The Issue of Non-Adherence to Test Construction Principles: Do Teachers' Commitment to Teaching or Attitude by the Teacher Really Matter?

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Abstract: This study examined teachers' skills and attitude towards test construction, commitment to work and adherence to test construction principles. The study adopted the quantitative inquiry approach. Through the census survey method, 346 high school teachers in Sekondi-Takoradi Metropolis, Ghana, were engaged. Questionnaire was used to survey the teachers. Reliability of the instrument was 0.8. Data were analysed using Structural Equation Modeling (SEM), through AMOS software, and mediation analysis using Hayes' PROCESS. It emerged from the study that teachers' attitude towards test construction significantly mediated between teachers' skills and adherence to test construction principles, but teachers' commitment to work did not. Both teachers' commitment and attitude did not serially mediate the relationship between teachers' test construction skills and adherence to test construction principles. It is recommended that the Ministry of Education (MoE) and heads of various high schools should organise special workshops and symposia to sensitize teachers on the essence of developing quality test items, since doing this would help teachers develop positive attitude towards test construction.

Keywords: Commitment to Work, Attitude Towards Test Construction, Test Construction Principles, Test Construction Skills, Adherence to Test Construction Principles, Senior High School, Competency in Test Construction

1. Introduction

The global agenda of promoting quality education, as specified in the Sustainable Development Goal (SDG) 4, seeks to ensure inclusive and equitable quality education and promote learning opportunities for all (UNESCO, 2017). In line with this agenda, member countries of the United Nations (UN) have come out with several policies to regulate and bind the teaching and learning activities, geared towards promoting quality education. The Target 1 of the SDG 4 advocates free and equitable quality education at the primary and secondary levels which will lead to learning outcomes that are relevant and effective. It is worthy to state that teachers are key actors as far as quality education is concerned. Teachers are the main implementers of the curriculum and for that matter issues that border on curriculum implementation activities such as teaching, and assessment of students' learning must be given the needed attention.

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The quality of any education system depends mainly on teachers who are responsible for guiding and carrying out most of the important tasks and activities in educational institutions (Swarnalatha, 2016). Teachers play a significant role in supporting and promoting learning in the classroom. Amedahe (2014) indicated that the importance of the teacher in the education system cannot be overemphasised; and added that "the teacher needs to be well trained, motivated and provided with the needed resources to be able to perform his/her duties properly" (p. 56).

The target of education leading to relevant and effective learning outcomes can only be realised through effective and comprehensive assessment of students' learning that provide feedback to the system. Assessment is one of the means through which learning can be made effective and relevant to learners. Students' assessment is a sine qua non in the teaching and learning processes. One of the purposes of assessing students, as indicated by Amedahe (2014a), is to motivate and/or encourage students to learn and help the teacher to evaluate his/her effectiveness as an educator. This implies that much attention must be given to the medium or means through which students are assessed. Therefore, teachers are required to have adequate knowledge and skills in assessment to assess students' achievement in an accurate and precise manner, thus, teachers must have the capability in the science and art of test construction (D'Agostino, 2007).

Achievement tests are relevant for measuring important aspects of a subject matter and as well as measuring appropriate level of students' knowledge in a school subject (Frey, 2007). These tests can be either classroom-based, which are developed by individual classroom teachers (teacher-made tests), or standardized, which are developed by test experts for more global purposes (Amedahe, 2014a). The most instructionally relevant achievement tests, however, are classroom-based and if carefully constructed, provide teachers with accurate and useful information about the knowledge and competence acquired by their students in particular school subjects (Childs, 1989). The issue of teacher assessment of students' learning in Ghana, has, over the years, been shown in many studies to be characterised by poor testing practices and skills/competencies (Anhwere, 2009; Quansah, Amoako, & Ankomah, 2019).

