
A SCHEME FOR ASSESSING TECHNICAL TEACHERS' COMPETENCIES IN CONSTRUCTING ASSESSMENT INSTRUMENTS IN TECHNICAL COLLEGES IN GOMBE STATE

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ABSTRACT

Scheme for Assessing Technical Teachers' Competencies for Constructing Assessment Instruments (SATTCCAI) that will improve technical teachers' competencies for constructing classroom assessment instruments was developed and validated in this study. The study used instrumentation research design. The population for the study was 96 technical teachers in technical colleges in Gombe State. The study answered one research question and tested two hypotheses. Data collected were analyzed using statistical mean, Cronbach's Alpha t-test and one way Analysis of Variance (ANOVA). The result of the study showed that 26 items were found important for the SATTCCAI. The instrument was found to possess a high reliability of 0.82. It was therefore, recommended amongst others that technical teachers in technical colleges in Gombe States should use the SATTCCAI for constructing assessment instruments.

INTRODUCTION

The process of assessment is one of the difficult tasks that teachers face in their work. Assessment includes all the process involved in making decisions about students learning progress. It facilitates teachers in decision making about learning progress through systematic information gathering. Okoro (2005) stated that assessment is the process of ascertaining the decision areas of concern, selecting appropriate information and collecting and analyzing information in order to report in selecting among alternatives. Classroom assessment includes the observation of students' written work, their answers to questions in class, and performance on teacher-made and standardized assessment instruments. It is the systematic collection, review, and use of information about educational

programmes undertaken for the purpose of making educational decision. Educational decisions are made based on the feedback provided through classroom assessment process. These decisions may be the ones that require information about the success of learning programmes or about students who have reached particular levels of skill and knowledge (Izard, 2005). Whatever type of information needed, educational decisions depend upon valid and reliable assessment instruments to inform those who make the decisions.

Validity and reliability are two technical properties of an assessment instrument that indicate the quality and usefulness of that assessment instrument. Validity refers to the degree to which assessment instrument is measuring what it is supposed to measure while reliability is an

indication of the consistency between two measures of the same assessment instrument (Alias, 2005). Alias further stated that an assessment instrument may be highly reliable but not necessarily valid, but a highly valid assessment instrument is usually reliable. Validity of an assessment instrument describes the extent to which the conclusions or interpretations derived from the results of any assessment are well-grounded or justifiable, that is relevant and meaningful (Cook & Beckman, 2006). It refers to the accuracy with which an instrument measures the personality traits or abilities it sets out to evaluate. In other words, validity describes how well one can legitimately trust the results of an assessment as interpreted for a specific purpose. A well-developed assessment instrument must measure what it is supposed to measure and produce dependable and repeatable information with sufficient evidence for a confident assessment decision to be made.

Most of the classroom-based assessment instruments in Nigeria lack validity and reliability because teachers seem to lack assessment instrument construction skills and thus cannot construct good assessment instruments (Baker, 2003; Dosumu, 2002; Alele-Williams, 2002). Adeola and Fajonyimi in Agu, Onyekuba and Anyichie (2013) observed that most of the assessment instruments used for continuous assessments and end of term examinations in the secondary schools contain ambiguous and misleading questions which may be the reason why some of the students fail. The implication of this is that teachers and school administrators will not be able to provide educational opportunities and supports each individual student needs as well as the programme at large. Koksai (2004) and Leighton and Gokiart (2005) affirmed that faulty assessment instrument items affect students' comprehension and ability to provide accurate answers to the items and the inference drawn about what a student knows and understands will be compromised. Since most of the assessment instruments used in Science and Technical Colleges are teacher-constructed (National Board for Technical Education [NBTE], 2003), there is therefore, need

for science and technical teachers to apply some acceptable degree of assessment instrument construction skills in order to be able to develop valid and reliable assessment instrument that will yield accurate feedback of students' achievement.

