

Investigating the Role of Supported Teaching in Schools (STS) in Improving Teaching of Foundational Literacy & Numeracy in Ghana



Revised Report on Observational Evaluation of Student Teachers' Supported Teaching of Foundational Numeracy and Literacy in Schools

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Executive Summary

Introduction

Since 2015, Ghana has introduced comprehensive system-wide reforms to address a set of challenges in Initial Teacher Education, including poor quality of entrants; content-heavy examinations-oriented Diploma in Basic Education (DBE) curriculum; lack of practical exposure to teaching; lack of specialisation and limited resources and lack of appropriate policies and procedures for quality assurance in the Colleges of Education (CoEs) among others.

The starting point of the reforms was the production of the National Teachers' Standards (NTS), which sets out a common expectation of Ghanaian teachers' knowledge, behaviour, and practice. This led to the review and replacement of the DBE with a 4-year Bachelor of Education (B.Ed.) in Initial Teacher Education commencing in 2018.

The B.Ed. was aligned to the National Teacher Education Curriculum Framework (NTECF) and required specialisations for Early Grade (KG–P3), Upper Primary (P4–P6) and Junior High School (JHS 1– JHS 3). To better develop teachers on the new B.Ed. programme, the original teaching practice component of the DBE was extended and revised to form the new practical Supported Teaching in Schools (STS) component within the B.Ed. curriculum. The new STS represents one of the distinctive features of the new curriculum and provides a significant opportunity for student teachers to learn within different practical settings over the four years of the B.Ed. to enhance their professional development.

Since its introduction, there has been little evidence to ascertain the impact of the new STS on teacher professional development in Foundational Literacy and Numeracy (FLN). This report presents empirical evidence on the impact of the revised STS component on the professional development of student teachers, with particular attention to FLN. It draws on data from student teachers who completed Year Three of the B.Ed. in Initial Teacher Education and have since transitioned into their 12-week Year Four (Extended Teaching) STS placement. The observational component of the study assesses their demonstrated competence and use of FLN pedagogical strategies and resources during this placement.

Methodology

The study sampled 30 CoEs using a four-stage proportional allocation procedure and selected 10 partner schools from each CoE for foundational literacy and numeracy class observations. A simple random sampling approach was used to select the partner schools. In all, 303 foundational numeracy and 294 foundational literacy observations were conducted.

Highlights from Findings

Quality of lesson plan

Student-teachers were generally rated as good in foundational numeracy but average in foundational literacy. Males performed better than females in both areas and student-teachers in the KG outperformed their counterparts at the primary level.

Competency in creating a conducive classroom culture

In foundational numeracy, student-teachers' performance in responding to learners' needs; listening and using learners' ideas; and promoting inclusivity in the classroom were scored as average, while their performance in encouraging cooperative learning and monitoring learners' learning activities was poor. The results show that more than 4 of every 5 student-teachers did not allow learners to ask questions. They were however scored as good in treating all learners respectfully and using positive language with learners.

In foundational literacy, student-teachers' performance in treating all learners respectfully and using positive language with learners was rated as good. However, their performance in the other indicators was rated average. Differences were observed in the use of positive language with learners, where males scored significantly higher than females. Those who taught KG also performed better than those who taught primary school in promoting a supportive learning environment.

Competency in adopting appropriate teaching methodologies for effective lesson delivery

Findings from the observation of Year Four STS lessons show mixed levels of competence in student teachers' use of appropriate teaching methodologies for effective lesson delivery. In numeracy, student teachers performed at an average level across all indicators related to lesson introduction. Male student teachers scored higher than females in using appropriate starters, linking these to new topics, and capturing learners' interest. In literacy, student teachers were generally rated as good in introducing lessons, but many struggled to clearly articulate the lesson objectives or performance indicators.

Across all the indicators of content delivery in foundational numeracy, student teachers' overall performance was average, except for relating the lesson to other content knowledge and learners' daily lives, where the performance was poor.

On content delivery for foundational literacy, student-teachers' overall performance in both facilitating learners' understanding of content using multiple forms of representation and relating the lesson to other content knowledge and learners' daily lives was rated as average. Also, only a small proportion of student-teachers were rated as good or very good in modifying/varying reading/writing materials to the proper level for individual learners (16.1%) and breaking down broader concepts (such as phonics) into specific, discrete skills (29.9%). In these same areas, 48.2% and 46.4%, respectively, were rated as poor or very poor, while 35.8% and 23.7% were assessed as average. While their performance in organising teaching and learning activities sequentially and logically was rated as good, their use of learners' language errors as an opportunity to facilitate effective learning was rated poor. Those who taught primary scored significantly higher than their KG counterparts.

In terms of providing learner support in teaching foundational numeracy, student-teachers' performed averagely across all the indicators measuring learner support, except for encouraging learners to monitor their own use of strategies where they performed poorly. Male student-teachers scored higher compared to female student-teachers.

For learner engagement in foundational numeracy, only 35.4% of student-teachers asked learners to answer questions in pairs (think-pair-share) or small groups, and just 15.2% did so four or more times. The frequency of such task assignment did not vary significantly by student-teachers' sex, the grade level taught, or class size. It was further observed, that only 16.5% of student-teachers allowed learners to ask questions, with just 3.0% allowing so four or more times. Only 1 out of every 25 were rated as good or very good in providing opportunities for learners to ask open-ended questions. This practice also did not differ significantly by student teachers' sex, the grade level taught, or class size.

In foundational literacy, student-teachers were rated as poor in all indicators, except for integrating components of language arts and breaking broad concepts (such as phonics) down into specific, discrete skills, where their performance was rated as average. Those who taught KG scored significantly higher in using collaborative approaches to address the learning needs of struggling readers and breaking broad concepts (such as phonics) down into specific, discrete skills compared to those who taught at the primary level.

Performance in adopting appropriate assessment strategies and feedback mechanisms

In teaching foundational numeracy, student-teachers' ability to link assessments to objectives and setting timely assessments was rated as good. However, their competence in encouraging learners' self-reflection on their knowledge and learning and using questions, prompts or other strategies to determine learners' level of understanding were rated as poor.

For foundational literacy, performance of student-teachers in linking assessment tasks to objectives/performance indicator(s), employing assessment periodically, as well as varying strategies for teaching basic skills based on ongoing informal assessment of learners were rated as average but their performance in encouraging learners' self-reflection on their knowledge and learning was rated as poor. Greater proportions of student-teachers were observed as average for encouraging learners to learn from their mistakes (84.7%); poor or very poor in engaging learners to talk with each other in class about books they are reading (96.0%); recommending a variety of quality children's literature to learners for their private/home reading (98.5%) and motivating learners to show interest in reading (92.7%). The mean scores across all the indicators did not differ significantly by the sex of the student-teachers, class taught or class size.

In terms of foundational literacy, student-teachers' performance across all the indicators of assessing the provision of feedback to learners was consistently rated as average.

Similar average results were obtained by student-teachers' performance in providing feedback to learners across all the indicators in foundational numeracy. Statistically significant sex differentials were observed in providing specific comments or prompts that help identify learners' successes and providing timely feedback to learners as part of classroom routines, with males scoring significantly higher than females.

Student-teachers consistently performed poorly on all the indicators used to assess their promotion of critical thinking during foundational numeracy lessons.

Competency in promoting socio-emotional skills

In foundational literacy, student-teachers' performance in providing learners opportunities to make choices and to take on roles in the classroom was scored as poor. Their performance in creating an environment that encourages learners to voluntarily participate in classroom learning was assessed as average, while that of creating a safe and child-friendly classroom climate for learners to freely express their ideas and understandings was assessed as good. Male student-teachers performed better than their female counterparts in providing learners with opportunities to make choices, to take on roles in the classroom, and create a safe and child-friendly classroom climate for learners to freely express their ideas and understandings. Student-teachers who taught larger classes (> 40 learners) significantly outperformed those who taught smaller classes in providing learners with an opportunity to take on roles in the classroom.

In foundational numeracy, student teachers' performance in providing learners with choices and with the opportunity to take on roles in the classroom was scored in the poor range. Similarly, their performance in creating an environment that encourages learners to voluntarily participate in classroom learning and creating a safe and child-friendly classroom climate for learners to freely express their ideas and understandings was scored within the average range. Men scored higher than females.

In the area of promoting perseverance in foundational numeracy, except for student-teachers exhibiting a positive attitude towards learners' challenges, where their performance was rated at average, for all other indicators they performed either poorly or very poorly.

For perseverance promotion in foundational literacy, student-teachers' performance in promoting positive attitudes towards learners' challenges and encouraging learners to learn from their mistakes was rated as average, while they were rated poor in encouraging learners to set goals, engaging learners to talk with each other in class about books they are reading, recommending a variety of quality children's literature to learners for their private/home reading, and motivating learners to show interest in reading. Student-teachers who taught large classes performed better in motivating learners to show interest in reading.

Student-teachers performed poorly in promoting learner collaboration through peer interaction and interpersonal skills development in foundational numeracy. Their performance in creating a sense of belongingness among learners in the classroom was average. In relation to creating a sense of belongingness among learners in the classroom, those who taught KG pupils performed better than those who taught at the primary level.

In foundational literacy, student-teachers' overall performance in promoting learner collaboration through peer interaction and interpersonal skills development was rated as poor. Their performance in creating a sense of belongingness among learners in the classroom was rated as average. Student-teachers at KG performed significantly better in promoting learner collaboration through peer interaction and interpersonal skills development than those who taught at primary.

Introduction

Since 2015, Ghana has introduced comprehensive system-wide reforms to address a set of challenges in Initial Teacher Education, including:¹

Poor quality of entrants and consequent focus on remedial content. The three-year DBE, offered by CoEs as the standard entry qualification for new teachers entering public basic schools until 2018, attracted applicants who did not have the required Senior High School grades to enter university. The academic content knowledge of many of these applicants was poor, particularly in English, Mathematics, and Science, meaning that tutors in CoEs had to spend much of the first year of the DBE doing remedial teaching to address gaps in content knowledge.

Content-heavy and examination-oriented DBE curriculum. This lent itself to rote learning by student-teachers.² Tutors predominantly used the **lecture method of instruction**. There was little explicit link between the content of the teacher education curriculum and the pre-tertiary curriculum that student-teachers were expected to teach in basic schools.

Lack of practical exposure to teaching. Student-teachers only gained hands-on teaching experience during the third year of the DBE where they would spend an extended amount of time across two semesters in partner schools. The quality of mentoring and supervision within these partner schools was variable. Tutors did not consider some teachers as adequate role models. There was often no formal oversight agreement of roles and responsibilities between the district, metropolitan, and municipal education offices, which oversee basic schools, and the CoE.

Lack of specialization. Along with the content-heavy nature of the curriculum, lack of specialization meant that tutors had difficulty in preparing teachers who might on the one hand be teaching reading to Primary 1 pupils or who could be teaching English Literature to junior high school (JHS) 3 pupils once they were posted to basic schools after completing the DBE.

Limited resources and lack of appropriate policies and procedures of CoEs. Quality assurance, management and assessment processes within institutions were often inadequate and the quality of teaching and learning was variable. Many tutors lacked the required academic qualifications to teach at the tertiary level. This combination of factors meant that most CoEs were really ‘tertiary’ in name only.

¹ These findings are taken from *Teacher Training in Ghana- Does it Count? Multi-Site Teacher Education Research Project (MUSTER)*, Kwame Akyeampong, 2003; *‘Girls Unite and Pass (Participatory Approaches for Student Success) Business Case’*, DFID, 2012; *‘Girls Participatory Approaches for Student Success G-PASS Programme in Ghana- Technical Proposal’*, Cambridge Education, 2014

² For the purposes of this report ‘student-teachers’ are the young people in training in the CoEs of Education undertaking the B.Ed. who will become teachers when they graduate, ‘tutors’ are the staff in the Colleges of Education who are responsible for training the student-teachers, ‘teachers’ are what the student-teachers become once they have graduated and start working in basic schools. The term ‘mentors’ is used to describe the teachers working in partner schools who play the role of mentors to the student-teachers during the practical, classroom-based elements of their training, which is known as Supported Teaching in School (STS).

The combined impact of the factors outlined above meant that, in 2014, “Teachers coming through Ghana’s CoE have limited hands-on practical exposure to good teaching methodology and fall back on familiar rote-learning (DFID, 2012:9).”

It was against this context that Ghana’s Initial Teacher Education reforms were supported by a \$34 million six-year (2015-2020) package of support from the Foreign Commonwealth and Development Office (FCDO) through Cambridge Education’s Transforming Teacher Education & Learning (T-TEL) programme.³ The starting point of the current reforms was the production of the NTS,⁴ which sets out a common expectation of Ghanaian teachers’ knowledge, behaviour, and practice. The NTS provided the foundation for subsequent reforms as they established a common set of agreed requirements which formed the foundation for teacher licensing, which was introduced for all new entrants to the teaching profession in 2018, and a review of the DBE initial teacher education curriculum. This review concluded that the DBE did not provide adequate training for beginning teachers to enable them to meet the requirements of the NTS.

Following the curriculum review, the Ministry of Education decided to replace the DBE with a new B.Ed. degree in Initial Teacher Education, commencing in 2018, which became the new minimum qualification for anyone aspiring to enter the teaching profession. The B.Ed. is aligned with a NTECF⁵ which set out the mandatory requirements that any B.Ed. in Initial Teacher Education programme would need to meet to be accredited by the National Accreditation Board (NAB). The NTECF required specialisations for Early Grade Education (KG–P3), Upper Primary (P4–P6), and JHS 1–3. These are the B.Ed. courses currently run by CoEs affiliated to Kwame Nkrumah University of Science and Technology (KNUST), the University of Education Winneba (UoE), the University for Development Studies (UDS) and the University of Ghana (UG). CoEs affiliated to the University of Cape Coast (UCC) run a slightly different system with B.Ed. Early Childhood Education (KG-P3), Primary Education (P1-P6) and JHS 1-3.

The new B.Ed. degree was introduced across Ghana’s 46 public CoEs in September 2018 with the first cohort of 16,000 student teachers graduating in October 2022. The new B.Ed. in Initial Teacher Education represents a major shift in how teacher education is conceptualized and delivered in Ghana with the intention that it:

- i. fully prepares student teachers to teach the basic school curriculum, concentrating on relevant subject and pedagogic knowledge and introducing specialisms (KG-P3, P3-P6, JHS education);

³ The Transforming Teacher Education & Learning (T-TEL) programme ran from 2015 to 2020 and was implemented by Cambridge Education. The Ghanaian team responsible for implementing T-TEL then established a Ghanaian-registered not-for-profit organization called Transforming Teaching, Education & Learning (T-TEL) in July 2020 which is completely independent of Cambridge Education. Further details of T-TEL’s work can be found here: [Our Work - T-TEL](#)

⁴ National Teachers’ Standards (NTS): <https://t-tel.org/download/national-teachers-standards/?wpdmdl=3301&refresh=64297217d167a1680437783>

⁵ NTECF: <https://t-tel.org/download/national-teacher-education-curriculum-framework/?wpdmdl=3287&refresh=64298d37878271680444727>

- ii. equips student teachers to develop learners' languages (Ghanaian Languages and English) and literacy so all can access the curriculum;
- iii. gives higher status to practical teaching experience through supported and assessed teaching in school, called Supported Teaching in School (STS);
- iv. widens the focus of assessment to include in-school learning and assignments as well as examinations, with students being assessed against the NTS;
- v. emphasizes a more interactive, learner-focused approach to training, modelling good teaching; and
- vi. is explicit in addressing vital cross-cutting issues: equity and inclusivity, assessment, core skills, professional values, action research and reflection.

Supported Teaching in School in the new B.Ed. curriculum

The extension of the practical STS component within the B.Ed. curriculum provides a very significant opportunity for student teachers to learn within different practical settings and is arguably the most important change brought about in Ghana's Initial Teacher Education reforms.

STS accounts for 30% of the total marks in the B.Ed. and takes place across all 4 years of the B.Ed. In the first year there is a greater focus on school-based, organised and directed learning experiences in school where students reflect on teachers' teaching and children's learning. This takes place one day a week for 6 weeks in Semester One and again in Semester Two. Subsequently, in future years, there is a greater focus on school-focused training where the student teacher, with the support of a mentor (a classroom teacher in a partner school), takes increasing amounts of responsibility for planning teaching and assessing the learners in their care alongside classroom enquiry and action research. During the four years student teachers teach and observe teaching in a range of schools to understand how children develop and learn in diverse contexts.

The structure of the STS over the four years of the B.Ed. is set out below.⁶

Year One: Beginning teaching – Provides support for the transition from school to college and recognizes that many student teachers will have come from school level education and from a wide range of backgrounds and experience. It introduces: the nature and core knowledge of subjects; supported teaching in school experiences; cross-cutting issues such as inclusion and equity in education; the school curriculum and approaches to teaching and learning, and the expectations for the learning and progress of learners in different subjects. Year One enables student teachers to be able to see their specialism within the wider curriculum.

⁶ Detailed information on the STS is taken from the official STS Year 4 School Placement Handbook (GTEC, NTC & T-TEL 2020) which can be accessed here: https://t-tel.org/download/supported-teaching-in-school_year-4_school-placement-handbook/?wpdmdl=8128&refresh=67b0878a919921739622282

STS Year One

By the end of the beginning placement student teachers, under the close guidance of a mentor, will be able to:

1. Work collaboratively, with 2-4 student teachers per class, to plan for and work with a small group or individual pupils, beginning to acquire the ability to consider children's learning, backgrounds, and experience.
2. Discuss features of the school curriculum, specifically focusing on English (literacy), Mathematics, and Science.
3. Undertake child studies focused on children's learning and progress.
4. Begin to identify the traits of the profession and qualities of a good teacher.
5. Reflect on and record their experiences in their professional portfolios – through this student teacher will begin working towards meeting the NTS.
6. May work towards 10-15% of class responsibility with a small group.

Duration 32 days: day visit and 4-week placement, in vacation, across 2 semesters.

Year Two: Developing teaching – student teachers select one of the three specialisms whilst key features from Year One continue to be developed as relevant to each specialism. The second year prepares student teachers to identify and assess weaknesses and barriers to learning for learners and carry out small-scale classroom enquiry under the guidance of mentors.

STS Year Two

By the end of the developing placement, under the close guidance of a mentor, the student teacher will be able to:

1. Teach, motivate, support, and manage (working individually and in pairs) the learning of small groups of pupils in the core subjects of English (literacy), mathematics, and science, and other subjects as appropriate to their specialism.
2. Begin to identify, assess, and analyses the needs of children, taking into account any issues of background and experience.
3. Discuss key features of the school curriculum, including issues of continuity and progression both within their specialism and across all the subjects they will teach.
4. Undertake small scale classroom enquiry focused on children's learning and progress, demonstrating an emerging ability to reflect on their developing understanding of teaching, learning, and assessment.
5. Demonstrate a high standard of professional conduct and positive professional values at all times and act as a good role model for pupils.
6. Those preparing for early grade or primary specialisms will have begun to develop knowledge of teaching the speaking, listening, reading, and writing of one Ghanaian language.
7. Demonstrate a growing understanding of the requirements of the NTS in terms of professional practice, knowledge, values and attitudes, in particular their

professional role as a teacher, and be able to reflect on, record, and discuss evidence of their progress towards meeting the NTS.

8. May be working towards 30% of class responsibility with the small groups they are planning for and teaching.

Duration 32 days: including day visits and across 2 semesters and in vacation.

Year Three: Embedding teaching – student teachers will continue to build skills, knowledge, and understanding in their chosen specialism. They will co-plan and co-teach groups of learners and whole classes, carry out small-scale classroom enquiries, and provide evidence of working towards meeting the NTS. Year Three includes preparation for Year Four, semester one: final supported teaching in school (internship), and for significant classroom-based enquiry and action research projects.

STS Year Three

By the end of the embedding placement the student teacher, with mentor guidance and support, will be able to:

1. Teach, motivate, manage, and extend the learning of classes with increasing consistency and independence, whatever their socio-cultural and linguistic background and regardless of age, aptitude, and ability. This will involve co-planning, co-teaching, and co-assessment with mentors and their ongoing presence in the classroom.
2. Plan for and teach sequences of lessons across all required subjects with regard for cross-cutting skills and issues of equity and inclusivity.
3. Undertake small-scale action research, evaluate, and reflect on their teaching and on pupils' learning to support students in improving their teaching and assessment.
4. Demonstrate emerging leadership qualities in the classroom and to contribute to wider school life, being guided by the legal and ethical codes of conduct required by a professional teacher.
5. Provide evidence and discuss how, with support from their mentor, they are able to meet the Teachers' Standards through much of their teaching and all of their professional conduct. They will be able to agree and act on targets to further improve their teaching.
6. May work towards 50-60% of class responsibility with agreed classes and periods in accordance with agreed placement requirements.

Duration 36 days: including day visits across 2 semesters.

Year Four: Extending Teaching: Following a supported teaching in school internship in Semester One, during Semester Two students will return to school to complete some courses. By the end of the fourth year, student teachers will: plan, teach, and assess their learners

independently and with increasing consistency; exhibit the ethical codes of conduct, values, and attitudes expected of a teacher; carry out extensive action research projects; and provide evidence of meeting the National Teachers' Standards in full.

STS Year Four

By the end of the extending placement the student teacher, with mentor guidance, will be able to:

1. Intently and independently plan for teaching, motivate and extend the learning of all children whatever their socio-cultural and linguistic background and regardless of age, aptitude, and ability.
2. Provide evidence in their planning and teaching of a comprehensive understanding of the school curriculum and of the age-related expectations before, during, and after their specialism.
3. Undertake an action research project to improve the learning opportunities of an agreed group of pupils to promote greater inclusion; and through this develop their teaching, classroom management, and organization strategies.
4. Demonstrate effective, growing leadership qualities in the classroom and in the wider school community and be guided by the legal and ethical codes of conduct required by a professional teacher.
5. Reflect on, discuss, and provide evidence of how they meet the NTS in full and identify targets for further development.
6. Have the qualities and attributes expected of a good teacher and fully meet the NTS.
7. May work towards 80% of class teaching responsibility with agreed classes and periods in accordance with agreed placement requirements.

Duration 60 days in school: these can be either residential or non-residential. 60 days in college working on action research project and professional portfolio and preparing for viva as appropriate.

The STS has proved the most challenging aspect of the B.Ed. to implement effectively, as evidenced by the findings of a comprehensive Fidelity of Implementation (FoI) assessment carried out by GTEC, with support from T-TEL, across all 46 CoEs in 2022.⁷

We currently have limited evidence to assess the influence of student teachers' experience of STS on their competencies, skills and behaviour. In response to this gap, Transforming Teaching, Education & Learning (T-TEL), in partnership with the University of Cape Coast (UCC) and Education Sub-Saharan Africa (ESSA), seeks to conduct research in CoEs and partner schools across Ghana to investigate the role of Supported Teaching in School (STS) in improving the teaching of Foundational Literacy & Numeracy for student teachers in Years 3 and 4 of their Bachelor of Education (B.Ed.) in Initial Teacher Education (KG-P3 specialism).

⁷ GTEC FoI Report : https://t-tel.org/download/report_fidelity-of-implementation-foi-of-b-ed-programme/?wpdmdl=8130&refresh=642c12e4634d01680610020

This report presents findings from an observational study focused on the competencies demonstrated by student teachers during their Year Four STS placement. The study explores how these competencies are applied in real classroom settings and addresses the following questions in relation to the teaching of foundational literacy and numeracy:

1. What is the quality of student teachers' lesson plans?
2. How competent are student teachers in creating a classroom environment that supports learning?
3. How effectively do student teachers adopt appropriate teaching methodologies for lesson delivery?
4. How well do student teachers apply assessment strategies and provide feedback?
5. To what extent do student teachers promote socio-emotional learning skills in the classroom?

Methodology

The 30 CoEs sampled for the pre-STs study were adopted for the observation of student-teachers' STS. The sampled using a four-stage proportional allocation procedure are shown in Table 1.

Table 1: Number of CoEs sampled in each stratum for the pre-STs study

Ecological zone and mentoring university	Sex composition			Total
	Mixed	Female	Male	
Coastal				
University of Cape Coast	1	2		3
University of Education, Winneba	2			2
University of Ghana	3			3
Total	6	2		8
Forest				
Kwame Nkrumah University of Science and Technology	2			2
University of Cape Coast	5	1		6
University of Development Studies	1			1
University of Education, Winneba	2	2	1	5
University of Ghana	1			1
Total	11	3	1	15
Savannah				
Kwame Nkrumah University of Science and Technology	1			1
University of Development Studies	3			3
University of Education, Winneba	2			2
University of Ghana	1			1
Total	7			7
Overall Total	24	5	1	30

A list of partner schools where student-teachers undertake their STS was obtained from each sampled CoE. A simple random sampling approach was used to select 10 partner schools from each CoE. Five of the sampled partner schools were allocated for foundational numeracy class observation, while the remaining five were allocated for foundational literacy class observation. In each partner school, two foundational numeracy and literacy observations were

expected to be undertaken. Thus, in total, 300 foundational numeracy and 300 foundational literacy observations were expected at the end of the exercise. However, during the fieldwork, it was observed that a few CoEs had student teachers only at the upper primary level and therefore, were not eligible for observation. In this regard, where there were still unsampled partner schools, additional ones were randomly selected to make up for the numbers. In all, 303 foundational numeracy observations were conducted in 28 CoEs and 294 foundational literacy observations were undertaken in 26 CoEs.

Background Characteristics of Student Teachers Observed

Table 2 shows the percentage distribution of background characteristics of student-teachers who were observed during the numeracy and literacy class sessions in the various schools. For both foundational numeracy and literacy, more than 7 out of every 10 of the student-teachers observed were females. Also, a higher proportion of the classes observed were at the primary level. Concomitant to the number of CoEs mentored by the universities, the majority of student-teachers observed were from colleges affiliated to UCC and UEW. Similarly, a high proportion of the student-teachers observed were from CoEs in the Forest zone, followed by the Coastal zone, with the least number of them coming from the Savannah zone.

Table 2: Percentage distribution of Student-Teachers that were observed

Background characteristics	Numeracy Frequency	Percent	Literacy Frequency	Percent
All	303	100.0	274	100.0
Sex				
Female	218	72.0	224	81.8
Male	85	28.1	50	18.3
Class type				
KG	73	24.1	85	31.0
Primary	230	75.9	189	69.0
Class size				
< 25	108	35.6	101	36.9
25 – 40	96	31.7	121	44.2
> 40	99	32.7	52	19.0
Mentoring university				
UCC	118	38.9	110	40.2
UoG	32	10.6	29	10.6
UEW	96	31.7	70	25.6
KNUST	17	5.6	14	5.1
UDS	40	13.2	51	18.6
Ecological zone				
Coastal	95	31.4	90	32.9
Forest	132	43.6	111	40.5
Savannah	76	25.1	73	26.6

Data Analysis

In terms of scoring metrics employed, Likert scale measures with score *S* ranging between 1 and 5, where 1 represents very poor and 5 represents very good, were adopted for rating student-teachers' teaching performance. To gauge student-teachers' level of teaching numeracy

and literacy at the foundational level, the weighted mean score for each indicator was computed as shown in Equation 1.

$$\bar{S} = \frac{\sum n_i S_i}{n} \quad (1)$$

Where $\bar{S}$ is the weighted mean score, n_i is the number of student-teachers who were scored S_i and n is the total number of student-teachers observed. Based on the literature, the weighted mean scores were therefore interpreted as 1.00 – 1.79 = very poor; 1.80 – 2.59 = poor; 2.60 – 3.39 = average; 3.40 – 4.19 = good; 4.20 – 5.00 = very good.

Findings

Student-Teachers' Performance in Teaching Foundational Numeracy

Quality of Lesson Plan

The results presented in Figure 1 show that most student-teachers at the time of undertaking their STS were at an average to good level with the quality of their lesson plan. It is important to note that about 1 out of every 4 student-teachers observed were rated poor in stating appropriate and varied TLRs and indicating when and how they will be used during the lesson. Less than 10.0% of student-teachers observed and assessed were deemed as very good in all the indicators.

