discuss the various ways they can support student teachers to build their subject portfolio	

	E.g. encouraging student teachers to file all their assignments with feedback in their folders. Taking notes in class and filing them	E.g. encouraging student teachers to file all their assignments with feedback in their folders.	
	3.8 Ask a tutor to model a presentation of an activity using projector, internet search and taking into consideration GESI issues (eg. Both gender taking the leading roles in their groups) NTS 1a, b, 2b, e, 3b, c, J; BSC pp. iii	3.8 Model a presentation of an activity using projector, internet search and taking into consideration GESI issues (eg. Both gender taking the leading roles in their groups) NTS 1a, b, 2b, e, 3b, c, J; BSC pp. iii	
4. Evaluation and	Evaluation and review of	Evaluation and review of	15 mins
• Tutors need to	session:	session:	
 identify critical friends to observe lessons and report at next session Identifying and addressing any outstanding issues relating to the lesson/s for clarification 	 4.1 Engage tutors in providing feedback of the PD session taking into consideration – Clarity of concepts, ICT integration, GESI, Twenty First Century Skills (NTS 1a, 3i, BSC pp. x-xvi) and make notes that will help them to teach Lesson 7 	4.1 Reflect and provide feedback on this PD session taking into consideration – Clarity of concepts, pedagogical approaches employed, ICT integration, GESI, Twenty First Century Skills (NTS 1a, 3i, BSC pp. x-xvi)? and make notes that will help you to teach Lesson 7	
	4.2 Engage tutors to identify unresolved issues relating to this lesson for clarification	4.2 Identify unresolved issues relating to this lesson for clarification.	
	N/B: Take note of all	N/B: Put your unresolved	
	unresolved issues that may	<i>issues unto</i> the	

following strategies to address them. i. put on SL/SWL WhatsApp platform for discussion ii. tutors to research for the next PD session for discussion	research into the issues raised.	
4.3 Ask tutors to identify a critical friend from the same or related discipline to observe the enactment of their lesson and provide feedback during the next PD Session (NTS 1a).	4.3 Identify a critical friend from the same or related discipline to observe the enactment of your lesson and to provide feedback during the next PD Session (NTS 1a).	
Advance Preparation	Advance Preparation	
to prepare proforma for Lesson 8 taking note of important or distinctive aspects of the lesson and crosscutting issues and read Lesson 8 of the Course Manual on: <u>Early Grade</u> – Characteristics	proforma for the Lesson 8 taking note of important or distinctive aspects of the lesson and crosscutting issues and read Lesson 8 of the Course Manual on: <u>Early Grade</u> – Teacher	
of children's developmental	beliefs about mathematics	
stages	and their relation to	
<u> Upper Primary</u> -	teaching	
Characteristics of children's	Upper Primary -	
developmental stages	Characteristics of	
<u>JHS(Core)</u> -	children's developmental	
Characteristics of children's	stages	
developmental stages	<u>JHS(COre)</u> - Characteristics of	
<u>JHS(Sp.)</u> –	Characteristics of	
indices and Logarithm:	children s developmental	
Learning, leacning and	stages	
uppiyiliy ∠ N/D		
in Poad the course manual	Indicos and Logarithms	
and the DD session quide	huices and Logarithm.	
ahead of time to identify	annlying 2	
ancua oj time to laentijy	appiying z	

any outstanding issues relating to the lesson for clarification. ii. Collect needed resources (such as projector, flip chart and sticky notes) you need ahead of time, prepare samples of TLRs you may need and rehearse how these may be used to support the	N/B: Take note of the PD session guide ahead of time to identify any outstanding issues relating to the lesson for clarification.	
achievement of your goals		

Age Levels/s:

Name of Subject/s:

- a. Early Grade
- b. Upper Grade
- c. JHS (Core) d. JHS (Elective
- c. Theories in Learning of Jnr High School Math.
 d. Further Algebra

Tutor PD Session for Lesson 8 in the Course Manual

Lesson Tittle:

- a. Characteristics of children's developmental stages
- b. Characteristics of children's developmental stages
- c. Characteristics of children's developmental stages
- d. Indices and Logarithm: Learning, teaching and applying

Focus: the bullet points provide the frame for what is to be done in the session. The SWL should use the bullets to guide what they write for the SL/HoD and tutors to do and say during each session. Each bullet needs to be addressed and specific reference should be made to the course manual/s.	Guidance notes on Leading the session. What the SL/HoDs will have to say during each stage of the session	Guidance Notes on Tutor Activity during the PD Session. What PD Session participants (Tutors) will do during each stage of the session.	Time in session
1 Introduction to the	1 1 Ice breaker activity: Begin	1 1 Demonstrate with any	20 mins
Review prior	with an investigational	relevant learning	
learning	activity for the lessons.	resources to	
 A critical friend to 	E.g., How will you guide a 12-	determine the	
share findings for a	year-old learner to identify	number of fives in 12	
short discussion	the number of fives (5s) in 12		
and lessons learned			
Reading and	1.2 Ask tutors to tell how	1.2 Tell how useful the	
discussion of the	userul the previous	previous semester's	
introductory	semester's PD session Was	PD session was and	
sections of the	their teaching in year 1	now it influenced	
lesson up to and	somestor 2	1 somostor 2	
including learning	semester z.	I Semester Z	

- a. Theories in the Learning of Numeracy in Early Grade b. Theories in Learning upper primary mathematics
- er Grade b

outcomes and	1.3 Ask a critical friend to	1.3 As a critical friend	
indicators	give a feedback on	share his/her	
Overview of	observation during	observation on the first	
content and	enactment of the seventh	lesson.	
identification of	(7 th) lesson.		
any distinctive			
aspects of the	NB: Things tutor might have		
lesson/s,	observed; tutor's choice of		
NB The guidance for	words, pedagogical content		
SL/HoD should identify	knowledge, content		
and address any areas	knowledge subject matter,		
where tutors might	ICT tools, GESI and the use of		
require clarification on	NTEAP		
any aspect of the			
lesson.	1.4 Ask tutors to read and	1.4 Read and discuss the	
NB SL/HoD should ask	discuss the introductory	introductory section of	
tutors to plan for their	section of the lesson	the lesson (up to	
teaching as they go	including the learning	learning outcomes).	
through the PD session	outcomes (LOs) in phase	Suggest relevant	
	groups.	previous knowledge of	
		students that will	
		support effective	
		teaching and learning	
		of the lesson.	
	1.5 Ask tutors to identify the	1.5 Identify the purpose of	
	purpose of the lesson	the lesson from the	
	from the course manual	course manual and	
	and state their	state your expectations	
	expectations of the PD	of the PD Session.	
	Session.		
	PURPOSE OF THE LESSON		
	Grade Primary		
	e g To develop student		
	teachers' understanding of		
	characteristics of		
	children's developmental		
	stages and its implication		
	for teaching at the upper		
	primary level		
	JHS (Elective)		
	e.g., to develop student		
	teachers' conceptual		

knowledge in order to		
prepare them well enough		
to be able to handle		
concepts in indices and		
logarithms as required by		
the JHS curriculum		
1.6 Ask tutors in phase	1.6 In phase groups,	
groups to discuss the	discuss the distinctive	
important or distinctive	aspects of the s lesson	
aspects of the lesson	including vocabulary	
including vocabulary and	and fundamental	
fundamental concepts.	concepts related to	
Distinct Aspects	the components of the	
a. EG/UP/JHS (core):	front matters.	
Characteristics of children's		
developmental stages		
b. JHS (Elective) - Indices and		
Logarithm		
Learning, Teaching and		
Applying		
<u>Vocabulary</u>		
EG/UP/JHS (core)		
Examples; Theories,		
Cognitive Speech, Emotional,		
Language and Physical.		
JHS (Elective): Indices,		
Logarithms, Operations,		
Equations, Applications		
Inverse etc.		
Fundamental Concepts		
EG/UP/JHS (core)		
 Meaning of 		
Development		
 Types of 		
Development		
 Some Psychologists 		
and their		
contributions towards		
teaching and learning		
of Maths. Examples:		
1. Maria		
Montessori		

	 2. Friedrich Froebel 3. Johann Heinrich JHS (Elective) Operations on indices and logarithms; Indicial and logarithm equations Applications of Indices and Logarithms. 		
 2. Concept Development (New learning likely to arise in lesson/s): Identification and discussion of new learning, potential barriers to learning for student teachers or students, concepts or pedagogy being introduced in the lesson, which need to be explored with the SL/HoD NB The guidance for 	 2.1 Ask tutors to identify familiar and unfamiliar concepts in their lessons and discuss with the larger group. EG/UP/JHS (core) Examples of Familiar Concepts: Development, types of Development etc. Unfamiliar concepts: Theories of Learning JHS (SP): Examples of Familiar Concepts: Indices, Equations etc. Unfamiliar concepts: Radical function 	2.1 Identify familiar and unfamiliar concepts in their lessons and discuss with the larger group.	15 mins
what they need to do to introduce and explain the issues/s with tutors	 2.2 Lead tutors to draw connections among concepts in the various lessons in line with the Basic School Curriculum. 2.3 Ask tutors to outline possible challenging areas in: Characteristics of children's developmental stages Indices and Logarithm: 	 2.2 Draw connections among concepts in the various lessons in line with the basic school curriculum. 2.3 Outline possible challenging areas in i. Characteristics of Children's Developmenta Stages. ii. Indices and Logarithms; 	