COMPETENCIES FOR CONSTRUCTION OF ASSESSMENT INSTRUMENT

A good assessment instrument is use to elicit from the student information that tells the teacher, examiner, school administrators, etc about student's achievement of educational objectives. It is a well standardized measuring device, appropriate to a given assessment (Adewunmi, 2008). The quality of assessment instrument given by a teacher determines its ability to provide information needed regarding students' performance. Well written items allow for accurate and consistent measures of students' mastery of content taught in class. Frey (2007) stated that any characteristics of an assessment instrument item which distracts the test-taker from the major point or focus reduces the effectiveness of that item. Koksai (2004) outlined factors that are inherent in poorly designed assessment instruments which if well-handled will lead to quality classroom-based assessment instruments. These are:

- i. Non specification of the target audience, what skill or area of ability the assessment instrument intended to measure, how much time allocated for each item, and what points the test-takers would get for each correct response.
- ii. Separate sections not clearly stated.
- iii. Assessment instrument items having more than one possible answer because they were not conceptualized.
- iv. Not stating time allocated for each task on the papers. Only the total time available to perform all the tasks that was given.
- v. Non consideration of level of students in assessment instrument construction.
- vi. Unclear instructions.

- vii. Tasks students are expected to perform not being in concert with the tasks they are told to do during the classroom instructions.
- viii. Lack of representativeness of items concerning what the teacher intends to assess.
- ix. College-production of some assessment instrument items.

In order to construct good assessment instruments, teachers should be able to set out targets and write objectives, choose an assessment items and technique, administer assessment and analyze the data and share the results with students. Chidolue in Agu et al (2013) outlined the following competencies that classroom teachers should possess to construct good assessment instrument item:

- i. determining the purpose of each assessment exercise;
- ii. stating specific, measurable educational objectives;
- iii. making good content outline;
- iv. preparing assessment plan which will guide item construction;
- v. choosing appropriate assessment instrument item formats;
- vi. constructing clear, precise and unambiguous items;
- vii. constructing items that focus the attention of a group of students, often with widely varying background experiences, on a single idea;
- viii. constructing items with appropriate difficulty and discriminative indices;
- ix. developing marking guide suited for the assessment;
- x. performing item analysis of their items;
- xi. developing assessment instrument that are economical in time and money;
- xii. giving clear directions on how the instrument should be administered and taken;
- xiii. Reviewing the instrument in order to correct any errors made during item construction.

In addition to these competencies and considering other relevant factors like convenience, appropriateness,

usability, storability and interpretability of an assessment instrument. Aworefa (2010) outlined the following major steps teachers should note in constructing assessment instruments: obtaining a list of instructional objectives; outlining the content to be covered; preparing a table of specifications; writing items for the instrument; item analysis and; determining validity and reliability coefficient of each item of the instrument and the instrument as a whole.

It is expected that students who perform well in teachers' classroom-based assessment instruments should equally perform well in the standardize assessment instruments like National Business and Technical Examination Board (NABTEB), West African Examination Council (WAEC) and, National Examination Council (NECD). However, it appears not to be so. Agu et al (2013) observed that the performance of secondary school students that performed well in classroom-based assessments revealed a 75% failure rate in the standardize assessment instruments in 2009. There is a need therefore, to assess technical teachers' assessment instruments construction skills in technical colleges. The purpose of this study was to develop a Scheme for Assessing Technical Teachers' Competencies for Constructing Assessment Instruments (SATCCAI) in technical colleges in Gombe State.

RESEARCH QUESTION

1. What items are considered important for inclusion in SATCCAI for assessing technical teachers' competencies for constructing assessment instruments?

HYPOTHESES

1. There is no significant difference between the mean ratings of male and female technical teachers on the importance of items for inclusion in SATCCAI.
2. There are no significant differences in the mean ratings of technical teachers of the five (5)

technical colleges in Gombe State regarding the importance of items for inclusion in SATTCCAI.

METHODOLOGY

The study employed instrumentation research design. According to Gay (1996) instrumentation design is appropriate for use when introducing new procedures, technologies or instrument for educational practices. The study was carried out in Gombe State. The target populations for the study include 96 technical teachers in the six Technical Colleges each in Gombe, Kumo, Tula, Amada, Deba and Kwame. The technical teachers include 84 male and 12 female. The entire population was used as sample for the study since it is relatively manageable.

The instrument SATTCCAI was developed from review of literature. The draft of the instrument comprises 29 items which were subjected to construct validity by two experts in Measurement and Evaluation from the departments of education, federal university kashere, Gombe State and university of Maiduguri, Borno State. The experts were asked to assess how well items of SATTCCAI marked the indispensable constructs (i.e. language usage, content coverage, item organization, assessment guidance etc) for constructing assessment instruments. The result of the validation indicated that items dealing with language mechanics, content coverage, items organization and assessment guidance are valid for assessing competencies of technical teachers in assessment instruments construction. The result therefore, revealed that 3 items were dropped and 26 items were accepted valid for assessing technical teachers' competencies for constructing assessment instruments.

