



Regular Article

Trainee teachers' classroom assessment practices: Towards evaluating trainee teachers' learning experience in a teacher education program

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ABSTRACT

This study investigated the extent to which trainee teachers' assessment competence and literacy prepare them for supporting students' learning and how trainee teachers' previous experience impacts their assessment practices. Data collected through interviews and questionnaires were subjected to factor analysis and identified four areas that can illuminate how trainees promote assessment. It also revealed that combining both new and existing experiences can help trainees to reflect on their practice and develop their assessment competence and literacy and suggested a restructuring of the contents and structure of assessment beyond what is provided to the trainees.

1. Introduction

Assessment for learning (AFL) has received so much attention over the years in various parts of the world with the ground-breaking work of Black and Wiliam (1998), for example, creating opportunities for teachers to embrace various assessment strategies and promote learning. The concept of assessment has become more dynamic and unpredictable following the Covid-19-induced disruption to assessments of students in the United Kingdom and elsewhere (Office of Qualifications, Regulation, & Ofqual, 2021). Assessment for learning and formative assessments are sometimes considered to be different concepts because while the latter can collect data at any point of instruction to assess and support students' learning, the former does not necessarily do so (Black & Wiliam, 1998; Swaffield, 2011). Nonetheless, both are sometimes used synonymously and interchangeably in promoting students' learning (Izci et al., 2020; Schildkamp et al., 2020).

Recently, the sudden disruption caused by the Covid 19 pandemic may suggest a timely review of the purposes of assessment and how it should be done across regions and countries. Could there be a universally acceptable pattern of assessments, with the teacher and students given more support to engage in AFL differently?

Teachers use formative assessments to gather information about students' learning (Black & Wiliam, 1998; DeLuca et al., 2016; Siarova et al., 2017) and this is used to adapt teaching to meet the needs of students. The ARG (2002) defines AFL as the process of seeking and

interpreting evidence for use by learners and their teachers to decide where the learners are in their learning, where they need to go, and how best to get there. Formative assessments should be a priority for teachers (Buck et al., 2010; DeLuca et al., 2019) and can be facilitated through mentoring and continuing professional development (CPD). However, the difficulty lies in finding ways to promote and develop assessment practices that are student-centered in order to facilitate change in their learning. The focus of assessment for many years in various parts of the world has centered on improving teachers' classroom assessment practices (Black & Wiliam, 1998; NFER, 2019). A further effort may be required to support teachers, and their conceptualizations of assessments, values and attitudes as this can become a means to improve their classroom assessment practices. Therefore, assessment competence and literacy become an important process as teachers need to be able to use various strategies to promote learning such as questions, feedback, self and peer assessments (Kippers et al., 2018; Panadero et al., 2016).

Formative assessment by teachers involves checking students' work, providing feedback to improve learning and creating opportunities for self and peer assessments (Black & Wiliam, 1998; Panadero et al., 2016; Ofsted, 2019; DFE, 2019). The information collected through this medium is used by teachers to promote learning and adapt their teaching. The NFER (2019) asserts that the assessment for learning approach recognizes that every classroom activity offers assessment opportunities for teachers to evaluate learning, provide feedback and inform their teaching, and teachers and students can be supported in this learning

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process. Unfortunately, summative assessment has been given too much emphasis over formative assessments (Black and Wiliam, 1998; Brown et al., 2019) and assessments from tests and examinations may not provide valid and reliable information about pupils' achievements.

Although summative assessment has a specific purpose, the outcome may not be an indication of everything a student knows or can do (NFER 2019). One possible implication of this might well be that there is a need for summative assessment outcomes to be used to inform the formative assessment process. Illustrating this potential use of formative assessment is the assessment regime introduced during the COVID-19 crisis. Because there were no summative assessment exercises during the Covid-19 pandemic, schools and stakeholders were required to revisit the purposes of assessment and its modality of implementation. This, in our view, gave more importance to formative assessments than ever before and provided a hint that it is possible to move away from examinations to other forms of more authentic assessments. This, we suggest, can create a transformative learning experience for teachers and students. To achieve this potential transition, teachers must have the required level of assessment competence and literacy to be able to fruitfully conduct and utilize the outcomes of summative assessment.

Existing studies have clearly shown the importance of the various forms of assessment and have argued for their importance in the learning process. While this identifies the various assessment skills that trainee teachers have, what is not known is the stage at which these skills manifest and the actual roles of these skills in teaching and learning. This amounts to a yawning gap in the context of assessment and its use. While there is no doubt that educators, including trainees such as the ones who participated in this study recognize the importance of assessment as a tool for learning, there is little evidence that they are aware of their readiness to use assessment in a structured form. Even when they do, there is no evidence that they can conclusively identify what is responsible for their acquisition of these skills at various stages. To help prepare trainee teachers to use this tool most effectively, it is important that we also identify the sources of acquiring these tools and the roles these skills play in facilitating teaching and learning. In doing this, we expect that a statement could be made about how to enhance the process of acquisition. In essence, it can be argued that the ability of trainees to reflect on their assessment practices and provide when and how they have acquired the tools for executing these practices is key to supporting their assessment literacy.

Toward this end, the goal of this study is to assess and establish trainee teachers' assessment competence and literacy at all levels of compulsory education, as well as in the further education sector. To do this, the study utilized a survey offered by James and Pedder (2006) to classify and analyze trainee teachers' classroom assessment practices. It drew on Dewey's theory of experience (Dewey, 1983; Schmidt, 2010) in exploring the quality of experience provided for the trainees taking into consideration various factors including their prior experience of assessments.

