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Influence of Knowledge of Assessment on Test Construction Skills among Tutors of College of Education in Ghana

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Abstract

Purpose: A tutor's ability to develop and incorporate assessment data into classroom instructions is a function of their assessment literacy. While the tutors' assessment literacy level is a determinant of the quality of education delivery, research in the area of test construction skills competency among teacher educators remains sparse. The main aim of the study was to explore the influence of tutors' knowledge in assessment on their test construction skills.

Methodology: The descriptive survey design was used in the study to investigate the predictive relationship between tutor knowledge in assessment and test construction skills. Hundred and fifty (150) tutors were sampled using proportionate stratified sampling technique. The Teacher Knowledge in Assessment Scale (TKAS) and Test Construction Skills Inventory (TCSI) were administered to 150 College of Education (CoE) tutors to solicit their views. Descriptive statistics, specifically, mean and standard deviations, and Structural Equation Modelling (SEM) approaches were used to test the study hypotheses.

Findings: The study's findings revealed that tutors had a high level of assessment knowledge and test construction skills. Also, tutors' knowledge of assessment was found to significantly predict test construction skills.

Recommendations: The study recommended the frequent use of literacy standards provided by AFT, NCME, and NEA (1990). The study further recommended that CoE management frequently organise workshops on state-of-the-arts modules of assessment to maintain the knowledge level of tutors. Finally, CoE management should take the interest in engaging measurement and evaluation experts frequently, not only as a strategy to updates tutors' knowledge but also to promote efficient implementation of multiple assessment procedures.

Keywords: *Assessment, curriculum, knowledge, high-stakes and performance.*

Introduction

Assessment of students is very critical because effective teaching decisions are based on the ability of teachers to understand their students and to match actions with accurate assessments (McMillan, 2008). As teachers are primarily responsible for evaluating instruction and student learning, there is a widespread concern about the quality of classroom assessment. In order to be used as tools for students' learning, classroom assessments must be transformed in two fundamental ways: first, the content and character of assessments must be significantly improved; and second, the gathering and use of assessment information and insights must become part of an ongoing learning process (Sherpard, 2000). The purpose of classroom assessment is not just to generate information for decision-making but also to foster learning improvement. For this reason, if properly offered on a frequent basis, it would help students refine and deepen their understanding of what they learn (McMillan & Nash, 2000). Competency in test construction is an essential tool needed by every teacher if learning and instructional objectives are to be effectively attained. The importance of tests in the educational system is enormous. The Hamafyelto, Hamman-Tukur, and Hamafyelto (2018) provide a platform for achieving any significant educational goals (Hamafyelto et al., 2018). The effectiveness of learning goals, entrenched in the curricula of a school, continues to be the most fundamental sign of institutional superiority, educational development, and individual goals. Teachers are therefore required to have adequate knowledge to achieve these learning objectives in an accurate and precise manner. Teachers must thus be skilled in both the science and the art of test construction (D'Agostino & Vanwinkle, 2007). This is to say that teachers' fundamental knowledge of assessment as a concept in education is critical to the achievement of instructional objectives. Scholars admit that in practice, some teachers are faced with challenges as they develop either formative or summative assessments (Broadfoot, 2002).

The initial challenge is that these teachers are unable to clarify for themselves what they mean by rudiments of assessment and how they can make initial changes to their practice that will assist learners in actively engaging in their own learning, being clear about their current performance, and deciding what they need to do next (Broadfoot, 2002). Another challenge that teachers are faced with when it comes to classroom assessment has to do with the difficulty of collecting and interpreting assessment data formatively (Tanner & Jones, 2006). The challenges, as mentioned in the literature, paint a picture of the need for teachers to have adequate assessment knowledge in order to easily implement assessment procedures. It is now even more critical to pay attention to teachers' knowledge of assessment since it determines how assessment procedures are implemented in schools. Since a substantial proportion of classroom time is devoted to the assessment of student learning (Mertler, 2003), suboptimal assessment practices might hinder desirable student learning and motivation. As such, it seems reasonable to argue that careful consideration of the teachers' classroom assessment skills is certainly warranted. The American Federation of Teachers, the National Council on Measurement in Education, and the National Education Association (1990) stipulate as part of the standards for teacher competence in educational assessment that teachers should competently be able to choose and develop assessment methods appropriate for instructional decisions. Further, teachers should also be able to use assessment results when making educational decisions; develop valid assessment-based grading procedures; communicate assessment results; and recognise unethical, illegal, and inappropriate methods and uses of assessment (Alkharusi, 2008). Unfortunately, findings from past and recent studies of classroom assessment have consistently expressed a concern about the adequacy of