After the validation exercise of draft instrument, it was administered on the research sample in order to determine the important items for inclusion in the final SATTCCAI. The instrument was arranged in two parts: A and B. Part A sought demographic information about the respondents while part B sought the important of each of the

26 items dealing with competencies in constructing assessment instruments. A five point scale of Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD), Undecided (U), were written against each of the item statements with a corresponding assigned values of 5, 4, 3, 2, and 1 respectively.

All the 96 draft copies of the SATTCCAI administered and returned were found to be valid and therefore used in the study. None of the 26 items was dropped as they were rated above 3.00 cut-off point. The result of this exercise was used to assemble the final form of SATTCCAI. In order to determine the initial reliability of the instrument, SATTCCAI was pilot tested on 12 technical teachers in Government Science and Technical College Potiskum, Yobe State. The initial internal consistency of the instrument was determined by calculating Cronbach's alpha reliability coefficient which yielded reliability of 0.84. The instrument SATTCCAI was then tried out on the sample for the study to ascertain its reliability coefficient. The internal consistency of the instrument was ascertained by calculating Cronbach's alpha reliability coefficient which yielded reliability of 0.82. These values exceeded Nunnally's criterion of 0.7 accepted for statistical consideration (Nunnally, 1978).

Data for answering the research question was analyzed using the mean and standard deviation. In order to select important items for inclusion in the SATTCCAI, a mean cut-off of 3.00 was used. Therefore, any item with a mean score of 3.00 and above was considered important for inclusion in the final SATTCCAI, while an item with a mean score below 3.00 was not considered. The null hypotheses one and two were tested at five percent level of significance (0.05), using student t-test and one-way Analysis of Variance (ANOVA) respectively. For testing null hypothesis 1, if the calculated t-value was equal or greater than the t-table value, the null hypothesis was rejected but if the t-calculated was less than t-table value, the null hypothesis was accepted. For testing null hypothesis 2, if the calculated F-value was equal or greater than the F-table value, the null hypothesis

was rejected but if the F-calculated was less than F-table value, the null hypothesis was accepted.

Research Question: What items are considered important for inclusion in SATTCCAI for assessing technical teachers' competencies in constructing assessment instruments?

RESULTS

Table 1: Mean Ratings of Technical Teachers on the Importance of items for inclusion in SATTCCAI

S/No.	Item	X	SD	Remark
1.	State the target group or class to be assessed	4.21	0.71	Agreed
2.	Write down specific objectives to be determined	3.81	0.39	Agreed
3.	Outlined the content covered before setting items from them	3.91	0.64	Agreed
4.	State the type of assessment instrument to construct	4.19	0.31	Agreed
5.	Prepare a marking guide while constructing the instrument	3.62	0.82	Agreed
6.	Prepare a blue-print as a guide for the instrument construction	3.33	0.29	Agreed
7.	Review standard text books in the subject area for guide	3.15	0.46	Agreed
8.	Review previous instruments and adapt questions from them	3.08	0.38	Agreed
9.	Draw/choose assessment items and techniques for the instrument	3.94	0.68	Agreed
10.	Include items that both high and low achievers can understand	3.81	0.72	Agreed
11.	Include sufficient items to cover all the levels of requisite domain of educational taxonomy	4.48	0.59	Agreed
12.	Include sufficient items to cover the appropriate instructional units	3.37	0.73	Agreed
13.	Avoid items that measures opinion outside the determined objectives	3.99	0.57	Agreed
14.	Avoid the use of interlocking items	3.21	0.33	Agreed
15.	Avoid too long questions or phrases in item writing	3.89	0.47	Agreed
16.	Avoid gender stereotypes in the instrument items	3.01	0.26	Agreed
17.	Set items that elicit creative and imaginative answers	3.66	0.52	Agreed
18.	Organize items in a logical manner	3.56	0.36	Agreed
19.	Ascribe scores for each item	4.75	0.97	Agreed
20.	Validate the assessment items	3.91	0.92	Agreed
21.	Determine the reliability of the instrument items	3.33	0.32	Agreed
22.	Subject assessment items to item analysis	4.32	0.47	Agreed
23.	Submit the items for vetting to the school administration	3.00	0.21	Agreed
24.	Prepare assessment with due regard to the time available for carrying out a test	3.85	0.55	Agreed
25.	Give instructions to guide the test-takers	3.84	0.59	Agreed
26.	Keep a resource bank of items aside that can be referred to when the need arise	3.15	0.37	Agreed