It is against this backdrop that this study will address the following research questions:

What are trainee teachers' perceptions of the roles of assessment in teaching and learning?

How do these roles manifest in their practice and in the context of learning for their students?

2. The Postgraduate Certificate of Education (PGCE) program delivery

The Initial Teacher Education (ITE) program in the university where this study took place includes courses in the early years, primary, secondary and further education leading to a qualified teacher status and a post-graduate certificate in education (PGCE). The trainee teachers were drawn from early years, primary, secondary and further education courses with various subject specialisms. For example, the secondary trainees included specialist areas such as maths, biology, chemistry,

physics and physical education. The courses involve university-taught sessions in the form of workshops, seminars and professional studies run by lecturers and expert guest speakers, and a school experience (practicum). The duration of the university taught sessions and school placement varies among the different phases, for example, the secondary trainees attend university sessions for 12 weeks during their training and this is interspersed with school placements that last for 24 weeks in any academic year. The academic year runs from September to June of the following year. The combined experience between university sessions and school experience provides trainees the opportunity to locate theory in their practice.

Teaching strategies to promote AfL are incorporated into the various courses through workshops, seminars and professional studies to enable the trainees to gain theoretical knowledge and assessment experience before embarking on school experience for a period depending on the phase they are training to teach. While on school experience, they can observe experienced teachers (mentors) delivering assessments and are allowed to plan and teach lessons that incorporate assessment strategies that they have learned. The mentors observe their teaching and give expert feedback by focusing on how the trainees are carrying out assessments in their classrooms.

3. Methodology

This mixed-methods study (Creswell, 2012) resonates with and reflects the researchers' acknowledgment of the constructivist worldview on learning. Demonstrating a commitment to the understanding of learning as a socially constructed process, the researchers felt that the alignment to a mixed-methods paradigm will facilitate the tracking of how the participants make meaning of their assessment practices and contribute to knowledge creation. This is one of the central goals of the study. The mixed-methods underpinning selected for this study permits participants to generate and present their understanding in a socially constructed process that draws on the realities of their practice and learning communities. As such, it broadly incorporates the principles of a constructivist approach to learning. The study design allows the collection of a rich and comprehensive data corpus to understand classroom assessment practices. Data was collected through questionnaires and interviews, with the trainees given the opportunity to provide evidence to support their responses to the assessment practices in the questionnaire. The interview schedule was informed by findings from the survey thus, the factors that emerged from the quantitative data analysis were important in analyzing interview findings. In essence, this manifests the nature of the sequential mixed methods used in this study.

3.1. Survey instrument

James and Pedder's (2006) validated survey on classroom assessment practices was modified and used in this study to assess trainee teachers' classroom assessment practices and elicit their perceptions of these practices. This allows them to assess their current state of knowledge and any experience regarding assessment practices carried out in their classrooms. The modification makes the survey unique because it is designed to create an opportunity for the trainees to provide evidence to justify their assessment practices drawing instinctively on their own learning experience. It also creates an awareness of various practices, thereby, identifying any gaps in their knowledge to promote assessment competence and literacy. The opportunity for trainees to justify their classroom assessment practices could transform their learning experiences and modify their actions. Ade-Ojo and Duckworth (2020) conclude that to develop trainee teachers' assessment practices, a review of the structure and content of assessment education beyond training programs should be considered, thus, recognizing trainee teachers' experiences as valuable in developing their assessment practices.

Given that the validated survey was modified, it was important to

pilot the survey to establish its viability in order to establish its validity, reliability and practicability (Cohen et al., 2011). More importantly, in this study, we were more concerned with establishing whether the instrument can be fruitfully utilized to address our research questions. As such, the modified survey was administered to a group of learners who studied in the same program the previous year. Piloting the survey led to the realization that responses have not referred to participants' cultural capital, as there were no mentions of related terms and concepts. We felt that recognizing learners' cultural capital is important because it is impossible to harness learners' prior learning without including their cultural capital. This was essentially a product of the researchers' reflection on responses and, therefore, led to a slight revision of the survey. As a result, the concept of cultural capital was included as the base for previous learning. This enabled the participants to consider further ways to develop students' schemas and assessment practices. The revised questionnaire was subsequently administered to two individuals from the same demographic group and their responses showed that it enabled them to reflect the element of cultural capital in their presentation of previous learning.

3.2. Participants

The participants are 122 trainee teachers in the compulsory education and further education sectors on teacher-training programs in a university in England. Following the analysis of the survey questionnaires, the trainee teachers were interviewed.

The university is notable for teachers' training for over 100 years and is representative of other teacher training institutions in England due to the similarities in their curriculum, students and tutors. Most of the tutors have similar backgrounds and experiences of being school-teachers who wanted to develop further the skills they employed in schools within an environment that focuses on teacher training in the university (Sinkinson, 1997) and this applies to other institutions in England. In addition, the trainee teachers involved in this study come from multicultural backgrounds and are of different classes including the working and middle classes. This is again a common feature of trainee teachers across the UK. The curriculum offered to these trainees, like other institutions in the UK, is informed by the Department for Education's core content framework (DFE, 2019) ensuring that all trainee teachers follow a similar curriculum, thus allowing for a coordinated training approach and development. These regulatory expectations for trainee teachers nationwide enable the trainee teachers in compulsory education to achieve Qualified Teacher Status (QTS) and Further education trainees achieving a Qualified Teacher Learning and Skills status (QTLS) at the end of their training. Given these common features, we feel confident that the sample involved in this study is representative of the larger sample of trainee teachers in the UK.