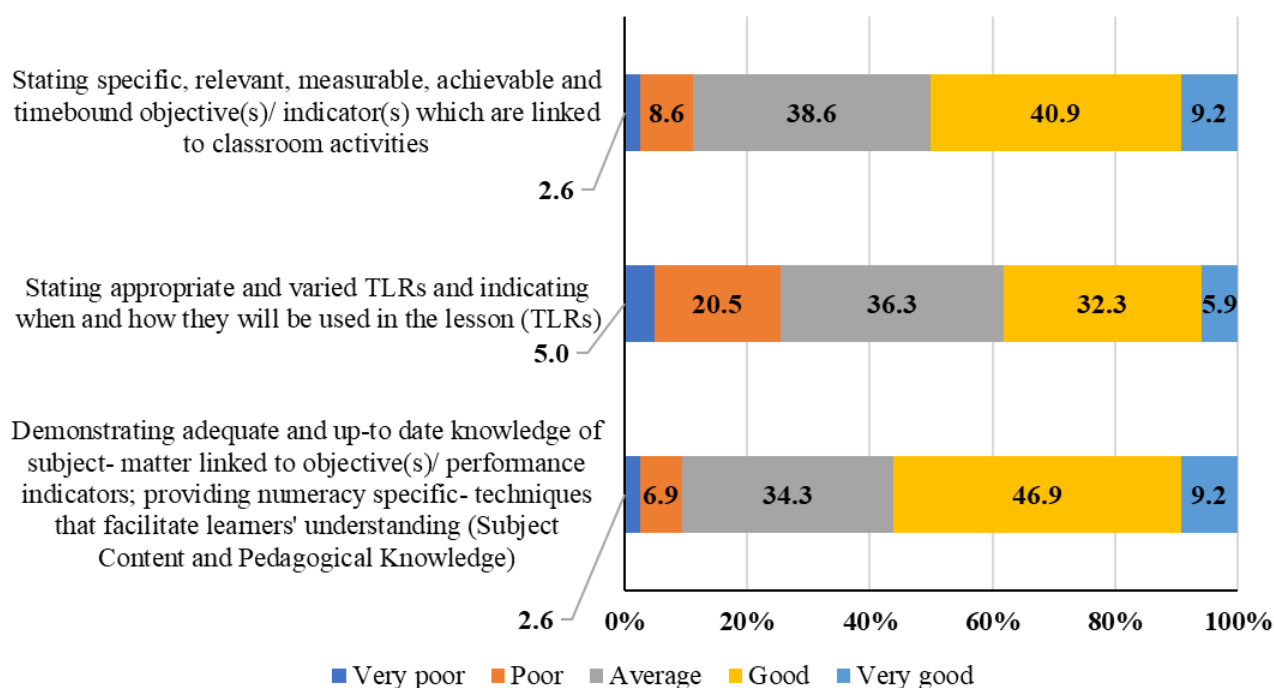


Figure 1: Percentage distribution of student-teachers and the quality of their lesson plan

Table 3 shows the mean scores of the indicators of student-teachers' quality of lesson plan by background characteristics. The mean scores show that overall, student-teachers were evaluated as good in stating specific, relevant, measurable, achievable and timebound objective(s)/indicator(s) which are linked to classroom activities and demonstrating adequate and up-to-date knowledge of subject matter linked to objective(s)/performance indicators. The scores also suggest that student-teachers were good as well in providing foundational numeracy-specific techniques that facilitate learners' understanding. However, they were average in stating appropriate and varied TLRs and indicating when and how they will be used in the lesson. The results further show that males were significantly good than their female counterparts who were average in stating specific, relevant, measurable, achievable and timebound objective(s)/indicator(s) which are linked to classroom activities. The result was similar to that of student-teachers from CoEs mentored by UoG who scored significantly higher and were good in stating specific, relevant, measurable, achievable and timebound objective(s)/indicator(s) which are linked to classroom activities compared to only their UCC counterparts who were average. Similar results were observed for demonstrating adequate and

up-to-date knowledge of subject matter linked to objective(s)/performance indicators; and providing foundational numeracy-specific techniques that facilitate learners' understanding between UoG (who were good) and their counterparts from UCC and UDS (who were average). With regards to stating appropriate and varied TLRs and indicating when and how they will be used in the lesson, student-teachers from CoEs in the Coastal zone scored significantly higher and were than those in the Forest zone. However, this significance was not meaningful since all the zones performed at the average level. Similar significant differences in terms of ecological zones that were not meaningful were found for demonstrating adequate and up-to-date knowledge of subject matter linked to objective(s)/performance indicators; providing numeracy-specific techniques that facilitate learners' understanding. This is because, all the zones were within the good level category despite the small differences in scores. The results highlight that at the time of undertaking STS, student-teachers were generally between average and good in the quality of their lesson plan.

Table 3: Mean score of student teachers' quality of lesson plan by background characteristics

Background Characteristics	Stating specific, relevant, measurable, achievable and timebound objective(s)/indicator(s) which are linked to classroom activities	Stating appropriate and varied TLRs and indicating when and how they will be used in the lesson (TLRs)	Demonstrating adequate and up-to-date knowledge of subject matter linked to objective(s)/performance indicators; providing numeracy-specific techniques that facilitate learners' understanding (Subject Content and Pedagogical Knowledge)
	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	3.46 [3.36, 3.56]	3.14 [3.03, 3.25]	3.53 [3.43, 3.63]
Sex	<i>0.025*</i>	<i>0.673</i>	<i>0.0771</i>
Female	3.39 [3.27, 3.50]	3.12 [3.00, 3.25]	3.48 [3.36, 3.59]
Male	3.64 [3.44, 3.83]	3.18 [2.95, 3.41]	3.67 [3.48, 3.86]
Class type	<i>0.515</i>	<i>0.796</i>	<i>0.780</i>
KG	3.40 [3.23, 3.57]	3.16 [2.99, 3.34]	3.51 [3.35, 3.66]
Primary	3.47 [3.35, 3.59]	3.13 [3.00, 3.26]	3.54 [3.42, 3.66]
Class size	<i>0.792</i>	<i>0.897</i>	<i>0.955</i>
< 25	3.45 [3.28, 3.68]	3.16 [2.97, 3.35]	3.53 [3.36, 3.70]
25 – 40	3.50 [3.33, 3.67]	3.16 [2.95, 3.36]	3.55 [3.38, 3.72]
> 40	3.41 [3.24, 3.59]	3.10 [2.92, 3.28]	3.52 [3.35, 3.68]
Mentoring university	<i>0.001**</i>	<i>0.061</i>	<i>0.011*</i>
UCC	3.21 [3.04, 3.38]	2.95 [2.76, 3.14]	3.37 [3.19, 3.55]
UoG	3.88 [3.65, 4.10]	3.41 [3.09, 3.72]	3.81 [3.56, 4.07]
UEW	3.61 [3.45, 3.78]	3.25 [3.06, 3.44]	3.71 [3.58, 3.84]
KNUST	3.47 [3.05, 3.89]	3.35 [3.02, 3.69]	3.47 [3.17, 3.77]
UDS	3.45 [3.18, 3.72]	3.13 [2.82, 3.43]	3.38 [3.09, 3.67]
Ecological zone	<i>0.295</i>	<i>0.017*</i>	<i>0.012*</i>
Coastal	3.54 [3.37, 3.70]	3.34 [3.15, 3.52]	3.75 [3.59, 3.91]
Forest	3.47 [3.31, 3.63]	2.97 [2.78, 3.16]	3.45 [3.30, 3.61]
Savanah	3.33 [3.13, 3.53]	3.18 [3.01, 3.36]	3.40 [3.21, 3.58]

*p-values in italics; ** $p < 0.01$; * $p < 0.05$; CI – Confidence Interval*

Classroom Culture

Supportive Learning Environment

Two key metrics (supportive learning environment and positive behavioural expectations) were used to assess student-teachers' classroom culture. Figure 2 shows student-teachers' performance on promoting a supportive learning environment for foundational numeracy. Although 76.2% of student-teachers scored good or very good on treating all learners respectfully and nearly 7 out of 10 (67.6%) using positive language with learners, a very high proportion (69.1%) scored average or below on responding to learners' needs, listening and using learners' ideas (75.9%) and encouraging cooperative learning and monitoring learners' learning activities (79.9%). It is important to note that more than half of the student-teachers scored poorly on encouraging cooperative learning and monitoring learners' learning activities. More than half of student-teachers scored average or below on promoting inclusivity in the classroom.

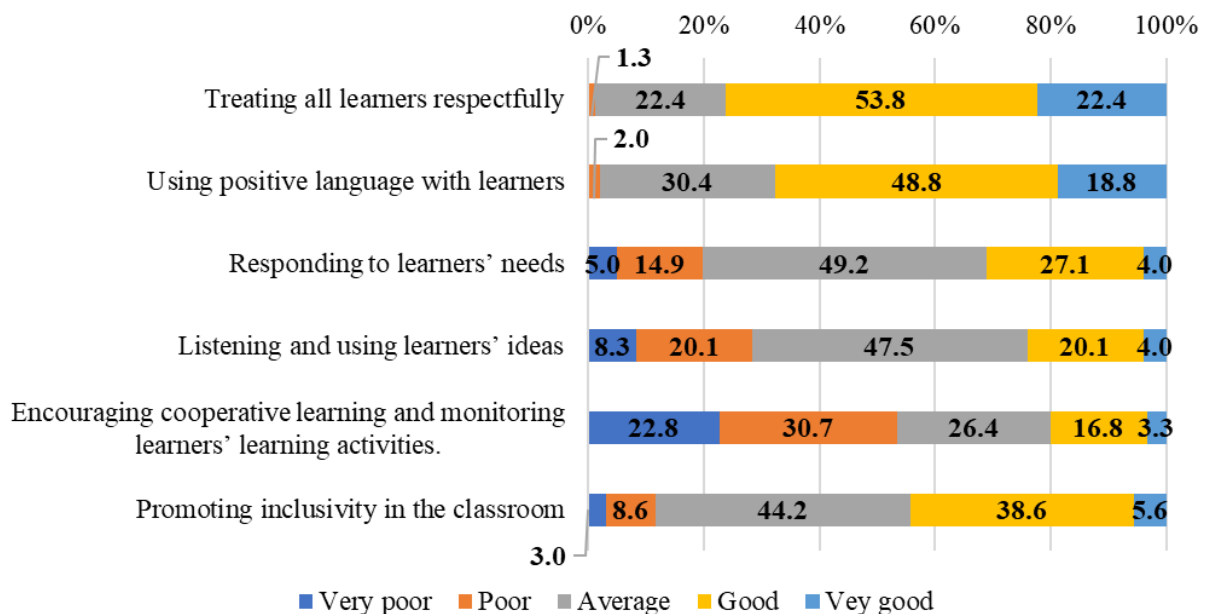


Figure 2: Percentage distribution of student teachers and their performance on a supportive learning environment

Table 4 shows the mean score of student-teachers' performance on a supportive learning environment by background characteristics. Overall, the students-teacher's performance was scored as good in treating all learners respectfully and using positive language with learners. This is because their overall mean scores were between the 3.40-4.19 threshold. However, their performance in responding to learners' needs, listening and using learners' ideas and promoting inclusivity in the classroom was scored as average (between 2.60-3.39 threshold). More importantly, their performance in encouraging cooperative learning and monitoring learners' learning activities was poor (between 1.80-2.59 threshold). Significant sex differentials were observed in using positive language with learners, with male student-teachers scoring higher than females. However, both sexes had good performances (between 3.40-4.19 threshold). Across the indicators of a supportive learning environment, the differences found

were for responses to learners' needs where student-teachers mentored by UDS were good but the other student-teachers were just average. Additionally, CoEs mentored by the other universities were rated good in promoting inclusivity in the classroom, and so were better than their counterparts mentored by UCC who were rated average.

Table 4: Mean score of student-teachers' performance in a supportive learning environment by background characteristics

	Treating all learners respectfully	Using positive language with learners	Response to learners' needs	Listening and using learners' ideas	Encouraging cooperative learning and monitoring learners' learning activities	Promoting inclusivity in the classroom
Background Characteristics	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	3.97 [3.89, 4.05]	3.84 [3.76, 3.93]	3.10 [3.00, 3.20]	2.91 [2.81, 3.02]	2.47 [2.35, 2.60]	3.35 [3.26, 3.45]
Sex	<i>0.095</i>	<i>0.014*</i>	<i>0.287</i>	<i>0.052</i>	<i>0.741</i>	<i>0.757</i>
Female	3.93 [3.84, 4.03]	3.78 [3.68, 3.88]	3.07 [2.95, 3.19]	2.85 [2.72, 2.98]	2.46 [2.31, 2.61]	3.36 [3.26, 3.47]
Male	4.08 [3.94, 4.23]	4.01 [3.85, 4.17]	3.19 [3.02, 3.36]	3.08 [2.91, 3.25]	2.51 [2.27, 2.74]	3.33 [3.13, 3.53]
Class type	<i>0.458</i>	<i>0.434</i>	<i>0.002**</i>	<i>0.500</i>	<i>0.670</i>	<i>0.070</i>
KG	4.03 [3.86, 4.19]	3.90 [3.74, 4.07]	3.38 [3.23, 3.54]	2.85 [2.66, 3.04]	2.52 [2.26, 2.78]	3.51 [3.33, 3.68]
Primary	3.96 [3.86, 4.05]	3.83 [3.73, 3.92]	3.01 [2.89, 3.13]	2.93 [2.81, 3.06]	2.46 [2.31, 2.60]	3.30 [3.19, 3.42]
Class size	<i>0.304</i>	<i>0.815</i>	<i>0.177</i>	<i>0.987</i>	<i>0.202</i>	<i>0.944</i>
< 25	4.06 [3.94, 4.17]	3.85 [3.71, 3.99]	3.19 [3.03, 3.35]	2.91 [2.74, 3.08]	2.58 [2.35, 2.81]	3.35 [3.18, 3.52]
25 – 40	3.95 [3.79, 4.11]	3.88 [3.73, 4.02]	3.15 [2.98, 3.31]	2.93 [2.74, 3.12]	2.51 [2.29, 2.73]	3.33 [3.17, 3.49]
> 40	3.91 [3.77, 4.05]	3.81 [3.65, 3.96]	2.97 [2.78, 3.16]	2.91 [2.71, 3.11]	2.31 [2.11, 2.51]	3.37 [3.22, 3.53]
Mentoring university	<i>0.049*</i>	<i>0.022*</i>	<i>0.032*</i>	<i>0.036*</i>	<i>0.011*</i>	<i>0.067</i>
UCC	3.85 [3.73, 3.97]	3.75 [3.63, 3.88]	3.01 [2.85, 3.17]	2.75 [2.55, 2.94]	2.25 [2.04, 2.47]	3.19 [3.10, 3.35]
UoG	4.10 [3.93, 4.26]	4.06 [3.85, 4.28]	3.28 [2.94, 3.63]	3.25 [2.97, 3.53]	2.72 [2.26, 3.18]	3.50 [3.17, 3.83]
UEW	4.13 [3.99, 4.26]	3.90 [3.74, 4.05]	2.99 [2.82, 3.16]	2.90 [2.72, 3.07]	2.54 [2.34, 2.74]	3.41 [3.27, 3.54]
KNUST	3.94 [3.55, 4.34]	3.94 [3.58, 4.30]	3.29 [3.01, 3.57]	3.12 [2.89, 3.35]	2.18 [1.83, 2.52]	3.59 [3.30, 3.88]
UDS	3.90 [3.60, 4.21]	3.78 [3.50, 4.05]	3.43 [3.17, 3.68]	3.10 [2.81, 3.39]	2.88 [2.58, 3.17]	3.50 [3.26, 3.74]
Ecological zone	<i>0.039*</i>	<i>0.414</i>	<i>0.025*</i>	<i>0.073</i>	<i>0.041*</i>	<i>0.336</i>
Coastal	4.07 [3.95, 4.20]	3.93 [3.79, 4.07]	3.23 [3.05, 3.42]	3.06 [2.85, 3.28]	2.71 [2.45, 2.96]	3.41 [3.23, 3.59]
Forest	3.86 [3.74, 3.97]	3.80 [3.68, 3.91]	2.95 [2.80, 3.10]	2.78 [2.63, 2.93]	2.33 [2.14, 2.52]	3.27 [3.13, 3.42]
Savannah	4.05 [3.85, 4.25]	3.83 [3.63, 4.03]	3.21 [3.03, 3.40]	2.96 [2.77, 3.15]	2.42 [2.23, 2.62]	3.42 [3.27, 3.57]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Positive Behavioural Expectations

Regarding positive behavioural expectations, Figure 3 shows that more than half (61.4%) of student-teachers scored average or below on setting clear behaviour expectations for classroom activities; acknowledging positive learner behaviour (54.5%); and redirecting misbehaviour, and focusing on the expected behaviour (73.0%). It is important to note that about one-quarter of student-teachers scored poorly (very poor or poor) across all the indicators used to assess positive behavioural expectations. The student-teachers' performance was much worse in redirecting misbehaviour and focusing on the expected behaviour, where about one-third performed poorly.

Considering the mean scores, Table 5 shows that overall, the student-teachers performed averagely across all the indicators used to measure positive behavioural expectations. Across all the indicators, there were no statistically significant differences between the sexes, the classes they taught and the class sizes. Nonetheless, there were statistically significant

differences among the mentoring universities. Across all the indicators of positive behavioural expectations, student-teachers from CoEs mentored by UCC scored significantly lower when compared to the other universities. Also, the results show that student-teachers from CoEs in the Savannah zone scored higher regarding setting clear behaviour expectations for classroom activities when compared to their counterparts in the Coastal and Savannah zones. The findings highlight that at the time of undertaking STS, a substantial proportion of student-teachers were either average or below average, regarding promoting a supportive learning environment and positive behavioural expectations, particularly, redirecting misbehaviour and focusing on the expected behaviour.

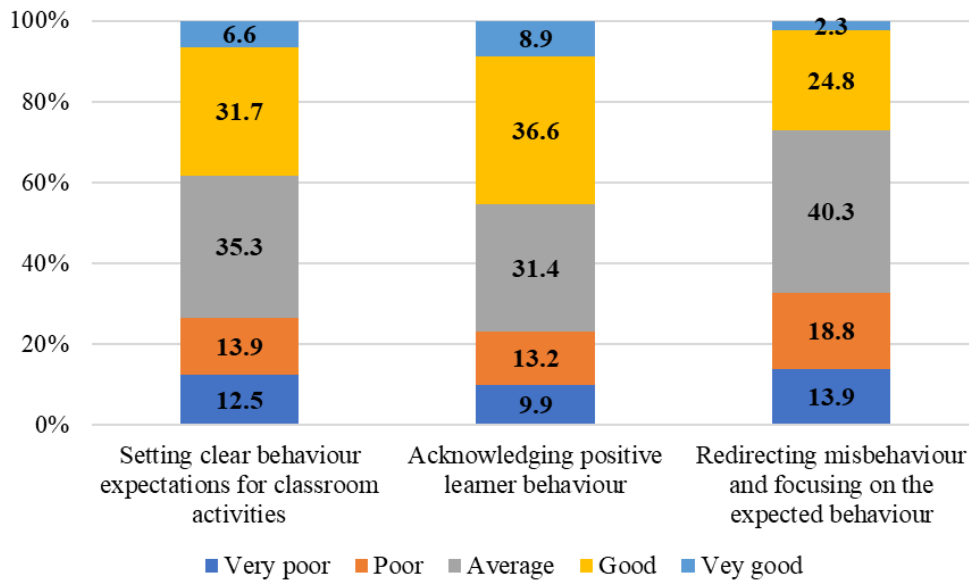


Figure 3: Percentage distribution of student-teachers and their performance on positive behavioural expectations

Table 5: Mean score of student-teachers' performance in positive behavioural expectations by background characteristics

	Setting clear behaviour expectations for classroom activities	Acknowledging positive learner behaviour	Redirecting misbehaviour and focusing on the expected behaviour
Characteristics	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	3.06 [2.93, 3.18]	3.21 [3.09, 3.34]	2.83 [2.71, 2.94]
Sex	0.822	0.172	0.942
Female	3.05 [2.90, 3.20]	3.16 [3.01, 3.31]	2.83 [2.69, 2.96]
Male	3.08 [2.85, 3.32]	3.35 [3.13, 3.57]	2.84 [2.62, 3.05]
Class type	0.057	0.103	0.214
KG	3.27 [3.03, 3.51]	3.40 [3.14, 3.65]	2.96 [2.74, 3.18]
Primary	2.99 [2.85, 3.14]	3.16 [3.02, 3.30]	2.79 [2.65, 2.92]
Class size	0.403	0.193	0.419
< 25	2.94 [2.73, 3.16]	3.31 [3.08, 3.53]	2.81 [2.60, 3.01]
25 – 40	3.11 [2.90, 3.33]	3.28 [3.07, 3.49]	2.94 [2.73, 3.14]
> 40	3.13 [2.91, 3.35]	3.05 [2.85, 3.25]	2.75 [2.56, 2.94]
Mentoring university	<0.001**	<0.001**	<0.001**
UCC	2.53 [2.30, 2.75]	2.82 [2.59, 3.05]	2.40 [2.18, 2.62]
UoG	3.50 [3.25, 3.75]	3.53 [3.21, 3.05]	3.22 [2.99, 3.45]
UEW	3.22 [3.05, 3.39]	3.36 [3.19, 3.54]	3.01 [2.85, 3.17]
KNUST	3.71 [3.27, 4.14]	3.53 [3.19, 3.88]	3.24 [2.92, 3.55]

UDS	3.63 [3.37, 3.88]	3.63 [3.34, 3.91]	3.18 [2.93, 3.42]
Ecological zone	<i><0.001**</i>	<i>0.194</i>	<i>0.060</i>
Coastal	3.12 [2.91, 3.32]	3.24 [3.02, 3.47]	2.91 [2.71, 3.10]
Forest	2.77 [2.57, 2.98]	3.10 [2.90, 3.30]	2.67 [2.47, 2.88]
Savanah	3.49 [3.28, 3.69]	3.38 [3.17, 3.59]	3.00 [2.85, 3.15]

p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval

Teaching Methodology and Delivery

Regarding student-teachers' teaching methodology and delivery, the observation focused on lesson introduction, content delivery, learner support and engagement, which are essential for lesson facilitation in foundational numeracy.

Lesson Introduction

Figure 4 presents the percentage distribution of student-teachers based on their performance in lesson introduction. The results show that 58.1% of student-teachers scored either average or below average in lesson introduction, specifically, providing an appropriate starter, linking it up with a new topic and stimulating learners' interest. Additionally, 67.4% and 43.9% of student-teachers scored average or below in explicitly articulating the objectives/performance indicator(s) of the lesson and in relating classroom activities to the objectives/performance indicator(s), respectively. It is essential to emphasise that more than one-quarter (26.4%) of student-teachers performed poorly (poor or very poor) in providing an appropriate starter, linking it up with a new topic and stimulating learners' interest, whilst more than one-third (37.7%) also scored poorly in explicitly articulating the objectives/performance indicator(s) of the lesson. Concerning relating classroom activities to the objectives/performance indicator(s), more than half (56.1%) of student teachers scored good or very good.

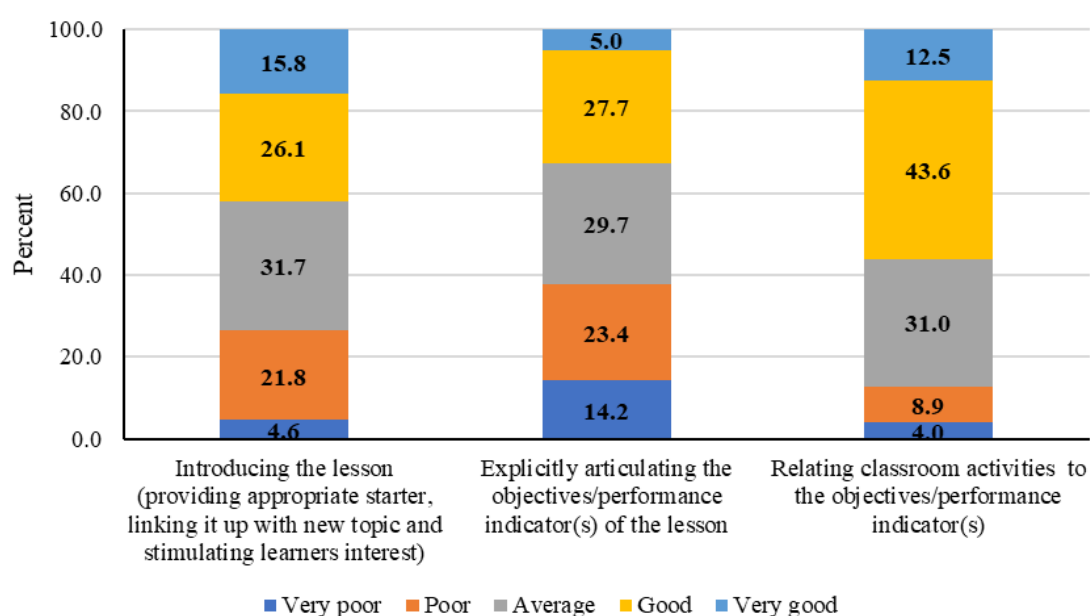


Figure 4: Percentage distribution of student-teachers and their performance in lesson introduction

In connection with the mean score of student-teachers' performance in lesson introduction, Table 6 shows that overall, student-teachers scored an average (ranged 2.60-3.39) across all the

indicators of lesson introduction with the exception of relating classroom activities to the objectives/performance indicators where they were generally good (ranged 3.40-4.19 threshold). Statistically significant female-male differentials were observed with males (rated as good) scoring higher than females (rated as average) in providing an appropriate starter, linking it up with a new topic and stimulating learners' interest and explicitly articulating the objectives/performance indicator(s) of the lesson. Across all the indicators of lesson introduction, there were no statistically significant differences in student-teachers' performance by the class they taught and the class sizes. However, the 95% confidence intervals suggest that student-teachers in CoEs mentored by UoG scored significantly higher (rated as good) in relating classroom activities to the objectives/performance indicator(s) when compared to CoEs mentored by UDS and UCC who were rated as average. Further, while CoEs in the Savannah zone scored significantly higher (rated as good) in providing an appropriate starter, linking it up with a new topic and stimulating learners' interest, than their counterparts in the coastal and forest zones who were rated as average. Finally, student-teachers in the coastal zone scored significantly higher (rated as good) in relating classroom activities to their objectives/performance indicator(s) than their counterparts from both the savannah and forest zones who were rated as average. The results highlight the need for improvement in the general lesson introduction skill.

Table 6: Mean score of student teachers' performance in lesson introduction by background characteristics

Background characteristics	Introducing the lesson (providing appropriate starter, linking it up with new topic and stimulating learners interest) Mean [95% CI]	Explicitly articulating the objectives/performance indicator(s) of the lesson Mean [95% CI]	Relating classroom activities to the objectives/performance indicator(s) Mean [95% CI]
All	3.27 [3.14, 3.39]	2.86 [2.73, 2.99]	3.52 [3.41, 3.63]
Sex	<i>0.035*</i>	<i>0.022*</i>	<i>0.144</i>
Female	3.18 [3.04, 3.33]	2.77 [2.62, 2.92]	3.47 [3.34, 3.59]
Male	3.48 [3.25, 3.72]	3.09 [2.86, 3.33]	3.65 [3.43, 3.86]
Class type	<i>0.079</i>	<i>0.845</i>	<i>0.657</i>
KG	3.47 [3.21, 3.73]	2.84 [2.58, 3.09]	3.56 [3.38, 3.74]
Primary	3.20 [3.06, 3.35]	2.87 [2.72, 3.01]	3.50 [3.37, 3.64]
Class size	<i>0.154</i>	<i>0.884</i>	<i>0.374</i>
< 25	3.11 [2.90, 3.33]	2.89 [2.69, 3.09]	3.61 [3.41, 3.81]
25 – 40	3.30 [3.09, 3.51]	2.81 [2.58, 3.04]	3.51 [3.33, 3.69]
> 40	3.40 [3.18, 3.63]	2.87 [2.64, 3.10]	3.42 [3.25, 3.60]
Mentoring university	<i>0.062</i>	<i>0.096</i>	<i>0.027*</i>
UCC	3.18 [2.98, 3.37]	2.68 [2.47, 2.89]	3.37 [3.18, 3.57]
UoG	3.03 [2.63, 3.43]	3.16 [2.79, 3.52]	3.91 [3.67, 4.15]
UEW	3.24 [3.00, 3.48]	2.86 [2.62, 3.09]	3.59 [3.44, 3.75]
KNUST	3.47 [2.99, 3.95]	3.24 [2.74, 3.73]	3.76 [3.33, 4.19]
UDS	3.70 [3.40, 4.00]	3.00 [2.67, 3.33]	3.35 [3.02, 3.68]
Ecological zone	<i>0.002**</i>	<i>0.449</i>	<i>0.016*</i>
Coastal	3.15 [2.92, 3.38]	2.94 [2.71, 3.16]	3.75 [3.58, 3.91]
Forest	3.13 [2.96, 3.30]	2.78 [2.58, 2.95]	3.44 [3.26, 3.62]
Savanah	3.66 [3.40, 3.92]	2.92 [2.64, 3.20]	3.37 [3.15, 3.58]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Content Delivery

Figure 5 presents the percentage distribution of student-teachers and their performance in content delivery. Across all the indicators used to measure student-teachers' performance in content delivery, more than 50.0% scored average or below. Considering student-teachers' performance in facilitating learners' understanding of content using multiple forms of representation, about 7 out of every 10 scored average or below, with 32% scoring poorly (poor or very poor). Similar performance was observed for using varied pedagogical strategies/techniques to facilitate learners' understanding through mathematical reasoning, orally and in writing, using appropriate mathematical language. On their performance in relating lessons to other content knowledge and learners' daily lives, 8 out of every 10 scored average or below, with more than half (54.1%) scoring poorly. Similar scoring patterns were observed for organising teaching and learning activities sequentially and logically, and for modelling how to solve a mathematical problem more than once, for learners to observe to facilitate their understanding. In this regard, slightly more than half (52.5% and 55.1%, respectively) of student-teachers performed averagely or below, with more than 1 in every 10 (12.9% and 17.5%, respectively) scoring poorly.

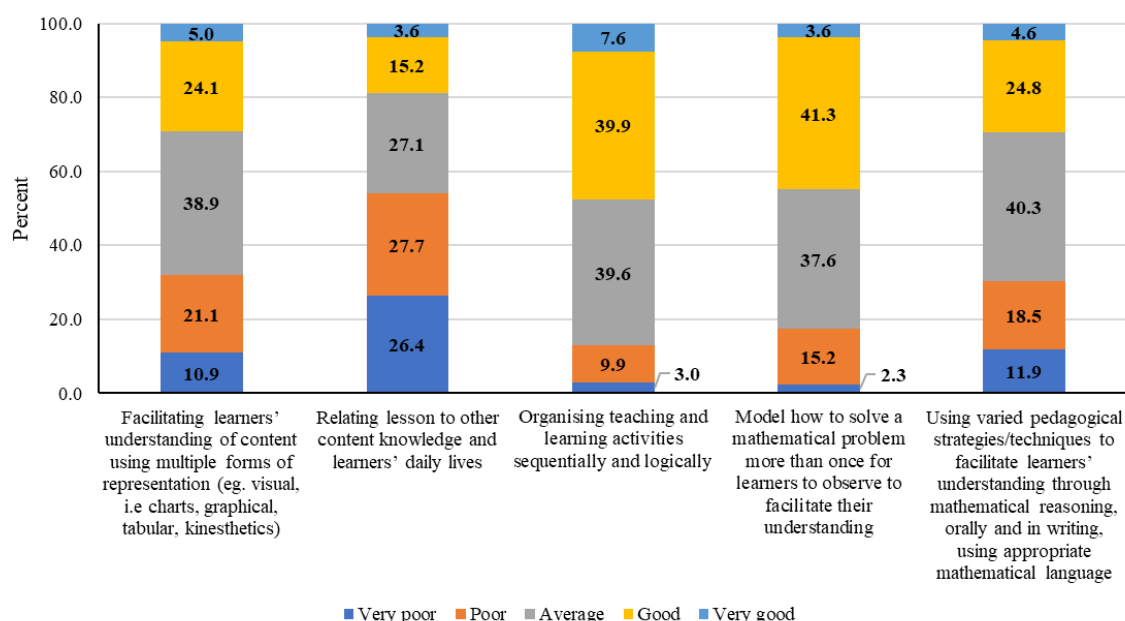


Figure 5: Percentage distribution of student-teachers and their performance in content delivery

The mean scores presented in Table 7 show that across all the indicators for content delivery, student teachers' performance overall was average, except for relating the lesson to other content knowledge and learners' daily lives, where the performance was poor. The only statistically significant differences were observed for modelling how to solve a mathematical problem more than once, for learners to observe to facilitate their understanding, where males performed significantly better (rated good) than their female counterparts who were rated as average. There was no statistically significant difference by the class taught or class size. The confidence intervals indicate that student-teachers in CoEs mentored by KNUST and UDS performed significantly better (rated average) in relating the lesson to other content knowledge and learners' daily lives when compared to those mentored by the others who were rated as

poor. UCC. Regarding organising teaching and learning activities sequentially and logically, student teachers in CoEs mentored by UoG (rated as good) performed better than their counterparts mentored by the other universities who were rated as average. Considering the ecological zones, CoEs in the Savannah zone performed significantly better (rated average) in relating the lesson to other content knowledge and learners' daily lives than their counterparts in the Coastal and Forest zones who were poor in this category. Nonetheless, those in the Coastal zone performed better (rated good) in organising teaching and learning activities sequentially and logically and modelling how to solve a mathematical problem more than once for learners to observe to facilitate their understanding; and using varied strategies/techniques to facilitate learners' understanding through mathematical reasoning, orally and in writing, using appropriate mathematical language when compared to CoEs in the Savannah and Forest zones who were rated as average.