1		T
Learning, teaching and	Learning, Teaching and	
applying	Applying. Taking into	
	consideration GESI. (eg	
	teacher makes sure to	
EG/UP/JHS(Core):	factor students	
How children learn	learning styles in the	
Maths	teaching of the lesson)	
How children		
dovelopment affects		
their understanding		
of mathematics		
JHS S (Elective):		
• Any number raised to		
the power zero is 1		
 Any number raised to 		
the power a negative		
number is a quotient		
NB		
Tutor makes sure learning		
styles of students are		
discussed in relation to the		
Challenges)		
2.4 Lead tutors to discuss	2.4 Participate actively in	
misconceptions and	the discussion on	
barriers in teaching and	misconceptions and	
learning of the lesson.	barriers in teaching	
	and learning of the	
Misconceptions	lesson.	
Example:		
a. EG/ UP/JHS (core) – All		
numans are one		
b. JHS(Elective) – There is no		
numbers and indices		
Barriers		
Some possible barriers		
• Time		
Learning Resources		
Teacher Competence		
NB: Guide tutors to discuss		
		1

	 how learning resource could be barrier to teaching and learning. 2.5 Support tutors to identify GESI responsive resources such as supporting staff with experts in sign language as well as resources such teacher and learner resource packs, textbooks, course manual, Posters illustrating people using mathematics in the jobs; video clips downloaded from the internet (NTS 3j, PD Manual pp.38) 	2.5 Identify as many GESI responsive resources such as supporting staff with experts in sign language as well as resources such teacher and learner resource packs, textbooks, course manual, Posters illustrating people using mathematics in the jobs; video clips downloaded from the internet. (NTS 3j, PD Manual pp.38)	
3. Planning for	Teaching and learning	Teaching and learning	40 mins
teaching, learning	activities	activities	
and assessment	2.1. Ask tutors to suggest	2.1. Suggest teaching and	
and assessment activities for the lesson/s	3.1 Ask tutors to suggest	3.1 Suggest teaching and learning activities for	
 and assessment activities for the lesson/s Reading and 	3.1 Ask tutors to suggest teaching and learning activities for the lesson	3.1 Suggest teaching and learning activities for the lesson taking into	
 and assessment activities for the lesson/s Reading and discussion of the 	3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI	3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI	
 and assessment activities for the lesson/s Reading and discussion of the teaching and 	3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues.	3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI	
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities 	 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. 	3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI	
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and 	 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for 	3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI	
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas 	 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for physically challenged 	3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI	
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may 	 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for physically challenged ii. Both genders take leading 	3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI	
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification 	 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for physically challenged ii. Both genders take leading roles in group task 	3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI	
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting 	 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for physically challenged ii. Both genders take leading roles in group task iii. Even distribution of 	3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI	
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for 	 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for physically challenged ii. Both genders take leading roles in group task iii. Even distribution of questions to different 	3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI	
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for making links to the Basia School 	 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for physically challenged ii. Both genders take leading roles in group task iii. Even distribution of questions to different categories of learners based on gender, ability 	3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI	
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for making links to the Basic School Curriculum 	 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. Provision made for physically challenged Both genders take leading roles in group task Even distribution of questions to different categories of learners based on gender, ability, previous experience, etc 	3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI	
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for making links to the Basic School Curriculum Noting 	 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for physically challenged ii. Both genders take leading roles in group task iii. Even distribution of questions to different categories of learners based on gender, ability, previous experience, etc NTS 1a, b, c, d, 2b, e, f, 3b, c 	3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI	
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for making links to the Basic School Curriculum Noting opportunities for 	 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. Provision made for physically challenged Both genders take leading roles in group task Even distribution of questions to different categories of learners based on gender, ability, previous experience, etc NTS 1a, b, c, d, 2b, e, f, 3b, c 	3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI	
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for making links to the Basic School Curriculum Noting opportunities for integrating: GESI 	 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. i. Provision made for physically challenged ii. Both genders take leading roles in group task iii. Even distribution of questions to different categories of learners based on gender, ability, previous experience, etc NTS 1a, b, c, d, 2b, e, f, 3b, c 3.2 Let tutors read the 	 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 3.2 Read the activities 	
 and assessment activities for the lesson/s Reading and discussion of the teaching and learning activities Noting and addressing areas where tutors may require clarification Noting opportunities for making links to the Basic School Curriculum Noting opportunities for integrating: GESI responsiveness and 	 3.1 Ask tutors to suggest teaching and learning activities for the lesson taking into account GESI issues. eg. Provision made for physically challenged Both genders take leading roles in group task Even distribution of questions to different categories of learners based on gender, ability, previous experience, etc NTS 1a, b, c, d, 2b, e, f, 3b, c 2 Let tutors read the activities outlined in 	 3.1 Suggest teaching and learning activities for the lesson taking into consideration GESI 3.2 Read the activities outlined in your course 	

	ICT and 21 st C skills	identify areas that	areas that require	
•	Reading, discussion,	require clarification.	clarification.	
	and identification of	Strategies to clarify the		
	continuous	otherwise dark spots		
	assessment	may include		
	opportunities in the	investigation, internet		
	lesson. Each lesson	search, etc.		
	should include at			
	least two	3.3 Lead tutors to brainstorm	3.3 Brainstorm to come up	
	opportunities to use	to come up with some	with some pedagogical	
	continuous	pedagogical approaches	approaches and their	
	assessment to	and their related core	related core	
	support student	competencies likely to be	competencies likely to	
	teacher learning	inculcated in students and	be inculcated in	
•	Resources:	for that matter Basic	students and for that	
	\circ links to the	School learners. eg.	matter Basic School	
	existing PD		learners.	
	Themes, for	(a)EG/UP/JHS (core)		
	example, action	Strategy: Expository and		
	research,	Discussion		
	questioning and	Core Competencies: Problem		
	to other external	solving, critical and creative		
	reference	thinking and communication.		
	material:	(b) JHS (Elective)		
	literature, on	Strategy: interactive and		
	web, Utube,	Collaborative group work,		
	physical	Discussion		
	resources, power	Core Competencies: Critical		
	point; how they	thinking skills, Collaborative		
	should be used.	learning and Problem-Solving		
	Consideration	Skills.		
	needs to be given			
	to local	3.4 Ask tutors to discuss the	3.4 Discuss the assessment	
	availability	assessment strategies to	strategies to be used	
	\circ guidance on any	be used during teaching	during teaching of the	
	power point	of the lessons.	lesson- Subject Project	
	presentations,	NB: Assessment must	and Subject Portfolio).	
	TLM or other	involve; the subject project	Assessment must be	
	resources which	and Subject Portfolio based	aligned with the	
	need to be	on: Teacher beliefs about	NTEAP.	
	developed to	mathematics and their		
	support learning	relation to teaching (EG, UP,		
•	Tutors should be	JHS (core) and Sequences		
	expected to have a	and Series: Learning,		

plan for the next lesson for student teachers	teaching and applying (JHS Elective) Assessment must be aligned to the NTEAP. Continuous assessment activities (assignments, quizzes, group presentations, etc, should be used to create subject projects and build subject portfolios (See, Appendix II)		
	3.5 Lead tutors to discuss the various ways they can support student teachers to build their project and subject portfolio.	3.5 Discuss the various ways they can support student teachers to build their project and subject portfolios	
	3.6 Let a tutor model a presentation of an activity using ICT tools and taking into consideration GESI issues (eg. Both gender taking the leading roles in their groups and in the demonstration of the use of ICT tools) to teach their lessons EG, UP JHS(Core)- similarities and differences among values, attitudes, and beliefs and how these impact learning JHS (Elective)- Finding the sum of the first <i>n</i> terms of arithmetic progression. Example: The sum of n and (n – 1) terms of an AP is 441 and 356 respectively. If the first term of the AP is 13 and the common difference is equal to the number of terms, find the common	3.6 Model a presentation of an activity using ICT tools and taking into consideration GESI issues in the lessons (NTS 1a, b, 2b, e, 3b, c, J; BSC pp. 23)	

	difference of the AP. (NTS 1a, b, 2b, e, 3b, c, J; BSC pp. 23 PD manual 21) NB: Guide tutors to use the internet to find the formula for finding the sum of the first <i>n</i> terms of arithmetic progression		
4. Evaluation and	Reflective Activity	Reflective Activity	15 mins
 review of session: Tutors should Identifying critical friends to observe lessons and report at next session. Identifying and addressing any outstanding issues relating to the lesson/s for clarification 	4.1 Engage tutors in self- evaluation as well as encourage tutors to provide feedback of the PD session taking into consideration inclusivity – how to be patient with Stutterers, using tactile and audio devices for visually challenged, paying attention to all courses, etc. Ask tutors to show by fingers/nods their level of satisfaction with the session. (NTS 1a, 3i).	4.1 Show by fingers/nods of 5 or 3 or 1 as to those who "really got it", "got some of it" or "didn't get it" respectively. Explain if you really got the lesson	
	 4.2 Engage tutors to identify unresolved issues relating to this lesson for clarification NB:Take note of all unresolved issues and use any of following strategies - put on SL/SWL WhatsApp platform for discussion -tutors to research for the next PD session for discussion 	4.2 Reflect on the activities in the session and outline unresolved issues relating to the lesson	
	4.3 Ask a critical friend to observe your teaching and record his/her findings to be presented	4.3 Identify critical friend observes teaching and record his/her findings to be presented after	

after delivery or in the Next PD session.	delivery or in the Next PD session.	
NB: Remind tutors to identify a critical friend from the same or related discipline to observe during teaching and provide feedback (NTS 1a)	NB: Identify a critical friend from the same or related discipline to observe during teaching and provide feedback (NTS 1a)	
Advance Preparation 4.4 Ask tutors to read Lesson 9 of the Course Manual on: Early Grade – Multiple intelligences Upper Primary - Multiple intelligences JHS(Core) - Multiple intelligences JHS(Elective) – Binomial expansions: Learning, teaching and applying	Advance Preparation 4.4 Read Lesson 9 of the Course Manual on: Early Grade – Multiple intelligences Upper Primary Multiple intelligences JHS(Core) Multiple intelligences JHS(Elective) – Binomial expansions: Learning, teaching and applying	
NB: I. Read the course manual, the PD session guide ahead of time to identify any outstanding issues relating to the lesson for clarification. Collect all-inclusive resources (such as projector, flip chart and sticky notes) you need ahead of time, prepare samples of TLMs you may need and		

Age Levels/s:

- a. Early Grade
- b. Upper Grade
- c. JHS (Core)
- d. JHS (Elective)

Name of Subject/s:

- a. Theories in the Learning of Numeracy in Early Grade
- b. Theories in Learning upper primary mathematics
- c. Theories in Learning of Jnr High School Math.
- d. Further Algebra

Tutor PD Session for Lesson 9 in the Course Manual

Lesson Tittle:

- i. Multiple intelligences
- ii. Multiple intelligences

Focus: the bullet per provide the frame what is to be done the session. The SV should use the bull to guide what they write for the SL/Ho and tutors to do ar say during each session. Each bulle needs to be address and specific referent should be made to course manual/s.	Dints Guidance notes on Leading for the session. What the in SL/HoDs will have to say /L during each stage of the ets session D d d session the session	Guidance Notes on Tutor Activity during the PD Session. What PD Session participants (Tutors) will do during each stage of the session.	Time in session
1. Introduction to	the Introduction	Introduction	20 mins
 session Review prior learning A critical friend t share findings for short discussion lessons learned Reading and discussion of the introductory sections of the lesson up to and 	 1.1 Ice breaker activity: Begin with mental mathematics games, and activities about r a knowledge of algebraic expansion and factorisation E.g., How will you guide a 12-year-old learner to identify the number of fives (5s) in 12 	1.1 Demonstrate with any relevant learning resources to determine the number of fives in 12.	
including learnir outcomes and indicators	g 1.2 Ask tutors to tell how useful the previous semester's PD session	1.2 Tell how useful the previous semester's PD session was and how it	