3.3. Data collection

Data were collected through questionnaires and interviews, with trainee teachers given the opportunity to provide evidence on the assessment practices in the questionnaire (appendix 1). The assessment practices in the questionnaire (alphabets A-R and U) were drawn from James and Pedder's (2006) validated survey on classroom assessments (see appendix 1) but modified to include a section on the provision of evidence. In this context, four additional assessment practices (S, T, V and W, see appendix 1) were included in the survey to account for other assessments carried out in the classroom. In total, the survey is made up of 23 assessment practices (appendix 1), and respondents were required to rate their practices using a Likert scale ranging from 1 = rarely true, 2 = occasionally true, 3 = sometimes true, 4 = often true and 5 = mostly true.

The interview was semi-structured and conducted by a research assistant with experience in formative assessment practices. The interview schedule was informed by findings from the survey thus, the factors that

emerged from the quantitative data analysis were important in analyzing interview findings. In essence, this manifests the nature of the sequential mixed methods used in this study. These questions enabled the collection of rich data on trainees' perceptions and conceptualizations of assessments. The interviews were audio-recorded to get access when required.

3.4. Data analysis

3.4.1. Quantitative data analysis

The questionnaire was analyzed using factor analysis to identify any similarities and differences in the classroom assessment practices (see Tables 1–4). Further, a descriptive statistic of the assessment practices including their Eigenvalues was conducted. The 23 assessment practices on the questionnaire (appendix 1) were subjected to factor analysis.

Before carrying out the factor analysis, the data was verified by inspecting the frequency distributions of the 23 assessment practices (appendix 1) in the questionnaire used for this study. The skewness and kurtosis were within the acceptable range of ± 3 for skewness and ± 10 for kurtosis thus indicating a normal distribution (Brown & Green, 2006; Demir, 2021). The verification of the histograms showed that the distributions appeared approximately normal in that there were no significant deviations from the mean scores of the responses on items relating to assessment practices.

The factorability of the 23 assessment practices was examined using the criteria for the factorability of a correlation. The correlation matrix indicated that 18 of the 23 assessment practices correlated at least at 0.3 with another item. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.761, which was above the 0.6 value that is recommended as the threshold for suitability for factor analysis (Leech et al., 2005), and Bartlett's test of sphericity was significant ($\chi^2(210) = 1203.1, p < .05$). Following these indicators, factor analysis was considered suitable for the 23 assessment practices. This meant that a central goal of the study, which was to identify the classroom assessment practice scores of the trainee teachers can be achieved through the exploration and analysis of the factors.

Factor analysis using varimax rotation was conducted on the 23 assessment practices. Although the Eigenvalue had an explained variance greater than 1.0, the application of varimax rotation enabled the use of the orthogonal method which allowed the inclusion of variables that may not be correlated, as it ensures that the findings will not be difficult to explain (Costello & Osborne, 2005). In addition, using this combination in this context allowed us to address the concerns around the issue of the expectation of non-correlation in social science studies.

Table 1
Making learning explicit to students.

Assessment practices	Factor loadings
A. The feedback that students receive helps them improve	0.636
D. Students' learning objectives are discussed with students in ways they understand.	0.572
H. Students are helped to understand the learning purposes of each lesson or series of lessons.	0.773
I. Assessment criteria are discussed with students in ways they understand	0.773
J. I provide guidance to help students assess their work	0.766
K. Students are helped to think about how they learn best	0.818
N. I provide guidance to help students assess their learning.	0.802
O. I regularly discuss with students, ways of improving learning how to learn.	0.812
P. My assessment practices help students to learn independently	0.653
R. The main emphasis in my assessments is on whether students know, understand or can do prescribed elements of the curriculum.	0.610
S. Students are given opportunities to create their questions using Bloom's taxonomy and give feedback to their peers.	0.718

Cronbach's alpha: 0.887 n = 108.

Table 2
An instructional purpose that promotes self-reflection and motivation.

Assessment practices	Factor loadings
E. Students are told how well they have done in relation to their previous performance.	0.746
F. Students are encouraged to view mistakes as valuable learning opportunities	0.796
Q. Students' effort is seen as important when assessing their learning	0.696

Cronbach's alpha: 0.718 n = 108.

Table 3
Trainee teachers' assessment competence and literacy.

Assessment practices	Factor loadings
L. I use questioning mainly to elicit reasons and explanations from my students.	0.623
T. My assessment practices promote differentiated learning through the use of Bloom's taxonomy, and this is also used to structure the LO and success criteria/outcomes	0.708
U. Students are given opportunities for peer assessments and are given guidance on what to do.	0.853
W. I provide challenging tasks to elicit higher order thinking and problem-solving in a constructivist learning classroom.	0.527

Cronbach's alpha: 0.730 n = 108.

Table 4
Reviewing students' learning.

Assessment practices	Factor loadings
C. Students are helped to find ways of addressing problems they have in their learning	0.880
G. The assessment provides me with useful evidence of students' understandings which they use to plan subsequent lessons	0.515
M. The main emphasis in teachers' assessment is on what students know, understand, and can do	0.765

Cronbach's alpha: 0.673 n = 108.