At all levels of education globally, teachers construct and administer tests as a means of assessing the amount of learning and skills students have acquired (Quaigrain & Arhin, 2017). This can be done by using, for example, teacher-made tests. These tests are mostly teacher-made tests. According to Asamoah-Gyimah (2002), classroom or teacher-made tests are frequently used as a major evaluating device of students' progress in schools in Ghana. Tests play an important role in providing feedback to teachers on their educational actions and for that matter, the quality of the teacher-made test is pertinent. Quaigrain and Arhin (2017) posit that strict adherence to the principles of test construction, test administration and analyses of the results and reporting are very essential. According to Anamuah-Mensah and Quaigrain (1998), teachers are placed in a sensitive and central role in the testing and evaluation process of their students, and this makes it imperative for the classroom teacher to be adequately conversant in the formalized testing techniques to ensure sound facilitation of the herculean task that impinges on their profession. Silker (2003) noted that test construction requires utilization of skills that can enable a teacher to develop a test with precision, appropriateness of language use, objective communication, items validation and good grading scales.

According to Agu, Onyekuba and Anyichie (2013), quality classroom-based assessment means adherence to standard procedures for test construction. Every classroom teacher is expected to possess and apply requisite skills in construction of good items for student assessment. A good test must yield both valid and reliable results. Lack of test construction skills by teachers might result in false assessment of students' achievements (Anhwere, 2009; Esomonu, 2002; Paulson, 2003; Ebinye, 2001; Quaigrain & Arhin, 2017). Teachers are expected to have adequate assessment knowledge or skill to perform well in their evaluation of students' achievement. According to the American Federation of Teachers [AFT], National Council on Measurement in Education [NCME], and National Education Association [NEA] (1990), teachers should demonstrate skills at selecting, developing, applying, using, communicating, and evaluating student assessment information and student assessment practices. In terms of developing assessment instruments, the bodies indicated that teachers should be skilled in choosing and developing assessment methods appropriate for instructional decisions. Teachers in the classroom are expected to develop assessment instruments that would aid in measuring the amount of students' learning regarding delineated instructional objectives.

Competency in test construction is an essential tool needed by every teacher, if learning and instructional objectives are to be effectively attained. Several studies have been conducted on assessment practices in Ghana (Amedahe, 1993; Amedahe, 1989; Anhwere, 2009; Oduro-Kyireh, 2008; Quagrain, 1992; Quansah et al., 2019). The findings of these studies revealed that teachers do not adhere to recommended principles in test construction, and subsequently attributing that to their limited knowledge in test construction. Interestingly, in attempts to measure teachers' test construction skills, the previous studies resorted to asking teachers what principles/guidelines they follow in developing test items. This, in our view, does not clearly indicate teachers' skills in test development. For example, a teacher might possess the skills, but for reasons best known to them, they may feel reluctant to adhere to recommended principles. In such an instance, it would be problematic to substitute adherence to test construction principles with skills or competence in test construction. There was, therefore, the need to conduct this study to ascertain the skills that teachers possessed, and to determine whether, teachers' skill would predict adherence to test construction principles.

It is interesting to note, however, that other factors such as teacher commitment and attitude towards test construction could have an influence on teachers' adherence to test construction principles. A teacher may have the requisite skills and competencies in test construction, but when they are not committed to their teaching profession, they may not follow recommended principles in test construction. The issue of teacher commitment to work and attitude towards test construction are of prime concern. Commitment and attitude on the part of teachers are key factors that can affect the quality of education (Amedahe, 2014). A teacher, for example, may have the requisite skills and competencies in test construction, but when they are not committed to their teaching profession, they may not follow recommended principles in test construction.

From the available literature, it appears much has not been documented regarding the intermediary roles of commitment and attitude between teachers' test construction skills and their level of adherence to test construction principles. However, some studies have attempted to make inferences from either commitment or attitude to teachers' level of adherence to principles of test construction (Monsaas & Engelhard, 1994; Kitiashvili; 2014; Zhang & Burry-Stock, 2003; Quansah & Amoako, 2018; Shukla, 2014). Monsaas and Engelhard (1994) found that teachers' attitude was highly correlated with their testing

practices. The study found that teachers who felt that the testing practices were dishonest, and a cumbersome activity were less likely to engage in them, and the vice versa. While Quansah and Amoako (2018) found a negative attitude of teachers in test construction, Kitiashvili (2014) found that teachers had a positive attitude towards assessment methods such as test construction, administration, scoring, among others. Kitiashvili, therefore, inferred that there is the likelihood of teachers executing these assessment practices once they have a positive attitude. Similarly, Zhang and Burry-Stock (2003) found a positive relationship between self-perceived assessment skills of teachers and their assessment practices. Thus, teachers who possess higher assessment skills are more likely to engage in better assessment practices. To them, assessment skills and assessment practices share 50% variance. In a related study, Shukla (2014) found that professional commitment and teaching competency have a positive correlation.