Table 7: Mean score of student-teachers' performance in content delivery by background characteristics

Background characteristics	Facilitating learners' understanding of content using multiple forms of representation (e.g., visual, i.e. charts, graphical, tabular, kinesthetics)	Relating lesson to other content knowledge and learners' daily lives	Organising teaching and learning activities sequentially and logically	Modelling how to solve a mathematical problem more than once for learners to observe to facilitate their understanding	Using varied pedagogical strategies/techniques to facilitate learners' understanding through mathematical reasoning, orally and in writing, using appropriate mathematical language
	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	2.91 [2.79, 3.03]	2.42 [2.29, 2.55]	3.39 [3.29, 3.49]	3.29 [3.19, 3.38]	2.92 [2.80, 3.04]
Sex	<i>0.847</i>	<i>0.706</i>	<i>0.066</i>	<i>0.005**</i>	<i>0.141</i>
Female	2.90 [2.76, 3.04]	2.40 [2.25, 2.55]	3.33 [3.22, 3.45]	3.20 [3.08, 3.32]	2.86 [2.72, 3.00]
Male	2.93 [2.71, 3.15]	2.46 [2.21, 2.71]	3.54 [3.35, 3.73]	3.51 [3.35, 3.66]	3.06 [2.84, 3.28]
Class type	<i>0.137</i>	<i>0.268</i>	<i>0.575</i>	<i>0.748</i>	<i>0.367</i>
KG	3.07 [2.84, 3.30]	2.55 [2.29, 2.81]	3.34 [3.14, 3.54]	3.32 [3.11, 3.52]	3.01 [2.79, 3.24]
Primary	2.86 [2.72, 3.00]	2.38 [2.23, 2.53]	3.41 [3.29, 3.52]	3.28 [3.17, 3.39]	2.89 [2.75, 3.02]
Class size	<i>0.430</i>	<i>0.049</i>	<i>0.771</i>	<i>0.262</i>	<i>0.573</i>
< 25	2.93 [2.73, 3.12]	2.20 [1.99, 2.42]	3.36 [3.19, 3.53]	3.37 [3.21, 3.53]	2.87 [2.66, 3.09]
25 – 40	3.00 [2.78, 3.22]	2.53 [2.30, 2.76]	3.38 [3.19, 3.56]	3.18 [2.98, 3.37]	3.01 [2.81, 3.21]
> 40	2.81 [2.61, 3.01]	2.55 [2.32, 2.77]	3.44 [3.28, 3.61]	3.30 [3.16, 3.45]	2.88 [2.68, 3.08]
Mentoring university	<i>0.077</i>	<i>0.002**</i>	<i>0.002**</i>	<i>0.083</i>	<i>0.083</i>
UCC	2.74 [2.53, 2.94]	2.14 [1.92, 2.35]	3.20 [3.03, 3.38]	3.25 [3.08, 3.41]	2.71 [2.50, 2.93]
UoG	3.03 [2.64, 3.42]	2.28 [1.87, 2.35]	3.81 [3.57, 4.05]	3.59 [3.30, 3.88]	3.03 [2.61, 3.45]
UEW	3.03 [2.91, 3.56]	2.57 [2.35, 2.79]	3.55 [3.40, 3.71]	3.18 [3.01, 3.34]	3.01 [2.83, 3.19]
KNUST	3.12 [2.67, 3.56]	2.71 [2.38, 3.03]	3.35 [3.02, 3.69]	3.59 [3.35, 3.83]	3.24 [2.92, 3.55]
UDS	2.76 [2.50, 3.05]	2.88 [2.57, 3.18]	3.25 [2.99, 3.51]	3.30 [3.03, 3.57]	3.08 [2.82, 3.33]
Ecological zone	<i>0.661</i>	<i>0.007**</i>	<i>0.039*</i>	<i>0.010*</i>	<i>0.164</i>
Coastal	2.99 [2.78, 3.19]	2.29 [2.06, 2.53]	3.57 [3.42, 3.72]	3.46 [3.29, 3.63]	3.01 [2.79, 3.24]
Forest	2.86 [2.67, 3.06]	2.30 [2.10, 2.51]	3.36 [3.19, 3.53]	3.29 [3.13, 3.44]	2.79 [2.59, 2.99]
Savannah	2.89 [2.69, 3.10]	2.78 [2.58, 2.97]	3.24 [3.06, 3.41]	3.07 [2.91, 3.22]	3.03 [2.87, 3.18]

p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval

Learner Support

Figure 6 shows the percentage distribution of student-teachers' performance in learner support. The results show that more than half of the student-teachers observed, scored an average or

below across all the indicators used to assess learner support. Regarding using or adapting materials and activities to offer assistance that learners can use to overcome their challenges, 74.7% scored an average or below, with 42.0% scoring poor or poorly. More than half (57.1%) of the student-teachers scored an average or below in appreciating learners' different ways of making contributions, with almost 1 out of every 5 student-teachers showing poor performance. Further, 4 out of every 5 student-teachers performed either average or below in encouraging learners to monitor their use of strategies. In line with the preceding performance, 2 out of every 5 student-teachers performed poorly. Similar findings were observed for supporting learners to remain on tasks (without removing the challenge) to achieve the performance indicator(s), where 86.8% scored an average or below, with 48.5% scoring poorly. Concerning monitoring learners' work while they are working, about 7 out of every 10 scored average or below, including 32.7% who scored poorly.

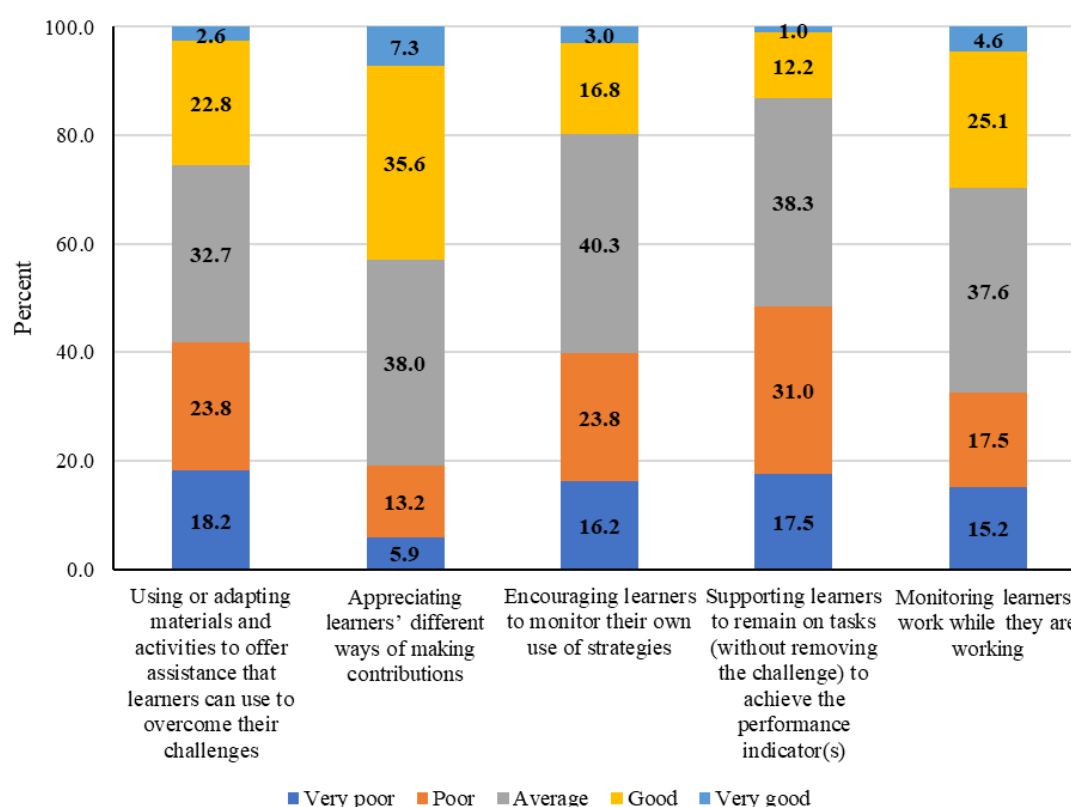


Figure 6: Percentage distribution of student-teachers and their performance in learner support

The mean scores presented in Table 8 shows that overall, the students-teachers performed averagely across all the indicators measuring learner support, except for encouraging learners to monitor their own use of strategies where they performed poorly. The only statistically significant sex difference was observed with monitoring learners' work while they are working, where male student-teachers scored higher compared to female student-teachers. However, both were at the average score level (2.60-3.39 threshold). There were no statistically significant differences in learner support provided by the student-teachers regardless of the class taught and the class size with the exception of appreciating learners' different ways of making contributions where student-teachers in KG were rated as good as against their counterparts in primary who were average on the same indicator. All the indicators used to assess learner support provided by the student-teachers exhibited statistically significant differences across the mentoring universities. The 95% confidence intervals indicate that

student-teachers in CoEs mentored by KNUST performed significantly better (rated as average) than those mentored by UCC (rated as poor) in using or adapting materials and activities to offer assistance that learners can use to overcome their challenges. However, the scores were not significantly different among those mentored by UoG, UEW, KNUST and UDS. Regarding appreciating learners' different ways of making contributions, student-teachers in CoEs mentored by both UCC and UEW scored significantly lower (rated as average) when compared to those mentored by other universities who were rated as good. Similar findings were observed for encouraging learners to monitor their own use of strategies and supporting learners to remain on tasks (without removing the challenge) to achieve the performance indicator(s) where CoEs mentored by UCC were rated poor as compared to their other counterparts mentored by the other four universities, who were average on this indicator. Similar significant difference (average vrs poor) was recorded for supporting learners to remain on tasks (without removing the challenge) to achieve the performance indicator(s) as well as monitoring learners' work while they are working, for student-teachers in CoEs mentored by other universities as compared to that of UCC. Further, the results show that student-teachers in CoEs in the Coastal zone and Savannah zones scored significantly higher (rated as good) in appreciating learners' different ways of making contributions, encouraging learners to monitor their own use of strategies, and supporting learners to remain on tasks (without removing the challenge) to achieve the performance indicator(s) than those from the Forest zone who were rated as average on the three aforementioned indicators. However, only students from the Savannah zone were rated as poor in monitoring learners' work while they are working.

Table 8: Mean score of student teachers' performance in learner support by background characteristics

Background characteristics	Using or adapting materials and activities to offer assistance that learners can use to overcome their challenges	Appreciating learners' different ways of making contributions	Encouraging learners to monitor their own use of strategies	Supporting learners to remain on tasks (without removing the challenge) to achieve the performance indicator(s)	Monitoring learners' work while they are working
	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	2.68 [2.56, 2.80]	3.25 [3.14, 3.36]	2.48 [2.37, 2.59]	2.67 [2.55, 2.78]	2.86 [2.74, 2.99]
Sex	0.888	0.631	0.106	0.098	0.041*
Female	2.67 [2.53, 2.82]	3.23 [3.11, 3.36]	2.43 [2.30, 2.55]	2.61 [2.47, 2.74]	2.78 [2.64, 2.93]
Male	2.69 [2.45, 2.94]	3.29 [3.07, 3.52]	2.62 [2.41, 2.84]	2.82 [2.60, 3.04]	3.07 [2.83, 3.31]
Class type	0.68	0.001**	0.557	0.862	0.473
KG	2.73 [2.49, 2.96]	3.58 [3.37, 3.78]	2.42 [2.21, 2.64]	2.68 [2.46, 2.91]	2.95 [2.71, 3.18]
Primary	2.67 [2.52, 2.81]	3.15 [3.02, 3.28]	2.50 [2.38, 2.62]	2.66 [2.53, 2.80]	2.84 [2.69, 2.98]
Class size	0.854	0.694	0.789	0.472	0.263
< 25	2.72 [2.50, 2.94]	3.29 [3.10, 3.48]	2.46 [2.29, 2.64]	2.69 [2.49, 2.90]	2.93 [2.71, 3.15]
25 – 40	2.68 [2.46, 2.89]	3.28 [3.09, 3.47]	2.45 [2.25, 2.65]	2.74 [2.53, 2.95]	2.95 [2.73, 3.17]
> 40	2.64 [2.43, 2.85]	3.18 [2.99, 3.38]	2.54 [2.35, 2.72]	2.57 [2.37, 2.76]	2.72 [2.52, 2.92]
Mentoring university	0.003**	<0.001**	<0.001**	<0.001**	0.009**
UCC	2.37 [2.15, 2.60]	2.93 [2.73, 3.14]	2.16 [1.97, 2.36]	2.30 [2.08, 2.51]	2.59 [2.36, 2.82]
UoG	2.93 [2.54, 3.33]	3.53 [3.23, 3.84]	2.91 [2.55, 3.27]	3.13 [2.73, 3.52]	3.22 [2.86, 3.58]
UEW	2.84 [2.66, 3.45]	3.39 [3.23, 3.54]	2.60 [2.46, 2.75]	2.82 [2.68, 2.97]	3.03 [2.84, 3.22]
KNUST	3.06 [2.66, 3.45]	3.76 [3.56, 3.97]	2.94 [2.68, 3.21]	2.94 [2.58, 3.30]	2.82 [2.52, 3.13]
UDS	2.83 [2.50, 3.15]	3.43 [3.13, 3.72]	2.60 [2.34, 2.86]	2.90 [2.63, 3.17]	3.00 [2.72, 3.28]
Ecological zone	0.084	<0.001**	0.001**	0.001**	0.246
Coastal	2.82 [2.59, 3.05]	3.40 [3.22, 3.58]	2.69 [2.49, 2.89]	2.96 [2.73, 3.18]	3.02 [2.79, 3.25]

Forest	2.52 [2.32, 2.73]	2.93 [2.75, 3.11]	2.25 [2.08, 2.42]	2.45 [2.27, 2.64]	2.80 [2.59, 3.00]
Savannah	2.78 [2.59, 2.96]	3.62 [3.44, 3.80]	2.62 [2.45, 2.78]	2.67 [2.52, 2.82]	2.29 [2.62, 2.96]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Learner Engagement

Table 9 presents the percentage distribution of student-teachers and the number of times they asked learners to answer questions in pairs (think-pair-share) or small groups by background characteristics. The results show that more than 3 of every 5 student-teachers did not ask learners such a question. Only 35.4% of student-teachers asked learners to answer questions in pairs (think-pair-share) or small groups, and just 15.2% did so four or more times. The frequency of such questioning did not vary significantly by student-teachers' sex, the grade level taught, or class size; however, it did vary by mentoring university and ecological zone, with comparatively larger proportions from CoEs mentored by UoG and those located in the Coastal zone asking such questions.

Table 9: Percentage distribution of student-teachers and the number of times they asked learners to answer a question in pairs (think-pair-share) or small groups by background characteristics

Background characteristics	Never	Once	Two times	Three times	Four or more times
All	64.7	7.3	5.6	7.3	15.2
Sex					
Female	65.1	8.7	6.0	7.3	12.8
Male	63.5	3.5	4.7	7.1	21.2
Class type					
KG	68.5	8.2	6.8	5.5	11.0
Primary	63.5	7.0	5.2	7.8	16.5
Class size					
< 25	57.4	10.2	6.5	11.1	14.8
25 – 40	65.6	6.3	4.2	6.3	17.7
> 40	71.7	5.1	6.1	4.0	13.1
Mentoring university**					
UCC	72.0	4.2	2.5	3.4	17.8
UoG	53.1	3.1	3.1	15.6	25.0
UEW	56.3	10.4	11.5	9.4	12.5
KNUST	100.0	0.0	0.0	0.0	0.0
UDS	57.5	15.0	5.0	10.0	12.5
Ecological zone**					
Coastal	42.1	7.4	5.3	9.5	35.8
Forest	74.2	6.1	6.1	6.8	6.8
Savannah	76.3	9.2	5.3	5.3	3.9

** $p < 0.01$; * $p < 0.05$

Table 10 presents the percentage distribution of student-teachers and the number of times they allowed learners to ask questions by background characteristics. The results show that more than 4 of every 5 student-teachers did not allow learners to ask questions. Only 16.5% of student-teachers allowed learners to ask questions, with just 3.0% allowing so four or more times. While this practice did not differ significantly by student teachers' sex, the grade level taught, or class size, it did vary by mentoring university and ecological zone. Student-teachers from CoEs mentored by UoG and those located in the Coastal zone were more likely to allow questions from learners. The picture projected by the results signify a minimal use of collaborative approaches by student-teachers in problem-solving approaches in their lessons. This could hinder the ability of learners to build group cohesion through cooperative learning and tolerance among themselves. Again, other benefits such as group leadership development tendencies and collaborative elaborateness of what is being learned through individual contributions to generate, ideate and co-create knowledge among themselves will be missing in the development of the learner.

Table 10: Percentage distribution of student teachers and the number of times they allowed learners to ask questions by background characteristics

Background characteristics	Never	Once	Two times	Three times	Four or more times
All	83.5	9.2	2.0	2.3	3.0
Sex					
Female	84.4	10.6	1.8	1.8	1.4
Male	81.2	5.9	2.4	3.5	7.1
Class type					
KG	91.8	2.7	1.4	1.4	2.7
Primary	80.9	11.3	2.2	2.6	3.0
Class size					
< 25	84.3	7.4	0.9	1.9	5.6
25 – 40	79.2	13.5	3.1	2.1	2.1
> 40	86.9	7.1	2.0	3.0	1.0
Mentoring university**					
UCC	88.1	6.8	1.7	0.8	2.5
UoG	65.6	15.6	0.0	6.3	12.5
UEW	75.0	15.6	4.2	3.1	2.1
KNUST	100.0	0.0	0.0	0.0	0.0
UDS	97.5	0.0	0.0	2.5	0.0
Ecological zone**					
Coastal	67.4	17.9	1.1	5.3	8.4
Forest	85.6	8.3	3.8	1.5	0.8
Savannah	100.0	0.0	0.0	0.0	0.0

**p < 0.01; *p < 0.05

Teaching and Learning Resources Used by Student-Teachers

Figure 7 shows the percentage distribution of student-teachers and the teaching and learning resources they used during the lessons observed. Most student-teachers, approximately 3 out of every five, used counting objects. However, a marginal proportion (15.5%) did not use any teaching or learning resources at all, while only 1.3% of those observed used varied objects.

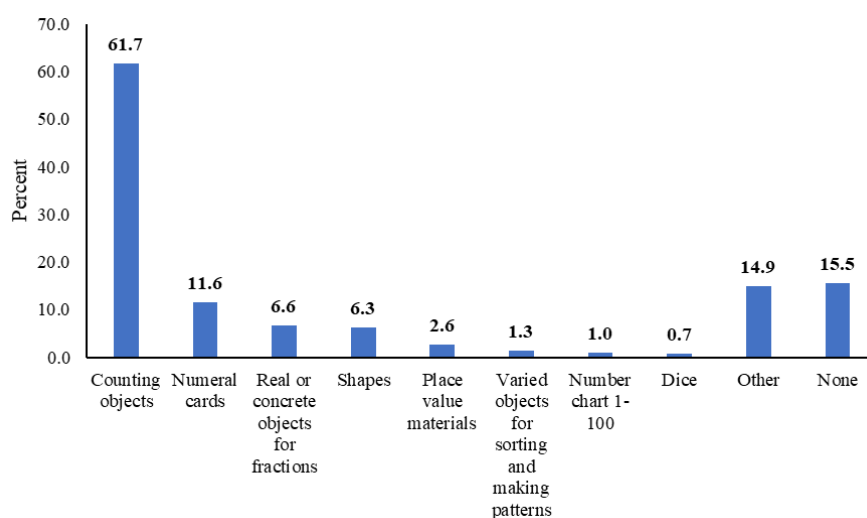


Figure 7: Teaching and learning resources used during the lesson or discussion

The results suggest over-reliance on counting objects as a major or dominant teaching and learning resource for student-teachers as compared to the others. It raises concern as to whether the non-availability of the other teaching and learning resources or the lack of competence on the part of student-teachers in using them for pedagogical practices, are the fundamental reasons for their under utilisation.

Assessment

Figure 8 presents the percentage distribution of student-teachers' performance in classroom assessments. The figure shows a mixed performance by the student-teachers. While more than half of student-teachers' performance was rated as good or very good in linking assessments to objectives (54,5%) and setting timely assessments (56.7%), less than 2 in every 5 were assessed as being good or very good in encouraging learners' self-reflection on their knowledge and learning (17.85) and using questions, prompts or other strategies to determine learners' level of understanding (18.5%). It is worthwhile to note that 13.9% and 12.6% were rated as poor or very poor in linking assessments to objectives and setting timely assessments, respectively. Nonetheless, 49.5% and 43.9% were rated as poor or very poor in encouraging learners' self-reflection on their knowledge and learning, and using questions, prompts or other strategies to determine learners' level of understanding. These results highlight a very weak achievement in the latter two indicators used to assess student teachers' performance in learners' assessment.

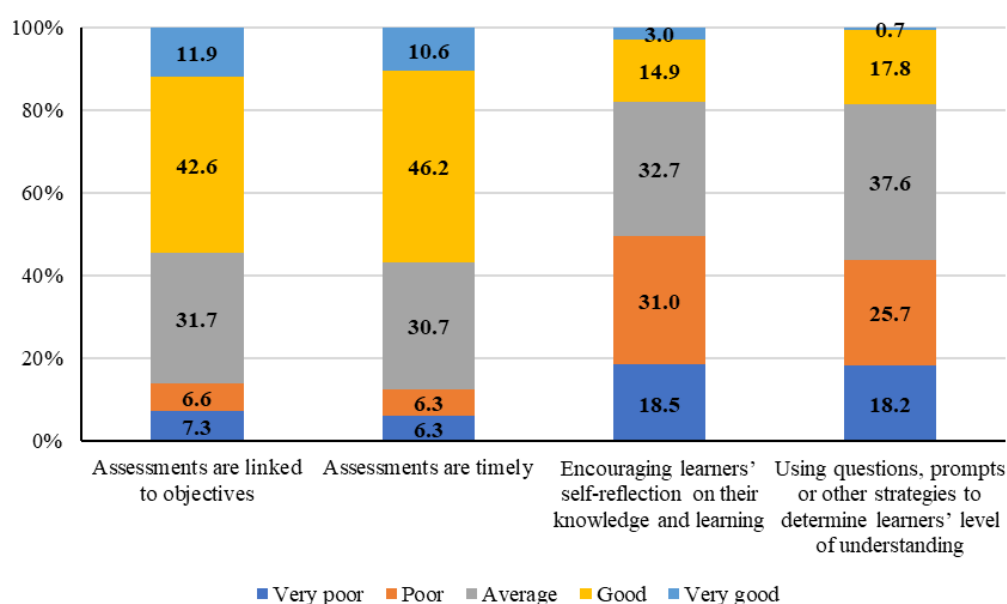


Figure 8: Percentage distribution of student-teachers' performance in assessment

The overall mean scores presented in Table 11 reveals that while student-teachers' ability to link assessments to objectives, and setting timely assessments were rated as good, their competence in encouraging learners' self-reflection on their knowledge and learning and using questions, prompts or other strategies to determine learners' level of understanding were rated as poor. The sex of the student-teachers and the size of the class they taught did not show any differences in their performance. The type of class they taught only impacted on encouraging learners' self-reflection on their knowledge and learning, where those who taught primary scored statistically significantly higher (rated as average) than those who taught KG (rated as

poor). There were statistically significant differences in the performance of the student-teachers across all the indicators used to assess their achievement in assessments based on the universities to which their colleges were affiliated. Regarding linking assessments to objectives, student teachers in CoEs mentored by UoG, UEW, UDS and KNUST performed significantly better (rated as good) than their counterparts mentored by UCC who were rated as average. Concerning setting timely assessments, those mentored by UoG performed significantly and meaningfully better (rated a good) than only those mentored by UCC who were again rated as average on this indicator. Student-teachers in CoEs mentored by UoG and UEW performed significantly better (rated as average) in encouraging learners' self-reflection on their knowledge and learning when compared to those mentored by UCC and UDS who were rated as poor. Additionally, student teachers in CoEs mentored by UEW, KNUST and UDS significantly outperformed (rated as average) those mentored by UCC (rated as poor) in using questions, prompts or other strategies to determine learners' level of understanding. Statistically significant differences across the ecological zones were also observed in the performance of the student-teachers. The results show that student-teachers in CoEs located in the Coastal zone performed significantly better (rated as good and average respectively) in linking assessments to objectives and encouraging learners' self-reflection on their knowledge and learning when compared to those in CoEs located in the Forest zone (rated as average and poor respectively) on the two aforementioned indicators. On setting timely assessments, those in the Coastal zone performed significantly better (rated as good) than those in the Savannah zone who were rated as average. Finally, CoEs in the Savannah zone significantly outperformed (rated as average) those in the Forest zone (rated as poor) in using questions, prompts or other strategies to determine learners' level of understanding.

Table 11: Mean score of student teachers' performance in assessment by background characteristics

	Assessments are linked to objectives	Assessments are timely	Encouraging learners' self-reflection on their knowledge and learning	Using questions, prompts or other strategies to determine learners' level of understanding
Background Characteristics	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	3.45 [3.34, 3.57]	3.49 [3.37, 3.60]	2.53 [2.41, 2.65]	2.57 [2.46, 2.68]
Sex	<i>0.118</i>	<i>0.014*</i>	<i>0.704</i>	<i>0.228</i>
Female	3.39 [3.26, 3.53]	3.40 [3.27, 3.53]	2.51 [2.37, 2.66]	2.53 [2.39, 2.66]
Male	3.60 [3.39, 3.81]	3.71 [3.51, 3.90]	2.56 [2.35, 2.78]	2.68 [2.48, 2.88]
Class type	<i>0.191</i>	<i>0.460</i>	<i>0.046*</i>	<i>0.928</i>
KG	3.32 [3.11, 3.52]	3.41 [3.21, 3.61]	2.32 [2.09, 2.54]	2.56 [2.34, 2.78]
Primary	3.50 [3.36, 3.63]	3.51 [3.38, 3.64]	2.60 [2.46, 2.73]	2.57 [2.44, 2.71]
Class size	<i>0.864</i>	<i>0.156</i>	<i>0.973</i>	<i>0.796</i>
< 25	3.48 [3.28, 3.69]	3.63 [3.42, 3.84]	2.51 [2.31, 2.71]	2.54 [2.33, 2.74]
25 - 40	3.41 [3.21, 3.60]	3.43 [3.25, 3.61]	2.54 [2.34, 2.75]	2.55 [2.36, 2.74]
> 40	3.46 [3.26, 3.67]	3.38 [3.21, 3.56]	2.54 [2.32, 2.75]	2.63 [2.43, 2.82]
Mentoring university	<i><0.001**</i>	<i>0.005**</i>	<i><0.001**</i>	<i>0.001**</i>
UCC	3.03 [2.80, 3.25]	3.26 [3.04, 3.49]	2.19 [1.98, 2.41]	2.27 [2.05, 2.49]
UoG	3.94 [3.72, 4.15]	3.94 [3.70, 4.17]	3.03 [2.73, 3.33]	2.66 [2.29, 3.03]
UEW	3.75 [3.59, 3.91]	3.60 [3.46, 3.75]	2.77 [2.58, 2.96]	2.72 [2.57, 2.87]

KNUST	3.76 [3.45, 4.08]	3.65 [3.41, 3.88]	2.65 [2.36, 2.94]	3.00 [2.76, 3.24]
UDS	3.48 [3.24, 3.71]	3.43 [3.16, 3.69]	2.48 [2.23, 2.72]	2.85 [2.61, 3.09]
Ecological zone	<i>0.027*</i>	<i>0.007**</i>	<i>0.002**</i>	<i>0.019*</i>
Coastal	3.61 [3.43, 3.79]	3.74 [3.57, 3.91]	2.83 [2.61, 3.05]	2.57 [2.36, 2.78]
Forest	3.27 [3.38, 3.75]	3.42 [3.22, 3.62]	2.33 [2.14, 2.52]	2.42 [2.23, 2.61]
Savannah	3.57 [3.38, 3.75]	3.29 [3.13, 3.45]	2.49 [2.31, 2.67]	2.83 [2.68, 2.98]

*p-values in italics; ** $p < 0.01$; * $p < 0.05$; CI – Confidence Interval*

Feedback

Figure 9 presents the percentage distribution of student-teachers' performance in providing feedback to learners. The figure shows that more than 3 out of every 5 (64.8%) student-teachers performed average or below in providing specific comments or prompts that help clarify learners' misunderstanding while 24.5% performed poorly. Student-teachers providing specific comments or prompts that help identify learners' successes were 63.8%, with 21.2% performing poorly. Slightly more than half (54.4%) of the student-teachers performed at average or below in providing timely feedback to learners as part of classroom routines. Student-teachers' performance in providing learners with opportunities for re-engagement and revision was particularly weak, given that more than 7 out of every 10 of them achieved scores that were average or below, with 36.0% scoring at poor or very poor.