We align with the argument that when variables are uncorrelated, orthogonal and oblique rotation almost have identical outcomes (Costello & Osborne, 2005). As all items in this analysis had loadings over 0.5, the varimax rotation provided the best-defined factor structure.

Four orthogonal factors were identified that explained 66% of the variance in participants' assessment practice scores (Tables 1–4). The Eigenvalue criterion of >1 was applied carefully to enable the identification of factors that at least explained a similar level of variance as one item. In recognition of the challenges associated with the sole use of the Eigenvalue threshold (Costello & Osborne, 2005), we used the scree test to identify the break in the curve reflective of the number of factors retained. Additional factor analysis testing was carried out using the number of retained factors and the number of factors identified from the scree test. Factors with no cross-loadings, factors with more than 3 items, and factors with an item loading greater than 0.5 were regarded as the most suitable fit to the data (Costello & Osborne, 2005; Leech et al., 2005). After applying these processes, 21 assessment practices remained part of the analysis, as assessment practices B (“I identify students' strengths and advise them on how to develop them further”) and V (“I create opportunity for new learning to be shaped by prior knowledge and students' cultural perspectives”) were eliminated due to cross-loading or and insufficient loading.

To interpret the data following the orthogonal rotation, we used the rotated factor matrix. Loadings of 0.5 and higher were identified and included, resulting in the extraction of 4 factors. This included factor 1 (Making learning explicit to students) with eleven assessment practices,

factor 2 (Instructional purpose that promotes self-reflection and motivation) with three assessment practices, factor 3 (Assessment competence and literacy), with four assessment practices, and factor 4 (Reviewing students' learning) with three assessment practices. We considered these assessment practices to be the most relevant in explaining the variance of each identified factor and this correlation between them aligns with our theoretical framing.

The internal consistency of each extracted factor was examined using Cronbach alpha and ranged between 0.673 and 0.887. The four extracted factors with their definitions, factor loadings and component items are presented in Tables 1–4.

To substantiate our findings and to better understand classroom assessment practices, we used the ARG (2002) principles of assessment. Following our theorization, we further investigated whether the correlated classroom assessment practices with high loadings for each factor would align with our original conceptualization which draws on ARG's (2002) principles of assessment. We determined that the four factors aligned with the principles. Factor 1, Making learning explicit to students was substantiated by the following ARG's principles: focusing on how pupils learn; central to classroom practice as it involves both teachers and learners in reflection, dialogue and decision making; promoting understanding of goals and criteria and helping learners know how to improve. Factor 2, Instructional purpose that promotes self-reflection and motivation aligned with the following principles: to foster motivation and recognize all educational achievements while factor 3, Assessment competence and literacy was substantiated by the principle that relates to effective planning and developing the capacity for self-assessment and peer assessments. Factor 4, Reviewing students' learning was corroborated by ARG's principles that include describing a key professional skill for teachers and one that is sensitive and constructive by using comments that focus on learning and motivation.

The assessment practices for each factor provided evidence of corresponding to ARG's principles, thus, allowing us to identify and differentiate the classroom assessment practices across the four areas. The factor analysis enabled us to identify the differences in the trainees' practices based on their responses. For example, for factor 1 (Making learning explicit to students), the trainee teachers' report on discussing students' learning objectives and providing feedback proved to be the best corresponding fit, whereas, for factor 2 (Instructional purpose that promotes self-reflection and motivation), the report on assessment practices following Bloom's taxonomy and peer assessment was found to be the best corresponding fit.

3.4.2. Qualitative data analysis

The study used a deductive thematic analysis to analyze the interview data as the data sources were coded based on the outcomes from the questionnaire analysis (Clarke et al., 2015). To achieve this, the interview recordings were transcribed and analyzed using thematic analysis (Braun & Clarke, 2006) that involved familiarisation with the data, generating initial codes, and searching for and reviewing themes related to classroom assessment practices. Recurrent themes were coded to give a truer indication of their meanings. Following the initial coding and thematization of the data, a neutral critical friend was invited to conduct their analysis of parts of the data independent of the researchers to establish the objectivity of the researchers' interpretation given their involvement in the program delivery as discussed under reflexivity. The research assistant and researchers were involved in the process of verifying and comparing the data as part of the coding process to generate more valid and reliable data. The interviews helped to identify the types of assessment practices carried out by trainees in their classrooms, their perceptions of assessments, and how their practices have evolved.

3.5. Reflexivity

The researchers recognize their role as members of staff within the

university and that there is the possibility of the conflation of roles. This raises the issue of power relations in the context of staff and student participants may affect the quality of the data collected. To resolve this situation, a research assistant was used for the data collection and interviews. The sample of data analysis was shared with neutrals to see if their interpretation converges with those of the researchers and where there were any discrepancies, the data was carefully scrutinised by all involved.

4. Findings

The findings from the questionnaire and interviews provide answers to the research questions:

What are trainee teachers' perceptions of the roles of assessment in teaching and learning?

