



Utilization of Cognitive Diagnostic Assessment (CDA) As A Feedback Tool by Secondary School Teachers in Maiduguri Metropolis, Borno State

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Abstract

The study determined the utilization of cognitive diagnostic assessment (CDA) as a tool for feedback among secondary school teachers in Maiduguri Metropolis, Borno State. The objectives of the study were to determine level of utilization of cognitive diagnostic assessment as a tool for feedback among secondary school teachers and if there are statistically significant differences in the level of utilization among teachers of secondary schools due to the variables of academic qualification, years of experience and gender. The study used exploratory survey research design to obtain data for the study. The target population for this study was all secondary school teachers in Maiduguri metropolis, Borno state. There were 3,170 secondary school teachers within the metropolis as at May, 2021. The sample for the study was one hundred and eighty-five teachers randomly sampled. The instrument for data collection was a researcher designed questionnaire consisting of 19 items. The Cronbach's Alpha reliability of the instrument was .75. The instrument was administered to the teachers in their offices and was collected on the same day. Percentage and frequency count were used to analyze data on the level of utilization of cognitive diagnostic assessment as a feedback tool by teachers while Krustal-Wallis Test Chi-Square was used to analyze data on differences in utilization of cognitive diagnostic assessment among teachers by academic qualification and years of experience. Data on gender difference in utilization of cognitive diagnostic assessment as among teachers was analysed by means of t-test of independent samples. Results on level of utilization of cognitive diagnostic assessment indicate a high level of utilization among teachers. On difference in utilization of cognitive diagnostic assessment the study found no significant differences among teachers by academic qualifications and years of experience. The result however indicates a significant gender difference in utilization of cognitive diagnostic assessment among teachers in favour of females.

Keywords: Utilization, Cognitive Diagnostic Assessment, Feedback Tool, Teachers

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Introduction

Diagnostic assessment is the process adopted by teachers to locate and identify students' areas of learning difficulties/weaknesses in a subject or skill and the cause(s). It implies a detailed study of learning weaknesses (Ketterlin-Geller & Yovanoff, 2009). It involves assessing components of underlying skills out of the context of the curriculum. Diagnostic assessment tends to expand student's knowledge and achievement. Stevens

(2009) asserts that diagnostic assessment process is a decision-making strategy for determining when and how to deliver instructional remediation to learners through additional instruction and also to help teachers determine whether the students can move on to the next skill or concept to be taught as outlined in the curriculum.

Teachers' qualifications in any educational system determine to a great extent the quality of the system itself. Teachers' qualification is



widely thought of as an essential determinant of students' academic performance (Ibeawuchi 2012). According to Ibrahim (2000), the qualification of a teacher could have far-reaching effects on how students' academic achievements are assessed. Good academic achievement could in part, contribute to the cognitive, affective and psychomotor domains of an individual. Teachers' qualification is directly proportional to assessment of students' achievement. This implies that teachers' role in the preparation of students to succeed in examinations cannot be undermined.

Teachers' years of experience have to do with experience gained over time which enhances knowledge, skills and productivity. According to Rice (2010) the magnitude of the effect of teacher experience varies depending on the teacher's level of education and the subject area. Teachers' gender has been established to facilitate teaching-learning and assessment process. Researchers have examined the influence of teacher characteristic such as gender on students' assessment with varied findings.

Studies on diagnostic assessment to improve students' achievement at the international level are extensive. Jang (2009) investigated the validity of the application of Cognitive Diagnostic Assessment (CDA) and concentrated on the importance of diagnostic feedback. The results indicated that CDA approach was more effective in providing diagnostic feedback about the level of proficiency in reading skills than that of the traditional ways.

Sun and Suzuki (2013) applied a cognitive diagnostic assessment (CDA) approach in fraction problems to 144 sixth grade students in an elementary school in Japan. Based on the result of the assessment each individual student's attribute mastery probabilities were reported which should be useful information for teachers to know about each student's detailed knowledge state and give them appropriate guidance individually for their future remedial work. After showing the results to three homeroom teachers, Sun and Suzuki also conducted a questionnaire survey to ask teachers about the effectiveness and usefulness of CDA's feedback results. Positive answers

from all the teachers considering diagnostic information of students' attribute mastery probabilities were received which are not possible to get from the current typical educational tests as effective feedback information. The researchers concluded that their study shows CDA could be a useful approach for effective feedback.