Gleaning from the literature, it can be said that teachers who are committed are more likely to be competent in executing their duties, including test construction. This is because such teachers may strive to enrich themselves with information that would enable them to execute their duties diligently. By so doing, their level of skill is enhanced, and such teachers may have a higher tendency to follow recommended principles in assessment. In this case, if teachers have the skills but do not adhere to recommended principles, then probably their attitude or commitment may be responsible for that. This would imply that teachers' level of commitment to work and attitude, to some extent, explain the relationship between teachers' test construction skills and their level of adherence to test construction principles. We, therefore, hold the view that teachers who have higher test construction skills will be committed to their work, and this will influence their attitude towards test construction, hence their compliance to recommended principles of test construction. Based on this assertion, we hypothesized that teachers' level of commitment to work and attitude towards test construction will mediate serially the relationship between teachers' test construction skills and adherence to recommended principles of test construction. This means that teachers' test construction skills will have an indirect effect on adherence to recommended principles of test construction, through commitment to work, which then influences attitude towards test construction.

Based on the literature reviewed, the study proposes relationships among teachers' test construction skills, commitment to work, attitude towards test construction and adherence to test construction principles. Figure 1 presents the model depicting relationships among the variables.

From Figure 1, it is hypothesised that the relationship between teachers' test construction skills and their level of adherence to principles of test construction will be mediated by both their level of commitment and attitude towards test construction. That is, teachers who have higher test construction skills will be committed to their work and this will influence their attitude towards test construction, which will finally influence their adherence to test construction principles.

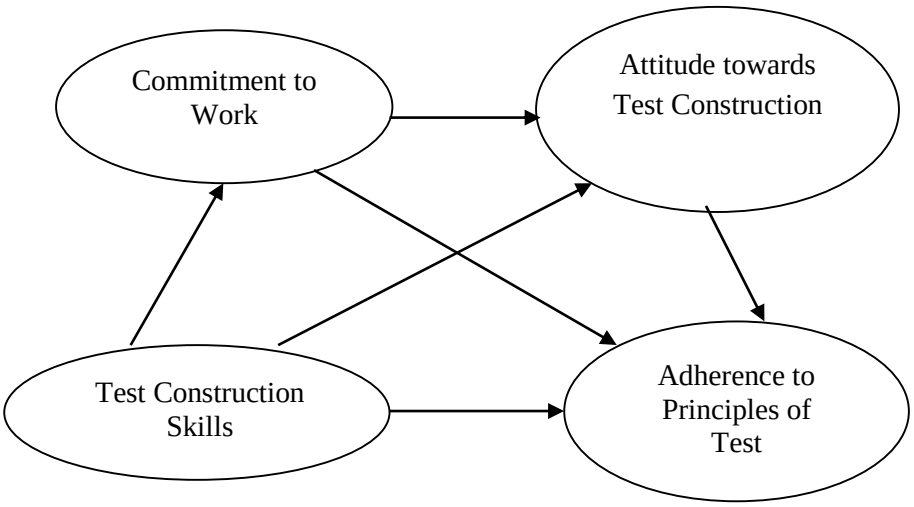

Figure 1: Relationships among test construction skills, commitment to work, attitude towards test construction, and adherence to principles of test construction. Source: Authors' construct

The following hypotheses were formulated to guide the study:

1. H_A: Commitment to work would significantly mediate the relationship between teachers' test construction skills and their adherence to test construction principles.
2. H_A: Attitude towards test construction would significantly mediate the relationship between teachers' test construction skills and their adherence to test construction principles.
3. H_A: Commitment to work and attitude towards test construction would serially mediate the relationship between teachers' test construction skills and their adherence to test construction principles.
4. H_A: The data collected would fit the proposed model.