How do these roles manifest in their practice and in the context of learning for their students? The correlation matrix showed that 18 of the 23 assessment practices correlated at 0.3 with other assessment practices. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.761, above the 0.6 value recommended, indicating the suitability for factor analysis, and Bartlett's test of sphericity was significant ($\chi^2(210) = 1203.1, p < .05$). Following these indicators, factor analysis using varimax rotation was considered suitable for analyzing the questionnaire. However, assessment practices B and V were eliminated from the analysis due to cross-loading or insufficient loading (see appendix 1). The assessment practices with factor loadings over 0.5 were retained as the varimax rotation provided the best-defined factor structure. Therefore, 21 assessment practices remained as part of the questionnaire analysis. Four factors emerged from the analysis of the questionnaire data and are discussed below.

4.1. Findings from the analysis of questionnaire data

4.1.1. Factor 1: making learning explicit to students

The assessment practices that make up factor 1 (Table 1) are interpreted as making learning explicit to students and are defined by ARG's (2002) principles of AfL that include focusing on how pupils learn; central to classroom practice as it involves both teachers and learners in reflection, dialogue and decision making; promote understanding of goals and criteria, and helps learners know how to improve. The factor loadings range from 0.572 to 0.818 with K, N and O having stronger effects in making learning explicit to students (Table 1).

4.2. Findings from open-ended elements of the questionnaire

The trainees provided comments to show how they implemented each assessment practice in their classrooms. Responses to assessment practice K from trainee 1 include *'students are not questioned on how they want to learn, they are given tasks and told to do them'* and trainee 2 said *'their personal learning preference is planned within zones of proximal development'*. The comments from trainee 1 demonstrate a lack of assessment competence compared to trainee 2. For assessment practice N, trainee 5 commented that *'this is done by plenaries which are reflection based on what went well and even better if'* while trainee 20 said *'I ask simple questions, and say great, ok.'* Trainees 30 and 58 responses to assessment practice O are *'I use peer mentoring to encourage new ways of thinking'* and *'this is sometimes ignored within the classroom until a test or exam is nearby. I teach them using videos and mnemonics to help them remember the topic'*. The comments from the trainees show a disparity in the way formative assessments are carried out in the classroom resulting from a lack of knowledge of assessment strategies.

4.2.1. Factor 2: instructional purpose that promotes self-reflection and motivation

The assessment practice reflected in factor 2 (Table 2) could be interpreted as having an instructional purpose that promotes self-

reflection and motivation. Two aspects of ARG's (2002) principles of AfL are addressed and they include, to foster motivation and recognizing all educational achievements. Assessment practices E and F have higher factor loadings of 0.746 and 0.796 showing greater effect in promoting self-reflection in their learning.

4.3. Findings from the open-ended elements of the questionnaire

Regarding assessment practice E, trainees 56, 75 and 102 respectively said *'always confidence building is vital'*, *'use of positive praise in class and marking'* and *'sharing the progress of students' work after marking their books'*. These comments suggest that the trainees can review students' learning and provide feedback based on outcomes. For assessment practice F, trainee 37 said *'we should create a safe classroom environment that allows students to make mistakes and help them to get to the correct answer themselves through targeted questioning'* while trainee 95 said that *'children are taught to persevere and not give up'*. These responses show that students are encouraged to learn from their mistakes and develop as self-reflective and autonomous learners.

4.3.1. Factor 3: assessment competence and literacy

The assessment practice (Table 3) constitutes assessment competence and literacy and addresses two areas of ARG's (2002) principles of AfL including effective planning and developing the capacity for self-assessment and peer assessments. Assessment practice U has the highest factor loading of 0.853 followed by T, 0.708.

4.4. Findings from the open-ended elements of the questionnaire

Responses from trainees 104 and 118 regarding assessment practice U include *'I use peer marking and peer discussions during class to support students' learning'* and *'students are regularly told to peer assess each other's work and are given success criteria with the answers followed by repeated verbal instructions'*. These comments show that the trainees are aware of the role that students can play in supporting the learning of their peers and can create an enabling environment to promote learning. For assessment practice T, trainees 89 and 33 said *'I revisit the work given to students by adapting it'* and *'I give students red, amber and green questions following Bloom's taxonomy order, with an option to answer any question from the levels of difficulties such as describe, explain and evaluate'*. The trainees demonstrate the ability to differentiate learning through tasks and resources to cater to the needs of all students following varying levels of cognitive challenge.

4.4.1. Factor 4: reviewing students' learning

This assessment practice (Table 4) reviews students' learning and addresses two aspects of ARG's (2002) principles of AfL that describe a key professional skill for teachers and one that is sensitive and constructive by using comments that focus on learning and motivation. Assessment practice C has the highest factor loading of 0.880 indicating a greater effect on learning.

4.5. Findings from the open-ended elements of the questionnaire

Comments on classroom practice C from trainees 63 and 84 include *'children are directed towards their personal learning preference'* and *'the students are helped to solve problems by marking work and giving feedback with targeted questions. I share the answers with the students and go through them as a class and during plenaries, the students are asked "what went well and even better if" to reflect on their work'*. These comments suggest that students are given support to address problems in their learning and are encouraged to evaluate outcomes for further progress. However, trainee 69 said *'is not always possible to spend a significant amount of time with each student to do this'*. For assessment evidence M, trainee 28 said *'the goal is to find the knowledge of what they have learned after explanation and use proof of progress activities'*. This trainee's idea of supporting learning

resonates with the previous and can be encouraged among other trainees.