Yaghmour, Luai and Qaseem (2016) determined level of diagnostic tests preparation skills among teachers of the first three elementary grades in Bani Kinana District, Jordan and its relationship to the variables of gender, academic qualification and years of experience. The sample of the study consisted of 264 male and female teachers. Data were collected through a questionnaire. Statistical analyses used included means, standard deviations and 3-way ANOVA. Results showed a medium degree of the presence of a moderate level of diagnostic tests' preparation skills among the teachers with a mean of 3.56, lack of statistically significant differences at the significance level of $\alpha \leq 0.05$, in the level of diagnostic tests preparation skills among the teachers of the first three elementary grades due to the variables of gender and number of years of experience. In terms of academic qualifications, the result showed statistically significant differences, at the significance level of $\alpha \leq 0.05$ in the diagnostic tests' preparation skills among the teachers. The difference was between high diploma and M.A. degree or Higher degree in favour of teachers with M.A. degree.

In Nigeria, Ofem, Idika and Ovat (2017) examined the influence of diagnostic and feedback evaluation methods in enhancing mathematics achievement among Secondary School students. A total of 119 students from 3 secondary schools were used for the study. Two schools constituted the experimental groups while one school was used as control. The researchers designed the Mathematics Achievement Test (MAT) for data collection. The result of the data analysis revealed that diagnostic and feedback evaluation methods enhance achievement in Mathematics. In their study, Ofem et al., did not utilize a developed and validated diagnostic test in their diagnostic assessment; rather certain questions were posed

to the students to gather data on the extent of intellectual accomplishment and not for identifying students' weak learning points.

Jimola and Ofodu (2019) explored teachers' attitudes and utilization of diagnostic assessment techniques and also investigated the factors influencing teachers' knowledge of assessment practices. The results showed that all 50 (100%) of the teachers do not use questionnaire for diagnostic assessment, while 40 (80%) use oral interviews for this purpose. The results also revealed that all 50 (100%) do not use misconception checks for diagnostic assessment in the classroom, but 37 (74%) use discussions. The results further revealed that all 50 (100%) and 48 (96%), respectively, never use checklists, portfolios or inventories as diagnostic assessment techniques. In contrast, 33 (66%) and 45 (90%) agreed that they use observation and questioning techniques, respectively, while 40 (80%) stated that they do not use written pre-tests for diagnostic assessment. Thus, the majority of the English language teachers who participated in the survey use oral interviews, discussions, observation and questioning for diagnostic assessments.

Esomonu and Eleje (2020) determined effect of diagnostic testing on students' academic achievement in secondary school Quantitative Economics. The design of the study was quasi-experimental which employed 2x4 factorial pretest-posttest designs. The sample consisted of 210 Senior Secondary 3 (SS3) economics students in the four co-educational schools purposely selected from Nnewi Education Zone of Anambra State, Nigeria. Instruments for data collection were Diagnostic Quantitative Economics Skill Test (DQUEST) and Test of Achievement in Quantitative Economics (TAQE). Statistics for data analysis were t-test and ANCOVA. Results of the analysis indicate a significant effect of treatment on students' achievement in favor of DQUEST with feedback and remediation group only ($F(3, 209) = 22.3114, p > 0.05$). Gender made no significant difference on students' achievement in TAQE. Thus, diagnostic tests are effective when used with feedback and remediation. The use of DQUEST with feedback and remediation in teaching and learning of



quantitative economics is therefore recommended

Available literature on diagnostic assessment in Nigeria indicates a dearth of data. The available ones were not on secondary school teachers' utilization. This calls for the need to conduct a study on utilization of cognitive diagnostic assessment among secondary school teachers for assessing students' learning difficulties.