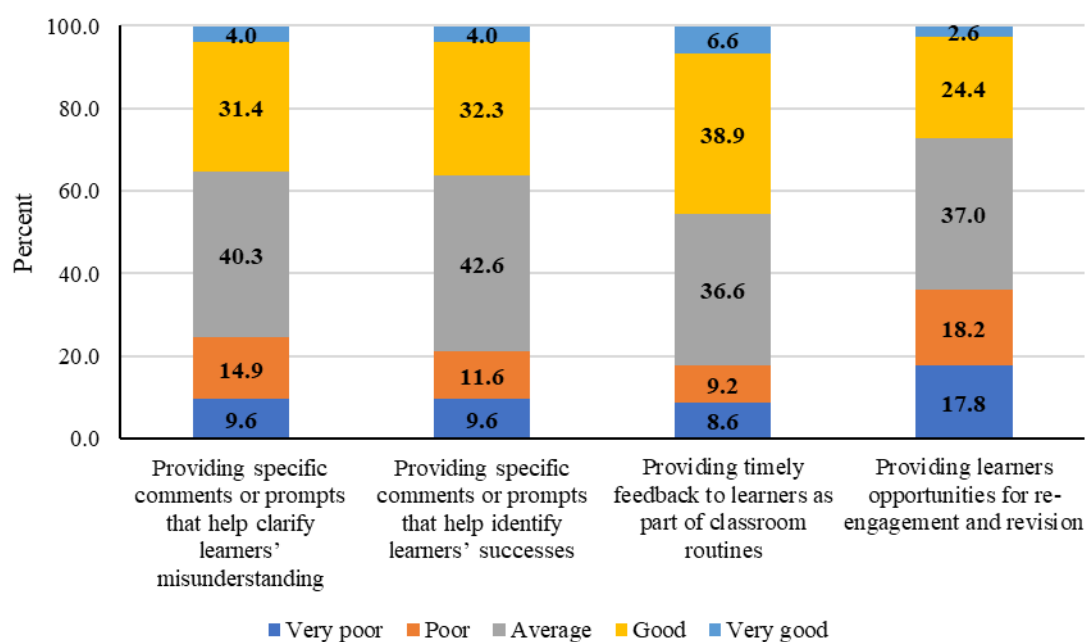


Figure 9: Percentage distribution of student teachers' performance in providing feedback

Table 12 presents student-teachers' mean scores in providing feedback by background characteristics. The results show that student-teachers' performance in providing feedback to learners was rated within the average range across all the indicators. Statistically significant sex differentials were observed in providing specific comments or prompts that help identify learners' successes and providing timely feedback to learners as part of classroom routines, with males scoring significantly higher than females. However, both sexes were rated as average for providing specific comments or prompts that help identify learners' successes. There were differences in providing timely feedback to learners as part of classroom routines

where males were rated as good but females as average. The class they taught and the size of the class did not impact performance in providing feedback. Nonetheless, statistically significant differentials by the mentoring university and ecological zone were observed across all the indicators used to assess the provision of feedback. Regarding providing specific comments or prompts that help clarify learners' misunderstanding, CoEs mentored by KNUST scored significantly higher (were rated as good) than all the CoEs affiliated to other institutions (rated as average). In terms of providing specific comments or prompts that help identify learners' successes, CoEs affiliated to UoG and KNUST were rated as good, and were statistically significantly better than the other CoEs who were rated as average. Similar statistical differences in the results were found for providing timely feedback to learners as part of classroom routines. In terms of providing learners opportunities for re-engagement and revision, student-teachers in CoEs mentored by UCC scored statistically significantly lower (poor rating) when compared to student-teachers in CoEs mentored by other universities who were rated as average (UEW and UDS) or good (UoG and KNUST). Considering the ecological zone, even though student-teachers in CoEs located in the Coastal and Savannah zones, achieved statistically significantly higher marks in providing specific comments or prompts that help clarify learners' misunderstandings, providing specific comments or prompts that help identify learners' successes, however, their performances were equally rated as average (from 2.60-3.39). However, statistical difference was found between Coastal zone who were rated as good and their counterparts in the other two zones rated as average on providing timely feedback to learners as part of classroom routine. Similar differences were found between the student-teachers in CoEs located Savannah zone who were rated as average on providing learners opportunities for re-engagement and revision, as compared to those located in the Forest and Coastal zones who had poor rating on the same.

Table 12: Mean score of student teachers' performance in providing feedback by background characteristics

Background Characteristics	Providing specific comments or prompts that help clarify learners' misunderstandings Mean [95% CI]	Providing specific comments or prompts that help identify learners' successes Mean [95% CI]	Providing timely feedback to learners as part of classroom routines Mean [95% CI]	Providing learners opportunities for re-engagement and revision Mean [95% CI]
All	3.05 [2.94, 3.17]	3.10 [2.98, 3.21]	3.26 [3.14, 3.37]	2.76 [2.64, 2.88]
Sex	<i>0.110</i>	<i>0.029*</i>	<i>0.003**</i>	<i>0.144</i>
Female	3.00 [2.87, 3.12]	3.02 [2.89, 3.15]	3.15 [3.02, 3.29]	2.70 [2.56, 2.84]
Male	3.20 [2.97, 3.43]	3.39 [3.08, 3.51]	3.53 [3.32, 3.73]	2.91 [2.66, 3.15]
Class type	<i>0.491</i>	<i>0.496</i>	<i>0.616</i>	<i>0.675</i>
KG	3.12 [2.91, 3.33]	3.16 [2.96, 3.36]	3.21 [2.99, 3.43]	2.71 [2.47, 2.96]
Primary	3.03 [2.90, 3.16]	3.07 [2.94, 3.21]	3.27 [3.14, 3.41]	2.77 [2.63, 2.92]
Class size	<i>0.799</i>	<i>0.789</i>	<i>0.536</i>	<i>0.778</i>
< 25	3.10 [2.90, 3.30]	3.15 [2.95, 3.35]	3.34 [3.12, 3.56]	2.81 [2.58, 3.03]
25 – 40	3.04 [2.85, 3.23]	3.06 [2.88, 3.25]	3.23 [3.04, 3.41]	2.70 [2.49, 2.91]
> 40	3.01 [2.81, 3.21]	3.07 [2.88, 3.26]	3.19 [3.01, 3.38]	2.77 [2.56, 2.97]
Mentoring university	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>
UCC	2.70 [2.49, 2.92]	2.71 [2.50, 2.92]	2.98 [2.75, 3.22]	2.34 [2.11, 2.56]
UoG	3.31 [2.98, 3.65]	3.66 [3.43, 3.88]	3.88 [3.63, 4.12]	3.13 [2.78, 3.45]
UEW	3.23 [3.08, 3.38]	3.24 [3.10, 3.38]	3.35 [3.23, 3.47]	2.95 [2.76, 3.14]
KNUST	3.53 [3.19, 3.87]	3.53 [3.23, 3.83]	3.53 [3.23, 3.83]	3.41 [3.12, 3.71]
UDS	3.25 [2.99, 3.51]	3.25 [2.99, 3.51]	3.30 [3.03, 3.57]	2.98 [2.73, 3.22]

Ecological zone	<i>0.021*</i>	<i>0.001**</i>	<i><0.001**</i>	<i><0.001**</i>
Coastal	3.19 [3.00, 3.39]	3.37 [3.20, 3.54]	3.62 [3.43, 3.81]	2.97 [2.75, 3.19]
Forest	2.87 [2.67, 3.08]	2.88 [2.68, 3.08]	3.09 [2.89, 3.30]	2.46 [2.26, 2.67]
Savannah	3.20 [3.04, 3.36]	3.13 [2.97, 3.29]	3.09 [2.96, 3.25]	3.01 [2.85, 3.17]

*p-value in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Critical Thinking

Figure 10 presents the percentage distribution of student-teachers according to their performance in critical thinking during the foundational numeracy lesson. Across all the indicators used to measure student-teachers' critical thinking, the figure shows that a substantial proportion performed average or below. Less than 1 out of every 5 (18.8%) were rated good or very good in asking open-ended questions for learners to apply what they've learned and build on prior knowledge, and providing an opportunity for learners to connect different ideas and apply prior knowledge to new contexts (13.2%). Only 1 out of every 25 were rated as good or very good in providing opportunities for learners to ask open-ended questions. Also, 15.2% were rated as good or very good in encouraging learners to actively listen to their peers and build on their ideas with 18.1% creating the environment for learners to engage with challenging ideas to make their own decisions. These results reveal a significant weakness in student-teachers' promotion of critical thinking skills during foundational numeracy lessons.

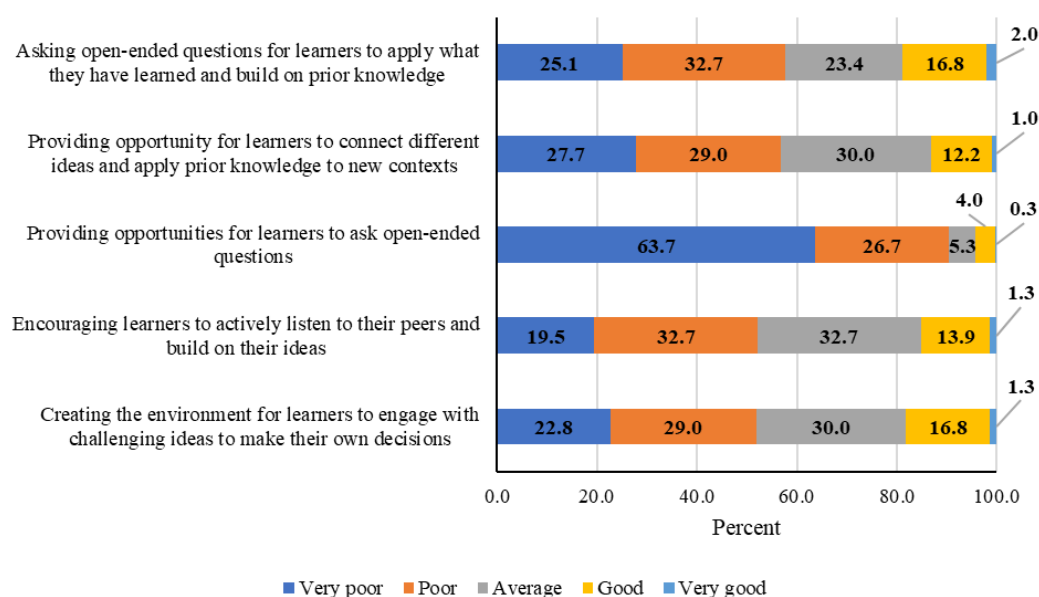


Figure 10: Percentage distribution of student teachers' performance in critical thinking

The overall mean scores displayed in Table 13 underscore the consistently poor performance of student-teachers for all the indicators used to assess their promotion of critical thinking during foundational numeracy lessons. Of particular concern was providing opportunities for learners to ask open-ended questions, where the overall score was within the range of very poor. No statistically significant differences were observed across all the scores for the indicators used to examine student-teachers' promotion of critical thinking based on their sex, the class they taught and the class size. However, certain aspects of student-teachers' critical thinking promotion scores differed significantly by the mentoring university and the ecological zone of the CoE. Regarding asking open-ended questions for learners to apply what they've learned and build on prior knowledge, student-teachers in CoEs mentored by UoG performed

significantly better than those mentored by the other universities. This is because they were rated as average, whereas all the other student-teachers were rated as poor. Additionally, student-teachers in CoEs mentored by UCC scored significantly lower (were rated poor) in encouraging learners to actively listen to their peers and build on their ideas and creating the environment for learners to engage with challenging ideas to make their own decisions, when compared to those mentored by the other universities who performed averagely on this indicator. Similar results were recorded for creating the environment for learners to engage with challenging ideas to make their own decisions with KNUST, UoG, UEW and UDS having a rating of average as compared to poor rating for UCC. Regarding ecological zone, the results show that CoEs located in the Coastal zone scored significantly higher (rated average) in asking open-ended questions for learners to apply what they've learned and build on prior knowledge, encouraging learners to actively listen to their peers and build on their ideas, as well as creating the environment for learners to engage with challenging ideas to make their own decisions, than the other CoEs in the Forest and Savannah zones who were rated poor in all three indicators. The results highlight a very weak performance in student-teachers' ability to promote critical thinking in foundational numeracy lessons, with those mentored by UCC in particular recording significantly lower scores.

Table 13: Mean score of student-teachers' performance in promoting critical thinking and feedback according to background characteristics

Background characteristics	Asking open-ended questions for learners to apply what they've learned and build on prior knowledge Mean [95% CI]	Providing an opportunity for learners to connect different ideas and apply prior knowledge to new contexts Mean [95% CI]	Providing opportunities for learners to ask open-ended questions Mean [95% CI]	Encouraging learners to actively listen to their peers and build on their ideas Mean [95% CI]	Creating the environment for learners to engage with challenging ideas to make their own decisions Mean [95% CI]
All	2.38 [2.26, 2.50]	2.30 [2.18, 2.41]	1.50 [1.41, 1.60]	2.45 [2.34, 2.56]	2.45 [2.33, 2.57]
Sex	<i>0.21</i>	<i>0.280</i>	<i>0.622</i>	<i>0.455</i>	<i>0.732</i>
Female	2.33 [2.18, 2.48]	2.26 [2.12, 2.39]	1.49 [1.39, 1.59]	2.42 [2.29, 2.56]	2.44 [2.29, 2.58]
Male	2.51 [2.28, 2.74]	2.40 [2.17, 2.63]	1.54 [1.36, 1.72]	2.52 [2.32, 2.72]	2.48 [2.26, 2.70]
Class type	<i>0.092</i>	<i>0.544</i>	<i>0.096</i>	<i>0.764</i>	<i>0.823</i>
KG	2.19 [1.95, 2.43]	2.23 [2.00, 2.46]	1.37 [1.20, 1.54]	2.48 [2.24, 2.72]	2.42 [2.19, 2.66]
Primary	2.44 [2.30, 2.58]	2.32 [2.18, 2.45]	1.55 [1.44, 1.65]	2.44 [2.31, 2.57]	2.46 [2.32, 2.60]
Class size	<i>0.818</i>	<i>0.280</i>	<i>0.967</i>	<i>0.869</i>	<i>0.513</i>
< 25	2.40 [2.19, 2.61]	2.19 [2.00, 2.37]	1.52 [1.36, 1.67]	2.44 [2.26, 2.63]	2.41 [2.21, 2.61]
25 – 40	2.42 [2.20, 2.63]	2.42 [2.21, 2.62]	1.49 [1.33, 1.65]	2.49 [2.28, 2.70]	2.55 [2.34, 2.77]
> 40	2.32 [2.11, 2.54]	2.30 [2.09, 2.52]	1.51 [1.35, 1.66]	2.41 [2.22, 2.61]	2.39 [2.18, 2.61]
Mentoring university	<i>0.007**</i>	<i>0.128</i>	<i>0.196</i>	<i><0.001**</i>	<i><0.001**</i>
UCC	2.14 [1.93, 2.36]	2.12 [1.91, 2.33]	1.40 [1.27, 1.53]	2.05 [1.86, 2.25]	2.05 [1.84, 2.56]
UoG	2.91 [2.55, 3.26]	2.59 [2.20, 2.99]	1.69 [1.36, 2.01]	3.00 [2.72, 3.30]	2.81 [2.43, 3.19]
UEW	2.46 [2.24, 2.67]	2.35 [2.13, 2.81]	1.61 [1.45, 1.78]	2.65 [2.48, 2.82]	2.65 [2.46, 2.83]
KNUST	2.29 [1.97, 2.62]	2.47 [2.13, 2.81]	1.47 [1.13, 1.68]	2.65 [2.24, 3.06]	2.88 [2.47, 3.29]
UDS	2.50 [2.20, 2.80]	2.38 [2.10, 2.65]	1.43 [1.17, 1.68]	2.63 [2.35, 2.90]	2.68 [2.42, 2.93]
Ecological zone	<i>0.016*</i>	<i>0.299</i>	<i>0.065</i>	<i>0.002**</i>	<i>0.006**</i>
Coastal	2.60 [2.37, 2.83]	2.42 [2.20, 2.65]	1.66 [1.49, 1.83]	2.75 [2.55, 2.94]	2.66 [2.44, 2.88]
Forest	2.37 [2.17, 2.57]	2.20 [2.02, 2.39]	1.43 [1.30, 1.56]	2.28 [2.10, 2.47]	2.23 [2.04, 2.43]
Savannah	2.12 [1.93, 2.30]	2.30 [2.12, 2.48]	1.43 [1.25, 1.62]	2.37 [2.19, 2.55]	2.55 [2.37, 2.73]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Socio-Emotional Skills

Autonomy

Promoting autonomy in numeracy at the foundational level is important as it fosters independent thinking, helps develop problem-solving skills and a sustained enthusiasm for acquiring knowledge. Figure 11 shows the percentage distribution of student-teachers' performance in promoting learners' autonomy in foundational numeracy. The figure shows that more than 4 out of every 5 student-teachers were rated average or below in providing learners with choices with 59.4% rated as poor or very poor. On creating an environment that encourages learners to voluntarily participate in classroom learning, 58.4% were rated average and below whilst 23.1% were poor to very poor. On the other hand, 82.1% and 56.7% of student-teachers were at least average and poor to very poor, respectively, on providing learners with opportunity to take on roles in the classroom. Student-teachers whose performance was at least average in creating a safe and child-friendly classroom climate for learners to freely express their ideas and understandings were 52.2% whilst those assessed as poor and below constituted 17.2%.

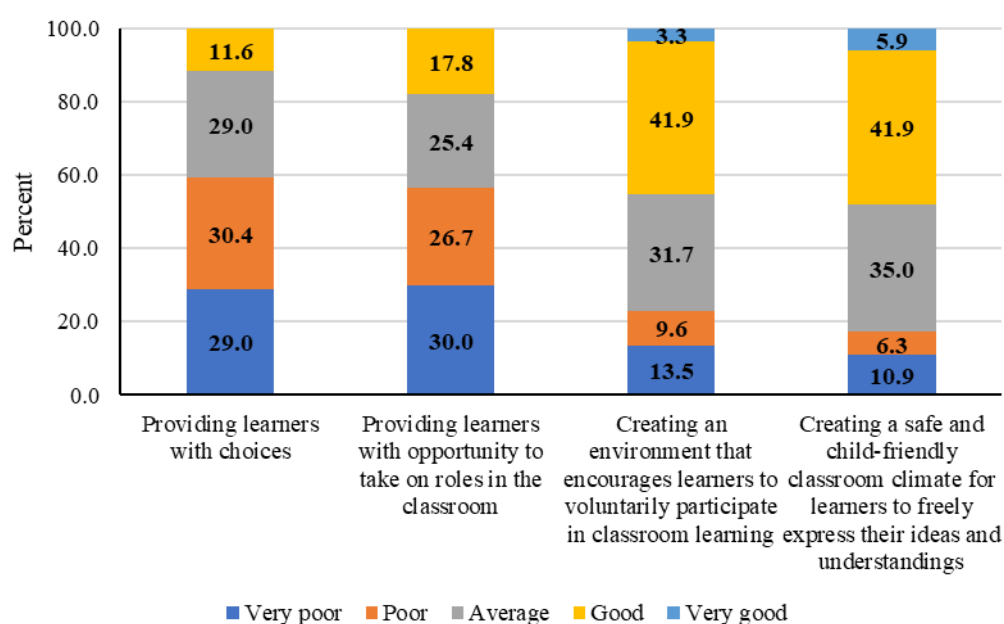


Figure 11: Percentage distribution of student teachers' performance in promoting learner autonomy

Table 14 presents the mean score of student-teachers' performance in promoting learner autonomy in the classroom by background characteristics. The results show that overall, student teachers' performance in providing learners with choices and with the opportunity to take on roles in the classroom was scored in the poor range. However, their performance in creating an environment that encourages learners to voluntarily participate in classroom learning and creating a safe and child-friendly classroom climate for learners to freely express their ideas and understandings was scored within the average range. Considering creating an environment that encourages learners to voluntarily participate in classroom learning and creating a safe and child-friendly classroom climate for learners to freely express their ideas

and understandings, men scored significantly higher than females. However, both sexes were rated as average on both indicators. The results also show that student-teachers' skills in promoting autonomy in foundational numeracy lessons do not vary by the class taught or the size. Nonetheless, their skills in promoting autonomy varied significantly based on the mentoring university and the ecological zone. Thus, student-teachers in CoEs mentored by UCC scored lower across all the indicators used to assess autonomy. This is because they were rated either poor or average on all the four indicators. On providing learners with choices, it was only KNUST affiliated CoE students who were rated as average while all the other student teachers were rated as poor. Similar statistical difference was found between KNUST affiliates and other university affiliates on providing learners with opportunity to take on roles in the classroom. In terms of the other two indicators, UoG and UEW affiliated CoE students were significantly better (rated as good) than their other counterparts who were rated as average. Evaluating the zones, all student-teachers in CoEs based in the different zones were rated as poor on the first indicator and average on the second and third indicators. However, on the last indicator, CoEs in the Coastal zone performed better (rated as good) in creating an environment that encourages learners to voluntarily participate in classroom learning and a safe and child-friendly classroom climate for learners to freely express their ideas and understandings when compared to those in the Forest and Savannah zones who were rated as average on this indicator. The findings indicate that student-teachers have demonstrated limited ability to promote learner autonomy, particularly in providing learners with choices and the opportunity to take on roles in the classroom.

Table 14: Mean score of student-teachers' performance in promoting learner autonomy by background characteristics

Background characteristics	Providing learners with choices	Providing learners with opportunity to take on roles in the classroom	Creating an environment that encourages learners to voluntarily participate in classroom learning	Creating a safe and child-friendly classroom climate for learners to freely express their ideas and understandings
	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	2.23 [2.12, 2.34]	2.31 [2.19, 2.43]	3.12 [3.00, 3.24]	3.26 [3.14, 3.38]
Sex	<i>0.641</i>	<i>0.941</i>	<i>0.019*</i>	<i>0.036*</i>
Female	2.25 [2.11, 2.38]	2.31 [2.16, 2.45]	3.03 [2.88, 3.18]	3.18 [3.03, 3.32]
Male	2.19 [1.99, 2.38]	2.32 [2.09, 2.54]	3.35 [3.15, 3.56]	3.46 [3.26, 3.66]
Class type	<i>0.879</i>	<i>0.566</i>	<i>0.483</i>	<i>0.877</i>
KG	2.25 [2.02, 2.47]	2.25 [1.99, 2.50]	3.04 [2.77, 3.31]	3.27 [3.01, 3.54]
Primary	2.23 [2.10, 2.36]	2.33 [2.19, 2.47]	3.14 [3.01, 3.28]	3.25 [3.12, 3.38]
Class size	<i>0.471</i>	<i>0.165</i>	<i>0.520</i>	<i>0.525</i>
< 25	2.14 [1.95, 2.33]	2.16 [1.97, 2.35]	3.12 [2.91, 3.33]	3.29 [3.08, 3.49]
25 – 40	2.30 [2.10, 2.50]	2.35 [2.13, 2.58]	3.21 [3.00, 3.42]	3.32 [3.11, 3.53]
> 40	2.26 [2.06, 2.46]	2.43 [2.22, 2.65]	3.03 [2.81, 3.25]	3.16 [2.96, 3.36]
Mentoring university	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>
UCC	1.84 [1.66, 2.02]	1.96 [1.76, 2.16]	2.68 [2.44, 2.91]	2.80 [2.57, 3.03]
UoG	2.25 [1.86, 2.61]	2.44 [2.06, 2.81]	3.56 [3.27, 3.85]	3.78 [3.57, 4.00]
UEW	2.56 [2.37, 3.02]	2.53 [2.44, 3.23]	3.46 [3.30, 3.62]	3.61 [3.46, 3.76]

KNUST	2.65 [2.27, 3.02]	2.88 [2.43, 3.33]	3.35 [2.98, 3.73]	3.35 [3.02, 3.69]
UDS	2.40 [2.15, 2.65]	2.48 [2.18, 2.77]	3.15 [2.91, 3.39]	3.30 [3.06, 3.54]
Ecological zone	<i>0.010*</i>	<i>0.009**</i>	<i>0.004**</i>	<i>0.006**</i>
Coastal	2.34 [2.15, 2.53]	2.42 [2.21, 2.64]	3.37 [3.16, 3.58]	3.51 [3.30, 3.71]
Forest	2.04 [1.84, 2.23]	2.10 [1.90, 2.30]	2.90 [2.69, 3.10]	3.06 [2.86, 3.26]
Savanah	2.43 [2.27, 2.60]	2.54 [2.35, 2.73]	3.20 [3.01, 3.38]	3.29 [3.13, 3.45]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Perseverance

Learners' ability to sustain effort and persist in learning despite challenges and difficulties, particularly at the foundational level, is an important cognitive skill that supports lifelong learning and academic achievement. Figure 12 shows the percentage distribution of student-teachers and their performance in promoting perseverance among learners. The figure shows a very weak performance among student-teachers in promoting perseverance. Almost 3 out of every 5 student-teachers performed at average or below in exhibiting a positive attitude towards learners' challenges, including 21.8% who performed poorly or very poorly. Ninety-five percent of student-teachers performed at average or below in encouraging learners to set goals, with 73.2% performing poorly or very poorly. On encouraging learners to learn from their mistakes, 88.1% of student-teachers were rated at average or below, including 52.1% who were rated poor or very poor. Concerning encouraging learners to talk with each other in class about the books they use, 96.0% performed at or below the average level, with 92.4% demonstrating poor or very poor performance. All the student-teachers observed (100.0%) were rated at or below average in recommending a variety of numeracy books for private/home use, with 99.3% rated poor or very poor. A very high proportion of student-teachers (96.1%) also performed at or below average in motivating learners to show interest in numeracy practice, including 76.6% who performed poorly or very poorly.

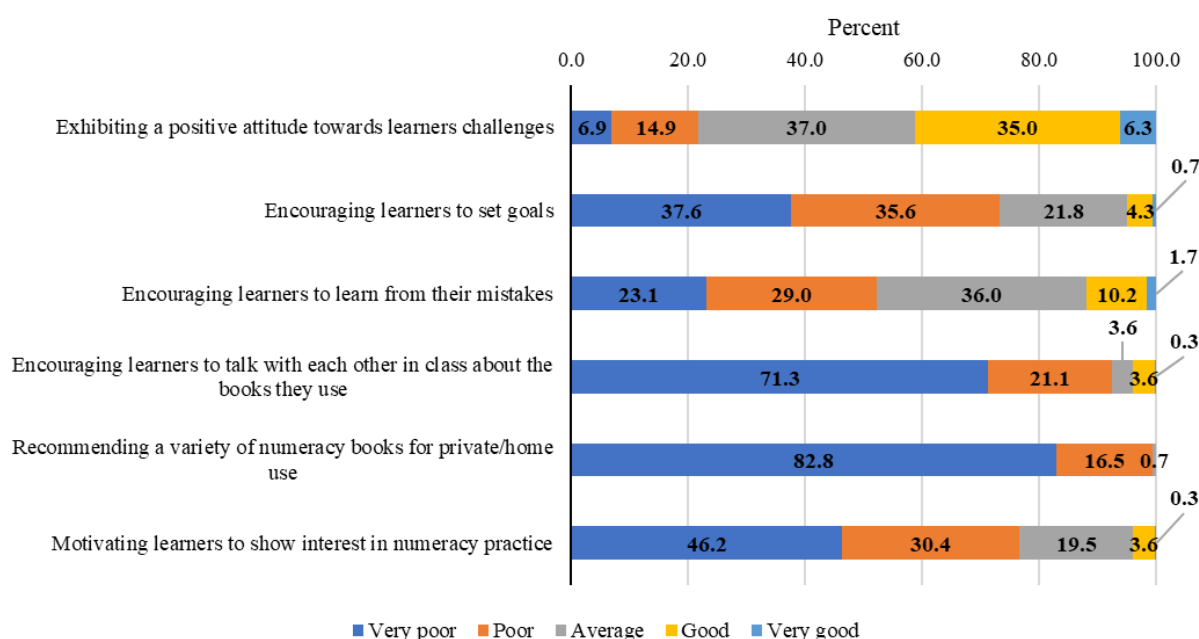


Figure 12: Percentage distribution of student-teachers' performance in promoting learner perseverance

The mean scores presented in Table 15 show that, except for student-teachers exhibiting a positive attitude towards learners' challenges, where their performance was rated at average, for all other indicators used to measure their ability to promote perseverance among learners, they performed either poorly or very poorly. The only sex differences observed were in exhibiting a positive attitude towards learners' challenges, where males performed significantly better (rated as good) than their female counterparts who scored average on this indicator. The class taught and the class size did not influence the scores. There were statistically significant differences across some indicators used to assess student-teachers' performance in promoting perseverance, with variations noted by the mentoring university and ecological zone. Colleges of Education institutions mentored by KNUST and UDS performed significantly better (rated as good) in exhibiting a positive attitude towards learners' challenges, when compared to those mentored by UCC who were rated as average. However, the performance of those mentored by UCC, UoG and UEW were not significantly different. Concerning encouraging learners to set goals, those mentored by UCC scored significantly lower (very poor) when compared to those mentored by the other universities who were rated as poor. However, all the student-teachers on this indicator were poorly rated. Similarly, although differences were observed on the third and the fourth indicators, all student-teachers were again rated as either poor or very poor. Colleges of Education located in the Savannah zone performed better (rated as good) than those in the Forest zone (rated as average) in exhibiting a positive attitude towards learners' challenges and encouraging learners to set goals, but the differences between those in the Savannah and Coastal zones were statistically the same. Also, CoEs located in the Coastal zone performed significantly better (with average rating) than their counterparts in the Forest zone (who had an average rating) in encouraging learners to learn from their mistakes. The other significant differences on indicators 2, 4, 5, and 6 were all marginal because all the CoEs from the three zones performed either poor or very poor on them. Although some statistically significant differences were observed across some of the background characteristics, overall performance levels of student-teachers in promoting learner perseverance remained generally weak across all groups.