teachers' assessment skills (Mertler, 1999; Alkharusi, 2009). Assessment skills reflect teachers' overall behaviour of applying research procedures in the classroom.

In Ghana, both the trained and untrained teachers in the classroom, from the basic level to the tertiary level, construct, administer, and score classroom achievement tests irrespective of whether they have had training in measurement and evaluation or not (Anhwere, 2009). Once again, teachers from the lower grade to the tertiary level in the Ghanaian education system engage in some sort of assessment practice in order to determine whether learning has taken place or not, or sometimes for selection decisions to the next level of academic pursuit. Besides, teachers also construct tests to find out the problem areas of students in specific subjects or topics treated (Amedahe, 1989). Like in other jurisdictions, studies have reported that in Ghana, teachers are trained in assessment. For example, universities that train teachers and Colleges of Education students are taken through a course in educational assessment.

The course content equips these learners with practical knowledge of assessment and, specifically, test construction skills (Quansah & Amoako, 2018; Anhwere, 2009). In the midst of providing teachers with training on the fundamentals of classroom assessment, particularly for teachers to acquire knowledge on assessment tasks, adequate skills for teachers to implement assessment procedures appear to be a concern (Quansah, Amoako, & Ankomah, 2019). Reviewed studies in the area of teachers' construction skills did not point in one direction. Some of the studies suggest that teachers have high skills (Ankomah, 2020; Oduro-Kyire, 2008), while others indicate low/poor skills (Quansah et al., 2018; Adamu et al., 2015). This is an indicator of the fact that studies are not conclusive on the issue of teachers' skills in test construction in Ghana. That calls for more empirical investigation in the area. This present study therefore sought to explore college tutors' test construction skills.

Research Hypotheses

Based on the available literature, the following hypotheses were posed to guide the study:

1. H_0 : *Participants will not have higher knowledge in assessment.*
 H_1 : *Participants will have higher knowledge in assessment.*
2. H_0 : *Participants test construction skills mean score will not be significantly higher than the criterion score (of test construction skills).*
 H_1 : *Participants test construction skills mean score will be significantly higher than the criterion score (of test construction skills).*
3. H_0 : *Tutor knowledge in assessment will not significantly predict their test construction skills.*
 H_1 : *Tutor knowledge in assessment will significantly predict their test construction skills.*

Materials and Methods

Research Design and Approach

The descriptive cross-sectional design of the quantitative research approach was used to examine the influence of tutor knowledge in assessment on their test construction skills. The design helps

in understanding current assessment practice of tutors within Colleges of Education institutions in Ghana.

Participants

The study targeted all tutors within the College of Education (CoE) institutions in Ghana. However, CoE institutions within the Ashanti region were directly accessible to the researchers. The accessible population were recorded as 336 as shown in Table 1. By referring to Krejcie and Morgan (1970) sample size estimations table (not provided in this study), 180 participants was deemed appropriate and representative of the entire population.

Table 1: Population and sample distribution of participants

CoE Institutions	Number of Tutors	Sample Estimate
St. Monica’s College of Education, Mampong.	42	23
Mampong Tech. College of Education	42	23
Offinso College of Education	49	26
St. Louis College of Education	40	22
Agogo Presby Women College of Education	47	25
Akrokerrri College of Education	56	30
Wesley College of Education, Kumasi	60	31
Total	336	180

Source: Field data from college administrators (2022)

For accurate representation of the right proportion of participants from each College, proportionate stratified sampling technique with sampling ratio of 0.535 was used to draw sub-samples each college which add up to 180 total sample (refer to table 1). In this study, gender did not have any significant role hence, it was not considered as a stratification variable.