4.6. Findings from the analysis of interview data

Comments from the interviews were analyzed and grouped into the four factors that emerged from the analysis of the survey. This is important as the interview schedule was informed by the outcomes from the survey thus, the factors were central to the analysis of interview findings as shown below. This structure might suggest that the findings from interviews were similar or the same as the findings from the questionnaire as presented above. However, the similarity is limited to the fact both the interviews and the open-ended elements of the questionnaire have been classified using the same factors which emerged from the questionnaire data. This was considered necessary, as the findings from the questionnaire informed the interview and the classification of the data that emerged from it. This accounts for what might appear to be overlaps between the two sections.

4.6.1. Factor 1: making learning explicit to students

As part of making learning explicit to students, comments from trainees 1 and 3 include *'I plan my lesson by looking at my success criteria and how to help the students to achieve the learning outcomes'* and *'after an activity, I use AfL to test each learning outcome if they have achieved it'*. While Trainees 12 and 10 said *'AfL is very important as it signposts and directs me to where I should go with their learning'* and *'I look at students' abilities, for example, with the high ability students, I do a lot of peer assessments, while with the low ability, I make them do more self-assessments'*.

4.6.2. Factor 2: an instructional purpose that promotes self-reflection and motivation

In this category of assessment, the responses from trainees 5, 8 and 17 include *'assessment activities help in appraising students' learning by collecting data on their performance to ensure that they are making progress'*; *'I ask students to create questions to ask each other and probe their knowledge'* and *'I give more verbal feedback to help them know where they are and reflect on how to improve'*.

4.6.3. Factor 3: trainee teachers' assessment competence and literacy

To demonstrate assessment competence and literacy, comments from trainees 4 and 9 include *'I use verbal feedback and questioning more often and self-assessment to check progress'* and *'I use traffic light or color coded multiple-choice questions as it is easier to notice rather than a whiteboard and you can address their misconceptions'*. Trainee 19 said *'I use peer assessments, feedback, exam-style questions and students attainment data to adjust my planning'*.

4.6.4. Factor 4: reviewing students' learning

To encourage students to evaluate their learning, trainees 2, 15 and 20 said *'I use differentiated questioning both low and high order questions, and I get students to think-pair and share the questions for peer support'*; *'I allow students to act on my feedback to address areas for improvement'* and *'the outcome from AfL help me to plan and adapt my lessons to meet the needs of students'*.

5. Discussion

5.1. Making learning explicit to students

Making learning explicit to students is an important assessment practice that explores how students learn and how to engage teachers and students in dialogue, decision making and reflection (ARG, 2002; Siarova et al., 2017). At the heart of this process is the need to help students to improve their work, and this resonates with the classroom practice of some of the participants who highlight the importance of using their success criteria in planning their lessons. Consistent with

making learning explicit to students, Table 1 shows three assessment practices having higher factor loadings K, N and O. However, other assessment practices with fewer factor loadings ranging from 0.572 to 0.773 may have contributed to making learning explicit, but with variations in their impact on students' learning. For example, helping students to understand the learning purposes of each lesson (H) and discussing the assessment criteria in ways that they can understand (I), have similar factor loadings of 0.773, higher when compared to discussing the learning objectives with students (D), a factor loading of 0.572. These results depict on the one hand a shift in assessment goals to focus more on the students rather than teachers which arguably suggests a change in teachers' assessment practices. Consequently, the assessment competence (Deluca et al., 2019) and literacy (Schildkamp et al., 2020) of teachers may require improvement to support students' learning. In this context, trainee teachers' experience of assessment becomes valuable as Schildkamp et al. (2020) consider their knowledge and skills of assessment as prerequisites for a more effective classroom assessment practice. In our view, the effectiveness of any classroom assessment practice must include features that would enable them to make learning more explicit to their students. The responses provided by participants in this study provide an indication that assessment does carry out this role. For example, comments highlighting the failure to find out how students prefer to learn in respect of assessment practice K (Table 1) reflects a lack of assessment experience and is in contrast to comments that emphasize the importance of success criteria and the use of AfL in helping students to achieve their learning outcomes. However, this may not be the case for all the trainees as some may have responded differently to demonstrate how previous or current experience gained from their school experience has been used to make learning explicit to students.

Trainees' experience of assessment is useful in supporting them as Dewey's theory of experience (Dewey, 1983; Schmidt, 2010) highlights the relevance of the quality of educational experience in promoting learning that is linked to social and interactive processes. It can be argued that the experience, in addition to relevant support, can transform their assessments in the classroom. Therefore, Mezirow's transformative learning theory (1997) may be seen as relevant in the context of facilitating changes in the frame of reference of these trainee teachers. It can also explain the process of helping them to utilize their experience of assessment in making learning explicit to students and effecting changes in their actions. For example, when participants say they use success criteria and relevant AfL strategies to help the students to achieve the learning outcomes, it can be argued that what they really imply is that elements of assessment help them to make learning explicit to students and promote learning through dialogue, decision making and reflection. Essentially, it amounts to a process of transformation. Mezirow emphasizes the notion of trainees' personal beliefs and attitudes as a function of this process. This relationship is echoed by Schildkamp et al. (2020), who highlights the relevance of psychological and social factors as responsible for promoting negative attitude toward formative assessments and improvement in classroom assessment practices respectively.