Table 15: Mean score of student-teachers' performance in promoting learner perseverance by background characteristics

Background characteristics	Exhibiting a positive attitude towards learners' challenges	Encouraging learners to set goals	Encouraging learners to learn from their mistakes	Encouraging learners to talk with each other in class about the books they use	Recommending a variety of numeracy books for private/home use	Motivating learners to show interest in numeracy practice
	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	3.19 [3.08, 3.30]	1.95 [1.84, 2.05]	2.38 [2.27, 2.50]	1.41 [1.32, 1.49]	1.18 [1.13, 1.22]	1.82 [1.71, 1.92]
Sex	<i>0.007**</i>	<i>0.945</i>	<i>0.086</i>	<i>0.449</i>	<i>0.493</i>	<i>0.967</i>
Female	3.09 [2.96, 3.23]	1.94 [1.82, 2.07]	2.32 [2.19, 2.46]	1.39 [1.29, 1.48]	1.19 [1.13, 1.24]	1.82 [1.70, 1.93]
Male	3.44 [3.23, 3.64]	1.95 [1.77, 2.14]	2.54 [2.34, 2.74]	1.46 [1.28, 1.64]	1.15 [1.08, 1.23]	1.81 [1.61, 2.02]
Class type	<i>0.479</i>	<i>0.900</i>	<i>0.499</i>	<i>0.059</i>	<i>0.313</i>	<i>0.601</i>
KG	3.26 [3.05, 3.47]	1.96 [1.74, 2.18]	2.45 [2.22, 2.69]	1.26 [1.12, 1.40]	1.14 [1.06, 1.22]	1.86 [1.64, 2.08]
Primary	3.17 [3.03, 3.30]	1.94 [1.83, 2.06]	2.36 [2.23, 2.49]	1.45 [1.35, 1.55]	1.19 [1.14, 1.25]	1.80 [1.69, 1.91]
Class size	<i>0.677</i>	<i>0.120</i>	<i>0.855</i>	<i>0.255</i>	<i>0.994</i>	<i>0.333</i>
< 25	3.13 [2.93, 3.33]	1.81 [1.65, 1.97]	2.43 [2.23, 2.63]	1.50 [1.33, 1.67]	1.18 [1.10, 1.25]	1.71 [1.56, 1.87]
25 – 40	3.19 [2.99, 3.39]	2.00 [1.81, 2.19]	2.36 [2.18, 2.55]	1.38 [1.24, 1.51]	1.18 [1.09, 1.26]	1.86 [1.69, 2.04]
> 40	3.25 [3.07, 3.44]	2.05 [1.87, 2.23]	2.35 [2.15, 2.56]	1.33 [1.20, 1.47]	1.18 [1.10, 1.26]	1.88 [1.68, 2.07]
Mentoring university	<i>0.002**</i>	<i><0.001**</i>	<i>0.050</i>	<i><0.001**</i>	<i>0.045*</i>	<i>0.089</i>
UCC	2.95 [2.74, 3.16]	1.58 [1.43, 1.72]	2.18 [1.97, 2.39]	1.37 [1.25, 1.50]	1.19 [1.12, 1.27]	1.64 [1.49, 1.80]
UoG	3.22 [2.87, 3.57]	2.19 [1.82, 2.56]	2.66 [2.29, 2.61]	1.81 [1.37, 2.26]	1.19 [1.02, 1.35]	1.94 [1.60, 2.30]

UEW	3.23 [3.07, 3.39]	2.08 [1.91, 2.56]	2.45 [2.28, 2.61]	1.49 [1.36, 1.62]	1.23 [1.14, 1.31]	1.89 [1.72, 2.06]
KNUST	3.59 [3.29, 3.88]	2.53 [2.23, 2.83]	2.65 [2.31, 2.98]	1.18 [0.99, 1.36]	1.18 [0.99, 1.36]	2.12 [1.59, 2.65]
UDS	3.60 [3.35, 3.86]	2.28 [1.98, 2.57]	2.50 [2.21, 2.79]	1.08 [0.93, 1.22]	1.00 [—, —]	1.93 [1.63, 2.22]
Ecological zone	<i>0.002**</i>	<i><0.001**</i>	<i>0.010*</i>	<i><0.001**</i>	<i><0.001**</i>	<i>0.022*</i>
Coastal	3.24 [3.05, 3.44]	2.04 [1.86, 2.23]	2.60 [2.40, 2.80]	1.65 [1.45, 1.85]	1.18 [1.20, 1.26]	1.89 [1.71, 2.07]
Forest	2.98 [2.80, 3.17]	1.64 [1.49, 1.78]	2.20 [2.01, 2.38]	1.45 [1.33, 1.57]	1.28 [1.20, 1.36]	1.66 [1.52, 1.80]
Savannah	3.47 [3.30, 3.65]	2.37 [2.20, 2.54]	2.43 [2.26, 2.61]	1.03 [0.99, 1.06]	1.00 [0.00, 0.00]	1.99 [1.76, 2.21]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Social and Collaborative Skills

Figure 13 presents the percentage distribution of student-teachers' performance in enhancing learners' social and collaborative skills in foundational numeracy. The figure shows that a substantial proportion of student-teachers performed at average or below across all the indicators used to assess their performance in promoting learners' social and collaborative skills. Almost 9 out of every 10 (86.8%) student-teachers performed at or below average in promoting learners' collaboration through peer interaction, including 63.3% who performed poorly or very poorly. A similar percentage (89.8%) performed at least average in promoting learners' interpersonal skills development, with 64.0% performing poorly or very poorly. Regarding creating a sense of belongingness among learners in the classroom, 78.4% of student-teachers were average or below, including 37.7% who demonstrated poor or very poor performance.

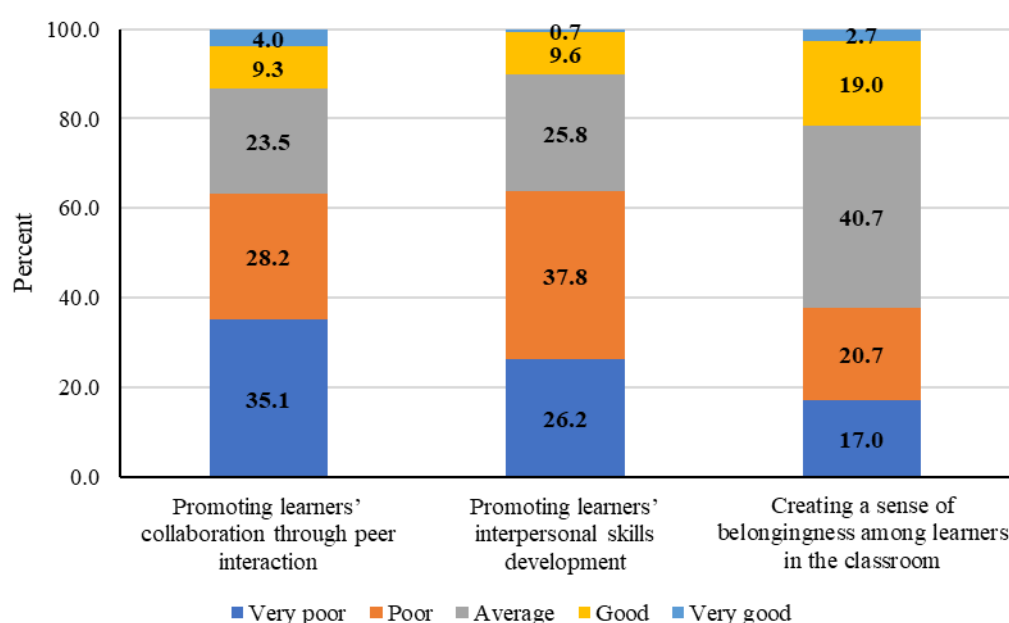


Figure 13: Percentage distribution of student-teachers' performance in enhancing learner social and collaborative skills

Table 16 shows the mean scores of student-teachers' performance in promoting learners' social and collaborative skills in foundational numeracy by background characteristics. Overall mean scores show that student-teachers performed poorly in promoting learner collaboration through peer interaction and interpersonal skills development, but were average in creating a sense of belongingness among learners in the classroom was average. Their performance across all the

indicators did not vary significantly by sex or class size. The only class-based difference observed was creating a sense of belongingness among learners in the classroom, where those who taught KG pupils performed significantly better than those who taught at the primary level. However, both groups were rated on the same average level. Regarding the mentoring universities, the results indicate that student teachers in CoEs mentored by UCC showed lower performance (rated as poor) in promoting learners' interpersonal skills development, and also creating a sense of belongingness among learners in the classroom, relative to those mentored by the other universities who had an average rating. Further, student-teachers in all CoEs located in the three zones were rated as poor on the first two indicators and average on the third. Generally, these results reveal a very weak performance among student-teachers in promoting learner social and collaborative skills. Although statistically significant differences were observed across some of the background characteristics, the overall performance levels of student-teachers in promoting learner social and collaborative skills remained generally weak across all groups.

Table 16: Mean score of student-teachers' performance in enhancing learner social and collaborative skills by background characteristics

Background characteristics	Promoting learners' collaboration through peer interaction Mean [95% CI]	Promoting learners' interpersonal skills development Mean [95% CI]	Creating a sense of belongingness among learners in the classroom Mean [95% CI]
All	2.20 [2.07, 2.33]	2.22 [2.11, 2.33]	2.70 [2.58, 2.82]
Sex	<i>0.251</i>	<i>0.741</i>	<i>0.789</i>
Female	2.15 [2.00, 2.30]	2.20 [2.07, 2.33]	2.69 [2.54, 2.83]
Male	2.33 [2.07, 2.58]	2.25 [2.06, 2.45]	2.72 [2.53, 2.92]
Class type	<i>0.927</i>	<i>0.599</i>	<i>0.041*</i>
KG	2.19 [1.96, 2.43]	2.28 [2.06, 2.50]	2.92 [2.67, 3.16]
Primary	2.20 [2.04, 2.35]	2.20 [2.07, 2.32]	2.63 [2.49, 2.76]
Class size	<i>0.378</i>	<i>0.897</i>	<i>0.421</i>
< 25	2.30 [2.06, 2.53]	2.25 [2.04, 2.45]	2.65 [2.43, 2.87]
25 – 40	2.23 [2.00, 2.45]	2.23 [2.05, 2.41]	2.81 [2.61, 3.01]
> 40	2.06 [1.86, 2.27]	2.17 [2.00, 2.35]	2.64 [2.44, 2.83]
Mentoring university	<i>0.052</i>	<i><0.001**</i>	<i><0.001**</i>
UCC	2.02 [1.80, 2.24]	1.82 [1.63, 2.00]	2.16 [1.95, 2.36]
UoG	2.59 [2.07, 3.12]	2.63 [2.27, 2.98]	3.03 [2.71, 3.36]
UEW	2.23 [2.03, 2.43]	2.47 [2.29, 2.64]	3.11 [2.94, 3.30]
KNUST	2.00 [1.66, 2.34]	2.41 [2.07, 2.75]	3.12 [2.89, 3.35]
UDS	2.40 [2.13, 2.67]	2.35 [2.14, 2.56]	2.80 [2.59, 3.01]
Ecological zone	<i><0.001**</i>	<i><0.001**</i>	<i>0.126</i>
Coastal	2.58 [2.32, 2.84]	2.47 [2.27, 2.68]	2.62 [2.41, 2.83]
Forest	2.02 [1.83, 2.22]	1.92 [1.75, 2.09]	2.63 [2.41, 2.84]
Savanah	2.01 [1.83, 2.20]	2.39 [2.25, 2.54]	2.91 [2.78, 3.04]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Student-Teachers' Performance in Teaching Foundational Literacy

Quality of Lesson Plan

Figure 14 presents the percentage distribution of student-teachers in relation to the quality of their foundational literacy lesson plan. More than half of the student-teachers observed, scored average or below across all the indicators used to assess the quality of their lesson plan. Regarding stating specific, relevant, measurable, achievable and timebound objective(s)/indicator(s) which are linked to classroom activities, 57.4% scored at average or below, including 18.3% who scored poor or very poor. In terms of stating appropriate and varied TLRs and indicating when and how they will be used in the lesson, 65.4% scored at average or below, with about one-third (33.3%) scoring poor or very poor. On demonstrating adequate and up-to-date knowledge of subject matter linked to objective(s)/performance indicators; providing literacy-specific techniques that facilitate learners' understanding, the results show that 55.8% scored average or below, with 11.3% receiving poor or very poor scores.

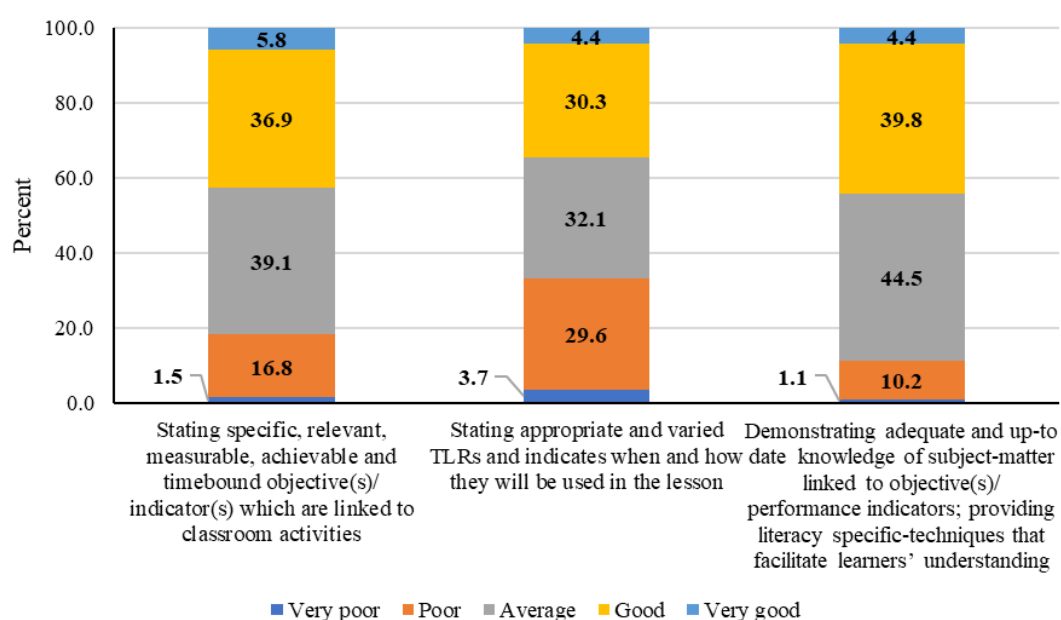


Figure 14: Percentage distribution of student-teachers and the quality of their lesson plan

Table 17 shows that the quality of student-teachers' lesson plans across all the indicators was rated as average. Statistically significant differences were observed by sex across two of the indicators, with males scoring significantly higher than females. Males were rated as good on both stating specific, relevant, measurable, achievable and timebound objective(s)/ indicator(s) which are linked to classroom activities; and demonstrating adequate and up-to-date knowledge of subject matter linked to objective(s)/ performance indicators; providing literacy-specific techniques that facilitate learners' understanding while their female counterparts were rated average on both indicators. Although there were statistically significant differences on stating appropriate and varied TLRs and indicating when and how they will be used in the lesson, both sexes were rated as average in demonstrating this skill. Those who taught KG scored significantly higher (rated good) in demonstrating adequate and up-to-date knowledge of subject matter linked to objective(s)/performance indicators; providing literacy-specific techniques that facilitate learners' understanding, compared to those who taught primary who scored average on this

indicator. Again, even though there was a statistically significant difference between the two grade levels on stating appropriate and varied TLRs and indicating when and how they will be used in the lesson, student-teachers in both grades were scored as average.

In terms of mentoring CoEs, student-teachers in CoEs mentored by KNUST and UDS (both rated as good or very good) performed significantly better than their counterparts mentored by the other universities (rated as average) across all the indicators, with those mentored by UCC scoring the lowest in their mean ratings. CoEs located in the Savannah zone scored significantly higher than those located in the Forest and Coastal zones across all three indicators. The savannah cohorts were rated as good in all the three indicators of quality lesson plan as compared to their peers in the Forest and Coastal zones who were rated as average and even poor on the second indicator for the Forest zone.

Table 17: Mean score of student-teachers' performance in quality of lesson plan by background characteristics

	Stating specific, relevant, measurable, achievable and timebound objective(s)/ indicator(s) which are linked to classroom activities	Stating appropriate and varied TLRs and indicating when and how they will be used in the lesson	Demonstrating adequate and up-to-date knowledge of subject matter linked to objective(s)/ performance indicators; providing literacy-specific techniques that facilitate learners' understanding
Background characteristics	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	3.29 [3.19, 3.39]	3.02 [2.91, 3.14]	3.36 [3.27, 3.45]
Sex	<i>0.036*</i>	<i>0.015*</i>	<i>0.026*</i>
Female	3.24 [3.12, 3.35]	2.96 [2.83, 3.08]	3.31 [3.21, 3.42]
Male	3.52 [3.32, 3.72]	3.32 [3.08, 3.56]	3.58 [3.41, 3.75]
Class type	<i>0.059</i>	<i>0.039*</i>	<i>0.002**</i>
KG	3.44 [3.27, 3.60]	3.20 [3.00, 3.4]	3.58 [3.42, 3.73]
Primary	3.22 [3.09, 3.35]	2.94 [2.8, 3.08]	3.26 [3.15, 3.37]
Class size	<i>0.008**</i>	<i>0.030*</i>	<i>0.074</i>
< 25	3.08 [2.90, 3.26]	2.82 [2.63, 3.01]	3.23 [3.06, 3.40]
25 – 40	3.43 [3.29, 3.57]	3.15 [2.97, 3.32]	3.46 [3.34, 3.58]
> 40	3.37 [3.13, 3.60]	3.12 [2.88, 3.35]	3.38 [3.17, 3.60]
Mentoring university	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>
UCC	2.93 [2.77, 3.09]	2.70 [2.55, 2.85]	3.17 [3.03, 3.31]
UoG	3.31 [3.09, 3.53]	2.86 [2.59, 3.13]	3.41 [3.23, 3.60]
UEW	3.23 [3.03, 3.43]	3.00 [2.76, 3.24]	3.17 [2.96, 3.38]
KNUST	4.21 [3.99, 4.44]	4.14 [3.95, 4.33]	3.86 [3.58, 4.14]
UDS	3.88 [3.70, 4.06]	3.53 [3.26, 3.80]	3.86 [3.73, 4.00]
Ecological zone	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>
Coastal	3.20 [3.05, 3.35]	3.01 [2.84, 3.18]	3.33 [3.19, 3.48]
Forest	2.99 [2.83, 3.15]	2.54 [2.39, 2.69]	3.13 [2.98, 3.28]
Savannah	3.85 [3.67, 4.02]	3.77 [3.57, 3.96]	3.75 [3.61, 3.90]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Classroom Culture

Supportive Learning Environment

Figure 15 shows the percentage distribution of student-teachers' performance in providing a supportive learning environment for learners in their foundational literacy lessons. The figure depicts a mixed level of performance by the student-teachers. While 39.1% and 35.1% of student-teachers scored at least average in treating all learners respectfully and using positive language with learners, respectively, much higher proportions, 76.3% , 72.2% and 81.0% scored average or below in responding to learners' needs, listening and using learners' ideas and encouraging cooperative learning and monitoring learners' learning activities, respectively. On promoting inclusivity in the classroom, 63.9% scored at average or below, while 18.6% scored poor or very poor.

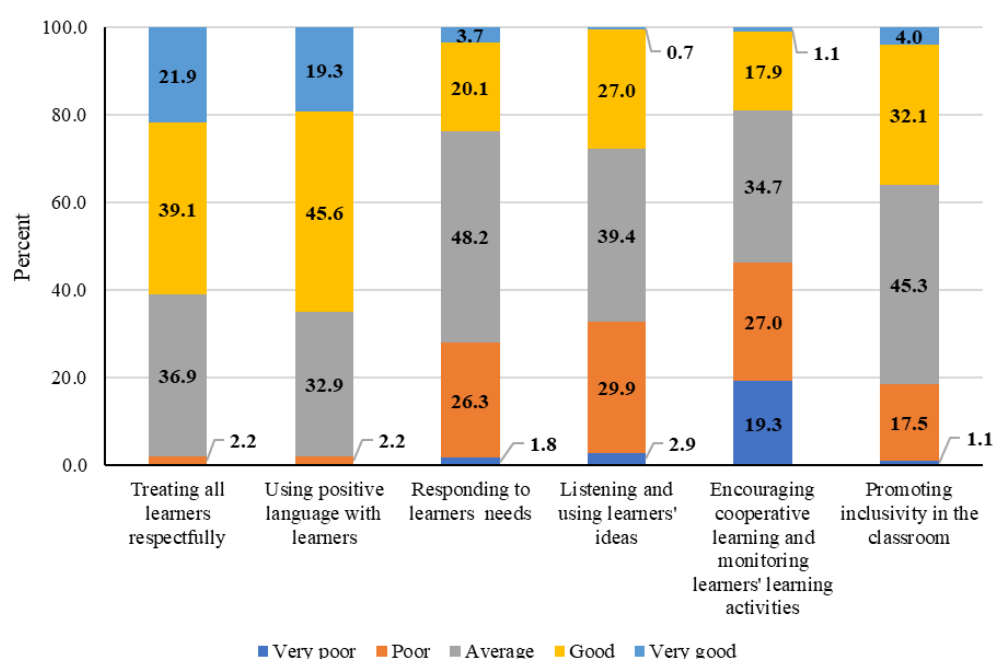


Figure 15: Percentage distribution of student-teachers' performance in providing a supportive learning environment

Table 18 shows the mean scores of student-teachers' performance in providing a supportive learning environment by background characteristics. Overall, the results show that while student-teachers' performance in treating all learners respectfully and using positive language with learners was rated as good, their performance in the other indicators was rated average. The statistically significant differences observed between males and females in the use of positive language with learners, but both sexes were rated as average on both indicators. Similarly, there were differences found for the class type on all the indicators except on encouraging cooperative learning and monitoring learners' learning activities, where student-teachers at the KG level were significantly higher (rated as average) than their peers in the primary level, who were rated as poor. Nonetheless, ratings were the same across all the indicators. The results further show that student-teachers in CoEs mentored by KNUST and UDS scored significantly higher (were rated as very good) in treating all learners respectfully and using positive language with learners when compared to those mentored by the other

universities who were rated as good. Similarly, those in CoEs mentored by KNUST and UDS performed significantly better (rated as average) in encouraging cooperative learning and monitoring learners' learning activities than that of UCC who were rated as poor. A similar outcome was observed for those mentored by KNUST and UDS for promoting inclusivity in the classroom, where they were rated as good and their other counterparts as average. Statistically significant differences were also observed across all indicators by ecological zone. However, the only meaningful ones were for the first two indicators as well as the fifth indicator. Student-teachers located in the Savannah zone performed better (rated as very good) than their counterparts who were rated a good both in treating all learners respectfully, and using positive language with learners. However, those located in the Coastal zone and Savannah zones performed better (rated as average) in encouraging cooperative learning and monitoring learners' learning activities than those in the Forest zone, which were rated as poor. Finally, student-teachers from all zones were rated as average in promoting inclusivity in the classroom.

Table 18: Mean score of student-teachers' performance in providing a supportive learning environment by background characteristics

Background characteristics	Treating all learners respectfully	Using positive language with learners	Responding to learners' needs	Listening and using learners' ideas	Encouraging cooperative learning and monitoring learners' learning activities	Promoting inclusivity in the classroom
	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	3.81 [3.71, 3.90]	3.82 [3.73, 3.91]	2.97 [2.88, 3.07]	2.93 [2.83, 3.03]	2.54 [2.42, 2.67]	3.20 [3.11, 3.30]
Sex	<i>0.022*</i>	<i>0.041*</i>	<i>0.810</i>	<i>0.296</i>	<i>0.052</i>	<i>0.135</i>
Female	3.75 [3.65, 3.86]	3.78 [3.68, 3.88]	2.97 [2.86, 3.08]	2.90 [2.79, 3.01]	2.49 [2.35, 2.62]	3.17 [3.06, 3.27]
Male	4.04 [3.81, 4.27]	4.02 [3.81, 4.23]	3.00 [2.78, 3.22]	3.04 [2.81, 3.27]	2.80 [2.51, 3.09]	3.36 [3.12, 3.60]
Class type	<i>0.042*</i>	<i>0.036*</i>	<i>0.010*</i>	<i>0.083</i>	<i>0.012*</i>	<i>0.122</i>
KG	3.95 [3.79, 4.12]	3.96 [3.81, 4.12]	3.16 [2.98, 3.35]	3.06 [2.87, 3.24]	2.78 [2.54, 3.01]	3.32 [3.14, 3.50]
Primary	3.74 [3.63, 3.86]	3.76 [3.65, 3.87]	2.89 [2.78, 3.00]	2.87 [2.75, 2.99]	2.44 [2.30, 2.58]	3.15 [3.04, 3.27]
Class size	<i>0.051</i>	<i>0.094</i>	<i>0.018*</i>	<i>0.358</i>	<i>0.963</i>	<i>0.501</i>
< 25	3.66 [3.51, 3.82]	3.70 [3.55, 3.85]	2.80 [2.62, 2.98]	2.85 [2.68, 3.03]	2.53 [2.31, 2.76]	3.18 [3.02, 3.34]
25 - 40	3.93 [3.78, 4.07]	3.93 [3.79, 4.06]	3.03 [2.90, 3.16]	3.01 [2.86, 3.15]	2.56 [2.39, 2.74]	3.26 [3.12, 3.40]
> 40	3.81 [3.58, 4.04]	3.81 [3.61, 4.01]	3.17 [2.95, 3.40]	2.88 [2.66, 3.11]	2.52 [2.26, 2.78]	3.12 [2.87, 3.36]
Mentoring university	<i><0.001**</i>	<i><0.001**</i>	<i>0.055</i>	<i>0.096</i>	<i>0.001**</i>	<i>0.042*</i>
UCC	3.51 [3.40, 3.62]	3.59 [3.49, 3.69]	2.82 [2.68, 2.95]	2.85 [2.69, 3.02]	2.25 [2.06, 2.45]	3.05 [2.91, 3.20]
UoG	3.55 [3.37, 3.74]	3.59 [3.4, 3.77]	2.97 [2.68, 3.25]	2.97 [2.63, 3.30]	2.69 [2.36, 3.02]	3.28 [3.00, 3.55]
UEW	3.67 [3.48, 3.86]	3.63 [3.43, 3.83]	3.03 [2.80, 3.26]	2.81 [2.60, 3.03]	2.60 [2.38, 2.82]	3.19 [2.99, 3.38]
KNUST	4.86 [4.67, 5.05]	5 [—, —]	3.36 [2.97, 3.75]	3.36 [2.97, 3.75]	2.79 [2.20, 3.38]	3.50 [3.01, 3.99]
UDS	4.49 [4.28, 4.70]	4.39 [4.20, 4.58]	3.14 [2.92, 3.36]	3.10 [2.91, 3.28]	2.94 [2.65, 3.23]	3.43 [3.19, 3.67]
Ecological zone	<i><0.001**</i>	<i><0.001**</i>	<i>0.002**</i>	<i>0.032*</i>	<i>0.003**</i>	<i>0.027*</i>
Coastal	3.53 [3.40, 3.66]	3.54 [3.41, 3.68]	2.98 [2.79, 3.16]	2.98 [2.79, 3.16]	2.78 [2.57, 2.99]	3.30 [3.15, 3.45]
Forest	3.47 [3.35, 3.58]	3.56 [3.45, 3.66]	2.80 [2.65, 2.95]	2.77 [2.62, 2.93]	2.30 [2.12, 2.48]	3.05 [2.90, 3.19]
Savannah	4.66 [4.52, 4.80]	4.56 [4.41, 4.72]	3.23 [3.07, 3.39]	3.10 [2.92, 3.27]	2.63 [2.38, 2.88]	3.33 [3.11, 3.55]

*p-values in italics; **p < 0.01; *p < 0.05*

Positive Behavioural Expectations

Figure 16 presents the percentage distribution of student-teachers' performance in promoting positive behavioural expectations among learners in foundational literacy lessons. A relatively small percentage of student-teachers' performance in promoting positive behavioural expectations was rated good or very good. Concerning setting clear behaviour expectations with learners for classroom activities, fewer than one out of every 5 were rated good or very

good, with 81.5% rated at average or below. Less than half (41.3%) of student-teachers were rated good or very good in acknowledging positive learner behaviour, with a relatively high proportion (48.2%) rated average. Approximately, 1 in 5 student-teachers were rated good or very good in redirecting misbehaviour and focusing on the expected behaviour, while the majority (77.0%) were rated as average or below.

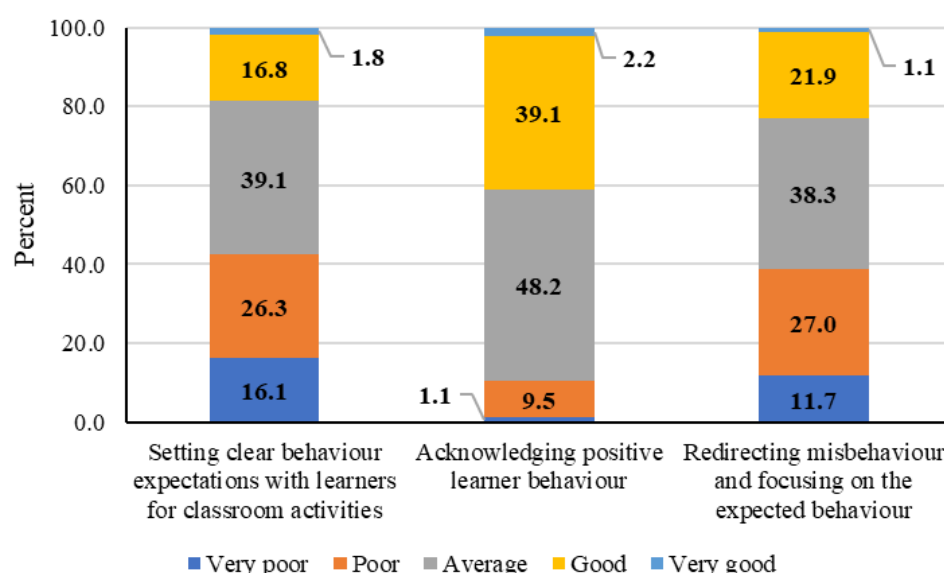


Figure 16: Percentage distribution of student teachers' performance in promoting positive behavioural expectations

Table 19 shows the mean scores of student-teachers' performance in promoting positive behavioural expectations among learners by background characteristics. The mean scores indicate that, across all the indicators, student-teachers were generally rated as average. Significant differentials were observed between males and females in setting clear behaviour expectations with learners for classroom activities and acknowledging positive learner behaviour, where males scored significantly higher (rated as average and good respectively) than females, who were rated as poor and average respectively on both indicators. The class taught had some significant differences in terms of redirecting misbehaviour and focusing on the expected behaviour, with those who taught KG scoring higher than those who taught primary. However, student-teachers from both KG and primary grades were rated as average. The size of the class did not impact promoting positive behavioural expectations. Significant differences were observed across all the indicators by the mentoring university. Regarding setting clear behaviour expectations with learners for classroom activities, student-teachers in CoEs mentored by UEW and UDS (rated as average) performed significantly better than those mentored by UCC (rated as poor). The scores for those mentored by UCC, UoG and KNUST were not significantly different. In acknowledging positive learner behaviour, those mentored by UEW, KNUST and UDS performed significantly better (rated as good) than those mentored by UCC (rated as average); however, the scores for those mentored by UCC and UoG did not differ significantly. However, in terms of redirecting misbehaviour and focusing on the expected behaviour, student-teachers mentored by KNUST and UDS (rated as good) performed significantly better than their counterparts, who performed poorly on this indicator. The ecological zone where the CoE is located is associated with both acknowledging positive

learner behaviour and redirecting misbehaviour, and focusing on the expected behaviour, with colleges in the Savannah zone scoring significantly higher than those in the Forest and Coastal zones. For instance, the Savannah zone performed average on the first indicator and good on both the second and third indicators, while their counterparts performed average and poor on the second and third indicators, with the Forest zone even performing poorly on setting clear behaviour expectations with learners for classroom activities.