Variable Measurement

A questionnaire was developed in English with two sections by combining two scales. We adapted the scales of other authors to measure the constructs of this study. The two sections of the questionnaire representing constructs measured were "tutor knowledge in assessment" and "test construction skills". The overall questionnaire had 34 items (i.e., 16 items from TKA and 18 items from TCSI).

Tutor Knowledge in Assessment (TKA) Variable

The tutor’s knowledge in assessment has to do with the competencies of tutors to undertake activities that are designed to collect information about the knowledge, attitude, or skills of the learner or group of learners. The Teacher Knowledge in Assessment Scale developed by Alufohai and Akinlosotu (2016) was used in the measurement of the variable. The four-dimension scale was adapted and was made up of 16 items on a dichotomous scale ranging from 0 (*false*) to 1 (*true*) across the four subscales. The first sub-dimension was on systematic, which has 4 items and a.57 Cronbach Alpha index. The second sub-dimension was on the comprehensiveness of continuous assessment. The dimension has four items and a Cronbach Alpha index of.62. The third sub-dimension also measured teachers’ knowledge about the cumulative nature of continuous assessment. The dimension has 4-items with a Cronbach Alpha index of.54. The last sub-dimension, which is the guidance-oriented nature of assessment, had 4-items and a Cronbach

Alpha index of.61. In all, the TKA scale had a total Cronbach Alpha index of.75, which was considered appropriate (Pallant, 2011).

Tutors Test Construction Variable (TTC)

The second variable, that is, "Test Construction Skills," was conceptualised as teachers' ability to craft meaningful items based on objectives of a curriculum and develop a test with moderate difficulty and discrimination indices. The Test Construction Skills Inventory (TCSI) was originally developed by Agu et al. (2013) and was further validated by Ankomah (2020) using data from Ghana. The instrument was an 18-item unidimensional scale with a Cronbach Alpha index of.65. The internal consistency reliability of.65 was also deemed appropriate based on Pallant (2011) standards. Both instruments were pilot tested to fine-tune the items and also to gauge how practicable the items would be in the field. The items proved to be practicable, and none of the items appeared to be ambiguous to participants.

Procedure

Ethical standards were applied in the conduct of the study. Ethical clearance was provided by the Institutional Review Board, University of Cape Coast, Ghana. Permission was also sought from the heads of the selected institutions, who acted as gatekeepers, to gain access to the research site (Creswell, 2012). Prior contact was made with the tutors through their head of department to establish rapport and to introduce to the tutors the general aim of the study. The benefit of the research and its impact on other relevant stakeholders were discussed with the selected participants. After creating a rapport with the tutors in the various colleges, arrangements were made with the participants regarding when they would be available to respond to the instrument. Participants agreed to respond to the items during working days and working hours. All participants were accepted to respond to a hard copy instrument and not an online type. Consent forms were signed by each participant before they responded to the instrument. Other ethical considerations such as anonymity, confidentiality, volition, protection from emotional or psychological harm, and privacy were thoroughly followed. For example, participants were given the right to opt out of the study if they so desired. Unfortunately, on the various days that participants assigned to the researcher to respond to the questionnaires on site, some of the participants (n= 20) were absent from their campuses on sick leave and travel purposes. Also 10 of the questionnaires were mishandled and not fit to be used. The response rate therefore was 83.3 % which was considered appropriate (Pallant, 2011). The entire data collection exercise lasted for six weeks.

Data Analysis Strategy

The analyses were organised based on the three hypotheses of the study. The first hypothesis was tested using descriptive statistics, specifically, mean and standard deviation. This was done because the idea of that hypothesis was to get information about the current knowledge level of tutors regarding the continuous assessment that is being implemented at the college. The second hypothesis was tested using a one-sample t-test, whereas the third hypothesis was tested using a structural equation modelling approach (i.e., AMOS path analysis) with 10,000 bootstrap samples.

Results

Hypothesis 1; H₀: *Participants will not have higher knowledge in assessment.*

The hypothesis sought to investigate the level of participants' knowledge level in educational assessment as a discipline. To gather data on the issue, knowledge in assessment variables was measured on a continuum with a scale. The scale was a four-point Likert type, ranging from 1 (least score) to 4 (highest score). By this scale, the standard mean for interpretation was 2.5. Table 2 shows details of the analysis results.