2. Methodology

The study adopted the descriptive survey design. Amedahe and Asamoah-Gyimah (2015) maintains that, in descriptive research, the condition or relationships to be described should exist, and that accurate description of activities, objects, processes and persons is the objective. Falling on Amedahe and Asamoah-Gyimah's assertion, this study examined the mediation role of commitment to work, attitude towards test construction, with the focus on the relationship between teachers' test construction skills and adherence to test construction principles. These phenomena or variables exist, in the sense that teachers engage and continue to engage in the construction of tests. Obviously, teachers exhibit some traits in terms of test construction skills, commitment to work, attitude towards test construction, and adherence to test construction principles. Exhibition of these traits clearly shows the existence of these phenomena, there the use of the descriptive design. Descriptive survey design was employed because they study basically described the mediating roles of teachers' commitment and attitude in the relationship between teachers' test construction skills and adherence to test construction principles. Using the census survey method, 346 teachers who taught mathematics, integrated science, and English language in all 11 public high schools

in the Sekondi-Takoradi Metropolis were surveyed using a questionnaire. The questionnaire was developed to measure (a) test construction skills, (b) attitude towards test construction, (c) commitment to work, and (d) adherence to test construction principles. These form sections of the questionnaire.

The test construction skills were measured using an adapted version of the Test Construction Skills Inventory (TCSI) by Agu et al. (2013). Using the three-parameter logistic model of item response theory, 18 items out of the original 25 were deemed validated and used for this study. The responses of the scale were scored dichotomously as right or wrong, with '1' and '0', respectively.

Attitude towards Test Construction (ATC), four-point Likert-type scale developed by Quansah and Amoako (2018) was adapted for the study. The original instrument was made up of 32 items, but through confirmatory factor analysis, 31 items with factor loadings above .30 were retained.

Commitment to work was measured using the Teacher Commitment Scale (TCS) developed by Thien, Razak, and Ramayah (2014). This scale originally has 13 items, but through confirmatory factor analysis validation procedure, 12 items were retained and used in the current study.

Adherence to test construction principles was measured using Agu et al.'s (2013) Test Construction Skills Inventory (TCSI). However, the responses were changed from the agreement-type to Never, Not often, Often, Very often, and Always response. All items in the original TCSI were retained after performing a confirmatory factor analysis on them. The reliability estimates for all the scales using Omega coefficient were above .83.

3. Data Analysis Technique and Its Justification

The study had a response rate of 96.8% (n = 335). Out of this number, 71.6% were males while 28.4% were females. The majority (85.4%, n = 286) of the participants had professional background in education.

The first three hypotheses (1, 2, and 3) were tested using the double mediation model (serial) of PROCESS by Hayes (2018). Specifically, 10000 bootstrap samples with 95% bootstrap percentile confidence intervals were performed. PROCESS is a regression-based model that is used in estimating model parameters using an ordinary least squares (OLS) regression. This linear regression model was used to generate many possible pairs. It minimizes the residual sum of squares.

This procedure is based on the assumption of more than one mediator. It is such that one mediator influences the other, which in turn influences the criterion variable. This model was used because we hypothesised (Hypothesis 3) that teachers' test construction skills will have an indirect effect on adherence to principles of test construction, through commitment to work, which then influences attitude towards test construction.

Hypothesis 4 was specifically tested using the covariance-based approach, specifically, with the use of Analysis of Moment Structures (AMOS). This was because the model, sought to determine whether the relationships that have been hypothesised (model) would fit the actual data collected. In other words, the hypothesis sought to determine whether there would be a discrepancy between the model proposed (conceptual framework) and the model predicted (results obtained).

4. Results

The scores for teachers test construction skills ranged from 8 to 18, with a mean of 15.12 ± 2.37 (out of 18). This mean score indicates that, on the average, teachers have high level of skills in test construction. The overall mean of respondents on commitment to work was, 4.14 ± 1.00 (out of 6.0). This implies teachers' level of commitment to work was moderate. It was also found that teachers had a positive attitude towards test construction 2.83 ± .49 (out of 4). The level of adherence to test construction principles was low, with a mean of 93.42 ± 15.15 (out of 120).