Overview of	was and how it	influenced your	
content and	influenced their	teaching.	
identification of any	teaching.	_	
distinctive aspects			
of the lesson/s,	1.3 Ask a critical friend to	1.3 As a critical friend share	
NB The guidance for	give feedback on	your observation on the	
SL/HoD should identify	observation during	eighth lesson.	
and address any areas	enactment of the eighth		
where tutors might	(8 th) lesson.		
require clarification on	NB: Thing's tutor might		
any aspect of the	have observed; tutor's		
lesson.	choice of words,		
NB SL/HoD should ask	pedagogical content		
tutors to plan for their	knowledge, content		
teaching as they go	knowledge subject		
through the PD session	matter, ICT tools, GESI		
	and the use of NTEAP		
	1.4 Ask tutors to read and	1.4 Read and discuss the	
	discuss the introductory	introductory section of	
	section of the lesson	the lesson (up to	
	including the learning	learning outcomes).	
	outcomes (LOs) in phase	Suggest relevant	
	groups.	previous knowledge of	
		students that will	
		support effective	
		teaching and learning of	
		the lesson.	
	1.5 Ask tutors to identify the	1.5. Identify the nurnose of	
	nurnose of the lesson	the lesson from the	
	from the course manual	course manual and state	
	and state their	your expectations of the	
	expectations of the PD	PD Session	
	Session		
	PURPOSE OF THE LESSON		
	EG UP		
	To establish and address		
	students learning needs,		
	perceptions and		
	misconceptions in		
	multiple intelligences.		
	JHS (Core)		

To establish how students learn JHS level Mathematics JHS (Specialism) To establish students' competence in handling Binomial Theorem and address their learning needs, perceptions, misconceptions and application in binomial theorems. 1.6 Ask tutors in phase groups to discuss the important or distinctive aspects of the lesson including vocabulary and fundamental concepts. DISTINCT ASPECTS a. EG/UP: foundations of multiple intelligences theory and personal development and implication in teaching numeracy.	1.6 In phase groups, discuss the distinctive aspects of the lesson including vocabulary and fundamental concepts related to the components of the front matters.	
 aspects of the lesson including vocabulary and fundamental concepts. DISTINCT ASPECTS a. EG/UP: foundations of multiple intelligences theory and personal development and implication in teaching numeracy. b. JHS (Core): logical and psychological approaches to learning mathematics. c. JHS (Sp): binomial expansion, applications of binomial theorem to real life. VOCABULARY EXAMPLES: EG/UP/JHS: theories, intelligences, multiple, psychology, readiness, and numeracy JHS (SP): binomial, expansion, applications binomial etc. 	vocabulary and fundamental concepts related to the components of the front matters.	

	Fundamental Concepts		
	 Meaning of multiple intelligence. Give an exposition on theories that explain how children develop number readiness. Some Psychologists and their contributions towards teaching and learning of Maths. Gardner's principle of multiple intelligence. Expansion binomial 		
 2. Concept Development (New learning likely to arise in lesson/s): Identification and discussion of new learning, potential barriers to learning for student teachers or students, concepts or pedagogy being introduced in the 	 2.1 Ask tutors to identify familiar and unfamiliar concepts in their lessons and discuss with the larger group. 2.2 Lead tutors to draw connections among concepts in the various lessons in line with the Basic School Curriculum. 	 2.1 Identify familiar and unfamiliar concepts in their lessons and discuss with the larger group. 2.2 Draw connections among concepts in the various lessons in line with the basic school curriculum. 2.2 Outling passible 	15 mins
introduced in the lesson, which need to be explored with the SL/HoD NB The guidance for SL/HoD should set out what they need to do to introduce and explain the issues/s with tutors	 2.3 Ask tutors to outline possible challenging areas in: a. Multiple of Intelligences theory (EG/UP) b. Psychological approaches to learning (JHS-Core) c. Application of binomial (JHS- Specialism) 	2.3 Outline possible challenging areas in teaching multiple intelligences, children and mathematics, binomial theorem taking into consideration GESI. (eg teacher makes sure to factor students learning styles in the teaching of the lesson)	

CHALLENGES		
<u>EG/UP/JHS(Core):</u>		
 How children learn 		
Mathematics?		
 How multiple 		
intelligence theory affect		
teaching?		
JHS Specialism:		
 Any number raised to 		
the power zero is 1		
 Any number raised to 		
the power a negative		
number is a quotient.		
NB		
Tutor makes sure learning		
styles of students are		
discussed in relation to the		
Challenges)		
2.4 Lead tutors to discuss	2.4 Participate actively in	
misconceptions and	the discussion on	
barriers in teaching and	misconceptions and	
learning of the lesson.	barriers in teaching and	
MISCONCEPTIONS	learning of the lesson	
Example:		
EG/ UP/JHS (core) – All		
humans are one		
JHS(Specialism) – do not		
recognise when the		
binomial distribution is an		
appropriate model and		
when it is not.		
BARRIERS		
Some possible barriers		
• Time		
• Learning Resources		
Teacher Competence		
NB: Guide tutors to discuss		
how learning resource		
could be barrier to teaching		
and learning.		
5		

		2.5 Support tutors to	2.5 Identify as many GESI	
		identify GESI responsive	responsive resources	
		resources such as	such as supporting staff	
		supporting staff with	with experts in sign	
		experts in sign language	language as well as	
		as well as resources	resources such teacher	
		such teacher and	and learner resource	
		learner resource packs.	packs, textbooks, course	
		textbooks, course	manual. Globe.	
		manual, Globe,	mathematical set.	
		mathematical set.	manila cards.	
		manila cards	nermanent markers	
		nermanent markers	oranges and a knife	
		oranges and a knife	(NTS 3i DD Manual	
		(NTS 3i PD Manual	nn 21)	
		nn 21)	μη.τ.ι	
		pp.21)		
3.	Planning for	Teaching and learning	Teaching and learning	40 mins
	teaching, learning	activities	activities	
	and assessment			
	activities for the	3.1 Ask tutors to suggest	3.1 Suggest teaching and	
	lesson/s	teaching and learning	learning activities for	
•	Reading and	activities for the lesson	the lesson taking into	
	discussion of the	taking into account GESI	consideration GESI	
	teaching and	issues.		
	learning activities	eg.		
•	Noting and	i. Provision made for		
	addressing areas	physically challenged		
	where tutors may	ii. Both genders take		
	require clarification	leading roles in group task		
•	Noting	iii. Even distribution of		
	opportunities for	questions to different		
	making links to the	categories of learners based		
	Basic School	on gender, ability, previous		
	Curriculum	experience, etc		
	Noting	NTS 1a, b, c. d. 2b. e. f. 3b. c		
	onnortunities for	, , , , , , , , , , , , , , , ,		
	intograting: GESI	3.2 Let tutors read the	3.2 Read the activities	
	responsiveness and	activities outlined in	outlined in your course	
	ICT and 21 st Cabille	their course manuals	manual and identify	
	Roading discussion	and identify areas that	areas that require	
	neauing, discussion,	require clarification	clarification	
		Strategies to clarify the		
	continuous	otherwise dark spots may		

	assessment	include investigation,		
	opportunities in the	internet search, etc.		
	lesson. Each lesson			
	should include at	3.3 Lead tutors to	3.3 Brainstorm to come up	
	least two	brainstorm to come up	with some pedagogical	
	opportunities to use	with some pedagogical	approaches and their	
	continuous	approaches and their	related core	
	assessment to	related core	competencies likely to	
	support student	competencies likely to	be inculcated in	
	teacher learning	be inculcated in students	students and for that	
•	Resources:	and for that matter Basic	matter Basic School	
	 links to the 	School learners. eg.	learners.	
	existing PD	(a)Early Grade		
	Themes. for	Strategy: Expository and		
	example, action	Discussion		
	research.	Core Competencies:		
	questioning and	Problem solving, critical and		
	to other external	creative thinking and		
	reference	communication		
	material:	(b)Upper primary		
	literature. on	Strategy: Strategy:		
	web, Utube,	Expository and Discussion		
	physical	Core Competencies:		
	resources, power	Problem solving, critical,		
	point; how they	creative thinking and		
	should be used.	communication		
	Consideration	(c)JHS (Core)		
	needs to be given	Strategy: Strategy:		
	to local	Expository and Discussion		
	availability	Core Competencies:		
	$\circ~$ guidance on any	Problem solving, critical,		
	power point	creative thinking and		
	presentations,	communication		
	TLM or other	(d) JHS Specialism		
	resources which	Strategy: Use interactive		
	need to be	and Collaborative group		
	developed to	work (with the aid of ICT		
	support learning	tools and other		
٠	Tutors should be	manipulatives to explore		
	expected to have a	the binomial expansion.		
	plan for the next	Core Competencies: Critical		
	lesson for student	thinking skills and		
	teachers	Collaborative learning		
1				

 3.4 Ask tutors to discuss the assessment strategies to be used during teaching of the lessons (Multiple intelligence theory and how student learn and develop numeracy [EG, UP, JHS]) Binomial Theorem: Learning, teaching and applying)-JHS Specialism – 'Assessment as' (NTS 3k). Assessment must be aligned to the NTEAP and required course. Continuous assessment activities (assignments, quizzes, group presentations, etc, should be used to create subject projects and build subject 	3.4 Discuss the assessment strategies to be used during teaching of the lesson – 'Assessment as' (NTS 3k, 3e).		
 portfolios 3.5 Lead tutors to discuss the various ways they can support student teachers to build their project and subject portfolio. 3.6 Let a tutor model a presentation of an 	 3.5 Discuss the various ways they can support student teachers to build their project and subject portfolios. 3.6 Model a presentation of an activity using ICT 		
activity using ICT tools and taking into consideration GESI issues (eg. Both gender taking the leading roles in their groups and in the demonstration of the use of ICT tools) to teach their lessons EG, UP JHS(Core)- developing multiple	tools and taking into consideration GESI issues in the lessons (NTS 1a, b, 2b, e, 3b, c, J; BSC pp. 23)		
	intelligence theorem and how it impacts on learning JHS (SP)- expansion of algebraic expression to n-power. <i>Example</i> : expand $[(a + b) + 3)]^3$. (NTS 1a, b, 2b, e, 3b, c, J; BSC pp. 23 PD manual 21) NB: Guide tutors to use the internet to find the formular for finding the sum of the first <i>n</i> terms of arithmetic progression		
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 4. Evaluation and review of session: Tutors should Identifying critical friends to observe lessons and report at next session. Identifying and addressing any outstanding issues relating to the lesson/s for clarification 	Evaluation and review of session 4.1 Engage tutors in self- evaluation as well as encourage tutors to provide feedback of the PD session taking into consideration inclusivity – how to be patient with Stammerers, using tactile and audio devices for visually challenged, paying attention to all courses, etc. Ask tutors to show by fingers/nods their level of satisfaction with the session. (NTS 1a, 3i).	Evaluation and review of session 4.1 Show by fingers/nods of 5 or 3 or 1 as to those who "really got it", "got some of it" or "didn't get it" respectively. Explain if you really got the lesson.	15 mins
	4.2 Engage tutors to identify unresolved issues relating to this lesson for clarification Take note of all unresolved issues and	4.2 Reflect on the activities in the session and outline unresolved issues relating to the lesson	