Results from Table1 revealed that the mean scores of technical teachers ranged from 3.00 to 4.75. All the items had their mean scores (X) above the cut-off point of 3.00, signifying that the technical teachers considered all the 26 items as being important competency statements (items) for inclusion in the SATCCAI. The standard deviation (SD) of the

items ranged from 0.21 to 0.97, implying that the technical teachers were very close in their ratings.

Hypothesis 1

There is no significant difference between the mean ratings of male and female technical teachers on important items for inclusion in SATCCAI.

Table 2: T-test Analysis of Mean Response of Male and Female Technical Teachers on Important Items for inclusion in SATCCAI

Group of Teachers	X	SD	N	df	Standard Error	t-cal	t-table
Male	3.7408	1.8174	84	94	0.5757	0.084	1.662
Female	3.6923	1.8723	12				

Table 2 shows that male technical teachers recorded a high mean score of 3.7408 (SD = 1.8174) above female technical teachers with mean score of 3.6923 (SD =1.8723). At 94 degree of freedom (df), the t-calculated value of 0.084 is lower than t-tabulated value of 1.662, indicating that there is no significant difference between male and

female technical teachers on important items for inclusion in SATCCAI. The first hypothesis therefore was accepted.

Hypothesis 2

There are no significant differences in the mean ratings of technical teachers of the 6 technical colleges in Gombe State regarding the important items for inclusion in SATCCAI.

Table 3: ANOVA of Six Technical Colleges Teachers’ Ratings of Important Items for Inclusion SATCCAI.

Source of Variation	Sum of Squares	df	Mean Square	F-cal.	F-table	Remark
Between Schools	66.1474	5	13.2295	-0.708	2.32	Accepted
Within Schools	-1681.928	90	-18.6881			
Total	-1615.7806	95				

Table 3 indicated that F-calculated value of -0.708 is less than F-table value of 2.32 at five percent level of significance. This implies that there are no significant differences among the six technical colleges’ teachers regarding the important items for inclusion SATCCAI. The second hypothesis therefore was accepted.

DISCUSSION

The main contribution of this study was the successful development of a valid and reliable scheme for assessing competencies of technical teachers in constructing

classroom-based assessment instruments. The result related to the research question in table 1 indicated that all the 26 items dealing with competencies were considered important for inclusion in SATCCAI. This indicates that, in the technical teacher’s opinions, all the 26 items are important in constructing assessment instruments in technical colleges. This finding is consistent with Silker (2003) regarding the fact that all the items of the assessment instruments they developed were considered by the respondents as appropriate for use in assessing teachers’ competencies in constructing assessment instruments.

The non-significance differences between male and female technical teachers that respondent to the important

items for inclusion in SATTCAL are further evidence of the instrument's validity and usability. The analysis of data relating to the null hypothesis 1 stated regarding important items for inclusion in SATTCAL revealed that the null hypothesis was accepted. This entails that gender was not a significant factor in deciding which item is important for the SATTCAL. The instrument therefore, is stable across gender and could be appropriately used to assess assessment instruments construction competencies of both male and female technical teachers. This is in concordance with the finding of Silker (2003) and Agu et al (2013) that all teachers irrespective of gender should develop some valid and reliable assessment instruments.

In respect of the null hypothesis 2, it was found that there were no significant differences among the six schools of technical teachers regarding the importance of items for inclusion in SATTCAL. This is an indication that location of school and environment was not a determining factor in selecting important items for inclusion in the SATTCAL instrument. This confirms that SATTCAL could be used to assess assessment instruments construction competencies of technical teachers in all the technical colleges regardless of their location and environmental factors.