Details of the indirect effects (mediation analysis) are presented in Table 1. As shown in the table, the direct effect of test construction skills on adherence to test construction principles was statistically significant, b = 2.84, *95%CI* [2.23, 3.46]. This implies that without any of the mediator variables (i.e., commitment to work or attitude towards test construction), teachers' test construction skills solely predicted adherence to test construction principles by 2.84. This suggests that as teachers' skills in test construction is enhanced, their level of adherence to test construction principles increases.

Table 1: Indirect Effect Test Construction Skills on Adherence to Test Construction Principles

					Confidence Interval	
	b	*SE*	CR	*p*	LLCI	ULCI
Total effect of Skills on Adherence	3.22*	.30	10.63	<.001	2.62	3.81
Direct effect of Skills on Adherence	2.84*	.31	9.11	<.001	2.23	3.46
Indirect effect of Skills on Adherence	*b*	SE	BootLLCI		BootULCI	
Total	.38*	.12	.15		.63	
Indirect effect 1	-.001	.02	-.03		.04	
Indirect effect 2	.37*	.12	.15		.62	
Indirect effect 3	.01	.02	-.03		.04	
Completely standardised indirect effect (c'_{cs})	c'_{cs}	SE	BootLLCI		BootULCI	
Total	.06	.02	.02		.10	
Indirect effect 1	-.001	.003	-.01		.01	
Indirect effect 2	.06	.02	.02		.10	
Indirect effect 3	.001	.002	-.004		.01	

*Significant, $p < .05$; Completely standardised effect (c'_{cs}): Total effect = .50; Direct effect = .44

Note:

Skills – Test construction skills; Adherence – Adherence to test construction principles

Indirect effect key:

Indirect effect 1: Test construction skills → Commitment → Adherence

Indirect effect 2: Test construction skills → Attitude → Adherence

Indirect effect 3: Test construction skills → Commitment → Attitude → Adherence

However, when the two mediators (commitment to work and attitude towards test construction) were introduced into the relationship, as shown in Indirect effect 3, the relationship was not statistically significant, *b* = .01, *95%CI* [-.03, .04]. This implies that commitment to work and attitude towards test construction do not serially mediate the relationship between test construction skills and adherence to test construction principles. The Research Hypothesis 3 was, therefore, rejected.

Even though the result of this study led to a decision of failing to accept the Research Hypothesis 3, it provided other interesting results. These results manifested in Indirect effect 2 (Hypothesis 2). The result revealed that, while controlling for commitment to work, attitude towards test construction significantly mediated the relationship between test construction skills and adherence to test construction principles, *b* = .37, *95%CI* [.15, .62]. The implication of this result is that attitude towards test construction explains the relationship between test construction skills and adherence to test construction principles. When all the effects (regression coefficients) were standardised, comparatively, the completely standardised effect for the direct effect (c′cs = .44) was higher than completely standardised effect for indirect effect, c′cs = .06, *95%CI* [.15, .62]. This implies attitude of teachers towards test construction reduced the effect of test construction skills on adherence to test construction principles by .38. This result, therefore, suggests that irrespective of teachers' level of skills in test construction, their level of adherence to test construction principles depends on their attitude towards test construction. Based on the results, the research Hypothesis 2 was accepted at .05 significance level.

In the case of Indirect effect 1 (Hypothesis 1), there was no significant mediation effect of commitment to work in the relationship between test construction skills and adherence to principles of test construction, *b* = -.001, *95%CI* [-.03, .04], while controlling for attitude towards test construction. This implies that commitment to work does not play any role as far as test construction skills and adherence to principles of test construction are concerned. That is, commitment does not explain the relationship between the two variables. In effect, teachers who have higher skills in test construction do not necessarily have to be committed to their work before they adhere to recommended principles in test construction.