use any of following strategies a. put on SL/SWL WhatsApp platform for discussion b. tutors to research for the next PD session for discussion		
4.3 Ask a critical friend to observe your teaching and record his/her findings to be presented after delivery or in the Next PD session.	4.3 A critical friend observes teaching and record his/her findings to be presented after delivery or in the Next PD session.	
Advance Preparation	Advance Preparation	
 Advance Preparation 4.4 Ask tutors to read Lesson 10 of the Course Manual on: Early Grade – Factors that affect teaching and learning of numeracy in Early Grade. Upper Primary - Factors that affect teaching and learning of numeracy in upper Primary. JHS(Core)- Factors that affect teaching and learning of numeracy in JHS. JHS(Specialism) – Simultaneous equations: Learning, teaching and 	Advance Preparation 4.4 Read Lesson 10 of the Course Manual on: Early Grade – Factors that affect teaching and learning of numeracy in upper primary: Upper Primary - Factors that affect teaching and learning of numeracy in Early Grade. JHS(Core)- Factors that affect teaching and learning of numeracy in JHS. JHS(Specialism) – Simultaneous	
applying.	equations: Learning,	
N/B	teaching and applying.	
Remind tutors to identify a	5 11 / 5	
critical friend from the same or related discipline to observe during teaching and provide feedback (NTS 1a).		
Read the course manual,		
the PD session guide		

ahead of time to identify any outstanding issues relating to the lesson for clarification. Collect all-inclusive resources (such as projector, flip chart and sticky notes) you need ahead of time, prepare	
samples of TLRs you may need and used	

i. Children and Mathematics

ii. Binomial expansions: *Learning, teaching and applying*

Age Levels/s:

Name of Subject/s:

- a. Early Grade
- b. Upper Grade
- c. JHS (Core)
- d. JHS (Elective)
- b. Theories in Learning upper primary mathematics

a. Theories in the Learning of Numeracy in Early Grade

- c. Theories in Learning of Jnr High School Math.
- d. Further Algebra

Tutor PD Session for Lesson 10 in the Course Manual

Lesson Title:

- a. Early Grade- Factors that affect teaching and learning of numeracy in Early Grade
- b. Upper Grade- Factors that affect teaching and learning of numeracy in Upper Grade
- c. JHS (Core)- Factors that affect teaching and learning of numeracy in JHS
- d. JHS (**Specialism**) Simultaneous equations: *Learning, teaching and applying*

Fc	cus: the bullet	Guidance notes on Leading	Guidance Notes on Tutor	Time in
ро	oints provide the	the session. What the	Activity during the PD	session
fra	ame for what is to be	SL/HoDs will have to say	Session. What PD Session	
do	one in the session.	during each stage of the	participants (Tutors) will do	
Tł	e SWL should use	session	during each stage of the	
th	e bullets to guide		session.	
w	hat they write for			
th	e SL/HoD and tutors			
to	do and say during			
ea	ich session. Each			
bu	Illet needs to be			
ac	Idressed and specific			
re	ference should be			
m	ade to the course			
m	anual/s.			
1.	Introduction to the	1.1 Icebreaker activity:	1.1 Ice breaker activity:	20 mins
1.	Introduction to the session	1.1 Icebreaker activity: Begin with an	1.1 Ice breaker activity: Begin with an	20 mins
1.	Introduction to the session Review prior	1.1 Icebreaker activity: Begin with an investigational activity	1.1 Ice breaker activity: Begin with an investigational activity	20 mins
1.	Introduction to the session Review prior learning	1.1 Icebreaker activity: Begin with an investigational activity according to the	1.1 Ice breaker activity: Begin with an investigational activity according to the	20 mins
1. •	Introduction to the session Review prior learning Reading and	1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age	1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases	20 mins
1. •	Introduction to the session Review prior learning Reading and discussion of the	1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases.	1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases	20 mins
1. •	Introduction to the session Review prior learning Reading and discussion of the introductory	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. Eg 	 1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases Eg. 	20 mins
1. •	Introduction to the session Review prior learning Reading and discussion of the introductory sections of the	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. Eg There are two positive 	 1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases Eg. There are two positive 	20 mins
1. •	Introduction to the session Review prior learning Reading and discussion of the introductory sections of the lesson up to and	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. Eg There are two positive numbers whose sum is 11 	 1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases Eg. There are two positive numbers whose sum is 11 	20 mins
1. •	Introduction to the session Review prior learning Reading and discussion of the introductory sections of the lesson up to and including learning	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. Eg There are two positive numbers whose sum is 11 and their product is 28. 	 1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases Eg. There are two positive numbers whose sum is 11 and their product is 28. 	20 mins
1. •	Introduction to the session Review prior learning Reading and discussion of the introductory sections of the lesson up to and including learning outcomes and	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. Eg There are two positive numbers whose sum is 11 and their product is 28. What are the numbers? 	 1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases Eg. There are two positive numbers whose sum is 11 and their product is 28. What are the numbers 	20 mins
1.	Introduction to the session Review prior learning Reading and discussion of the introductory sections of the lesson up to and including learning outcomes and indicators	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. Eg There are two positive numbers whose sum is 11 and their product is 28. What are the numbers? 	 1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases Eg. There are two positive numbers whose sum is 11 and their product is 28. What are the numbers 	20 mins
1. •	Introduction to the session Review prior learning Reading and discussion of the introductory sections of the lesson up to and including learning outcomes and indicators Overview of	 1.1 Icebreaker activity: Begin with an investigational activity according to the subjects and age phases. Eg There are two positive numbers whose sum is 11 and their product is 28. What are the numbers? 1.2 Ask tutors to tell how 	 1.1 Ice breaker activity: Begin with an investigational activity according to the subjects and age phases Eg. There are two positive numbers whose sum is 11 and their product is 28. What are the numbers 1.2 Discuss how useful the 	20 mins

content and	session was and how it	influenced their	
identification of	influenced their	teaching over the week.	
any distinctive	teaching in lesson 9.	_	
aspects of the			
lesson/s,	1.3 Expose tutors to the	1.3 Participate in the	
NB The guidance for	overview of the subject	discussion on the	
SL/HoD should identify	age phases to be	overview of the subject	
and address any areas	covered in this PD	age phases to be	
where tutors might	session and how it will	covered in this PD	
require clarification on	be organised.	session and how it will	
any aspect of the		be organised.	
lesson.	Early and upper grade and		
NB SL/HoD should ask	JHS (Core) lessons focus on		
tutors to plan for their	developina an		
teaching as they go	understanding of factors		
through the PD session	that affect children's		
	learning of numeracy and		
	how these can inform their		
	teachina practice		
	JHS (Maths Specialism)		
	lesson seeks to develop		
	student teachers'		
	understanding and		
	conceptual knowledge of		
	simultaneous equation and		
	how to apply the knowledge		
	and understanding in other		
	areas of mathematics and		
	bevond.		
	1.4 Ask a critical friend to	1.4 Participate in the	
	give feedback on	critiquing of the	
	observation during the	feedback on	
	enactment of lesson 9.	observation during the	
		enactment of lesson 9.	
	1.5 Ask tutors to suggest	1.5 Engage tutors to	
	the purpose of the	suggest the purpose of	
	lesson and state their	the lesson and state	
	expectations of the PD	your expectations of the	
	Session.	PD Session.	
	1.6 Guide tutors to	1.6 Participate in the	
	establish the linkage	linkage of the CLOs and	

			1
between LOs of th each of t	CLOs and the le lesson for he Phases	the LOs of the lesson for each of the phases	
1.7 Ask tuto groups to importar aspects o including and func concepts Distinctive a	rs in phase o discuss the of or distinctive of the lesson g vocabulary lamental S. spects includes	1.7 In pairs discuss the distinctive aspects of the lesson including vocabulary and fundamental concepts related to the components of the front matters.	
the interactiv activities, em connecting c	ve nature of the ophasis on oncepts:		
a. Early, Opp (Core) Grade The explora implications	er Prim & JHS e: – eg. tion on of multiple		
intelligences and students numeracy. b. JHS (Furth	on teaching s' learning of ner Algebra): –		
eg. To exploi conceptual understandi of simultane	re the ng of the nature ous equation		
and its appli life problems	cation to real		
Be ready for from tutors j Anticipated a. How does	likely questions for clarification. questions: maturation		
and principle intelligence learning of r	of multiple affect the numeracy?		
b. Do we hav inequalities? N/B: Guide t	ve Simultaneous		
the possible anticipated of bearing in m	answers to the questions, ind pedagogy,		

	GESI, ICT – E.g. the most		
	appropriate methods		
	depend on age and previous		
	knowledge of learners,		
	objective of lesson.		
2. Concept	Concept Development	Concept Development	15 mins
Development (New	(New learning likely to	(New learning likely to	
learning likely to	arise in lesson/s)	arise in lesson/s)	
arise in lesson/s):			
 Identification and 	2.1 Ask tutors to identify	2.1 Participate in the	
discussion of new	familiar and unfamiliar	identification of familiar	
learning, potential	concepts in the lesson	and unfamiliar concepts	
barriers to learning	and discuss with the	in the lesson and discuss	
for student teachers	larger group	with the larger group.	
or students,			
concepts or	2.2 Lead tutors to draw	2.2 Draw connections	
pedagogy being	connections among	among concepts in the	
introduced in the	concepts in the various	various lessons in line	
lesson, which need	lessons in line with the	with the basic school	
to be explored with	basic school curriculum	curriculum.	
the SL/HoD	Example:	Example:	
NB The guidance for	Early, Upper Prim & JHS	Early, Upper Prim & JHS	
SL/HoD should set out	(Core) Grade:-	(Core) Grade:-	
what they need to do	Connecting implications of	Connecting implications of	
to introduce and	multiple intelligences on	multiple intelligences on	
explain the issues/s	learning and students	learning and students	
with tutors	(DD Theme 2)	(PD Theme 2)	
	(PD Theme 3)	(PD Theme 3)	
	JHS (Further Algebra): –	JHS (Further Algebra): –	
	connecting the concept of	connecting the concept of	
	linear graphs and points of	linear graphs and points of	
	intersection in solving	intersection in solving	
	simultaneous equations	simultaneous equations	
	2.3 Ask tutors to use Think-	2.3 Individually, outline the	
	Pair-Share to outline	challenging areas in	
	possible challenging	your lesson, share with	
	areas in teaching and	a member of the same	
	assessing of;	phase group and then	
		with the whole group.	
	a. Early, Upper Prim & JHS	a. Early, Upper Prim & JHS	
	(Core) Grade: – Theoretical	(Core) Grade: – Theoretical	
	principles and factors that	principles and factors that	