Table 19: Mean score of student-teachers' performance in promoting positive behavioural expectations by background characteristics

Background characteristics	Setting clear behaviour expectations with learners for classroom activities	Acknowledging positive learner behaviour	Redirecting misbehaviour and focusing on the expected behaviour
	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	2.62 [2.50, 2.74]	3.32 [3.23, 3.40]	2.74 [2.62, 2.85]
Sex	<i>0.019*</i>	<i>0.004**</i>	<i>0.140</i>
Female	2.55 [2.42, 2.69]	3.26 [3.16, 3.35]	2.70 [2.57, 2.82]
Male	2.92 [2.66, 3.18]	3.58 [3.40, 3.76]	2.92 [2.62, 3.22]
Class type	<i>0.283</i>	<i>0.586</i>	<i>0.006**</i>
KG	2.72 [2.49, 2.94]	3.35 [3.18, 3.52]	2.98 [2.79, 3.16]
Primary	2.58 [2.44, 2.72]	3.30 [3.20, 3.40]	2.63 [2.49, 2.77]
Class size	<i>0.326</i>	<i>0.660</i>	<i>0.837</i>
< 25	2.58 [2.37, 2.80]	3.27 [3.12, 3.42]	2.73 [2.55, 2.92]
25 – 40	2.57 [2.40, 2.74]	3.36 [3.23, 3.48]	2.77 [2.59, 2.94]
> 40	2.81 [2.54, 3.07]	3.33 [3.13, 3.52]	2.67 [2.41, 2.94]
Mentoring university	<i>0.012*</i>	<i><0.001**</i>	<i><0.001**</i>
UCC	2.36 [2.17, 2.56]	3.05 [2.92, 3.19]	2.51 [2.36, 2.65]
UoG	2.72 [2.40, 3.05]	3.28 [3.04, 3.51]	2.48 [2.12, 2.84]
UEW	2.81 [2.58, 3.05]	3.49 [3.33, 3.64]	2.56 [2.29, 2.83]
KNUST	2.64 [2.04, 3.25]	3.86 [3.67, 4.05]	3.79 [3.56, 4.01]
UDS	2.84 [2.60, 3.09]	3.53 [3.34, 3.72]	3.33 [3.14, 3.53]
Ecological zone	<i>0.116</i>	<i><0.001**</i>	<i><0.001**</i>
Coastal	2.73 [2.53, 2.93]	3.28 [3.14, 3.42]	2.54 [2.33, 2.76]
Forest	2.47 [2.27, 2.66]	3.15 [3.02, 3.29]	2.45 [2.29, 2.61]
Savannah	2.71 [2.49, 2.94]	3.62 [3.46, 3.77]	3.41 [3.24, 3.58]

*p-values in italics; **p < 0.01; *p < 0.05*

Teaching Methodology and Delivery

Student-teachers' teaching methodology and delivery were assessed based on lesson introduction, content delivery, learner support and pedagogical strategies. These are essential for lesson facilitation in foundational literacy.

Lesson Introduction

Figure 17 presents the percentage distribution of student-teachers and their performance in lesson introduction. The figure shows that while a relatively smaller proportion scored poor or very poor in the general lesson introduction (12.8%), and relating classroom activities to the objectives/performance indicator(s) (11.7%), more than half (53.7%) of student-teachers scored poor or very poor in explicitly articulating the objectives/performance indicators of the lesson.

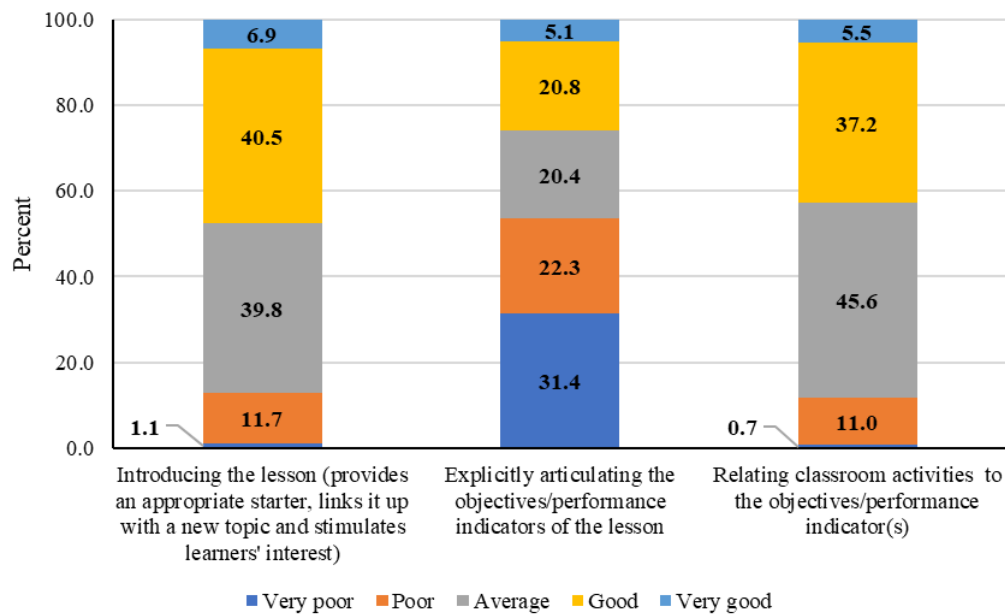


Figure 17: Percentage distribution of student teachers' performance in lesson introduction

The mean scores presented in Table 20 reveal that overall, the performance of student-teachers was rated as good for the general introduction of the lesson, poor for explicitly articulating the objectives/performance indicators of the lesson and average for relating classroom activities to the objectives/performance indicators. No significant differences were observed in the scores for any of the indicators based on sex or class size. The scores for the general introduction of the lesson varied significantly by the type of class taught, with those who taught KG scoring significantly higher (rated as good) than those who taught primary (rated as average). Also, statistically significant differences were observed in the scores for the general introduction of the lesson by the mentoring university, with those mentored by KNUST and UDS scoring significantly higher (rated very good and good, respectively) than those mentored by UCC, UoG and UEW, who were rated as average. CoEs in the Forest zone scored significantly lower (average rating) on both the general introduction of the lesson and on relating classroom activities to the objectives/performance indicators compared to those in the Savannah and Coastal zones (rated as good). However, there were no significant differences between CoEs in the Savannah and Coastal zones.

Table 20: Mean score of student-teachers' performance in lesson introduction by background characteristics

Background characteristics	Introducing the lesson (provides an appropriate starter, links it up with a new topic and stimulates learners' interest)	Explicitly articulating the objectives/performance indicators of the lesson	Relating classroom activities to the objectives/performance indicator(s)
	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	3.41 [3.31, 3.50]	2.46 [2.31, 2.61]	3.36 [3.27, 3.45]
Sex	<i>0.098</i>	<i>0.388</i>	<i>0.103</i>
Female	3.37 [3.26, 3.48]	2.43 [2.27, 2.59]	3.32 [3.22, 3.43]
Male	3.58 [3.38, 3.78]	2.60 [2.21, 2.99]	3.52 [3.33, 3.71]
Class type	<i>0.002**</i>	<i>0.477</i>	<i>0.051</i>
KG	3.64 [3.47, 3.80]	2.54 [2.25, 2.83]	3.49 [3.32, 3.66]
Primary	3.30 [3.18, 3.42]	2.42 [2.25, 2.60]	3.30 [3.19, 3.41]
Class size	<i>0.474</i>	<i>0.369</i>	<i>0.240</i>
< 25	3.34 [3.16, 3.51]	2.34 [2.10, 2.58]	3.30 [3.14, 3.46]
25 – 40	3.47 [3.33, 3.62]	2.49 [2.26, 2.72]	3.45 [3.31, 3.58]
> 40	3.38 [3.18, 3.59]	2.63 [2.27, 3.00]	3.27 [3.06, 3.48]
Mentoring university	<i>0.001**</i>	<i>0.289</i>	<i>0.225</i>
UCC	3.24 [3.08, 3.40]	2.26 [2.05, 2.47]	3.28 [3.14, 3.42]
UoG	3.28 [3.06, 3.49]	2.59 [2.17, 3.01]	3.52 [3.25, 3.79]
UEW	3.43 [3.23, 3.62]	2.60 [2.30, 2.90]	3.27 [3.07, 3.48]
KNUST	4.07 [3.69, 4.46]	2.36 [1.47, 3.25]	3.57 [3.17, 3.97]
UDS	3.63 [3.41, 3.84]	2.65 [2.24, 3.05]	3.49 [3.30, 3.68]
Ecological zone	<i><0.001**</i>	<i>0.180</i>	<i>0.001**</i>
Coastal	3.46 [3.31, 3.60]	2.57 [2.34, 2.79]	3.54 [3.39, 3.69]
Forest	3.16 [2.99, 3.33]	2.29 [2.07, 2.51]	3.14 [2.99, 3.29]
Savannah	3.71 [3.55, 3.88]	2.59 [2.23, 2.95]	3.45 [3.28, 3.62]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Content Delivery

Figure 18 shows the percentage distribution of student-teachers' performance in content delivery. Only 7.7% of student-teachers were rated as poor or very poor in organising teaching and learning activities sequentially and logically, compared to 32.5% for facilitating learners' understanding of content using multiple forms of representation, 34.6% for relating the lesson to other content knowledge and learners' daily lives and 52.9% for using learners' language errors as an opportunity to facilitate effective learning. The figure shows that for all the indicators, the majority of student-teachers were rated as average or good.

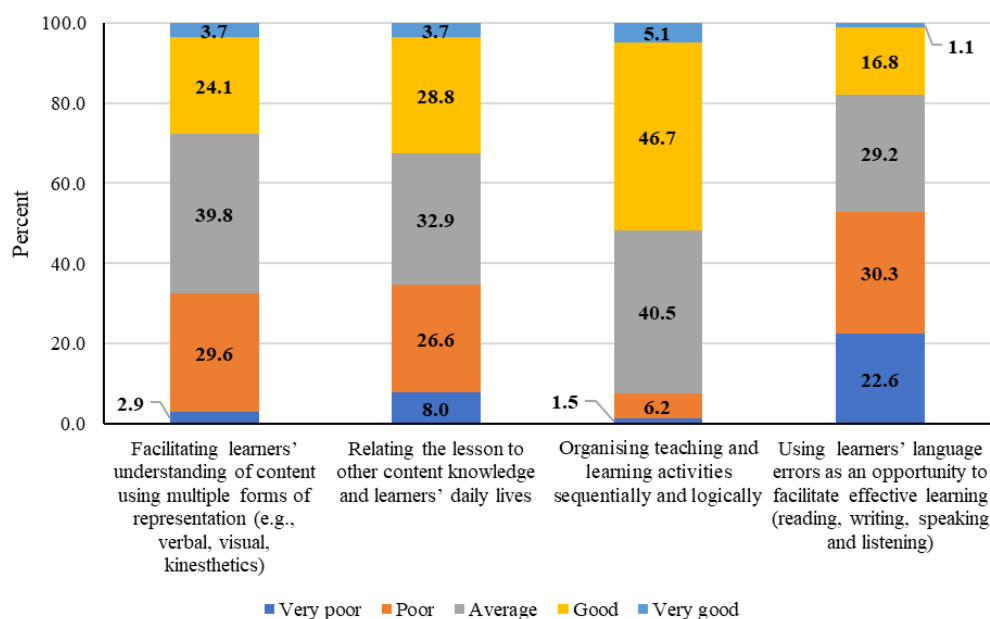


Figure 18: Percentage distribution of student-teachers' performance in lesson delivery

The mean scores in Table 21 show that, overall, student-teachers' performance in both facilitating learners' understanding of content using multiple forms of representation and relating the lesson to other content knowledge and learners' daily lives was rated as average. While their performance in organising teaching and learning activities sequentially and logically was rated as good. However, their use of learners' language errors as an opportunity to facilitate effective learning was rated poor. Statistically significant differences were observed between males and females for all the indicators. However, the ratings were the same for all the indicators except for using learners' language errors as an opportunity to facilitate effective learning (reading, writing, speaking and listening) where females had poor ratings compared to males who scored average. Both sexes scored equally (either average or good) on the remaining indicators.

All student-teachers in all four mentored CoEs had average ratings for facilitating learners' understanding of content using multiple forms of representation (e.g., verbal, visual, kinesthetics). For instance, on organising teaching and learning activities sequentially and logically, CoEs mentored by KNUST, UoG, and UDS had better performances than their counterparts from UEW and UCC, who had average ratings. Similarly, student-teachers mentored by UoG and UDS were average in using learners' language errors as an opportunity to facilitate effective learning (reading, writing, speaking and listening) but significantly better than their counterparts who were mentored by the other universities (rated as poor) on this indicator. The results further showed that the scores for all the indicators varied significantly across the ecological zones. Nonetheless, it was only for indicators three and four that had meaningful differences. For the remaining two indicators, all ecological zones were rated as average. While CoEs in the Coastal and Savannah zones performed significantly better (rated as good) in organising teaching and learning activities sequentially and logically, their counterparts from the Forest zone were rated as average. However, on using learners' language errors as an opportunity to facilitate effective learning, those in the Coastal zone performed better (with an average rating), while those in the Forest and Savannah zones were poorly rated.

Table 21: Mean score of student-teachers' performance in content delivery by background characteristics

Background characteristics	Facilitating learners' understanding of content using multiple forms of representation (e.g., verbal, visual, kinesthetics)	Relating the lesson to other content knowledge and learners' daily lives	Organising teaching and learning activities sequentially and logically	Using learners' language errors as an opportunity to facilitate effective learning (reading, writing, speaking and listening)
	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	2.96 [2.85, 3.07]	2.93 [2.81, 3.05]	3.48 [3.39, 3.57]	2.43 [2.31, 2.56]
Sex	<i>0.003**</i>	<i>0.009**</i>	<i>0.012*</i>	<i>0.023*</i>
Female	2.88 [2.77, 3.00]	2.86 [2.72, 2.99]	3.42 [3.32, 3.53]	2.37 [2.23, 2.50]
Male	3.30 [3.06, 3.54]	3.28 [3.02, 3.54]	3.72 [3.56, 3.88]	2.74 [2.47, 3.01]
Class type	<i>0.050</i>	<i>0.032*</i>	<i>0.012*</i>	<i>0.104</i>
KG	3.12 [2.91, 3.33]	3.13 [2.92, 3.33]	3.65 [3.47, 3.82]	2.59 [2.37, 2.81]
Primary	2.89 [2.77, 3.01]	2.85 [2.70, 2.99]	3.40 [3.30, 3.50]	2.37 [2.21, 2.52]
Class size	<i>0.866</i>	<i>0.813</i>	<i>0.127</i>	<i>0.924</i>
< 25	2.94 [2.76, 3.12]	2.98 [2.77, 3.19]	3.38 [3.22, 3.54]	2.46 [2.23, 2.68]
25 – 40	2.95 [2.79, 3.11]	2.89 [2.71, 3.07]	3.58 [3.45, 3.71]	2.44 [2.26, 2.62]
> 40	3.02 [2.77, 3.26]	2.94 [2.70, 3.19]	3.44 [3.25, 3.63]	2.38 [2.13, 2.64]
Mentoring university	<i>0.013*</i>	<i>0.080</i>	<i><0.001**</i>	<i>0.009**</i>
UCC	2.76 [2.60, 2.93]	2.77 [2.57, 2.98]	3.35 [3.22, 3.49]	2.25 [2.04, 2.45]
UoG	3.34 [3.06, 3.63]	3.31 [3.00, 3.62]	3.41 [3.21, 3.62]	2.79 [2.36, 3.22]
UEW	3.03 [2.81, 3.25]	2.90 [2.66, 3.14]	3.29 [3.08, 3.49]	2.37 [2.11, 2.63]
KNUST	2.86 [2.36, 3.36]	3.00 [2.35, 3.65]	4.00 [3.71, 4.29]	2.21 [1.91, 2.52]
UDS	3.10 [2.86, 3.33]	3.10 [2.88, 3.32]	3.90 [3.74, 4.06]	2.78 [2.58, 2.99]
Ecological zone	<i><0.001**</i>	<i>0.002**</i>	<i><0.001**</i>	<i>0.026*</i>
Coastal	3.28 [3.11, 3.44]	3.23 [3.04, 3.42]	3.44 [3.30, 3.58]	2.62 [2.37, 2.87]
Forest	2.74 [2.56, 2.91]	2.73 [2.52, 2.94]	3.25 [3.10, 3.40]	2.23 [2.03, 2.43]
Savannah	2.90 [2.71, 3.10]	2.88 [2.68, 3.08]	3.86 [3.72, 4.00]	2.51 [2.34, 2.67]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Learner Support

Figure 19 presents the percentage distribution of student-teachers and their performance in providing learner support. More than 60% of student-teachers performed at an average or below-average level across all indicators assessing the provision of learner support. Furthermore, over 20% were rated as performing poorly or very poorly in providing learner support across all indicators. Specifically, more than 40% of student-teachers performed poorly or very poorly in encouraging learners to monitor their own use of reading/writing strategies (46.7%), helping learners figure out unknown words when they are reading (42.7%) and to figure out letters they have difficulty writing (44.6%). Similar performances were observed for providing learners with writing opportunities in response to reading (41.6%), and opportunities for learners to practice writing letters and words in conjunction with learning their sounds (40.2%).

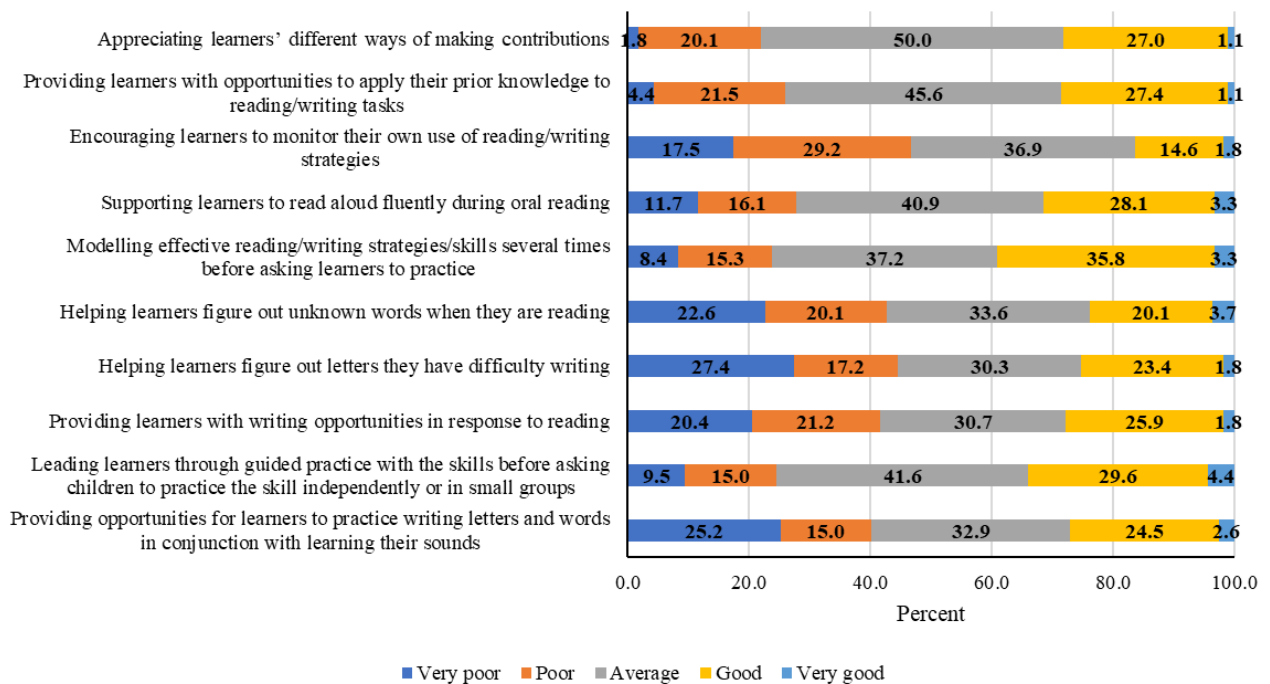


Figure 19: Percentage distribution of student teachers' performance in providing learner support

Table 22 shows the mean scores of student-teachers' performance in providing learner support by background characteristics. The results show that, except for encouraging learners to monitor their use of reading/writing strategies, and helping learners figure out letters they have difficulty writing, where the overall performance was rated as poor, student-teachers were rated average across all the other indicators. Their performance across all the indicators did not vary by sex, the class they taught or the class size. Nonetheless, the performances varied significantly by the mentoring university and the ecological zone where the CoE is located. Except for providing learners with opportunities to apply their prior knowledge to reading/writing tasks, where statistically significant differences were not observed, the performance of CoEs mentored by UCC across all the other indicators was rated significantly lower with performances ranging from poor to average. It is important to state that CoEs affiliated to KNUST had good performances on all the indicators of learner support with the exception of indicators one, two and three where they scored averagely. Regarding ecological zones, all student-teachers from the CoEs scored average on indicators: appreciating learners' different ways of making contributions; providing learners with opportunities to apply their prior knowledge to reading/writing tasks; supporting learners to read aloud fluently during oral reading; modelling effective reading/writing strategies/skills several times before asking learners to practice; and leading learners through guided practice with the skills before asking children to practice the skill independently or in small groups, with the exception of the remaining five indicators where there was meaningful statistical significance. For instance, CoEs from the Coastal and Savannah zones were rated as average and significantly better on the indicators: encouraging learners to monitor their own use of reading/writing strategies; helping learners figure out unknown words when they are reading; providing learners with writing opportunities in response to reading; and providing opportunities for learners to practice writing letters and words in conjunction with learning their sounds than their counterparts in the Forest zone who scored poorly on the aforementioned indicators. Finally,

CoEs in the Savannah zone were rated as average and significantly better than their colleagues from both the Coastal and Forest zones who had poor ratings on helping learners figure out letters they have difficulty writing.

Table 22: Mean score of student-teachers' performance in providing learner support by background characteristics

Background characteristics	Appreciating learners' different ways of making contributions	Providing learners with opportunities to apply their prior knowledge to reading/writing tasks	Encouraging learners to monitor their own use of reading/writing strategies	Supporting learners to read aloud fluently during oral reading	Modelling effective reading/writing strategies/skills several times before asking learners to practice	Helping learners figure out unknown words when they are reading	Helping learners figure out letters they have difficulty writing	Providing learners with writing opportunities in response to reading	Leading learners through guided practice with the skills before asking children to practice the skill independently or in small groups	Providing opportunities for learners to practice writing letters and words in conjunction with learning their sounds
	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	3.05 [2.96, 3.15]	2.99 [2.89, 3.09]	2.54 [2.42, 2.66]	2.95 [2.83, 3.07]	3.10 [2.98, 3.22]	2.62 [2.48, 2.76]	2.55 [2.41, 2.69]	2.68 [2.54, 2.81]	3.04 [2.92, 3.16]	2.64 [2.5, 2.78]
Sex	<i>0.506</i>	<i>0.419</i>	<i>0.086</i>	<i>0.151</i>	<i>0.159</i>	<i>0.102</i>	<i>0.097</i>	<i>0.863</i>	<i>0.045*</i>	<i>0.606</i>
Female	3.04 [2.94, 3.14]	2.97 [2.86, 3.09]	2.49 [2.36, 2.62]	2.91 [2.77, 3.05]	3.06 [2.93, 3.20]	2.57 [2.42, 2.72]	2.50 [2.34, 2.65]	2.67 [2.52, 2.82]	2.99 [2.85, 3.12]	2.63 [2.47, 2.78]
Male	3.12 [2.94, 3.30]	3.08 [2.87, 3.29]	2.76 [2.46, 3.06]	3.14 [2.91, 3.37]	3.28 [3.05, 3.51]	2.86 [2.53, 3.19]	2.80 [2.50, 3.10]	2.70 [2.39, 3.01]	3.30 [3.09, 3.51]	2.72 [2.42, 3.02]
Class type	0.819	0.2384	0.4285	0.8018	0.4037	0.1999	0.0182	0.1136	0.1804	0.0007
KG	3.07 [2.90, 3.24]	3.08 [2.89, 3.28]	2.61 [2.40, 2.82]	2.93 [2.72, 3.14]	3.18 [2.97, 3.39]	2.75 [2.48, 3.02]	2.80 [2.53, 3.07]	2.84 [2.58, 3.09]	3.16 [2.94, 3.39]	3.00 [2.75, 3.25]
Primary	3.05 [2.94, 3.15]	2.95 [2.84, 3.07]	2.51 [2.36, 2.65]	2.96 [2.81, 3.11]	3.07 [2.93, 3.21]	2.56 [2.41, 2.72]	2.44 [2.28, 2.60]	2.60 [2.45, 2.76]	2.99 [2.85, 3.13]	2.48 [2.32, 2.64]
Class size	<i>0.967</i>	<i>0.764</i>	<i>0.564</i>	<i>0.518</i>	<i>0.848</i>	<i>0.155</i>	<i>0.237</i>	<i>0.588</i>	<i>0.296</i>	<i>0.199</i>
< 25	3.04 [2.88, 3.20]	2.95 [2.77, 3.13]	2.46 [2.25, 2.66]	2.86 [2.65, 3.07]	3.10 [2.90, 3.30]	2.52 [2.29, 2.76]	2.46 [2.21, 2.70]	2.58 [2.36, 2.81]	2.92 [2.70, 3.14]	2.48 [2.23, 2.72]
25 – 40	3.07 [2.94, 3.20]	3.03 [2.89, 3.18]	2.59 [2.42, 2.76]	3.02 [2.84, 3.19]	3.13 [2.96, 3.31]	2.77 [2.56, 2.97]	2.69 [2.48, 2.89]	2.74 [2.53, 2.94]	3.11 [2.95, 3.27]	2.74 [2.54, 2.94]
> 40	3.06 [2.85, 3.26]	2.98 [2.76, 3.20]	2.60 [2.32, 2.87]	2.98 [2.71, 3.25]	3.04 [2.78, 3.30]	2.46 [2.19, 2.73]	2.42 [2.12, 2.73]	2.71 [2.41, 3.01]	3.13 [2.88, 3.39]	2.73 [2.41, 3.05]
Mentoring university	<i>0.024*</i>	<i>0.077</i>	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>
UCC	2.97 [2.83, 3.12]	2.89 [2.72, 3.06]	2.25 [2.06, 2.43]	2.64 [2.42, 2.85]	2.81 [2.60, 3.01]	2.21 [2.00, 2.42]	2.21 [1.98, 2.44]	2.47 [2.26, 2.68]	2.74 [2.53, 2.95]	2.28 [2.04, 2.52]
UoG	3.38 [3.11, 3.65]	3.34 [3.10, 3.59]	2.52 [2.17, 2.86]	3.24 [2.87, 3.62]	3.41 [3.13, 3.70]	2.79 [2.45, 3.14]	2.55 [2.19, 2.91]	2.59 [2.23, 2.95]	3.31 [3.03, 3.59]	2.48 [2.10, 2.87]
UEW	3.13 [2.94, 3.32]	2.91 [2.70, 3.13]	2.63 [2.38, 2.88]	3.00 [2.77, 3.23]	3.06 [2.83, 3.28]	2.56 [2.29, 2.82]	2.37 [2.13, 2.62]	2.54 [2.25, 2.83]	3.14 [2.93, 3.36]	2.73 [2.48, 2.98]
KNUST	2.64 [2.31, 2.98]	3.00 [2.64, 3.36]	2.93 [2.54, 3.31]	3.43 [3.16, 3.70]	3.86 [3.51, 4.21]	3.57 [3.23, 3.91]	3.50 [3.23, 3.77]	3.29 [2.72, 3.85]	3.29 [2.80, 3.77]	3.36 [2.72, 4.00]
UDS	3.06 [2.87, 3.25]	3.12 [2.92, 3.31]	2.96 [2.73, 3.19]	3.27 [3.09, 3.46]	3.41 [3.22, 3.60]	3.24 [2.96, 3.51]	3.27 [3.00, 3.55]	3.18 [2.93, 3.42]	3.35 [3.13, 3.57]	3.20 [2.96, 3.44]
Ecological zone	<i><0.001**</i>	<i>0.010*</i>	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>	<i>0.002**</i>	<i>0.003**</i>	<i><0.001**</i>
Coastal	3.33 [3.18, 3.49]	3.21 [3.05, 3.37]	2.61 [2.39, 2.83]	3.11 [2.89, 3.33]	3.26 [3.06, 3.45]	2.64 [2.42, 2.87]	2.59 [2.35, 2.82]	2.82 [2.60, 3.04]	3.20 [2.99, 3.41]	2.74 [2.51, 2.98]
Forest	2.95 [2.80, 3.09]	2.87 [2.69, 3.05]	2.26 [2.07, 2.45]	2.63 [2.42, 2.84]	2.79 [2.60, 2.99]	2.13 [1.92, 2.34]	2.06 [1.84, 2.29]	2.39 [2.17, 2.60]	2.79 [2.59, 2.99]	2.29 [2.06, 2.52]
Savannah	2.88 [2.72, 3.03]	2.90 [2.75, 3.05]	2.88 [2.70, 3.06]	3.25 [3.09, 3.40]	3.38 [3.20, 3.57]	3.34 [3.16, 3.53]	3.25 [3.07, 3.43]	2.93 [2.69, 3.18]	3.23 [3.05, 3.42]	3.05 [2.83, 3.28]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Pedagogical Strategies

Figure 20 shows the percentage distribution of student-teachers' performance in using pedagogical strategies. The figure reveals a markedly weak performance in student-teachers' use of pedagogical strategies. Only 27.7% and 21.9% were rated as good or very good in integrating components of language arts and using collaborative approaches to address the learning needs of struggling readers, respectively. In contrast, 35.1% and 45.7% were rated as poor or very poor in these areas, with 37.2% and 32.5% rated average. Student-teachers' performance was similarly low in implementing word study strategies to teach spelling and using learners' writing to teach grammar and spelling, with only 23.0% and 10.3% rated as good or very good, respectively. Meanwhile, 45.6% and 58.8% received poor or very poor ratings, and about 3 in every 10 were assessed as average in each area. Also, only a small proportion of student-teachers were rated as good or very good in modifying/varying reading/writing materials to the proper level for individual learners (16.1%) and breaking down broader concepts (such as phonics) into specific, discrete skills (29.9%). In these same areas, 48.2% and 46.4%, respectively, were rated as poor or very poor, while 35.8% and 23.7% were assessed as average.