Table 2: Participants knowledge of assessment

Sub-dimension	Number of items	Mean	SD
Systematic.	4	3.0	.74
Cumulative.	4	3.1	.74
Comprehensiveness.	4	2.8	.86
Guidance-oriented.	4	2.9	.79
Mean of means		2.9	.80

Source: Field data (2021)

Results as shown in table 2 show that mean scores obtained after the analysis of the data were higher than the standard mean score of 2.5 across the four hypothetical sub-dimensions of the variable of interest (i.e., knowledge in assessment). Using the range of scores of 1 (lowest), 2.5 (medium) and 4 (highest), the mean of means score of 2.9 is suggestive of the fact that participants' "knowledge of assessment" level was higher than the standard mean of the scale that was used in the measurement. The implication is that tutors had sufficient knowledge of educational assessment. Higher knowledge in educational assessment means participants have the "know how" on how to take educationally relevant data to make decisions about their learners.

H2: H₀: Participants test construction skills mean score will not be significantly higher than the criterion score (of test construction skills).

The hypothesis sought to examine the test construction skills of participants by comparing their perceived skills mean score to the maximum criterion score performance estimated from the standard metric used in this study. The maximum criterion value for the metric was 72 (with a mean of 45 and the least score of 18). Table 3 (a) and (b) provide details of the results about the participants' test construction skills.

Table 3a: Descriptive statistics of participants test construction skills

	N	Mean	Std. Deviation	Std. Error Mean
Knowledge scale	150	97.66	14.42	1.17

Table 3b: One-sample t-test of participants test construction skills

	Test value= 72					
	t	df	Sig.(2tailed)	Mean difference	95% CI of difference	
					L	U
Knowledge scale	21.805	149	.000	25.66	23.34	27.99

Source: Field Data, 2022

Results in table 3b show a significant difference $t(df = 149, p = 001) = 21.81$ between the criterion score of 72 (refer to table 3b) and the sample mean score of 97 (refer to table 3a). The difference in the mean scores was 25.66. The results indicate that the test construction skills of the tutors are above the standard skill score attached to the metric that was used in measuring their test construction skills. This implies that participants used in this study were doing better in terms of test construction compared to a known standard.

Hypothesis 3; H_0 : *Tutor knowledge in assessment will not significantly predict their test construction skills.*

This hypothesis sought to determine the influence of participants’ knowledge in an assessment on their test construction skills. This hypothesis was tested with SEM path analysis, with 1000 bootstrap samples with bias corrected confidence intervals. The endogenous (criterion) variable was "test construction skills". This was measured on a continuous basis using a scale. The exogenous (predictor) variable was ‘knowledge of assessment’, which was also measured on a continuous basis using a scale. Figure 1 and table 4 present the regression coefficients.

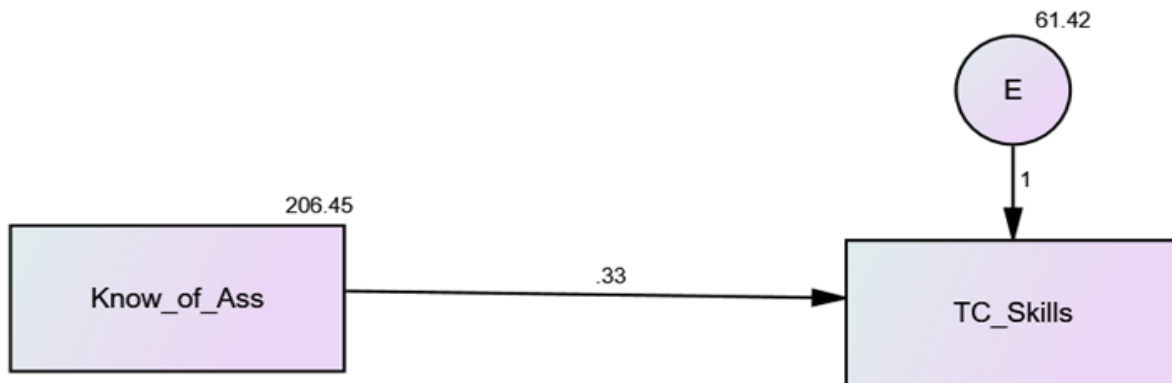


Figure 1: Path model for knowledge and test construction skills

From figure 1, knowledge of assessment predicts test construction skills by .33 with an error variance of 206.45 for knowledge and 61.42 for test construction skills. Table 3 presents the results of the test of significance prediction. From table 4, participants’ knowledge in assessment explained 26% of the variance in test construction skills. Participants’ knowledge of assessment is