explains children's learning of numeracy b. JHS (Further Algebra) in appropriate substitution of an expression of one variable obtained from one to the other	explains children's learning of numeracy b. JHS (Further Algebra) in appropriate substitution of an expression of one variable obtained from one to the other	
N/B Eg. The use of differentiated instruction to cater for the needs of all children in the early and upper grade and JHS classrooms, including those with special educational needs (SEN) and creating a safe, secure, happy and stimulating learning environment (NTS 3c 3f, pg. 14).		
 2.4 Lead tutors to discuss misconceptions and barriers in teaching and learning of the lesson Example: <u>Misconceptions</u> a. <i>Early, Upper Prim & JHS</i> (<i>Core</i>) <i>Grade:</i> – All mathematics is about numeracy b. JHS (Sp): Simultaneous equation always involves two linear equations <u>Barriers</u> a. <i>Early, Upper Prim & JHS</i> (<i>Core</i>) <i>Grade:</i> – may include weak prior knowledge, lack of appropriate resources, lack 	2.4 Participate in the discussion on misconceptions and barriers in teaching and learning of the lesson	
of opportunity to use ICT due to failure of electric power (lights-out), bad/weak network,		

		unavailability of internet bundle for students, inadequate contact time due to staff meetings, Different entry behaviours, Socio-cultural issues, different learning needs, misconceptions about the lesson.		
3.	Planning for	Planning for teaching,	Planning for teaching,	
	teaching, learning	learning and assessment	learning and assessment	
	and assessment	activities for the lesson/s	activities for the lesson/s	
	activities for the	2.1. In their phase groups	2.1 Suggest teaching and	
	lesson/s	ask tutors to suggest	learning activities for	
•	Reading and	teaching and learning	the lesson.	
	teaching and	activities for the lesson.		
	learning activities	i. Provision is made for		
•	Noting and	physically challenged		
	addressing areas	persons and persons with		
	where tutors may	other forms of disability		
	require clarification	II. Both genders take		
٠	Noting	iii Even distribution of		
	opportunities for	questions to different		
	making links to the	categories of learners based		
	Basic School	on gender, ability, previous		
•	Noting	experience, etc. referring		
•	opportunities for	to NTS 1a, b, c, d, 2b, e, f,		
	integrating: GESI	3b, c		
	responsiveness and	3.2 Ask tutors to go	3.2 Read the activities	
	ICT and 21 st C skills	through the lesson in	outlined in your course	
•	Reading, discussion,	the course manual and	manual and identify	
	and identification of	Identify areas that	areas that require	
	continuous	Fa	claimcation	
	opportunities in the	Strategies to clarify the		
	lesson. Each lesson	otherwise dark spots may		
	should include at	include investigation,		
	least two	internet search, etc.		
	opportunities to use	3.3 Ask tutors to brainstorm	3.3 Brainstorm and explain	
	continuous	and explain how	how	
		a. the understanding	 a. understanding factors 	

assessment to	factors affecting the	affecting the learning of	
support student	learning of numeracy can	numeracy can improve	
teacher learning	improve the learning of	the learning of the	
Resources:	the lesson	lesson	
\cap links to the	b. relating real life problem	b. relating real life problem	
evicting DD	to simultaneous	to simultaneous	
Themes for	equations can improve	equations can improve	
ovample action	on the learners	on the learners	
rocoarch	understanding of the	understanding of the	
auostioning and	lesson Refer to Resid	lesson Refer to Resid	
to other external	School Curriculum (BSC	School Curriculum (BSC	
roforonco	$p_{\rm D} x_{\rm V} = x_{\rm V}$	$nn_{\rm NV} = vvii)$	
matarial	μρ. χν = χνη)	μρ. xv = xvii)	
literature on web	2.4 Load tutors to come up	2 4 Suggest same	
Iltube physical	with some pedagogical	nodagogical approaches	
resources. power	approaches and their	and their related core	
point; how they	related core	competencies likely to	
should be used.	competencies likely to	he inculcated in	
Consideration	be inculcated in students	students and for that	
needs to be given	and for that matter Basic	matter Basic School	
to local availability	School learners eg		
 guidance on any 	(a)FG/HP/HS (core).		
power point	Strategy: Expository		
presentations,	inquiry and Discussion: to		
TLM or other	evolore the effectiveness		
resources which	factors affect the teaching		
need to be	and learning numeracy		
developed to			
support learning	Core Competencies:		
Tutors should be	problem formulation and		
expected to have a	identification, Problem		
plan for the next	solving, critical and creative		
lesson for student	thinking and		
teachers	communication		
	(b) JHS Specialism		
	Strategy: interactive and		
	Collaborative group work		
	(with the aid of ICT tools		
	and other manipulatives to		
	examine the solution to		
	simultaneous equations		
	Core Competencies: Critical		
	thinking skills and		
	Collaborative learning		
	Collaborative learning		

3.5 Ask tutors to mention	3.5 Mention some GESI	
some GESI responsive	responsive resources	
resources that can be	that can be used with	
used with the suggested	the suggested	
approaches and	approaches and	
stratogios in achieving	stratogios in achieving	
the LOc	the LOc	
E a Basauraas may includa		
E.g. Resources may include	E.g Resources may	
supporting stajj with	include supporting staff	
experts in sign language as	with experts in sign	
well as resources such	language as well as	
teacher and learner	resources such teacher	
resource packs, textbooks,	and learner resource	
course manual, prisms,	packs, textbooks, etc	
pyramids, projectors, flip		
charts, sticky notes, braille,		
tactile materials, audio and		
audio-visuals that can be		
used in the teaching and		
learning of the concepts		
mentioned above (NTS 3j)		
3.6 Ask tutors to identify	3.6 Identify and discuss	
and discuss continuous	continues assessment	
assessment for the	strategies for the lesson	
lesson to support	to support student	
student teacher learning	teacher learning (NTS	
(NTS 3k)	3k)	
N/B:	S.y.	
Assessment must be alianed		
to the NTFAP and required		
course Assessment to		
include subject project		
subject portfolio and end of		
samester examination		
	F -	
Lg. Example: Early Linner	Eg.	
Example. carry, Opper	Example: Early, Upper	
Grades Interview about 9	Primary and JHS (Core)	
basis school toochors during	Grades – Interview about 8	
basic school teachers during	basic school teachers during	
the STS activity on	the STS activity on	
mathematics that basic	mathematics that basic	
school learners are exposed	school learners are exposed	
to a) at home & b) during	to a) at home & b) during	

	play JHS Grade – In groups of four, develop any game for teaching any concept within your course outline.	play JHS Grade – In groups of four, develop any game for teaching any concept within your course outline.	
	 3.7 Lead tutors to discuss the various ways they can support student teachers to build their subject portfolio. E.g. encouraging student teachers to file all their assignments with feedback in their folders. 	3.7 Lead tutors to discuss the various ways they can support student teachers to build their subject portfolio E.g. encouraging student teachers to file all their assignments with feedback in their folders.	
	Taking notes in class and filing them		
	3.8 Ask a tutor to model a presentation of an activity using projector, internet search and taking into consideration GESI issues (eg. Both gender taking the leading roles in their groups) NTS 1a, b, 2b, e, 3b, c, J; BSC pp. iii	3.8 Model a presentation of an activity using projector, internet search and taking into consideration GESI issues (eg. Both gender taking the leading roles in their groups) NTS 1a, b, 2b, e, 3b, c, J; BSC pp. iii	
4. Evaluation and	Evaluation and review of	Evaluation and review of	15 mins
review of session:	session:	session:	
 Tutors need to identify critical friends to observe lessons and report at next session Identifying and 	4.1 Engage tutors in providing feedback of the PD session taking into consideration – Clarity of concepts, ICT integration, GESI,	4.1 Reflect and provide feedback on this PD session taking into consideration – Clarity of concepts, pedagogical approaches	
addressing any outstanding issues relating to the lesson/s for clarification	Twenty First Century Skills (NTS 1a, 3i, BSC pp. x-xvi) and make notes that will help them to teach Lesson 7	employed, ICT integration, GESI, Twenty First Century Skills (NTS 1a, 3i, BSC pp. x-xvi)? and make	
Clameaton		notes that will help you to teach Lesson 7	

4.2 Engage tutors to identify unresolved	4.2 Identify unresolved issues relating to this	
issues relating to this	lesson for clarification.	
lesson for clarification.		
N/B: Take note of all	N/B: Put your unresolved	
unresolved issues that may	<i>issues unto</i> the	
need further research or	department's WhatsApp/	
consultation and use any of	Telegram platform and	
following strategies to	research into the issues	
address them.	raised.	
i. put on SL/SWL WhatsApp		
platform for discussion		
ii. tutors to research for the		
next PD session for		
discussion		
4.3 Ask tutors to identify a	4.3 Identify a critical friend	
critical friend from the	from the same or	
same or related	related discipline to	
discipline to observe the	observe the enactment	
enactment of their	of your lesson and to	
lesson and provide	provide feedback during	
feedback during the	the next PD Session	
next PD Session (NTS	(NTS 1a).	
1a).		
Advance Preparation	Advance Preparation	
4.4 Ask tutors to remember	4.4 Remember to prepare	
to prepare proforma for	proforma for the Lesson	
Lesson 11 taking note of	11 taking note of	
important or distinctive	important or distinctive	
aspects of the lesson	aspects of the lesson	
and read Lesson 11 of	and read Lesson 11 of	
the Course Manual on	the Course Manual on	
Early Grade –	Early Grade –	
Factors <i>that</i> affect teaching	Factors <i>that</i> affect teaching	
and learning numeracy in	and learning numeracy in	
Early Grade	Early Grade	
<u> Upper Primary</u> -	Upper Primary - Factors	
Factors that affect teaching	that affect teaching and	
and learning numeracy in	learning numeracy in Upper	
Upper Primary	Primary	
<u>JHS(Core)</u> - Factors that	<u>JHS(Core)</u> - Factors that	

Age Levels/s:

Name of Subject/s:

- a. Early Grade
- b. Upper Grade
- c. JHS (Core)
- d. JHS (Elective)
- a. Theories in the Learning of Numeracy in Early Gradeb. Theories in Learning upper primary mathematics
- c. Theories in Learning of Jnr High School Math.
- d. Further Algebra

Tutor PD Session for Lesson 11 in the course manual

Lesson Tittle:

- a. Early Grade Factors that affect teaching and learning numeracy in Early Grade
- b. Upper Grade Factors that affect teaching and learning numeracy in Upper primary
- c. JHS (CORE) Factors that affect teaching and learning numeracy in Junior High School
- d. JHS (Elective) Matrices: Learning, teaching and applying