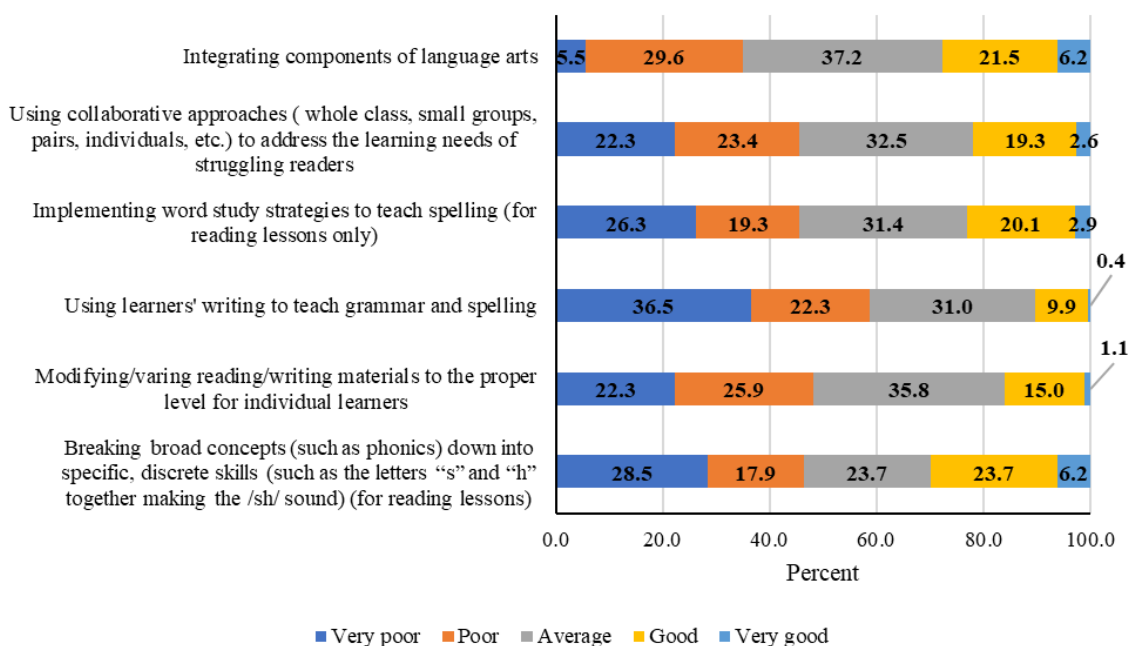


Figure 20: Percentage distribution of student-teachers' performance in using pedagogical strategies

Table 23 presents the mean scores of student-teachers' performance in using pedagogical strategies by background characteristics. The results show that overall, except for integrating components of language arts and breaking broad concepts (such as phonics) down into specific, discrete skills, where student teachers' performance was rated as average, they were assessed as poor in all the other indicators. There were no statistically significant differences in performance by sex. Those who taught KG scored significantly higher (rated average) in using collaborative approaches to address the learning needs of struggling readers and breaking broad concepts (such as phonics) down into specific, discrete skills compared to those who taught at the primary level who had poor ratings on these indicators. However, no significant differences were observed in performance across the other indicators. Regarding the size of the class

taught, a statistically significant difference was observed in respect of integrating components of language arts, with those who taught smaller classes scoring significantly higher than those who taught larger classes. However, all groups were scored average on this indicator. Significant differences by mentoring university and ecological zone were observed across all the indicators. Except for integrating components of language arts, where student-teachers in CoEs mentored by UoG scored significantly higher (rated average) than those mentored by KNUST who performed poorly on this indicator (with no significant differences among those mentored by UCC, UoG and UEW), those mentored by UCC scored significantly lower across all the other indicators. However, those from KNUST affiliates were significantly better (rated as good) than the other CoEs who scored either average or poor on breaking broad concepts (such as phonics) down into specific, discrete skills (such as the letters “s” and “h” together making the /sh/ sound) (for reading lessons). Regarding the ecological zone where the CoE is located, those in the Coastal and Forest zones performed better (good and average ratings respectively) than those in the Savannah zone (who had poor rating) in integrating components of language arts. However, those in the Coastal and Savannah zones significantly outperformed (rated average) those in the Forest zone (who were poorly rated) in using collaborative approaches to address the learning needs of struggling readers, implementing word study strategies to teach spelling and modifying/varying reading/writing materials to the proper level for individual learners. Concerning using learners' writing to teach grammar and spelling, all the zonal CoEs scored average. However, on breaking broad concepts (such as phonics) down into specific, discrete skills, student-teachers in CoEs located in the Savannah zone scored significantly higher (rated good) than their counterparts in CoEs located in the Coastal and Forest zones who had poor ratings.

Table 23: Mean score of student-teachers' performance in using pedagogical strategies by background characteristics

Background characteristics	Integrating components of language arts	Using collaborative approaches (whole class, small groups, pairs, individuals, etc.) to address the learning needs of struggling readers	Implementing word study strategies to teach spelling (for reading lessons only)	Using learners' writing to teach grammar and spelling	Modifying/varying reading/writing materials to the proper level for individual learners	Breaking broad concepts (such as phonics) down into specific, discrete skills (such as the letters "s" and "h" together making the /sh/ sound) (for reading lessons)
	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	2.93 [2.82, 3.05]	2.57 [2.43, 2.70]	2.54 [2.40, 2.68]	2.15 [2.03, 2.28]	2.47 [2.34, 2.59]	2.61 [2.46, 2.77]
Sex	<i>0.558</i>	<i>0.346</i>	<i>0.031</i>	<i>0.690</i>	<i>0.582</i>	<i>0.210</i>
Female	2.95 [2.82, 3.08]	2.54 [2.39, 2.68]	2.47 [2.31, 2.62]	2.17 [2.02, 2.31]	2.45 [2.31, 2.59]	2.57 [2.39, 2.74]
Male	2.86 [2.61, 3.11]	2.70 [2.40, 3.00]	2.86 [2.57, 3.15]	2.10 [1.85, 2.35]	2.54 [2.29, 2.79]	2.82 [2.49, 3.15]
Class type	<i>0.637</i>	<i>0.035*</i>	<i>0.903</i>	<i>0.997</i>	<i>0.971</i>	<i><0.001**</i>
KG	2.98 [2.73, 3.23]	2.78 [2.53, 3.03]	2.55 [2.28, 2.83]	2.15 [1.92, 2.38]	2.47 [2.23, 2.71]	3.06 [2.78, 3.34]
Primary	2.92 [2.79, 3.04]	2.47 [2.32, 2.62]	2.53 [2.38, 2.69]	2.15 [2.01, 2.30]	2.47 [2.32, 2.61]	2.41 [2.24, 2.59]
Class size	<i>0.001**</i>	<i>0.458</i>	<i>0.331</i>	<i>0.240</i>	<i>0.212</i>	<i>0.217</i>
< 25	3.22 [3.03, 3.41]	2.50 [2.28, 2.71]	2.41 [2.16, 2.65]	2.02 [1.81, 2.23]	2.35 [2.13, 2.57]	2.44 [2.17, 2.70]
25 – 40	2.78 [2.61, 2.95]	2.55 [2.35, 2.76]	2.64 [2.44, 2.84]	2.21 [2.01, 2.40]	2.59 [2.41, 2.76]	2.73 [2.50, 2.96]
> 40	2.75 [2.47, 3.03]	2.73 [2.43, 3.03]	2.58 [2.27, 2.88]	2.29 [2.04, 2.53]	2.42 [2.17, 2.67]	2.69 [2.37, 3.01]
Mentoring university	<i>0.002**</i>	<i>0.001**</i>	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>
UCC	3.09 [2.91, 3.27]	2.25 [2.03, 2.46]	2.15 [1.92, 2.37]	1.85 [1.66, 2.05]	2.07 [1.88, 2.27]	2.18 [1.95, 2.41]
UoG	3.31 [3.05, 3.57]	2.86 [2.49, 3.24]	2.97 [2.58, 3.35]	2.03 [1.65, 2.42]	2.62 [2.26, 2.98]	2.48 [2.07, 2.89]
UEW	2.84 [2.59, 3.10]	2.64 [2.39, 2.90]	2.64 [2.37, 2.91]	2.27 [2.03, 2.51]	2.80 [2.57, 3.03]	2.67 [2.34, 3.00]
KNUST	2.29 [1.96, 2.61]	2.71 [2.33, 3.10]	2.93 [2.36, 3.49]	2.64 [2.20, 3.09]	3.14 [2.64, 3.64]	3.50 [2.89, 4.11]
UDS	2.69 [2.41, 2.96]	2.94 [2.66, 3.22]	2.90 [2.65, 3.16]	2.57 [2.33, 2.81]	2.59 [2.37, 2.81]	3.29 [3.03, 3.56]
Ecological zone	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>	<i>0.024*</i>	<i><0.001**</i>	<i><0.001**</i>
Coastal	3.43 [3.26, 3.60]	2.83 [2.61, 3.06]	2.86 [2.61, 3.11]	2.18 [1.95, 2.41]	2.62 [2.41, 2.84]	2.54 [2.27, 2.82]
Forest	2.88 [2.69, 3.07]	2.25 [2.03, 2.47]	2.03 [1.81, 2.24]	1.97 [1.77, 2.18]	2.07 [1.88, 2.27]	2.11 [1.88, 2.33]
Savannah	2.40 [2.21, 2.58]	2.71 [2.49, 2.93]	2.93 [2.75, 3.12]	2.40 [2.20, 2.59]	2.88 [2.71, 3.05]	3.47 [3.26, 3.67]

p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval

Assessment

Figure 21 shows the percentage distribution of student-teachers' performance in the assessment of learners. The figure shows that a substantial proportion of the student-teachers' performance was rated as average or below. In linking assessment tasks to objectives/performance indicator(s), 66.4% were rated as average or below, with 16.8% rated as poor or very poor. Regarding employing assessment periodically, more than 7 out of every 10 were rated as average or below, including 24.1% who were rated poor or very poor. A substantial number (84.7%) of student-teachers scored an average or below average, with a corresponding 55.9% rated poor or very poor in encouraging learners' self-reflection on their knowledge and learning. Similarly, a markedly 77.1% scored at average or below in varying strategies for teaching basic skills based on ongoing informal assessment of learners, with 36.2% scoring at poor or very poor.

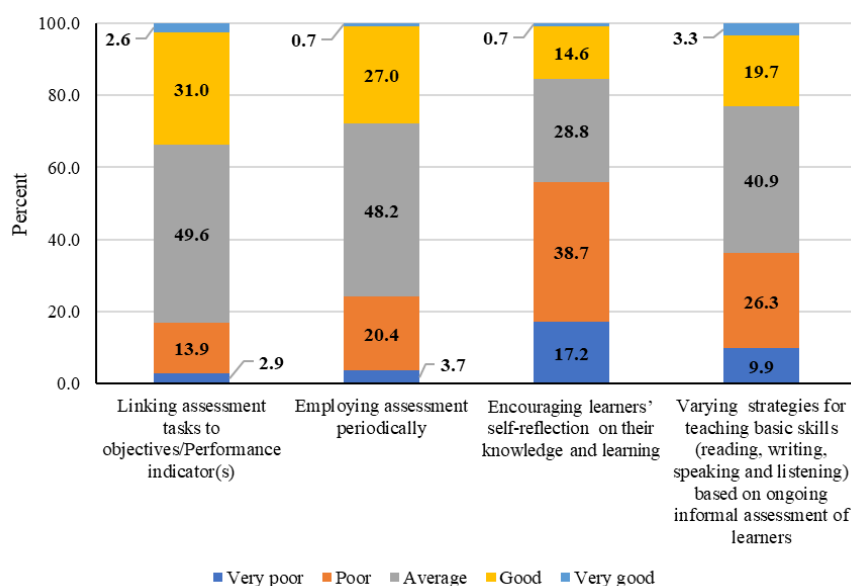


Figure 21: Percentage distribution of student-teachers' performance in the assessment of learners

As shown in Table 24, the mean performance of student-teachers in linking assessment tasks to objectives/performance indicator(s), employing assessment periodically, as well as varying strategies for teaching basic skills based on ongoing informal assessment of learners were rated as average but their performance in encouraging learners' self-reflection on their knowledge and learning was rated as poor. The mean scores across all the indicators did not differ significantly by the sex of the student-teachers, class taught or class size. A significant difference by the mentoring university was observed in the area of encouraging learners' self-reflection on their knowledge and learning, where student-teachers in CoEs mentored by KNUST and UDS performed significantly better (rated as average) than those mentored by UCC, UG and UEW (rated as poor). Additionally, CoEs mentored by KNUST significantly outperformed (had a good rating) compared to the other affiliates, who were rated as average on linking assessment tasks to objectives/ performance indicator(s). However, the scores of student-teachers mentored by UCC, UoG and UEW did not differ significantly. The scores also varied significantly by ecological zone in terms of varying strategies for teaching basic skills

based on ongoing informal assessment of learners, with student-teachers in CoEs located in the Coastal and Savannah zones (rated as average) performing significantly better than those in the Forest zone who had poor ratings on this indicator. Finally, on encouraging learners' self-reflection on their knowledge and learning, CoEs in the Savannah zone outperformed (had average ratings) their counterparts in the Coastal and Forest zones, who were rated poor in this category.

Table 24: Mean score of student teachers' performance in the assessment of learners by background characteristics

Background characteristics	Linking assessment tasks to objectives/ Performance indicator(s)	Employing assessment periodically	Encouraging learners' self-reflection on their knowledge and learning	Varying strategies for teaching basic skills (reading, writing, speaking and listening) based on ongoing informal assessment of learners
	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	3.16 [3.07, 3.26]	3.01 [2.91, 3.10]	2.43 [2.32, 2.55]	2.80 [2.69, 2.92]
Sex	<i>0.351</i>	<i>0.902</i>	<i>0.226</i>	<i>0.668</i>
Female	2.43 [2.32, 2.55]	3.00 [2.90, 3.11]	2.40 [2.27, 2.53]	2.79 [2.66, 2.92]
Male	2.80 [2.69, 2.92]	3.02 [2.81, 3.23]	2.58 [2.33, 2.83]	2.86 [2.65, 3.07]
Class type	<i>0.191</i>	<i>0.385</i>	<i>0.203</i>	<i>0.065</i>
KG	3.26 [3.08, 3.44]	3.07 [2.88, 3.26]	2.54 [2.33, 2.75]	2.96 [2.75, 3.18]
Primary	3.12 [3.01, 3.23]	2.98 [2.87, 3.09]	2.38 [2.24, 2.52]	2.73 [2.60, 2.87]
Class size	<i>0.340</i>	<i>0.914</i>	<i>0.307</i>	<i>0.433</i>
< 25	3.15 [2.98, 3.32]	2.98 [2.81, 3.15]	2.32 [2.12, 2.51]	2.70 [2.49, 2.91]
25 – 40	3.23 [3.10, 3.37]	3.02 [2.88, 3.17]	2.48 [2.31, 2.65]	2.86 [2.69, 3.03]
> 40	3.04 [2.82, 3.25]	3.02 [2.83, 3.21]	2.54 [2.29, 2.79]	2.87 [2.62, 3.11]
Mentoring university	<i>0.062</i>	<i>0.217</i>	<i>0.002**</i>	<i>0.003**</i>
UCC	3.05 [2.90, 3.21]	2.98 [2.83, 3.14]	2.22 [2.05, 2.39]	2.55 [2.36, 2.75]
UoG	3.31 [3.07, 3.55]	3.10 [2.82, 3.39]	2.48 [2.14, 2.83]	3.21 [2.91, 3.51]
UEW	3.11 [2.92, 3.31]	2.87 [2.68, 3.06]	2.41 [2.15, 2.68]	2.84 [2.60, 3.09]
KNUST	3.64 [3.15, 4.13]	3.36 [2.97, 3.75]	3.14 [2.74, 3.55]	2.79 [2.36, 3.21]
UDS	3.25 [3.08, 3.43]	3.10 [2.88, 3.31]	2.69 [2.48, 2.89]	3.06 [2.86, 3.26]
Ecological zone	<i><0.001**</i>	<i>0.058</i>	<i><0.001**</i>	<i><0.001**</i>
Coastal	3.37 [3.22, 3.51]	3.16 [2.99, 3.32]	2.51 [2.30, 2.72]	3.09 [2.87, 3.30]
Forest	2.94 [2.78, 3.10]	2.88 [2.73, 3.04]	2.17 [1.99, 2.35]	2.54 [2.36, 2.73]
Savannah	3.26 [3.09, 3.43]	3.01 [2.83, 3.20]	2.73 [2.55, 2.90]	2.85 [2.67, 3.02]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Feedback

Figure 22 shows that the performance of more than 3 out of every 5 student-teachers across all the indicators used to assess the provision of feedback to learners was rated as average or below. In the area of providing specific comments or prompts that help clarify learners' misunderstandings, most student-teachers (70.8%) were rated as average or below, including 23.0% who were rated poor or very poor, while only 29.2% achieved a good or very good rating in this area. Concerning providing specific comments or prompts that help identify learners' successes and timely feedback to learners as part of classroom routines, a similar proportion of student-teachers (69% and 68%, respectively) were rated as average or below. Specifically, 17.5% and 14.3% of student-teachers, respectively, were rated as poor or very poor, while similar proportions (31.1% and 32.2%, respectively) were rated as good or very

good. On providing learners opportunities for re-engagement and revision, more than 7 out of every 10 student-teachers were rated as average, including 39.8% who were rated as poor or very poor. The percentage rated good or very good in this case was 24.4%.

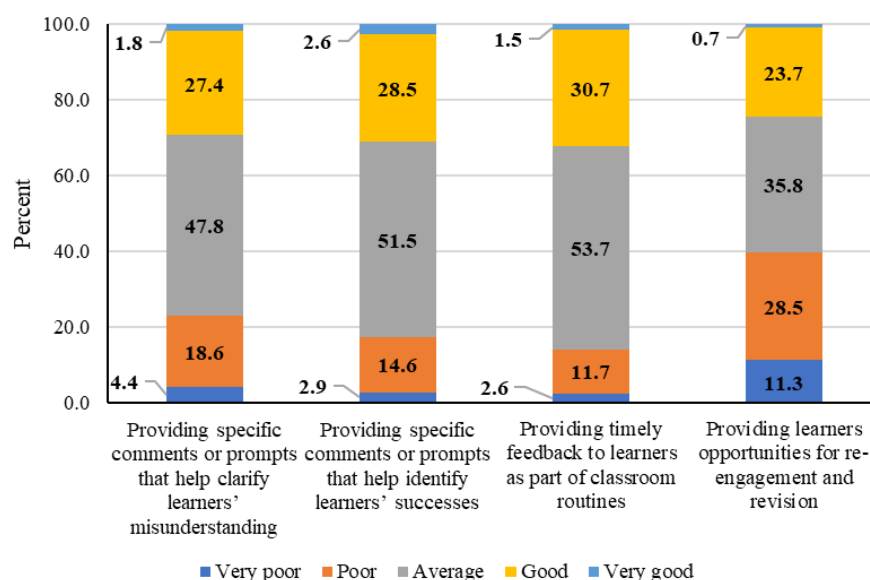


Figure 22: Percentage distribution of student teachers' performance in providing feedback

Table 25 shows the mean scores of student-teachers' performance in providing feedback to learners by background characteristics. Overall, the mean scores indicate that student-teachers' performance across all the indicators assessing the provision of feedback to learners was consistently rated as average. A difference in male-female performance was observed with providing learners opportunities for re-engagement and revision, where males scored higher than females, but both sexes scored average on this indicator. Neither the type of class taught nor the size affected student-teachers' performance in providing feedback. The mentoring university of a CoE was only significantly associated with providing learners opportunities for re-engagement and revision, where those mentored by UCC scored significantly lower (poor) compared to those mentored by KNUST (rated as good) and UDS (rated as average). The scores for CoEs mentored by UCC, UoG and UEW were not significantly different. With regards to the ecological zone in which the CoE is located, the results show that CoEs in the Coastal and Savannah zones were significantly better (had average ratings) than their peers from the Forest zone who were rated poor on this indicator. The other differences among the zones were not meaningful since they all scored average on the first three indicators. Thus, were deemed as performing within the same threshold (2.60 to 3.39) when rated on providing specific comments or prompts that help clarify learners' misunderstandings and identify learners' successes; providing specific comments or prompts that help identify learners' successes; and providing learners with opportunities for re-engagement and revision.

Table 25: Mean score of student-teachers' performance in providing feedback by background characteristics

Background characteristics	Providing specific comments or prompts that help clarify learners' misunderstandings Mean [95% CI]	Providing specific comments or prompts that help identify learners' successes Mean [95% CI]	Providing timely feedback to learners as part of classroom routines Mean [95% CI]	Providing learners opportunities for re-engagement and revision Mean [95% CI]
All	3.04 [2.94, 3.14]	3.13 [3.04, 3.23]	3.17 [3.08, 3.26]	2.74 [2.63, 2.86]
Sex	<i>0.252</i>	<i>0.207</i>	<i>0.899</i>	<i>0.024*</i>
Female	3.01 [2.89, 3.13]	3.10 [2.99, 3.21]	3.17 [3.06, 3.27]	2.68 [2.55, 2.81]
Male	3.16 [3.00, 3.32]	3.26 [3.08, 3.44]	3.18 [3.01, 3.35]	3.02 [2.77, 3.27]
Class type	<i>0.631</i>	<i>0.531</i>	<i>0.515</i>	<i>0.418</i>
KG	3.00 [2.81, 3.19]	3.18 [2.97, 3.38]	3.21 [3.03, 3.40]	2.81 [2.60, 3.03]
Primary	3.05 [2.94, 3.17]	3.11 [3.01, 3.21]	3.15 [3.05, 3.25]	2.71 [2.57, 2.85]
Class size	<i>0.667</i>	<i>0.913</i>	<i>0.963</i>	<i>0.850</i>
< 25	3.02 [2.85, 3.19]	3.16 [2.99, 3.33]	3.16 [3.00, 3.31]	2.70 [2.51, 2.90]
25 – 40	3.08 [2.95, 3.22]	3.12 [2.98, 3.25]	3.18 [3.06, 3.31]	2.78 [2.60, 2.95]
> 40	2.96 [2.70, 3.23]	3.12 [2.90, 3.33]	3.15 [2.94, 3.37]	2.73 [2.47, 2.99]
Mentoring university	<i>0.079</i>	<i>0.3307</i>	<i>0.559</i>	<i><0.001**</i>
UCC	2.92 [2.76, 3.08]	3.08 [2.94, 3.22]	3.15 [3.02, 3.29]	2.53 [2.36, 2.70]
UoG	3.38 [3.11, 3.65]	3.28 [2.98, 3.57]	3.17 [2.93, 3.41]	2.93 [2.58, 3.28]
UEW	2.99 [2.76, 3.21]	3.09 [2.86, 3.31]	3.07 [2.86, 3.28]	2.63 [2.36, 2.90]
KNUST	3.21 [2.99, 3.44]	3.50 [3.23, 3.77]	3.29 [3.04, 3.53]	3.43 [3.09, 3.77]
UDS	3.12 [2.90, 3.34]	3.12 [2.92, 3.31]	3.29 [3.11, 3.48]	3.06 [2.85, 3.27]
Ecological zone	<i><0.001**</i>	<i>0.004**</i>	<i>0.599</i>	<i><0.001**</i>
Coastal	3.32 [3.17, 3.47]	3.32 [3.16, 3.48]	3.23 [3.08, 3.39]	2.81 [2.62, 3.01]
Forest	2.77 [2.61, 2.94]	2.95 [2.80, 3.11]	3.14 [2.99, 3.28]	2.44 [2.25, 2.63]
Savannah	3.08 [2.90, 3.27]	3.16 [3.00, 3.33]	3.14 [2.97, 3.30]	3.11 [2.93, 3.29]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Critical Thinking

Figure 23 shows the percentage distribution of student-teachers' promotion of critical thinking skills in foundational literacy lessons. The figure indicates that across all the indicators used to assess student-teachers' promotion of critical thinking skills, the majority performed at an average level or below. Across all the indicators, more than 7 out of every 10 performed at average or below. Regarding asking open-ended questions for learners to apply what they've learned and build on prior knowledge, 44.5% of student-teachers were rated as poor or very poor. Slightly more than one-third (33.9%) were assessed as poor or very poor in providing an opportunity for learners to connect different ideas and apply prior knowledge to new contexts. A substantial 74.5% of the student-teachers were rated poor or very poor in providing opportunities for learners to ask questions. Notably, almost one-half were assessed as poor or very poor in encouraging learners to actively listen to their peers and build on their ideas. Concerning creating the environment for learners to engage with challenging ideas to make their own decisions, 35.1% were rated poor or very poor.

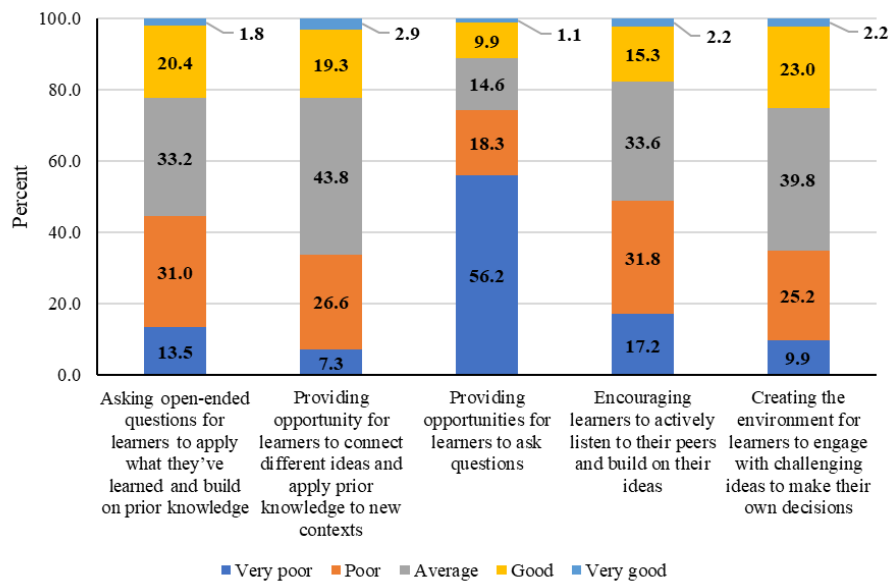


Figure 23: Percentage distribution of student teachers' performance in critical thinking skills

Table 26, shows the mean scores of student-teachers' performance in promoting critical thinking skills, based on their background characteristics. The results indicate an overall average performance in asking open-ended questions for learners to apply what they have learned and build on prior knowledge; providing opportunity for learners to connect different ideas and apply prior knowledge to new contexts, and creating the environment for learners to engage with challenging ideas to make their own decisions. Nonetheless, their performance in providing opportunities for learners to ask questions and encouraging them to actively listen to their peers and build on their ideas was assessed as poor. A significant and meaningful difference between male and female student-teachers was observed with respect to encouraging learners to actively listen to their peers and build on their ideas, where males were scored significantly higher (rated as average) than females who had poor ratings. The class taught and class size did not significantly affect any of the performances in relation to critical thinking skills. The mentoring university not meaningful in significant differences associated with providing opportunities for learners to connect different ideas and apply prior knowledge to new contexts, and for learners to ask questions. This is because they were all rated as average or poor on the indicators. Except for asking open-ended questions for learners to apply what they've learned and build on prior knowledge, meaningful statistically significant differences were found across ecological zones in indicators four and five. Student-teachers from Coastal zone performed better (rated as average) than their counterparts from Forest and Savannah zones who were rated poorly on encouraging learners to actively listen to their peers and build on their ideas. On the other hand, CoEs in the Coastal and Savannah zones performed better (rated average) than those in the Forest zone who had poor performance on this indicator.