Another illustration of the contrasting experiences of trainees is reflected in some of the responses provided concerning assessment practice O (Table 1). While some trainees acknowledge the role of peer mentoring in encouraging innovation, others felt that it is often neglected until close to a summative assessment activity. Other participants, still, pointed out that AfL is very important, particularly in the context of directing the learner toward their learning objective. Although this practice may have resonated with some trainees, it would seem that quite a few trainees did not understand the impact of making learning explicit to students. This may have been informed by an over-reliance on summative assessment to demonstrate the progress of students. Again, this indicates differences in teachers' assessment preferences, competence and literacy. This brings into relevance the argument of Ade-Ojo and Duckworth (2020) (2020) who advocates for a

review of the structure and content of assessment education beyond training programs, thus utilizing trainee teachers' experiences of assessment as a starting point in helping their classroom practices. Evidence from this study has shown that the trainees should embrace all possible means to improve their assessment competence and literacy with a positive attitude of can do, and an open mind to further learn and implement assessment strategies to make learning explicit to their students.

5.2. An instructional purpose that promotes self-reflection and motivation

This assessment practice fosters motivation and recognizes all educational achievements (ARG, 2002; Dixon & Worrell, 2016; Siarova et al., 2017; Gan et al., 2019), with teachers considering how they can encourage students as independent learners. In responding to assessment practice E in Table 2, with a factor loading of 0.746, there were comments from trainees which identify the use of positive praise in class and feedback comments, and when sharing the progress of students' work after marking their books as one of the positives. There was also an acknowledgment of the importance of its use in creating a safe learning environment and promoting confidence induced by the application of rules. There was further indication that this in its way promotes perseverance. These views suggest that the trainees are aware of strategies that promote self-reflection and motivation among students, and this may have been gained through observing and working with experienced teachers during their school experience (DFE, 2019) and workshops attended at the university. On the other hand, some trainees may have had previous experience with assessments in supporting roles such as teaching assistants and unqualified teachers before joining the course. However, they confirmed that the experience was not enough to help them implement assessment practices that promote self-reflection and motivation among students, and this may have accounted for variations in the outcomes of the assessment practices in Table 2, with practice F having higher factor loadings than others.

The trainees' ability to use new and existing experiences will help them to reflect on their practices and provide evidence to justify certain actions concerning their classroom assessment practices (Dewey, 1983; Schmidt, 2010). Although, Mezirow's (1997) concept of transformative learning could be applied in this situation, as trainees can utilize the previous experience of assessments to support students' learning without constantly relying on new information. The argument centres on the relevance and sufficiency of their previous experiences in promoting self-reflection and motivation among students. Responses from participants provide a glimmer of hope, as some of them indicate an understanding of assessment such as its role in appraising students' learning, data collection on learners' performances. Participants also highlighted its role in promoting peer review and support, as well as in the provision of feedback to help progress learning.

Most of the trainees acknowledged that they gained experience from attending AfL workshops in the university and from observing subject mentors in their school experience, thus suggesting that these might constitute a form of transformative experiences (Mezirow, 1997, pp. 5–12). Despite this indication, the challenge remains in terms of how to combine the quality of experience that the trainees may have acquired before and during their training, and how this can be used to support them to become effective classroom practitioners. The various notions discussed here suggest that the trainees are aware that formative assessment can promote self-reflection, motivation and autonomy. Indicating that it should be a daily practice utilized in checking students' work and providing feedback to improve learning (Black & Wiliam, 1998; Panadero et al., 2016).

5.3. Trainee teachers' assessment competence and literacy

Assessment competence and literacy in the context of this study are part of effective planning and developing the capacity for self and peer

assessments among students (ARG, 2002; Schildkamp et al., 2020; Siarova et al., 2017). Responses to assessment practice U (with the highest factor loading of 0.853) in Table 3 highlight the fact that students are often required to peer-assess using the success criteria they are provided and aided by verbal instructions. An interesting reflection related to the identification of their assessment practice to the taxonomy offered by Bloom which they see as enabling them to differentiate learning outcomes. There was also some emphasis on revisiting the work given to students through adaptation. Interestingly, these sentiments were similarly echoed in responses to questions around assessment practice T where a trainee utilizes verbal feedback, questioning and self-assessment to check students' progress. This is in addition to carrying out assessments before and after the lesson to support the whole class's progress. Whereas another trainee considers the use of traffic light cards or multiple choice with color-coded questions as visible means to assess the learning of students and address their misconceptions. These differences in assessment practices highlight the need to develop trainee teachers' pedagogy to promote the knowledge and skills required to effectively carry out assessments in their classrooms.

The outcomes from the interview and quantitative data show a strong relationship in how the trainees can demonstrate assessment competence and literacy to support students' learning, but with varying degrees of experience when implementing them in their classrooms. However, it appears that some trainees find it difficult to provide comments on this assessment practice. Nonetheless, new professional learning could be proposed as the way forward to support these trainees, creating awareness of how they interact with students and the materials used in assessments, and developing relevant knowledge, skills, attitudes, values, and qualities of the intricacies of assessment practices in the classroom. This constitutes their assessment competence and literacy, and unless they are given the relevant support to overcome barriers to assessment practices, the benefits of the process cannot be experienced. Panadero et al. (2016) offer further insight by arguing that formative assessment in principle can stimulate students' active involvement in assessment, however, some teachers do not engage students in this process as it is often teacher-led. As such, students become passive learners. It is, therefore, important to prioritize assessment competence and literacy (DeLuca et al., 2019; Schildkamp et al., 2020), as it would allow trainees to embed various assessment strategies such as questioning, feedback, as well as self and peer assessments of which the trainees have provided evidence in response to the outcome of the data presented in Table 3 as means to promote the learning of students.