Fc pc fra dc Th th w th to ea bu ac re m	ocus: the bullet bints provide the ame for what is to be one in the session. The SWL should use e bullets to guide that they write for e SL/HoD and tutors do and say during the session. Each allet needs to be ldressed and specific ference should be ade to the course	Guidance notes on Leading the session. What the SL/HoDs will have to say during each stage of the session	Guidance Notes on Tutor Activity during the PD Session. What PD Session participants (Tutors) will do during each stage of the session.	Time in session
		· · · · ·	· · · · ·	
1.	Introduction to the	Introduction	Introduction	20 mins
	Session Prior	1.1 ICE DI Edicei activity. Ask	teaching a lesson you	
•	learning	feelings after a lesson	considered verv	
•	A critical friend to	they considered verv	successful and one	
-	share findings for a	successful and one	which was not. Tell what	
	short discussion and	which was not and what	influenced the success	
	lessons learned	influenced the	and failure of the lesson.	
•	Reading and	successes or failures.		
	discussion of the			
	introductory	1.2 Ask tutors to tell how	1.2 Tell how useful the	
	sections of the	useful the lesson 10 PD	previous PD session was	
	lesson up to and	session was and how it	and how it influenced	

including learning outcomes and indicators • Overview of content and identification of any distinctive aspects of the lesson/s, NB: The guidance for SL/HoD should identify and address any areas where tutors might require clarification on any aspect of the lesson. NB: SL/HoD should ask tutors to plan for their teaching as they go through the PD session	 influenced their teaching over the week. Lead them to mention how students were well placed to employ the various strategies and skills during the Basic School classroom work including STS Field Experience. N/B: Draw tutors' attention to all NTS references and salient points necessary for the development of their proforma. 1.3 Ask the critical friend to give feedback on his/ her observation of the previous enacted lesson laying emphasis on clarity of content, assessment strategies, ICT integration, GESI, Twenty First Century Skills. 1.4 Lead tutors to discuss any challenges that arose during the enactment. Eg. In what ways did explanations obtained by students 	 your teaching over the week. Explain how students were well placed to employ the strategies and skills during Basic School classroom work including STS Field Experience. N/B: Pay attention to NTS references and salient points necessary for the development of their proforma. 1.3 As a critical friend, describe how the previous lesson observed went laying emphasis on clarity of content, assessment strategies, ICT integration, GESI, Twenty First Century Skills. 1.4 Discuss any challenges that arose during the enactment. 	
	through internet search complicate understanding of concepts?		
	1.5 Ask tutors to read individually and discuss in pairs the introductory sections of the lesson up to Learning Outcomes.	1.5 Read individually and discuss the introductory sections of the lesson up to Learning Outcomes.	

1.6 Lead tutors in pairs to	1.6 In pairs, discuss the	
discuss the distinctive	distinctive aspects of	
aspects of lesson 11	lesson 11 such as	
such as fundamental	fundamental concepts	
concepts and	and developing	
developing awareness	awareness of equity and	
of equity and diversity	diversity issues and	
issues and issues on ICT.	issues on ICT.	
Distinctive aspects include	Distinctive aspects include	
the interactive nature of the	the interactive nature of the	
activities, emphasizing on	activities, emphasizing on	
connecting concepts:	connecting concepts:	
a. Early Grade– eg.	a. Early Grade– eg.	
Socio-cultural factors	Socio-cultural factors	
and Implications for	and Implications for	
classroom practice	classroom practice	
b. Upper Grade – eg.	b. Upper Grade – eg.	
Socio-cultural factors	Socio-cultural factors	
and Implications for	and Implications for	
classroom practice	classroom practice	
c. JHS (Core) – eq. Socio-	c. JHS (Core) – eg. Socio-	
cultural factors and	cultural factors and	
Implications for	Implications for	
classroom practice	classroom practice	
d. JHS (Specialism) – eq.	d. JHS (Specialism) – eq. The	
The concept of	concept of Matrices. Types	
Matrices, types of	of matrices: Operations and	
matrices: operations	property of matrices	
and properties of		
matrices		
N/B		
Be ready for likely auestions		
from tutors for clarification.		
<i>Guide tutors to discuss the</i>		
possible responses to the		
anticipated questions, bearing		
in mind pedagogy, GESI, ICT.		
Anticipated questions:		
i Are the factors mentioned		
the only ones that affect		
the teaching and learning		
of mathematics?		
ii In what ways can		

2. Concept Development (New	matrices be seen in everyday life? Eg. Considering the ages of learners sitting in rows and columns. Concept Development 2.1 Ask tutors to identify	Concept Development 2.1 Identify familiar and	15 mins
 learning likely to arise in lesson/s): Identification and discussion of new learning potential 	familiar and unfamiliar concepts in their lessons and discuss with the larger group.	unfamiliar concepts in your lesson and discuss with the larger group.	
barriers to learning for student teachers or students, concepts or pedagogy being introduced in the lesson, which need to be explored with the SL/HoD	 2.2 Lead tutors to draw connections among concepts in the various lessons in line with the basic school curriculum. Example: Adding and subtracting horizontal and column 	2.2 In your phase groups, draw connections among concepts in the lesson and in line with the basic school curriculum.	
NB The guidance for SL/HoD should set out what they need to do to introduce and explain the issues/s with tutors	 2.3 Ask tutors to use Think-Pair-Share to outline possible challenging areas in teaching and assessing the lesson. <i>Example:</i> a. Early, Upper Prim & JHS (Core) Grade: – Assumptions needed to establish socio-cultural factors affecting teaching and learning mathematics. b. JHS (Elective): - Steps in Multiplication of matrices 	2.3 Individually, outline the challenging areas in your lesson, share with a member of the same phase group and then with the whole group.	
	2.4 Lead tutors to go through the lesson 11 in the Course manual and discuss	2.4 In whole group, go through the lesson 11 in the Course manual and discuss	

	misconceptions and	misconceptions and	
	barriers raised. Let	barriers raised. Suggest	
	them suggest other	other possible ones not	
	possible ones not	captured in the	
	captured in the	manual.	
	manual.		
	Example:	Example:	
	a. Early, Upper Prim & JHS	a. Early, Upper Prim & JHS	
	(Core) Grade: –	(Core) Grade: –	
	Some people are born	Some people are born	
	with Mathematics and	with Mathematics and	
	so they easily	so they easily	
	understand lessons.	understand lessons.	
	b. JHS (Elective) – Zero	b. JHS (Elective) – Zero	
	matrices do not have	matrices do not have	
	entries in the matrix	entries in the matrix	
	while unit matrix has	while unit matrix has	
	only one number written	only one number written	
	in the matrix.	in the matrix.	
	Barriers:	Barriers:	
	Poor foundational	Poor foundational	
	knowledge about	knowledge about	
	matrices, lack of	matrices, lack of	
	appropriate resources,	appropriate resources,	
	lack of opportunity to	lack of opportunity to	
	use ICT due to failure of	use ICT due to failure of	
	electric power (lights-	electric power (lights-	
	out), bad/weak network,	out), bad/weak network,	
	unavailability of internet	unavailability of internet	
	bundle for students and	bundle for students and	
	emergency academic	emergency academic	
	staff meetings.	staff meetings.	
3. Planning for	Planning for teaching,	Planning for teaching,	40 mins
teaching, learning	learning and	learning and	
and assessment	assessment activities	assessment activities	
activities for the		24 14 4 4 4	
lesson/s	3.1 In their phase groups,	3.1 In your phase groups,	
Reading and	ask lutors to suggest	ask lutors to suggest	
aiscussion of the	ceaching and learning	ceaching and learning	
teaching and	taking into	the lossen ensuring	
learning activities		the lesson ensuring;	
 Noting and 	i Drovision is made for	i Drovision is made for	
addressing areas	i. Provision is made for	i. Provision is made for	

where tutors may	SEN	SEN	
require clarification	ii. Areas of the lesson	ii. Areas of the lesson	
 Noting opportunitie 	s that genders can be	that genders can be	
for making links to	ensured (such as	ensured (such as	
the Basic School	group task)	group task) Refer to	
Curriculum	iii. Even distribution of	NTS 1a, b, c, d, 2b, e,	
Noting opportunitie	s questions to different	f, 3b, c	
for integrating: GES	categories of learners	,, -	
responsiveness and	based on gender.		
ICT and 21 st C skills	ability, previous		
Reading discussion	experience, etc.		
and identification o	referring to NTS 1a. b.		
continuous	c. d. 2b. e. f. 3b. c		
assassment	0, 0, 20, 0, 1, 00, 0		
opportunities in the	3.2 Ask tutors to read the	3.2 Read the activities	
lesson Each lesson	activities of the lesson	outlined in your course	
should include at	outlined in the course	manuals and identify	
	manual and identify	areas that require	
opportunities to us	areas that require	clarification on content	
continuous	clarification on content	knowledge	
assossment to	knowledge	nedagogical knowledge	
assessment tudont	nedagogical knowledge	and nedagogical	
toochor loorning	and pedagogical	content knowledge.	
	content knowledge		
• Resources.	NB: Refer to	NB: Refer to	
ovisting PD	https://www.researchaa	https://www.researchaa	
Thomas for	te.net	te.net	
ovample action	For information on socio-	For information on socio-	
rosoarch	cultural factors affecting	cultural factors affecting	
auostioning and	teaching and learning of	teaching and learning of	
to other externa	mathematics	mathematics	
reference	https://en.wikipedia.ora to	https://en.wikipedia.ora to	
material.	clarify the otherwise	clarify the otherwise	
literature on web	dark spots in matrices.	dark spots in matrices.	
Utube, physical			
resources, power	3.3 Lead tutors to	3.3 Brainstorm to come up	
point; how they	brainstorm to come up	with some pedagogical	
should be used.	with some pedagogical	approaches that can be	
Consideration	approaches and their	employed during the	
needs to be given	impact on learning of	lesson and their	
to local availability	the concepts taking	effectiveness towards	
 guidance on any 	into consideration	learning of the	
power point	inclusivity.	concepts. Mention any	
presentations,	,	GESI issues that need	