Statement of the Problem

Majority of teachers in secondary schools in Maiduguri metropolis are inclined to formal assessment of students which are pre-planned, systematic attempts to ascertain what students have learned, to assign grades, promote students to next level and report students' progress to parents. Contrary to these practices examiners have advocated the need for educators to often assess students' learning and achievement to gain knowledge about students' level of understanding, identify learning difficulties and factors inhibiting learning progress in order to guide the direction of future learning. This study therefore determined utilization of cognitive diagnostic assessment among secondary school teachers as a feedback tool in Maiduguri metropolis.

Research Objectives

Objectives of the Study were to determine:

1. the level of utilization of cognitive diagnostic assessment among secondary school teachers in Maiduguri metropolis, Borno State,
2. if there are statistically significant differences in the level of utilization of cognitive diagnostic assessment—among secondary school teachers in Maiduguri metropolis due to the variables of academic qualification, gender and years of experience.

Research Question

1. What is the level of utilization of cognitive diagnostic assessment among secondary school teachers in Maiduguri metropolis, Borno State?



Research Hypotheses

1. Secondary school teachers in Maiduguri Metropolis do not significantly differ in the utilization of cognitive diagnostic assessment by academic qualification.
2. Secondary school teachers in Maiduguri Metropolis do not significantly differ in the utilization of cognitive diagnostic assessment by years of experience.
3. Secondary school teachers in Maiduguri Metropolis do not significantly differ in the utilization of cognitive diagnostic assessment by gender.

Methodology

The study used exploratory survey research design to obtain data for the study. The target population for this study was all secondary school teachers in Maiduguri metropolis, Borno state. There were 3,170 secondary school teachers within the metropolis as at May, 2021. The sample for the study was one hundred and eighty-five (185) teachers randomly sampled. The instrument for data

collection was a researcher designed questionnaire consisting of 19 items. The Cronbach's Alpha reliability of the instrument was .75. The instrument was administered to the teachers in their offices and was collected on the same day. Percentage and frequency count were used to analyze data on the level of utilization of cognitive diagnostic assessment as a feedback tool by teachers while Krustal-Wallis Test Chi-Square was used to analyze data on differences in utilization of cognitive diagnostic assessment among teachers by academic qualification and years of experience at .05 level of significance. Data on gender difference in utilization of cognitive diagnostic assessment as among teachers was analysed by means of t-test of independent samples at .05 level of significance.

Results

Research Question 1:

What is the level of utilization of cognitive diagnostic assessment among secondary school teachers in Maiduguri metropolis, Borno State?



Table 1: Results on Level of Utilization of Cognitive Diagnostic Assessment by Secondary School Teachers in Maiduguri Metropolis, Borno State.

| S/No | Statement | Always N (%) | Sometimes N (%) | Never N (%) | Remark |
|------|--|-----------------|--------------------|----------------|--------|
| 1. | Assessing students at the beginning of term | 120(65) | 55 (30) | 10(5) | High |
| 2. | Assessing students at the end of each topic | 150(81) | 35(19) | 00 | High |
| 3. | Assessing individual student based on identified learning difficulties | 75(41) | 80(43) | 30(16) | Low |
| 4. | Conducting corrective lesson for students when weaknesses in certain areas are revealed | 80(43) | 100(54) | 5(3) | Low |
| 5. | Examining students to assess needs of each student | 70(37) | 110(60) | 5(3) | Low |
| 6. | Using results of test to provide corrective teaching for revealed problems | 130(70) | 55(30) | 00 | High |
| 7. | Analyzing every students' class work and assignment | 135(73) | 50(27) | 00 | High |
| 8. | Observing students' participation in classroom discussion | 130(70) | 55(30) | 0 | High |
| 9. | Assessing students to identify strengths and areas of improvement | 110(60) | 75(40) | 00 | High |
| 10. | Conducting assessment that do not count as scores for students' results | 25(14) | 125(67) | 35(19) | Low |
| 11. | Pre-assessment before teaching each topic | 90(48) | 70(38) | 25(14) | High |
| 12. | Using results of assessment to provide remedy to instruction | 115(62) | 70(38) | 00 | High |
| 13. | Providing solution to students' learning difficulties due to factors outside the school | 70(38) | 115(62) | 00 | Low |
| 14. | Assessing students to locate and identify learning difficulties | 125(68) | 60(32) | 00 | High |
| 15. | Utilizing other procedures apart from written assessment to obtain feedback on learning difficulties | 80(43) | 100(54) | 5(3) | Low |
| 16. | Assessing students on topics outside the curriculum, but related to content | 50(27) | 120(65) | 15(8) | Low |
| 17. | Assessing students to determine when to give remedial instruction | 60(32) | 110(60) | 15(8) | Low |
| 18. | Assessing students before moving to next topic | 145(78) | 40(22) | 00 | High |
| 19. | Assessing students on your own apart from the conventional C. A. and end of term examinations | 110(60) | 75(40) | 00 | High |