The aim of Research Hypothesis 4 was to determine whether the model proposed (serial model) would fit the data collected. Thus, the hypothesis sought to determine the discrepancy between the hypothesised model (conceptual framework) and the actual model predicted (results obtained). This would determine whether the data gathered on the variables would reproduce the hypothesised model. The hypothesis was tested using SEM with AMOS, a covariance-based approach. Model fit indices such as NFI, TLI, CFI, PNFI, PCFI, among others were estimated. Details of the results are presented in Table 2 and Figure 2.

In terms of chi-square, large values suggest poor fit. From Table 2, the chi-square ($\square^2$) = 0, implies that there is no difference between the expected data and the actual data. In addition, the NFI, TLI, CFI, and IFI indices for the model were equal to 1.0, respectively. This indicates perfect fit of data and the model. For NFI, TLI, CFI, and IFI, smaller values suggest good fit. Furthermore, the degree of freedom (*df*) for Model 1 was equal to 0. The implication of this is that the model is a saturated model. Saturated models perfectly fit or reproduce the data.

Table 2: Model Fit Indices

Fit Measure	Range	Index	Recommended cut-off
Absolute fit indices			
Chi-square (χ^2)		0	
Incremental fit indices			
Normed Fit Index (NFI)	0 – 1	1.0	.90 or greater
Incremental Fit Index (IFI)	0 – 1	1.0	.90 or greater
Tucker-Lewis Index (TLI)	0 – 1	1.0	.90 or greater
Comparative Fit Index (CFI)	0 – 1	1.0	.90 or greater
Parsimony-Adjusted Measures			
Parsimony Normed Fit Index (PNFI)	0 - 1	0	
F minimum (FMIN)	0 - 1	0	

Model 1: NPAR = 14; Non-redundant observations = 14; *df* = 0

In sum, the research hypothesis that "The data collected would fit the proposed model" is accepted. The model, therefore, fit the data. Figure 2 presents the model.

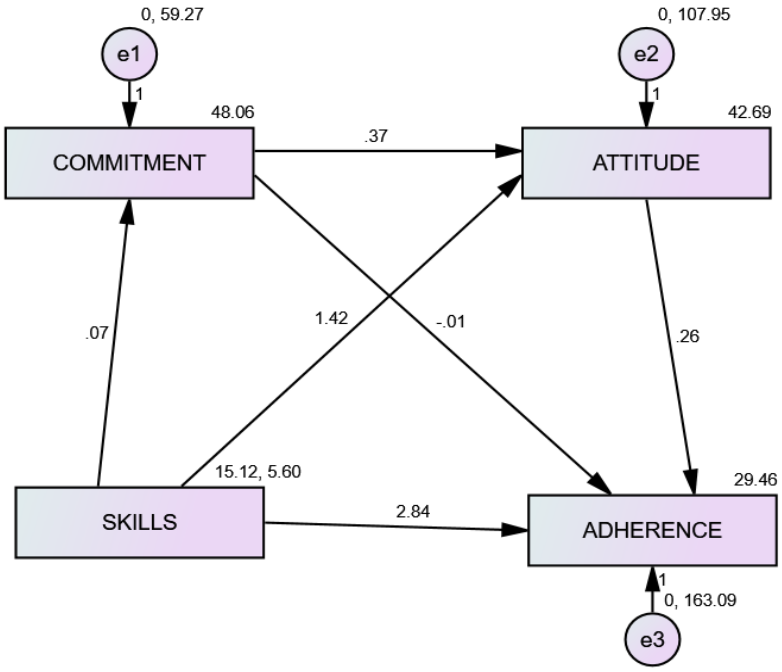

Figure 2: Model for adherence to test construction principles

The results for the model suggest a perfect fit model which precisely reproduces the data. By implication, this model can be tested with other samples in order to validate its usefulness.

5. Discussion

The results showed that teachers have high level of skills in test construction, and their level of commitment to work was moderate. It was also found that teachers had a positive attitude towards test construction. The level of adherence to test construction principles was low.