TLM or other	Example: i) The use of	consideration while
resources which	inquiry to explore	using those
need to be	Connections between	approaches
developed to	the socio-cultural factors	
support learning	and the implication to	
• Tutors should be	teaching and learning of	
expected to have a	mathematics.	
plan for the next	(ii) The use of	
lesson for student	differentiation and	
teachers	scaffolding to ensure	
	that no learner is left	
	behind (SBC pp. xv)	
	iii) Being patient with	
	stutterers, using tactile	
	or braille for visually	
	challenged, providing	
	peer support for those	
	who might need, while	
	you pay attention to all	
	Phases.	
	3.4 Ask tutors to explain	3.4 Suggest teaching
	some suggested	strategies to be used in
	teaching strategies that	achieving the LOs of
	can help inculcate core	the lesson and explain
	competencies in	how they can help
	student teachers and	inculcate core
	for that matter Basic	competencies in
	School learners.	student teachers and
	eg. Using a) Internet Search	for that matter Basic
	to identify the types of	School learners.
	matrices –use of ICT	
	Skills b) Exploring other	
	factors other than socio-	
	cultural factors which	
	affect teaching and	
	learning of mathematics	
	– Critical Thinking	
	3.5 Ask tutors to mention	3.5 Mention some GESI
	some GESI responsive	responsive resources
	resources that can be	that can be used with
	used with the	the suggested
	suggested approaches	approaches and

and strategies in achieving the LOs. E.g. <i>Resources may include</i> <i>supporting staff with</i> <i>experts in sign</i> <i>language as well as</i> <i>resources such teacher</i> <i>and learner resource</i> <i>packs, textbooks,</i> <i>course manual,</i> <i>projectors, flip charts,</i> <i>sticky notes, braille,</i> <i>tactile materials, audio</i> <i>and audio-visuals that</i> <i>can be used in the</i> <i>teaching and learning</i> <i>of the concepts</i> <i>mentioned above (NTS</i> <i>3j)</i>	strategies in achieving the LOs. E.g. <i>Resources may include</i> <i>supporting staff with</i> <i>experts in sign</i> <i>language as well as</i> <i>resources such teacher</i> <i>and learner resource</i> <i>packs, textbooks, etc</i>	
 3.6 Using discussion, lead tutors to come out with assessment strategies ('as' and 'for') to be used during teaching of the lesson. NB: Continuous assessment activities such as assignments, quizzes, group presentations, etc. should be used to create subject projects and build subject portfolios. E.g. i) A project on factors affecting 3 known topics in the SBC. (EG, UP, JHS(Core) ii) A project on the operations on matrices. (JHS-Elective) 	 3.6 Using discussion, lead tutors to come out with assessment strategies ('as' and 'for') to be used during teaching of the lesson. NB: Continuous assessment activities such as assignments, quizzes, group presentations, etc. should be used to create subject projects and build subject portfolios. E.g. i) A project on how factors affecting 3 known topics in the SBC. (EG, UP, JHS(Core) ii) A project on the development of a game for teaching a concept under matrices. (JHS) 	

Make reference to	Make reference to	
manual and NTEAP	manual and NTEAP	
3.7 Ask each tutor to develop a sample assessment item based on the LOs and share with the whole group.	3.7 Develop a sample assessment items based on the LOs and share with the whole group.	
Example: Early, Upper Primary and JHS (Core) Grades – In groups of 4, interview 5 tutors on factors that affected their interest in mathematics during their Basic School days. JHS Grade – In groups of	Example: Early, Upper Primary and JHS (Core) Grades – In groups of 4, interview 5 tutors on factors that affected their interest in mathematics during their Basic School days. JHS Grade – In groups of	
four, develop any game to be used to teach a concept in matrices.	four, develop any game to be used to teach a concept in matrices.	
3.8 Lead tutors to discuss the various ways they can support student teachers to build their subject portfolio.	3.8 Discuss the various ways you can support student teachers to build their subject portfolio.	
E.g. Encouraging student teachers to i) file all their assignments with feedback in their folders and to take notes in class and filing them.	E.g. Encouraging student teachers to file all their assignments with feedback in their folders and to take notes in class and filing them.	
3.9 Ask a tutor to model a presentation of an activity using projector, internet search and ensuring both gender take leading roles in the groups. NTS 1a, b, 2b, e, 3b, c, J; BSC pp. iii)	3.9 Prepare and model a presentation of an activity using projector, internet search and ensuring both gender take leading roles in the groups. NTS 1a, b, 2b, e, 3b, c, J; BSC pp. iii)	

4. Evaluation and	Evaluation and review of	Evaluation and review of	15 mins
review of session:	session	session	
 Tutors should Identifying critical friends to observe lessons and report at next session Identifying and addressing any 	 4.1 Engage tutors in providing feedback of the PD session taking into consideration – Clarity of content, ICT integration, GESI, Twenty First Century 	4.1 Reflect and provide feedback on this PD session taking into consideration – Clarity of content, pedagogical approaches employed, ICT integration, GESI,	
outstanding issues relating to the lesson/s for clarification	Skills (NTS 1a, 3i, BSC pp. x-xvi) and make notes that will help them to teach Lesson 5.	Twenty First Century Skills (NTS 1a, 3i, BSC pp. x-xvi)? and make notes that will help you to teach Lesson 5	
	4.2 Engage tutors to identify unresolved issues relating to this lesson for clarification.	4.2 Identify unresolved issues relating to this lesson for clarification.	
	NB: Take note of all unresolved issues that may need further research or	NB: Put your unresolved issues unto the department's WhatsApp/	
	consultation and use any of following strategies to address them. i. put on SL/SWL WhatsApp/ Telegram platform for discussion ii. tutors to research for the next PD session for discussion	Telegram platform and research into the issues raised.	
	4.3 Ask tutors to identify a critical friend from the same or related discipline to observe the enactment of their lesson and provide feedback during the next PD Session (NTS 1a).	4.3 Identify a critical friend from the same or related discipline to observe the enactment of your lesson and to provide feedback during the next PD Session (NTS 1a).	
	Advance Preparation 4.4 Ask tutors to remember	Advance Preparation 4.4 Remember to prepare	

to prepare proforma for	proforma for the lesson	
Lesson 5 taking note of	5 taking note of	
distinctive aspects of	important or distinctive	
the lesson and	aspects of the lesson	
crosscutting issues and	and crosscutting issues	
read Lesson 12 of the	and read Lesson 12 of	
Course Manual on:	the Course Manual on:	
Early Grade – Factors that	Early Grade – Factors that	
affect learning and teaching	affect learning and teaching	
of numeracy in Early Grade	of numeracy in Early Grade	
<u>Upper Primary</u> - Factors	<u>Upper Primary</u> - Factors	
that affect learning and	that affect learning and	
teaching of numeracy in	teaching of numeracy in	
Upper primary	Upper primary	
<u>JHS(Core)</u> - Factors that	<u>JHS(Core)</u> - Factors that	
affect learning and teaching	affect learning and teaching	
of numeracy in Junior High	of numeracy in Junior High	
School	School	
<u>JHS (Elective.)</u> – Matrices:	<u>JHS (Elective.)</u> – Matrices:	
Learning, teaching and	Learning, teaching and	
applying 2	applying 2	
NB:	NB:	
i. Read the course manual	Take note of the PD	
and the PD session guide	session guide ahead of	
ahead of time to identify	time to identify any	
any outstanding issues	outstanding issues relating	
relating to the lesson for	to the lesson for	
clarification.	clarification.	
ii. Collect all inclusive		
resources (such as		
projector, flip chart and		
sticky notes) you need		
ahead of time, prepare		
samples of TLMs you		
may need and rehearse		
how these may be used		
to support the		
achievement of your		
goals		

Age Levels/s:

Name of Subject/s:

- a. Early Grade
- b. Upper Grade
- c. JHS (Core) d. JHS (Elective)
- d. Further Algebra

Tutor PD Session for Lesson 12 in the Course Manual

Lesson Tittle:

- e. Factors that affect learning and teaching of numeracy in Early Grade
- f. Factors that affect learning and teaching of numeracy in Upper primary
- g. Factors that affect learning and teaching of numeracy in Junior High School
- h. Matrices: Learning, teaching and applying 2

Focus: the bullet points provide the frame for what is to be done in the session. The SWL should use the bullets to guide what they write for the SL/HoD and tutors to do and say during each session. Each bullet needs to be addressed and specific reference should be made to the course manual/s.	Guidance notes on Leading the session. What the SL/HoDs will have to say during each stage of the session	Guidance Notes on Tutor Activity during the PD Session. What PD Session participants (Tutors) will do during each stage of the session.	Time in session
1. Introduction to the session	Introduction 1.1 Ice breaker activity:	Introduction 1.1 Select all the prime	20 mins
Review prior learningA critical friend to	Begin with an	numbers from the	
	investigational detivity	following numbers: 2, 3,	
share findings for a short discussion and	for the lessons. E.g., Select all prime	following numbers: 2, 3, 4, 5, 6, 7, 8, and 9	
share findings for a short discussion and lessons learned	for the lessons. E.g., Select all prime numbers from the list of	following numbers: 2, 3, 4, 5, 6, 7, 8, and 9	
 share findings for a short discussion and lessons learned Reading and discussion of the 	for the lessons. E.g., Select all prime numbers from the list of the numbers: 2, 3, 4, 5, 6, 7, 8 and 9.	following numbers: 2, 3, 4, 5, 6, 7, 8, and 9	
 share findings for a short discussion and lessons learned Reading and discussion of the introductory sections 	for the lessons. E.g., Select all prime numbers from the list of the numbers: 2, 3, 4, 5, 6, 7, 8 and 9.	following numbers: 2, 3, 4, 5, 6, 7, 8, and 9	
 share findings for a short discussion and lessons learned Reading and discussion of the introductory sections of the lesson up to and including 	for the lessons. E.g., Select all prime numbers from the list of the numbers: 2, 3, 4, 5, 6, 7, 8 and 9. 1.2 Ask tutors to tell how	1.2 Tell how useful the	
 share findings for a short discussion and lessons learned Reading and discussion of the introductory sections of the lesson up to and including learning outcomes 	for the lessons. E.g., Select all prime numbers from the list of the numbers: 2, 3, 4, 5, 6, 7, 8 and 9. 1.2 Ask tutors to tell how useful the previous semester's PD session	 1.2 Tell how useful the previous semester's PD session was and how it 	

- b. Theories in Learning upper primary mathematics c. Theories in Learning of Jnr High School Math.
- a. Theories in the Learning of Numeracy in Early Grade