a significant predictor of test construction skills, $B = .33$, *Boot95%CI* (.217, .413). The results indicate that an additional increase in participants' knowledge in assessment would lead to a .33 increase in test construction skills by participants.

Table 4: Structural regression model of knowledge of assessment and test construction skills

Model	B	Std. Error	CR	95% Confidence Interval	
				Lower	Upper
(Constant)	206.449	23.919	8.631	169.494	253.564
KoA → TC_Skills	.325*	.045	7.280	.217	.413

*Significant, $p < .05$, $R = .51$; $R^2 = .26$

Generally, based on the results, it can be said that higher knowledge in assessment would lead to higher test construction skills by participants (i.e., college tutors). In this case, tutors with an increased knowledge of educational assessment courses would have an increased skill in test item construction. Higher test construction skills may also imply that teachers strictly follow the necessary requirements in test item construction. Based on the results of this study, the null hypothesis that "participants' knowledge in assessment will not predict their test construction skills" is rejected in favour of the alternative hypothesis (which is the reverse of the null).

Discussion

The study examined the level of tutors' knowledge in educational assessment. In line with this objective, the study revealed that participants' (tutors') knowledge in the assessment was above average knowledge. This finding means participants had sufficient knowledge of educational assessment. This implies that the participants have what it takes in terms of their knowledge base to implement effectively an assessment module in schools. The finding is not surprising since participants were teacher educators who trained prospective teachers for Ghana basic schools; hence, by their practice, they often teach their students (i.e., teacher trainees) the rudiments of classroom assessments. Again, their current level of assessment knowledge could be attributed to their frequent monitoring of trainee teachers on teaching practice (both micro and macro) programs. These monitoring exercises help them to frequently update their knowledge on how children are assessed in schools. Understanding the general and fundamental principles and ideas in assessment is the most essential part of enhancing students' learning and teacher effectiveness (McMillan, 2000).

Although the findings of this study appear to be palatable, they contradict the majority of the study findings in the literature. For instance, in Mertler and Campbell (2005), a descriptive study investigated teachers' assessment knowledge and reported that teachers had limited knowledge of assessment. For Alkharusi, Aldhafri, Alnabhani, and Alkalbani's (2012) study, the objective was to explore teachers' knowledge of classroom assessment procedures. According to the findings, the teachers used in the study had a low level of knowledge in educational assessment in Oman. In Ghana, Akayuure (2021) also investigated classroom assessment literacy among mathematics teachers in some senior high schools. As in the case of other studies outside the shores of Ghana, Akayuure's study indicated that teachers had insufficient knowledge of classroom assessment.

Aside from the sample size issues, the current study findings deviated from studies in the literature on the account that most of the previous studies made use of post-service teachers at the pre-tertiary level, whereas the current study made use of college tutors (tertiary level instructors), who in terms of qualification are more advanced. If qualification has anything to offer a person in terms of know-how, then this is likely to be the distinguishing factor. The contradictory study findings further point to the significance of more empirical studies on the issue, especially at the tertiary level. This will help settle the waters of tutors' knowledge of assessment.

Another aspect of the study was to investigate the participants' test construction skills. Findings showed that participants' skills in test construction were high. This means participants had what it takes to construct a good test for the purpose of classroom assessment. Adequate test construction skills imply that participants adhered to test construction principles. This means that teaching and learning activities would be effective since the assessment instruments that would be developed by tutors would not be dead wood but rather efficiently estimate the true abilities of their learners. Most definitely, the task of supervising preservice teachers on teaching practice to design effective assessment tools would add up to tutors' experience and skills in test development. The findings in this study align with those of Ankomah (2020), who explored the test construction skills of senior high school teachers in Takoradi Metropolis and discovered that the teachers had a high level of skills in test construction. The difference between these two studies was in the unit of analysis.