It was found out that commitment to work and attitude towards test construction do not serially mediate the relationship between test construction skills and adherence to test construction principles. However, there was a direct relationship between test construction skills and adherence to test construction principles. Therefore, it could be said that teachers with higher skills in test construction would adhere to test construction principles. Teachers, however, do not necessarily have to be committed to their work, which would in turn influence their attitude towards test construction and then finally to adherence to test construction principles. Simply put, commitment and attitude concurrently are not requirements for teachers to adhere to test construction principles. This means that commitment and attitude concurrently do not explain the relationship between teachers' test construction skills and adherence to test construction skills. Based on the result, the research hypothesis that "Teachers' level of commitment to work and attitude towards test construction would mediate (serial) the relationship between teachers' test construction skills and adherence to recommended principles of test construction" was rejected. The finding of this study agrees with Shukla (2014), who found no relationship between commitment and competency in assessment. Based on the result, Shukla concluded that teachers who are competent need not be equally committed before they engage in better practices in assessment. This implies that commitment is not a requirement for better assessment practices.

Again, the result revealed no significant mediation effect of commitment to work in the relationship between test construction skills and adherence to principles of test construction. This shows that teachers who have higher skills in test construction do not necessarily have to be committed to their work before they adhere to recommended principles in test construction. This could explain the reason why the serial mediation was not significant. On the contrary, attitude towards test construction significantly mediated the relationship between test construction skills and adherence to test construction principles. This means that attitude towards test construction explains the relationship between test construction skills and adherence to test construction principles; that is, it reduced the effect of test construction skills on adherence to test construction principles by .38 (see Table 1). In effect, it can be said that attitude towards test construction plays a significant role as far as adherence to test construction principles is concerned. The result of this study underscores the need for teachers to have positive attitude towards test construction.

Finally, the result of this study provided evidence in support of the proposed model directly fits the data collected would fit the proposed model. It was revealed that the data collected perfectly reflected the proposed model. There was no discrepancy between the actual model and the proposed model. Based on this, we can confidently say, from the data collected and analysed that, the relationship between teachers' test construction skills and adherence to test construction principles can be explained by their attitude towards test construction.

6. Conclusions and Recommendations

Based on evidence gleaned from this study, it can be concluded that teachers do not necessarily have to be committed to their work before they develop positive attitude towards test construction, which then influences their adherence to test construction principles. However, a positive attitude towards test construction, solely, has the potency to influence teachers' adherence to principles of test construction. Commitment to work is not a requirement for teachers to adhere to principles of test construction. It can also be concluded that commitment to work could not explain why teachers with a particular level of skills in test construction would not adhere to recommended principles of test construction. Thus, even teachers who are not committed to their work, but have a positive attitude towards test construction, would be motivated to learn more about test construction, which in the end, would lead to high adherence to recommended principles.

It is recommended that to the Ministry of Education, Ghana (MoE), Ghana Education Service (GES), and heads of the various high schools in the Sekondi-Takoradi Metropolis that as part of their training programmes or workshops for teachers, they should continue and intensify the acquisition of skills by teachers in test construction to improve their skills as well as develop positive attitude towards test construction. The stakeholders are also encouraged to organise special workshops and symposia, which would sensitize teachers on the essence of developing quality test items, and this would at the end help teachers develop positive attitude towards test construction. The teachers in the various high schools in the Sekondi-Takoradi Metropolis and by extension other districts in Ghana are entreated to develop a strong positive attitude towards test construction; and embrace it as an essential component of their core duties as teachers. Finally, the heads of the various high schools in the Sekondi-Takoradi Metropolis are encouraged to periodically assess teachers' attitude towards test construction, since this would enable the heads identify, and offer the necessary assistance and guidance to the teachers in question.

This result has implications for teachers and other educational stakeholders such as the ministries and directorates of education, heads of schools, teachers, and other education-related NGOs worldwide. Even though this study was conducted among teachers in a developing country, it may be useful to those of developed and other developing countries, since test construction principles are unique and general, irrespective of the context. Test construction principles culminate from the provisions in the Standards by the NCME. Findings from this study provides empirical evidence which would be useful to ministries and directorates of education, heads of schools, teachers, and other education-related NGOs worldwide. This would help the stakeholders of education in strengthening existing policies to help address the issue of non-adherence to test construction principles. Knowledge on the possible causes of non-adherence to test construction principles by teachers is a step in the right direction towards providing antidote to the situation.

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