• Overview of content and identification of	influenced their teaching.	teaching.	
any distinctive aspects of the lesson/s, NB The guidance for SL/HoD should identify and address any areas where tutors might require clarification on any aspect of the lesson. NB SL/HoD should ask tutors to plan for their teaching as they go through the PD session	 1.3 Ask a critical friend to give a feedback on observation during enactment of the seventh (11th) lesson. NB: Things tutor might have observed; tutor's choice of words, pedagogical content knowledge, content knowledge subject matter, ICT tools, GESI and the use of NTEAP 	 1.3 As a critical friend to share his/her observation on the 11th lesson NB: Consider choice of words pedagogical content knowledge, content knowledge subject matter, ICT tools, GESI and the use of NTEAP 	
	 1.4 Ask tutors to read and discuss the introductory section of the lesson including the learning outcomes (LOs) in phase groups. 	1.4 Read and Discuss the introductory section of the lesson (up to learning outcomes). Suggest relevant previous knowledge of students that will support effective teaching and learning of the lesson.	
	1.5 Ask tutors to identify the purpose of the lesson from the course manual and state their expectations of the PD Session.	1.5 Identify the purpose of the lesson from the course manual and state your expectations of the PD Session.	
	PURPOSE OF THE LESSONEarlyUpperJHS(CORE)GradePrimarye.g. develop in studentteachers an awarenessand understanding ofhow social andemotional intelligence,among other factors,		

like attitudes heliefs		
and anyiety can		
influence their		
loarning and teaching of		
mathematics		
a g to develop student		
e.g. to develop student		
teachers understanding		
of matrices and apply		
matrix concepts in other		
fields of mathematics		
1.6 Ask tutors in phase	1.6 In phase groups, discuss	
groups to discuss the	the distinctive aspects of	
important or	the s lesson including	
distinctive aspects of	vocabulary and	
the lesson including	fundamental concepts	
vocabulary and	related to the	
fundamental concepts.	components of the front	
	matters.	
Distinct Aspects		
a. EG/UP/HS (core):		
Factors that affect		
teaching and		
learning numeracy		
b. JHS (Elective) -		
Matrices: Learning,		
teaching and		
applying 2		
Vocabulary		
a. EG/UP/JHS (core)		
Examples:		
Intelligence.		
cooperation		
b. JHS (SP):		
Transpose Adjoint		
Determinants		
inverse and		
Application.		
Fundamental Concepts		
EG/UP/JHS (core):		
Social and		
emotional		
intelligence and		
intelligence and		

	 children's learning of mathematics social qualities to be nurtured in children to promote effective learning of mathematics 		
 2. Concept Development (New learning likely to arise in lesson/s): Identification and 	2.1 Ask tutors to identify familiar and unfamiliar concepts in their lessons and discuss with the larger group.	2.1 Identify familiar and unfamiliar concepts in your lessons and discuss with the larger group.	15 mins
learning, potential barriers to learning for student teachers or students, concepts or pedagogy being introduced in the	2.2 Lead tutors to draw connections among concepts in the various lessons in line with the Basic School Curriculum.	2.2 Draw connections among concepts in the various lessons in line with the basic school curriculum.	
lesson, which need to be explored with the SL/HoD NB The guidance for SL/HoD should set out what they need to do to introduce and explain the issues/s with tutors	 2.3 Ask tutors to outline possible challenging areas in: (g) Factors that affect learning and teaching of numeracy (h) Matrices: Learning, teaching and applying 2 <u>CHALLENGES</u> <u>EG/UP/JHS(Core):</u> 	2.3 Outline possible challenging areas in Factors that affect learning and teaching of numeracy. Matrices: Learning, teaching and applying 2.	
	 What social qualities are to be nurtured in children to promote effective learning of mathematics in Early Grade classroom? JHS Specialism: Inverse and applications. NB: Ensure that learning 	Take into consideration GESI. (eg teacher makes sure to factor students learning styles in the teaching of the lesson) <i>NB: Ensure that learning</i>	

styles of students are	styles of students are	
discussed in relation to the	discussed in relation to the	
Challenges)	Challenges)	
5,	5 ,	
2.4 Lead tutors to discuss	2 4 Participate actively in	
misconcontions and	the discussion on	
harriana in tagahing		
barriers in teaching	misconceptions and	
and learning of the	barriers in teaching and	
lesson.	learning of the lesson	
MISCONCEPTIONS		
Example:		
a. EG/ UP/JHS (core) –		
Numbers and Numeral		
are the same		
b. JHS(Elective) –		
Vectors and		
Matrices are the		
same.		
NB: Guide tutors to		
differentiate between		
numbers and numerals.		
Also they should be able		
to differentiate hetween		
and the representation of		
Matrices.		
BARRIERS		
Some possible barriers		
• Time		
 Learning 		
Resources		
Teacher		
Competence		
NB: Guide tutors to		
discuss how loarning		
resource coula be barrier		
to teaching and learning.		
	2.5 Identify as many GESI	
2.5 Support lutors to		
Identify GESI	responsive resources	
responsive resources	such as supporting staff	
such as supporting	with experts in sign	

		staff with experts in	language as well as	
		sign language as well	resources such teacher	
		as resources such	and learner resource	
		teacher and learner	packs, textbooks, course	
		resource packs.	manual. Posters	
		textbooks, course	illustrating people using	
		manual. Posters	mathematics in the jobs:	
		illustrating people	video clips downloaded	
		using mathematics in	from the internet. (NTS	
		the jobs: video clips	3i PD Manual nn 38)	
		downloaded from the		
		internet (NTS 3i PD		
		Manual nn 38)		
3.	Planning for	Teaching and learning	Teaching and learning	40 mins
0.	teaching, learning	activities	activities	
	and assessment			
	activities for the	3 1 Ask tutors to suggest	3 1 Suggest teaching and	
	lesson/s	tooching and loarning loarning activities for the		
	Reading and	activities for the lesson	lesson taking into	
	discussion of the	taking into account	consideration GESI	
	tooching and	GESLISSUAS	consideration desi	
		Δg		
	Noting and	i Provision made for		
•	Noting and	nbysically challenged		
	addressing areas	ii. Both gondors take		
	where tutors may	loading roles in group		
_		task		
•	Noting opportunities	iii Evon distribution of		
	for making links to	auestions to different		
	the Basic School	questions to unrerent		
	Curriculum	based on gondor		
•	Noting opportunities	ability provious		
	for integrating: GESI	ability, previous		
	responsiveness and	$\begin{array}{c} \text{experience, etc} \\ \text{NTS 1a, b, c, d, 2b, a, f, 2b} \end{array}$		
	ICT and 21 st C skills			
•	Reading, discussion,	C		
	and identification of		2.2 Dood the activities	
	continuous	5.2 Let lutors read the	5.2 Kedu the activities	
	assessment	activities outlined in	outlined in your course	
	opportunities in the	their course manuals	manual and identify	
	lesson. Each lesson	and identify areas that	areas that require	
	should include at	require clarification.	clarification.	
	least two	Strategies to clarify		
		the otherwise dark		

	opportunities to use	spots may include		
	continuous	investigation, internet		
	assessment to	search, etc.		
	support student			
	teacher learning	3.3 Lead tutors to	3.3 Brainstorm to come up	
•	Resources:	brainstorm to come	with some pedagogical	
	\circ links to the	up with some	approaches and their	
	existing PD	pedagogical	related core	
	Themes, for	approaches and their	competencies likely to	
	example action	related core	be inculcated in students	
	research	competencies likely to	and for that matter Basic	
	questioning and	be inculcated in	School learners.	
	to other external	students and for that		
	reference	matter Basic School		
	material.	learners eg		
	literature on	icumers. eg.		
	web Utube	(a)EG/UP/IHS (core)		
	nhysical	Strategy: Expository and		
		Discussion		
	noint: how they	Core Competencies:		
	chould be used	Broblom solving critical		
	Silouid de useu.	and croative thinking and		
		communication		
	heeds to be given	(b) US Specialism		
		(b) JHS Specialism		
	availability	Strategy: Interactive and		
	o guidance on any	Discussion		
	power point	Discussion		
	presentations,	Core Competencies:		
	I LIVI or other	Critical thinking skills,		
	resources which	Collaborative learning and		
	need to be	Problem-Solving Skills.		
	developed to			
	support learning	3.4 Ask tutors to discuss	3.4 Discuss the assessment	
•	Tutors should be	the assessment	strategies to be used	
	expected to have a	strategies to be used	during teaching of the	
	plan for the next	during teaching of the	lesson- Subject Project	
	lesson for student	lessons.	and Subject Portfolio).	
	teachers	NB: Assessment must	Assessment must be	
		involve; the subject	aligned with the NTEAP.	
		project and Subject		
		Portfolio based on:		
		Teacher beliefs about		
		mathematics and their		
		relation to teaching (EG,		

UP, JHS (core) and Sequences and Series: Learning, teaching and applying (JHS Specialism) Assessment must be aligned to the NTEAP. Continuous assessment activities (assignments, quizzes, group presentations, etc, should be used to create subject projects and build subject portfolios (See, Appendix II)		
3.5 Lead tutors to discuss the various ways they can support student teachers to build their project and subject portfolio.	3.5 Discuss the various ways they can support student teachers to build their project and subject portfolios	
3.6 Let a tutor model a presentation of an activity using ICT tools and taking into consideration GESI issues (eg. Both gender taking the leading roles in their groups and in the demonstration of the use of ICT tools) to teach their lessons EG, UP JHS(Core)- Social and emotional intelligence and children's learning of mathematics JHS (Elective)- Inverse and applications. Example: Assign student teachers to explore and use manipulative and ICT tools to find inverses of	3.6 Model a presentation of an activity using ICT tools and taking into consideration GESI issues in the lessons (NTS 1a, b, 2b, e, 3b, c, J; PD Manual pp.51)	

		matrices and to solve simultaneous equations. (NTS 1a, b, 2b, e, 3b, c, J; PD manual 51) NB: Guide tutors to use the internet to find the formular for finding the sum of the first <i>n</i> terms of arithmetic progression		
4.	Evaluation and	Reflective Activity	Reflective Activity	15 mins
	review of session:			
	Tutors should Identifying critical friends to observe lessons and report at next session. Identifying and addressing any outstanding issues relating to the lesson/s for clarification	 4.1 Engage tutors in self- evaluation as well as encourage tutors to provide feedback of the PD session taking into consideration inclusivity – how to be patient with Stammerers, using tactile and audio devices for visually challenged, paying attention to all courses, etc. Ask tutors to show by fingers/nods their level of satisfaction with the session. (NTS 1a, 3i). 	4.1 Show by fingers/nods of 5 or 3 or 1 as to those who "really got it", "got some of it" or "didn't get it" respectively. Explain if you really got the lesson	
		4.2 Engage tutors to identify unresolved issues relating to this lesson for clarification Take note of all unresolved issues and use any of following	4.2 Reflect on the activities in the session and outline unresolved issues relating to the lesson	
		strategies i. put on SL/SWL WhatsApp platform for discussion ii. tutors to research for		

 the next PD session for discussion 4.3 Ask a critical friend to observe your teaching and record his/her findings to be presented after delivery or in the Next PD session. 	4.3 Identify critical friend observes teaching and record his/her findings to be presented after delivery or in the Next PD session.	
NB: Remind tutors to identify a critical friend from the same or related discipline to observe during teaching and provide feedback (NTS 1a)	NB: to identify a critical friend from the same or related discipline to observe during teaching and provide feedback (NTS 1a)	
Advance Preparation 4.4 Ask tutors to record their suggestions and recommendations that will inform the next PD Session.	Advance Preparation 4.4 Record and submit your suggestions and recommendations that will inform the next PD Session to the Subject lead	

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