Table 26: Mean score of student-teachers' performance in critical thinking skills by background characteristics

Background characteristics	Asking open-ended questions for learners to apply what they've learned and build on prior knowledge	Providing opportunity for learners to connect different ideas and apply prior knowledge to new contexts	Providing opportunities for learners to ask questions	Encouraging learners to actively listen to their peers and build on their ideas	Creating the environment for learners to engage with challenging ideas to make their own decisions
	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	2.66 [2.54, 2.78]	2.84 [2.73, 2.95]	1.81 [1.69, 1.94]	2.54 [2.42, 2.66]	2.82 [2.71, 2.94]
Sex	<i>0.539</i>	<i>0.173</i>	<i>0.363</i>	<i>0.002**</i>	<i>0.353</i>
Female	2.64 [2.51, 2.78]	2.80 [2.68, 2.93]	1.79 [1.64, 1.93]	2.45 [2.31, 2.58]	2.80 [2.67, 2.93]
Male	2.74 [2.49, 2.99]	3.00 [2.80, 3.20]	1.94 [1.66, 2.22]	2.94 [2.68, 3.20]	2.94 [2.70, 3.18]
Class type	<i>0.427</i>	<i>0.927</i>	<i>0.457</i>	<i>0.218</i>	<i>0.676</i>
KG	2.59 [2.37, 2.81]	2.85 [2.64, 3.05]	1.74 [1.52, 1.96]	2.42 [2.21, 2.64]	2.79 [2.56, 3.02]
Primary	2.69 [2.55, 2.84]	2.84 [2.71, 2.97]	1.85 [1.69, 2.00]	2.59 [2.44, 2.73]	2.84 [2.71, 2.97]
Class size	<i>0.493</i>	<i>0.833</i>	<i>0.661</i>	<i>0.412</i>	<i>0.261</i>
< 25	2.57 [2.37, 2.78]	2.80 [2.59, 3.01]	1.82 [1.60, 2.04]	2.45 [2.23, 2.66]	2.80 [2.60, 3.01]
25 – 40	2.69 [2.50, 2.87]	2.88 [2.72, 3.03]	1.76 [1.57, 1.95]	2.55 [2.39, 2.72]	2.76 [2.59, 2.93]
> 40	2.77 [2.52, 3.01]	2.83 [2.63, 3.03]	1.92 [1.63, 2.21]	2.67 [2.38, 2.96]	3.02 [2.80, 3.24]
Mentoring university	<i>0.771</i>	<i>0.016*</i>	<i>0.009**</i>	<i>0.104</i>	<i>0.063</i>
UCC	2.65 [2.44, 2.85]	2.68 [2.50, 2.87]	1.82 [1.62, 2.02]	2.34 [2.14, 2.53]	2.64 [2.45, 2.82]
UoG	2.79 [2.35, 3.23]	3.31 [2.98, 3.64]	2.41 [1.96, 2.87]	2.76 [2.43, 3.09]	3.17 [2.88, 3.47]
UEW	2.60 [2.37, 2.83]	2.91 [2.70, 3.13]	1.77 [1.51, 2.03]	2.63 [2.37, 2.89]	2.89 [2.64, 3.13]
KNUST	2.93 [2.60, 3.25]	3.00 [2.54, 3.46]	1.29 [0.85, 1.72]	2.57 [2.17, 2.97]	2.93 [2.54, 3.31]
UDS	2.63 [2.39, 2.86]	2.76 [2.56, 2.97]	1.67 [1.40, 1.93]	2.71 [2.45, 2.96]	2.92 [2.68, 3.17]
Ecological zone	<i>0.401</i>	<i><0.001**</i>	<i><0.001**</i>	<i>0.002**</i>	<i><0.001**</i>
Coastal	2.78 [2.55, 3.00]	3.14 [2.95, 3.34]	2.31 [2.06, 2.57]	2.78 [2.57, 2.99]	3.08 [2.89, 3.27]
Forest	2.61 [2.42, 2.81]	2.68 [2.50, 2.85]	1.64 [1.46, 1.82]	2.29 [2.09, 2.49]	2.56 [2.37, 2.75]
Savannah	2.59 [2.40, 2.78]	2.71 [2.53, 2.89]	1.47 [1.27, 1.66]	2.62 [2.42, 2.81]	2.92 [2.72, 3.11]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Socio-Emotional Skills

Autonomy

Promoting autonomy, that is, giving learners choices in their reading and writing activities in foundational literacy lessons, is essential as it empowers them to take charge of their learning, leading to a deeper understanding and lasting literacy development. Figure 24 presents the percentage distribution of student-teachers' performance in promoting autonomy in foundational literacy class. The figure indicates a very weak performance among student-teachers in providing learners opportunities to make choices and to take on roles in the classroom. Specifically, 83.6% and 83.2% of student-teachers were rated as average or below average, with 47.8% and 51.8%, respectively, rated as poor or very poor. Comparatively, their performance in the other two indicators; i.e. creating an environment that encourages learners to voluntarily participate in classroom learning, and a safe and child-friendly classroom climate for learners to freely express their ideas and understandings, was marginally better. Here, 57.3% and 38.0% were rated as average or below average, including 20.8% and 7.3%, respectively, who were rated as poor or very poor.

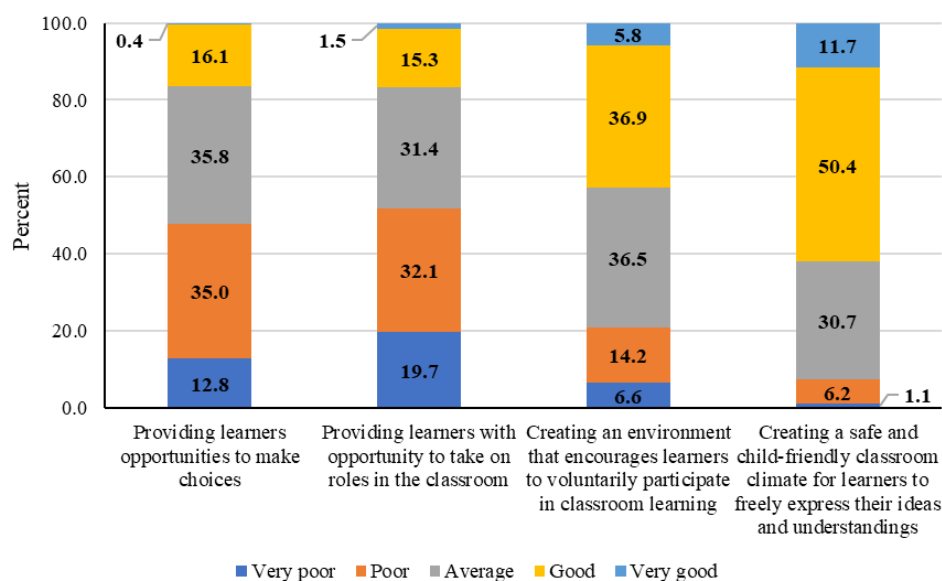


Figure 24: Percentage distribution of student-teachers' performance in promoting autonomy in class

Table 27 shows the mean score of student-teachers' performance in promoting autonomy in class according to their background characteristics. Overall, the student-teacher's performance in providing learners opportunities to make choices and to take on roles in the classroom was scored as poor. Their performance in creating an environment that encourages learners to voluntarily participate in classroom learning was assessed as average, while that of creating a safe and child-friendly classroom climate for learners to freely express their ideas and understandings was assessed as good. Male student-teachers performed significantly better than their female counterparts in providing learners with opportunities to make choices, to take on roles in the classroom, and create a safe and child-friendly classroom climate for learners to freely express their ideas and understandings. The results show that student-teachers who taught larger classes (> 40 learners) significantly outperformed (rated as average) those who taught smaller classes (rated as poor) in providing learners with an opportunity to take on roles in the classroom. Significant differences in performance were observed across all the indicators based on the mentoring university and the ecological zone where the CoEs are located. Regarding the mentoring universities, those mentored by UoG and UEW performed significantly better (rated as average) than all the others (who performed poorly) in providing learners with opportunities to make choices. Those mentored by UoG, UEW and UDS (all had average ratings) significantly outperformed those mentored by UCC (had poor ratings) in providing learners with an opportunity to take on roles in the classroom. However, the scores for those mentored by UCC and KNUST were not significantly different. Further, those mentored by KNUST and UDS, performed significantly better (were rated as good and very good respectively) in creating an environment that encourages learners to voluntarily participate in classroom learning and creating a safe and child-friendly classroom climate for learners to freely express their ideas and understandings than their counterparts who had average and good ratings respectively on the two aforementioned indicators. Concerning ecological zones, CoEs in the Coastal zone performed better (had average rating) than those in the Forest and Savannah zones (rated poor) in providing learners with opportunities to make choices. Those in the Coastal and Savannah zones outperformed (had average rating) those in

the Forest zone (who were poorly rated) in providing learners with opportunities to take on roles in the classroom. The results further show that those in the Savannah zone outperformed, that is, were rated as good and very good respectively than their counterparts in the Coastal and Forest zones in creating an environment that encourages learners to voluntarily participate in classroom, and a safe and child-friendly classroom climate for learners to freely express their ideas and understandings who had average ratings on the aforementioned indicators.

Table 27: Mean score of student teachers' performance in promoting autonomy in class by background characteristics

Background characteristics	Providing learners opportunities to make choices	Providing learners with opportunity to take on roles in the classroom	Creating an environment that encourages learners to voluntarily participate in classroom learning	Creating a safe and child-friendly classroom climate for learners to freely express their ideas and understandings
	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	2.56 [2.45, 2.67]	2.47 [2.35, 2.59]	3.21 [3.09, 3.33]	3.65 [3.56, 3.75]
Sex	<i>0.028*</i>	<i>0.103</i>	<i>0.048*</i>	<i>0.028*</i>
Female	2.50 [2.38, 2.63]	2.42 [2.28, 2.56]	3.16 [3.02, 3.29]	3.60 [3.49, 3.71]
Male	2.82 [2.58, 3.06]	2.68 [2.41, 2.95]	3.46 [3.22, 3.70]	3.88 [3.68, 4.08]
Class type	<i>0.166</i>	<i>0.392</i>	<i>0.354</i>	<i>0.296</i>
KG	2.45 [2.23, 2.66]	2.39 [2.16, 2.62]	3.13 [2.89, 3.37]	3.73 [3.54, 3.91]
Primary	2.61 [2.49, 2.74]	2.50 [2.36, 2.64]	3.25 [3.12, 3.38]	3.62 [3.51, 3.73]
Class size	<i>0.512</i>	<i>0.041*</i>	<i>0.482</i>	<i>0.217</i>
< 25	2.51 [2.33, 2.70]	2.30 [2.09, 2.51]	3.12 [2.90, 3.33]	3.55 [3.39, 3.72]
25 – 40	2.55 [2.39, 2.70]	2.50 [2.33, 2.66]	3.26 [3.09, 3.42]	3.74 [3.61, 3.88]
> 40	2.69 [2.42, 2.96]	2.73 [2.45, 3.01]	3.29 [3.04, 3.54]	3.63 [3.41, 3.86]
Mentoring university	<i><0.001**</i>	<i>0.007**</i>	<i>0.007**</i>	<i><0.001**</i>
UCC	2.39 [2.21, 2.57]	2.19 [1.99, 2.39]	3.00 [2.81, 3.19]	3.39 [3.26, 3.53]
UoG	2.90 [2.54, 3.25]	2.72 [2.35, 3.10]	3.14 [2.73, 3.55]	3.55 [3.25, 3.85]
UEW	2.87 [2.67, 3.08]	2.67 [2.43, 2.92]	3.26 [3.04, 3.48]	3.60 [3.39, 3.81]
KNUST	2.36 [2.10, 2.62]	2.50 [2.16, 2.84]	3.71 [3.39, 4.04]	4.36 [4.10, 4.62]
UDS	2.37 [2.15, 2.60]	2.63 [2.39, 2.86]	3.51 [3.25, 3.76]	4.16 [4.00, 4.32]
Ecological zone	<i>0.001**</i>	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>
Coastal	2.87 [2.67, 3.06]	2.72 [2.50, 2.95]	3.22 [3.01, 3.43]	3.51 [3.34, 3.68]
Forest	2.38 [2.19, 2.57]	2.16 [1.96, 2.36]	2.95 [2.76, 3.14]	3.38 [3.24, 3.51]
Savannah	2.47 [2.32, 2.61]	2.62 [2.46, 2.77]	3.60 [3.43, 3.78]	4.25 [4.11, 4.38]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Perseverance

Promoting learner perseverance in a foundational literacy class is important, as learners often encounter challenges that require sustained effort and resilience. It helps learners to build resilience, foster independence and lifelong learning. Figure 25 presents the percentage distribution of student-teachers' performance in promoting perseverance in foundational literacy lessons. The figure shows a clear weakness in student-teachers' performance in promoting perseverance among learners. Except for promoting a positive attitude towards learners' challenges, where 62.4% were assessed as average or below, across all the indicators used to measure perseverance, more than 4 out of every 5 were scored as average or below. Regarding encouraging learners to set goals, 95.6% were rated as average or below, including 70.0% who were rated as poor or very poor. Similar proportions were observed for encouraging

learners to learn from their mistakes (84.7%); engaging learners to talk with each other in class about books they are reading (96.0%); recommending a variety of quality children's literature to learners for their private/home reading (98.5%) and motivating learners to show interest in reading (92.7%).

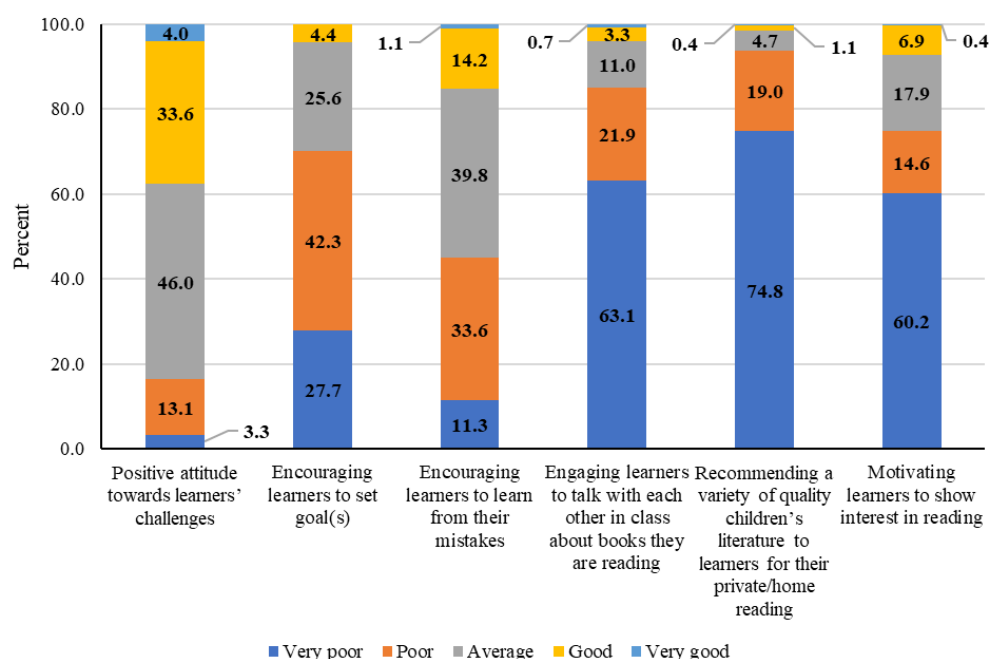


Figure 25: Percentage distribution of student teachers' performance in promoting perseverance in class

Table 28 presents the mean scores of student-teachers' performance in promoting perseverance in foundational literacy lessons by background characteristics. Overall, student-teachers' performance in promoting positive attitudes towards learners' challenges and encouraging learners to learn from their mistakes was rated as average, while they were rated poor in encouraging learners to set goals. The student-teachers were also rated very poor in engaging learners to talk with each other in class about books they are reading, recommending a variety of quality children's literature to learners for their private/home reading and motivating learners to show interest in reading. The scores across all the indicators did not vary significantly by sex or the class taught. By class size, those who taught large classes performed significantly better in motivating learners to show interest in reading. However, this significant was not considered as meaningful because student-teachers across all the class types were rated as poor on that specific indicator. Significant differences in performance were observed in respect of the mentoring university in promoting a positive attitude towards learners' challenges, where those mentored by UCC scored significantly lower than (average) those mentored by other universities who had good ratings. Also, those mentored by KNUST (were average) outperformed those mentored by the other universities in encouraging learners to set goals because they were rated as poor. In reference to ecological zones, CoEs in the Savannah zone performed significantly better than those in the Forest zone in promoting positive attitudes towards learners' challenges, encouraging learners to set goals and engaging learners to talk with each other in class about books they are reading. However, student-teachers in all the ecological zones had same performance of either average and poor on the different indicators.

Table 28: Mean score of student-teachers' performance in promoting perseverance in class by background characteristics

Background characteristics	Positive attitude towards learners' challenges	Encouraging learners to set goal(s)	Encouraging learners to learn from their mistakes	Engaging learners to talk with each other in class about books they are reading	Recommending a variety of quality children's literature to learners for their private/home reading	Motivating learners to show interest in reading
	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]
All	3.22 [3.12, 3.32]	2.07 [1.97, 2.17]	2.60 [2.49, 2.71]	1.57 [1.46, 1.67]	1.33 [1.25, 1.41]	1.73 [1.61, 1.85]
Sex	<i>0.192</i>	<i>0.381</i>	<i>0.234</i>	<i>0.116</i>	<i>0.418</i>	<i>0.961</i>
Female	3.19 [3.07, 3.30]	2.04 [1.93, 2.16]	2.57 [2.45, 2.69]	1.53 [1.42, 1.64]	1.32 [1.23, 1.4]	1.73 [1.59, 1.86]
Male	3.36 [3.17, 3.55]	2.16 [1.95, 2.37]	2.74 [2.53, 2.95]	1.74 [1.45, 2.03]	1.40 [1.2, 1.60]	1.72 [1.47, 1.97]
Class type	<i>0.499</i>	<i>0.806</i>	<i>0.403</i>	<i>0.556</i>	<i>0.878</i>	<i>0.497</i>
KG	3.27 [3.09, 3.46]	2.05 [1.86, 2.23]	2.67 [2.48, 2.86]	1.61 [1.42, 1.80]	1.34 [1.22, 1.47]	1.79 [1.57, 2.01]
Primary	3.20 [3.08, 3.32]	2.07 [1.95, 2.19]	2.57 [2.44, 2.70]	1.54 [1.42, 1.67]	1.33 [1.23, 1.43]	1.70 [1.55, 1.84]
Class size	<i>0.627</i>	<i>0.049</i>	<i>0.846</i>	<i>0.088</i>	<i>0.151</i>	<i>0.040*</i>
< 25	3.17 [2.99, 3.35]	1.91 [1.75, 2.08]	2.61 [2.42, 2.80]	1.43 [1.26, 1.59]	1.25 [1.14, 1.36]	1.52 [1.34, 1.71]
25 – 40	3.22 [3.09, 3.36]	2.12 [1.97, 2.27]	2.57 [2.42, 2.72]	1.61 [1.47, 1.76]	1.35 [1.23, 1.46]	1.85 [1.67, 2.03]
> 40	3.31 [3.06, 3.56]	2.23 [2.00, 2.46]	2.65 [2.39, 2.92]	1.73 [1.45, 2.01]	1.46 [1.24, 1.69]	1.83 [1.53, 2.12]
Mentoring university	<i>0.001**</i>	<i>0.040*</i>	<i>0.096</i>	<i>0.567</i>	<i>0.3205</i>	<i>0.488</i>
UCC	2.98 [2.81, 3.15]	1.97 [1.82, 2.13]	2.57 [2.40, 2.75]	1.48 [1.33, 1.63]	1.25 [1.15, 1.34]	1.63 [1.44, 1.81]
UoG	3.41 [3.16, 3.66]	2.00 [1.68, 2.32]	2.93 [2.62, 3.24]	1.62 [1.26, 1.98]	1.38 [1.10, 1.66]	1.66 [1.27, 2.04]
UEW	3.41 [3.20, 3.62]	2.09 [1.85, 2.33]	2.41 [2.18, 2.65]	1.57 [1.37, 1.77]	1.46 [1.27, 1.64]	1.87 [1.63, 2.11]
KNUST	3.64 [3.20, 4.09]	2.71 [2.47, 2.96]	2.71 [2.47, 2.96]	1.50 [1.16, 1.84]	1.29 [1.04, 1.53]	1.57 [1.17, 1.97]
UDS	3.24 [3.07, 3.40]	2.10 [1.94, 2.26]	2.71 [2.49, 2.92]	1.73 [1.44, 2.01]	1.33 [1.15, 1.51]	1.82 [1.52, 2.12]
Ecological zone	<i>0.001**</i>	<i><0.001**</i>	<i>0.046</i>	<i>0.011*</i>	<i>0.294</i>	<i>0.534</i>
Coastal	3.33 [3.15, 3.51]	2.10 [1.90, 2.30]	2.74 [2.54, 2.95]	1.62 [1.43, 1.82]	1.33 [1.18, 1.49]	1.71 [1.50, 1.93]
Forest	3.00 [2.83, 3.17]	1.83 [1.67, 1.98]	2.44 [2.27, 2.62]	1.39 [1.25, 1.52]	1.27 [1.17, 1.37]	1.67 [1.48, 1.85]
Savannah	3.41 [3.25, 3.57]	2.38 [2.27, 2.50]	2.67 [2.52, 2.83]	1.77 [1.55, 1.98]	1.42 [1.26, 1.59]	1.84 [1.60, 2.07]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Social and Collaborative Skills

Enhancing learners' social and collaborative skills is essential for teaching foundational literacy, as it creates an interactive and supportive environment that helps learners to develop their communication and thinking abilities alongside their reading and writing skills. Figure 26 shows the percentage distribution of student-teachers' performance in enhancing learners' social and collaborative skills during foundational literacy lessons. The figure indicates a weak performance among student-teachers, particularly in promoting learner collaboration through peer interaction and interpersonal skills development. In both cases, the performance of 82.5% was scored at average or below, with about one-half rated as poor or very poor. The performance for creating a sense of belongingness among learners in the classroom was marginally better, with 48.2% scored at average or below, including 16.8% who were scored as poor or very poor.

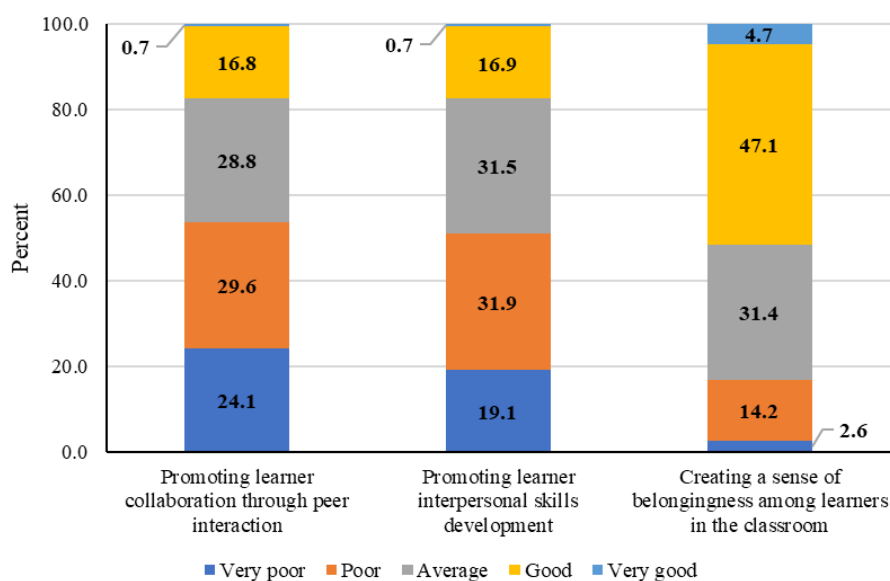


Figure 26: Percentage distribution of student teachers' performance in enhancing social and collaborative skills

The mean scores of student-teachers' performance in enhancing social and collaborative skills by background characteristics, as shown in Table 29, indicate that student-teachers' overall performances in promoting learner collaboration through peer interaction and interpersonal skills development were rated as poor. Their performance in creating a sense of belongingness among learners in the classroom was rated as average. Performance did not differ significantly across any indicators by sex or class size. However, those who taught KG performed significantly better than those who taught primary in promoting learner collaboration through peer interaction and interpersonal skills development. Performance differed significantly across all indicators based on the mentoring university and the ecological zone. The performance of student-teachers in CoEs mentored by UCC was significantly lower across all the indicators. Furthermore, student-teachers in CoEs within the Forest zone demonstrated significantly lower performance across all indicators compared to their counterparts in other zones.

Table 29: Mean score of student teachers' performance in enhancing social and collaborative skills by background characteristics

Background characteristics	Promoting learner collaboration through peer interaction Mean [95% CI]	Promoting learner interpersonal skills development Mean [95% CI]	Creating a sense of belongingness among learners in the classroom Mean [95% CI]
All	2.40 [2.28, 2.53]	2.48 [2.36, 2.60]	3.37 [3.27, 3.47]
Sex	<i>0.194</i>	<i>0.171</i>	<i>0.188</i>
Female	2.36 [2.22, 2.50]	2.44 [2.31, 2.58]	3.34 [3.22, 3.45]
Male	2.58 [2.30, 2.86]	2.66 [2.42, 2.90]	3.52 [3.29, 3.75]
Class type	<i>0.003**</i>	<i>0.005**</i>	<i>0.091</i>
KG	2.68 [2.44, 2.91]	2.74 [2.51, 2.96]	3.50 [3.30, 3.70]
Primary	2.28 [2.13, 2.43]	2.37 [2.23, 2.51]	3.31 [3.19, 3.43]
Class size	<i>0.146</i>	<i>0.514</i>	<i>0.099</i>
< 25	2.39 [2.17, 2.60]	2.40 [2.18, 2.61]	3.23 [3.04, 3.41]
25 – 40	2.31 [2.13, 2.48]	2.52 [2.34, 2.69]	3.48 [3.33, 3.62]
> 40	2.65 [2.35, 2.96]	2.58 [2.33, 2.83]	3.40 [3.17, 3.63]
Mentoring university	<i>0.005**</i>	<i><0.001**</i>	<i><0.001**</i>
UCC	2.16 [1.94, 2.38]	2.19 [1.98, 2.40]	3.08 [2.93, 3.23]
UoG	2.79 [2.46, 3.12]	2.79 [2.49, 3.09]	3.41 [3.07, 3.76]
UEW	2.36 [2.13, 2.59]	2.45 [2.22, 2.68]	3.29 [3.06, 3.52]
KNUST	2.50 [2.10, 2.90]	2.86 [2.45, 3.26]	4.14 [3.95, 4.33]
UDS	2.73 [2.47, 2.98]	2.88 [2.67, 3.09]	3.86 [3.69, 4.04]
Ecological zone	<i><0.001**</i>	<i><0.001**</i>	<i><0.001**</i>
Coastal	2.79 [2.56, 3.01]	2.78 [2.56, 2.99]	3.22 [3.04, 3.41]
Forest	2.05 [1.86, 2.25]	2.10 [1.91, 2.29]	3.07 [2.91, 3.23]
Savannah	2.47 [2.26, 2.67]	2.71 [2.53, 2.89]	4.00 [3.88, 4.12]

*p-values in italics; **p < 0.01; *p < 0.05; CI – Confidence Interval*

Conclusion

This study suggests that across all the components used to measure teaching performance (i.e. quality of lesson plan, classroom culture, teaching methodology and content delivery, assessment strategies and feedback mechanisms, critical thinking, and socio-emotional skills), student-teachers scored average to below average. The findings raise concerns about their preparedness to engage effectively in professional teaching after school. This calls for measures to provide targeted support to student-teachers during the Year 3 and Year 4 STS sessions to foster continuous improvement in their competencies for teaching foundational numeracy and literacy. Judging from the findings, the targeted support should be holistic or in totality across all the indicators that are necessary to adequately prepare teachers for FLN. This is because, teaching is a total experience and occurs in a continuum with well inter-connected components necessary for effective lesson delivery.

The findings from the observational study revealed that generally, across almost all the components of the classroom teaching observation in both foundational numeracy and literacy, there were variations in performance according to gender, with males performing better. Especially, those ones that were deemed not only statistically significant but also differentials in the specific performance levels of either very poor, poor, average, good, or very good. Performance across the components of foundational numeracy and literacy teaching also varied among student-teachers based on their ecological zones (Coastal, Forest, and Savanna), with student-teachers in the coastal and savanna zones performing better. Interestingly, class size did not significantly influence student-teachers' performance across most of the components of both foundational literacy and numeracy teaching.

Across both subjects, student-teachers generally performed poorly in critical instructional areas such as using varied teaching resources, applying formative assessment, engaging learners and encouraging autonomy and perseverance. A striking observation made was the fact that student-teachers from mentoring universities, especially KNUST and UG, performed better in teaching both foundational numeracy and literacy than their counterparts from CoEs mentored by UCC. Across most of the components of assessing foundational numeracy and literacy teaching, student-teachers in KG performed better than their primary school counterparts.

Male student-teachers consistently outperformed their female counterparts across several indicators, and those teaching kindergarten (KG) often performed better than those teaching at the primary level, especially in creating inclusive environments and fostering learner participation. Critical thinking, autonomy, perseverance and collaboration among learners were poorly supported, indicating a gap between pedagogical training and practical classroom application.

Teaching learning resources used in teaching foundational numeracy were mostly counting materials, while in foundational literacy, it was reading charts. The variations in performances of student-teachers in foundational numeracy and literacy across the components and indicators based on gender, ecological zone, mentoring university, and class level warrant further investigation to unravel the underlying issues and to design the appropriate interventions.

Recommendations

Based on the findings of this study, the following recommendations are made.

- i. Conduct further studies to unravel the underlying issues accounting for variations in performance of student-teachers in foundational numeracy and literacy across the components and indicators based on gender, ecological zone in which a College of Education is located, the mentoring university and grade level. This should provide insight to inform the design of appropriate interventions.
- ii. Strengthen Training on Practical Pedagogy and Learner Engagement to emphasise participatory methods, group activities and classroom-based formative assessment.
- iii. Enhance Support for Female Student-Teachers. This will require targeted mentoring and capacity-building strategies for female student-teachers to bridge the performance gap, particularly in classroom management and instructional delivery.
- iv. Integrate socio-emotional learning (SEL) frameworks and critical thinking development strategies more explicitly into the B.Ed. curriculum, ensuring student-teachers are trained to apply these in foundational subject contexts.
- v. Exposition on varied assessment strategies (especially those that promote critical thinking, reflection and collaboration), their effective usage as well as relevance to foundational numeracy and literacy should be consciously inculcated into student-teachers for them to appreciate the need to effectively use them in their pedagogical activities.
- vi. Provide more structured observation tools, mentoring support, and reflective feedback opportunities during the Supported Teaching in Schools (STS) placement to support continuous improvement.
- vii. Recognise and support the unique demands of teaching at KG versus primary levels by ensuring that teacher preparation programmes include level-specific instructional strategies and classroom management techniques.
- viii. Conduct regular longitudinal studies to track changes in competency levels, focusing on the impact of intervention strategies and curriculum adjustments on teaching quality and learner outcomes.