In contrast, assessment literacy includes the knowledge and skills that trainees can utilize in the entire assessment process such as collecting information on students' learning and making instructional changes based on these (Schildkamp et al., 2020, p. 5). For example, an interviewee said, *'I use peer assessments, feedback, exam-style questions to help students, and the attainment data to adjust my planning'*. This trainee response demonstrates an understanding of the assessment process, and importantly, how the data collected can be used for further planning. This may not be the case for other trainees who did not provide comments to justify this assessment practice. Although it is assumed that both assessment competence and literacy are relevant in supporting trainees' classroom practices, evidence from this study has shown that the lack of relevant assessment experience (Dewey, 1983; Schmidt, 2010) may hinder trainees' assessment literacy. Arguably, assessment competence may have been demonstrated by some of the trainees as seen in their comments but the need to develop assessment literacy is important if they are to transform their learning.

A strong element of the ITT program lies in the quality of the AfL experience provided for the trainees taking into consideration their prior experience. This study has shown that the experience provided to the trainees during university workshops and school placements outweighs any prior learning they may have had. This, therefore, can be argued, to

account for a greater volume of transformative experiences in their learning (Mezirow, 1997, pp. 5–12). Mezirow suggests that students can interpret new information based on previous experience but cannot be constantly presented with new information when their previous experience is not utilized to advance their learning.

5.3.1. Reviewing students' learning

Reviewing students' learning is a daily process and a key professional skill for teachers. This needs to be done sensitively and constructively and must use comments that focus on learning and motivation (ARG, 2002; Leeuwenkamp et al., 2019). The responses provided by the trainees demonstrate how some of them have carried out assessment practice C (highest factor loading of 0.880), Table 4. However, there appear to be dissenting voices. For example, some participants highlight constraints induced by time. This appears to be a superficial level of engagement with this issue. It is possible that the reasons for not supporting students in addressing problems could be a lack of experience in relevant assessment strategies in reviewing students' learning, and this may have accounted for the high variations in the factor loadings presented in Table 4. On the contrary, in situations where trainees have some experience in reviewing students' learning, the lack of assessment competency and literacy (Deluca et al., 2019) could be a limiting factor. Therefore, it can be argued that based on Dewey's theory of experience (Dewey, 1983; Schmidt, 2010), the quality of assessment experience the trainees receive from workshop sessions at the university and their school experience is vital in transforming their learning and assessment (Mezirow, 1997, pp. 5–12) when compared to any previous experience of assessment practices. The ability of these trainees to combine both forms of experience becomes a defining factor in helping them to review the learning of students.

6. Conclusion

This study sets out to answer the research questions:

What are trainee teachers' perceptions of the roles of assessment in teaching and learning?

How do these roles manifest in their practice and in the context of learning for their students?

The themes that emerged from the study: making learning explicit to students, an instructional purpose that promotes self-reflection and motivation, assessment competency and literacy, and reviewing students' learning can help us to understand how trainee teachers promote assessments in their classrooms. James and Pedder's (2006) classroom assessment survey is useful in highlighting areas in which the trainees may need a conceptual change to their assessment practices, and these have been accounted for, through the trainees' responses to the questionnaires and the interviews, and how they have engaged with assessment practices. A key finding from this study is that most of the trainees conclude that their previous experience with assessments did not have an impact on how they implemented assessments in their classrooms. This may be due to the quality of the experience and how to combine it with the new knowledge of assessments to effect changes in students' learning. However, the trainees confirmed that observing experienced teachers and implementing strategies learned in their classrooms were productive. For example, in developing assessment competence and literacy, there is a correlation between responses from the questionnaire and interviews as trainees mentioned the use of verbal feedback, questioning, self-assessments and checking students' learning through the traffic light system. This correlation indicates the extent to which the trainees acknowledge that they have acquired the relevant skills in advancing their assessment practices with the help of their mentors who facilitated the coaching process.

Dewey's theory of experience and Mezirow's transformative learning have been vital in understanding how these trainees implement assessment practices in their classrooms, and an intriguing aspect is that they encourage the trainees' prior experience of assessments as means to

support them. Although very few who may have had roles in schools such as teaching assistants and unqualified teachers could have a better start to assessment practices when compared to novices, this may depend on the duration of the experience and how they were involved in the assessment processes. So, what we may learn from this study is that previous experience of assessment may be useful in helping the trainees to develop classroom pedagogy, but this is not conclusive as the quality of experience matters and how they will apply them in their classrooms. Therefore, combining both new and existing experiences has helped the trainees to reflect on their practices and develop their assessment competence and literacy. The outcome of this study suggests that to develop trainee teachers' assessment competence and literacy, the contents and structure of the assessment should go beyond what is provided to them by considering other sources of prior knowledge of assessments.

The limitations in this study could be improved by gathering further evidence from lesson observations to augment evidence where trainees are unable to provide examples from their practices in the questionnaire responses.

CRedit authorship contribution statement

A. Magaji: research and, Methodology, Conceptualization, data collection and, Formal analysis, Validation, Writing – original draft, Writing – review & editing. **G. Ade-Ojo:** research and, Methodology, Conceptualization, data collection and, Formal analysis, Validation, Writing – original draft, Writing – review & editing.

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Appendix A. Supplementary data

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