CONCLUSION

Findings of this study indicate that SATTCAL is valid and reliable and could be used in assessing technical teachers' competencies in constructing assessment instruments in technical colleges. The SATTCAL may guide technical teachers to construct valid and reliable assessment instruments that will give dependable estimate of students' performances for educational decision making. In so doing, technical teachers will be able to identify their areas of weakness in constructing assessment instruments. It is believed that technical teachers' competencies in constructing assessment instruments will be improved. The study also implies that the Gombe State Teaching Service Commission can use this instrument to assess the extent to

which technical teachers possess the skills to develop valid and reliable assessment instruments. It may also use the instrument in recruiting and evaluating staff for the assessment instruments development unit of the commission.

REFERENCES

- Adewunmi, J. A. (2008) Introduction to Educational Research Technique. Ilorin, Gbenle Press.
- Agu N. N., Onyekuba, C. & Anyichie, A. C. (2013). Measuring teachers' competencies in constructing classroom-based tests in Nigerian secondary schools: Need for a test construction skill. *Academic Journals*, 8(8), pp. 431-439. Retrieved from <http://www.academicjournal.org/ERR> on September 15, 2014.
- Alele-Williams, G. (2002). Measurement and evaluation in mathematics: The way forward. *Journal of Basic Science*, 1(1), 1-7.
- Alias, M. (2005). Assessment of learning outcomes: validity and reliability of classroom test. *World Transaction on Engineering and Technology Education* Vol. 4, No. 2. Retrieved from [http://www.wiete.com.au/journals/WTE&TE/pages/vol.4.%20No.2%20\(2005\)/16-Alias32.pdf](http://www.wiete.com.au/journals/WTE&TE/pages/vol.4.%20No.2%20(2005)/16-Alias32.pdf), on May 15, 2014.
- Aworefa, A. T. (2010). *Designing instruments for measuring students' educational outcomes: the NABETEB approach*. Retrieved from <http://www.curriculum.wcape.school.za/resources>, on May 20, 2014.
- Baker, J. O. (2003). *Testing in modern classrooms*. London: George Allen and Urwin Ltd.
- Chidolue, M. (1999). *Introduction to tests and measurements*. Unpublished mimeograph on measurement and

- evaluation. Department of education, Nnamdi Azikiwe University, Awka.
- Cook, D. A. & Beckman, T. J. (2006). Current concepts in validity and reliability for psychometric instruments: theory and application. *The American Journal of Medicine*, Vol 119, No 2. Retrieved from <http://www.cursuri.sas.unibuc.ro/.../uploads/.../cook2006> on 5 May, 2014.
- Dosumu, C. T (2002). *Issues in teacher-made tests*. Ibadan: Olatunji and Sons Publishers.
- Frey, B. B. (2007). *An introduction to quality test construction*. Retrieved on February 19, 2014 from <http://www.specisconnection.ku.edu/cgi-bin/cgiwrap/speccom/mainphp?cat=assessment§ion=main§ion=qualitytest/main>.
- Gay, L. R. (1996). *Educational research .competences, for analysis and application*. (5th Ed.). Merrill, NJ: Prentice Hall.
- Izard, J. (2005). Overview of test construction. In K. N. Ross. *Quantitative Research Methods in Educational Planning*. Paris: UNESCO International Institute for Educational Planning.
- Koksal, D. (2004). Assessing teachers' testing skills in Elt and enhancing their professional development through distance learning on the net. *Turkish Journal of Distance Education*. 5(1).
- Leighton, J. P & Gokiert, R. J. (2005). *The cognitive effect of test item features*. Retrieved from <http://www.education.ualberta.ca/educ/psych/craime/files/.../LeighandGokiert.pdf> on May 17, 2013.
- National Board for Technical Education (2001). Mechanical engineering craft curriculum and module specifications: National Technical Certificate (NTC) and Advanced National Technical Certificate (ANTC).
- UNESCO – Nigeria Project*. Retrieved from <http://www.unesdo.unesco.org/images/0016/001613/161353e.pdf>, on May 15, 2014.
- Nunnally, J. C. (1978). *Psychometric theory*. New York: McGraw-Hill.
- Okoro, D. M. (2005). *Programme evaluation in education*. Uruawunu-Obosi: pacific publishers.
- Okwelle P. C. & Okoye K. R. E. (2012). Development and validation of instrument for assessing practical skills in building electronic systems in Nigerian technical colleges: *journal of emerging trends in engineering and applied sciences*. Retrieved May 26, 2014 from <http://www.jeteas.scholarlinkresearch.org>.
- Silker, R. T. (2003). *Teachers and tests*. London: Basil Blackwell.