As the current studies made use of tutors in the college, the former engaged senior high school teachers. Koloi-Keaikitse's (2017) study also reported similar findings of perceived high test construction skills among tutors in Botswana. Adamu et al. (2015) similarly assessed teachers' competencies in constructing assessment instruments and reported that teachers were competent in constructing test items. Even though the current study's finding aligned with existing studies, it shared a counter view with other studies in the literature as well. For example, Oduro-Kyireh (2008) explored teachers' skills in test item construction. For this study, participants were reported to have limited skills in the business of test construction. Other studies equally identified some teachers as possessing limited skills in test construction (Quansah, Amoako, and Ankomah, 2018; Amedahe, 1989). The disparities in findings are largely attributable to methodological dynamics such as location of the investigation, design, and sample size. As previous studies focused attention on preservice teachers, the current study made use of tertiary instructors (specifically, college of education tutors).

The desire of this current study was above all to explore the predictive connection between "knowledge in assessment" and "test construction skills". The idea was to find out whether knowledge in educational assessment necessarily explains efficiency in test construction. The findings in this study showed that "knowledge in assessment" substantially predicts test construction skills. The position of this finding is that knowledge in assessment sufficiently explains the variances in test construction skills of practitioners. The percentage of the variances accounted for in the criterion variable by the predictor variable was 26%. The implication is that tutors with sufficient assessment knowledge are more likely to have good test construction skills and, as a result, to construct good items. This result was predicted because participants had adequate knowledge in the assessment, which greatly influenced their adherence to standard testing principles. The findings of the current study point to the necessary ingredient (i.e., sufficient knowledge level of assessment) that helps tutors craft good items. The significance of tests in a

school system is enormous since it is the channel by which any meaningful attainment of educational goals is determined (Hamafyelto et al., 2015). The current study finding of tutors' knowledge in assessment adequately influencing their test construction skills aligns with Darling-Hammond's (2000) assertion that the quality of a teacher's knowledge affects competences in test development. The critical idea at this point is that a tutor or teacher can do little in terms of coming up with good test items if he has insufficient knowledge of assessment. Essential knowledge in assessment covers principles of test construction; crafting of quality items based on relevant objectives; test review and test item analysis (Nitko, 2001), which help in the business of developing a good test.

Practical Implications

The significant predictive connection of "assessment knowledge" to "test construction skills" should remind educational stakeholders (such as Colleges of Education management, Ghana Education Service, other higher educational institutions that train teachers, teachers and researchers) that sufficient knowledge in assessment helps in the acquisition of relevant skills for test construction. A premium, therefore, should be placed on equipping practitioners with relevant knowledge of assessment, especially on principles of test development and validity and reliability issues, which are critical aspects of classroom assessment practice.

Conclusion

The study emphasizes tutors' high level of knowledge in educational assessment, which could be attributed to their own practice as well as ongoing collaboration with preservice teachers in designing assessment modules during micro and macro teaching practices. In the same respect, their test construction practices were also found to be high. The high level of assessment knowledge and test construction means that tutors did not only know how but also constructed tests by following test construction principles. It is essential to emphasize that knowledge in assessment is critical in developing high skills in test construction. Acquiring efficient test construction skills requires that a person have adequate knowledge of the various principles that underpin the activity. In this regard, adequate knowledge is essential to the acquisition of higher test construction skills for efficient classroom practice.

Recommendations

The study therefore recommends that, in an attempt to sustain the knowledge and skills in test construction, Colleges of Education management can frequently organize workshops on state-of-the-art modules of assessment. Tutors are also encouraged to frequently make use of literacy standards recommended by AFT, NCME, and NEA (1990) to augment their classroom practice of assessment. Finally, CoE management should take the interest in engaging Measurement and Evaluation experts frequently, not only as a strategy to update tutors' knowledge but also to promote efficient implementation of multiple assessment procedures. Future researchers can concentrate their efforts on this topic at tertiary institutions to better understand assessment in higher education institutions.

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