The result of data analysis on utilization of cognitive diagnostic assessment by secondary school teachers in Maiduguri Metropolis, Borno State indicates a high level of utilization as high level of utilization was found in twelve items out of the nineteen items on the questionnaire. 120 teachers representing 65% indicated that they assess students at the beginning of term, on assessing students at the end of each topic 150 teachers representing 81% do that, on using results of test to provide

corrective teaching for revealed problems 130 teachers representing 70% indicated they do that. The result further indicates that 135 teachers representing 73% analyse, every students' class work and assignment while 130 teachers representing 70% observe students' participation in classroom discussion. On assessing students to identify strengths and areas of improvement 110 teachers representing 59.5% do that, 115 teachers representing 62% use results of assessment to



provide remedy to instruction, while 125 teachers representing 68% assess students to locate and identify learning difficulties, 145 teachers representing 78% assess students

before moving to next topic and 110 teachers representing 60% assess students on their own apart from the conventional C. A. and end of term examinations.

Table 2: Result of Chi-square on Difference in Utilization of Cognitive Diagnostic Assessment among Secondary School Teachers by Academic Qualification

| Chi-Square | d.f | P-Value | Decision |
|------------|-----|---------|-----------------|
| 6.51 | 3 | .09 | Not Significant |

Significant at 0.05 level

The result of chi-square Kruskal-Wallis Test in table 2 indicated that there was no significant difference in utilization of cognitive diagnostic assessment among secondary school teachers in Maiduguri Metropolis due to academic qualification. The null hypothesis is therefore accepted.

Table 3: Result of Chi-Square on Difference in Utilization of Cognitive Diagnostic Assessment Among Secondary School Teachers by Years of Experience

| Chi-Square | d.f. | P-Value | Decision |
|------------|------|---------|-----------------|
| 1.94 | 2 | .38 | Not Significant |

Significant at 0.05 level

The result of chi-square Kruskal-Wallis Test in table 3 indicated that there was no significant difference in utilization of cognitive diagnostic assessment among secondary school teachers

in Maiduguri Metropolis due to years of experience. The null hypothesis is therefore accepted.

Table 4: Result of t-test of Independent Samples on Gender Difference in Utilization of Cognitive Diagnostic Assessment as a Tool for Feedback Among Secondary School Teachers

| Gender | N | Mean | SD | df | t-value | p-value | Decision |
|--------|-----|-------|------|-----|---------|---------|-------------|
| Male | 115 | 27.65 | 4.37 | 183 | -4.78 | .000 | Significant |
| Female | 70 | 30.86 | 4.47 | | | | |

Correlation is significant at 0.05 level (2-tailed)

The result of t-test of independent samples on gender difference in utilization of cognitive diagnostic assessment among secondary school teachers revealed a significant difference in favour of females with mean and standard deviation [M=30.86, SD4.47) which is higher than that of their male counterpart whose mean and standard deviation was (M=27.65, SD=4.36); $t(143.26)=-4.76, p< 0.05$]. The null hypothesis is therefore rejected.

Summary of Findings

The following findings were deduced from the study:

1. High level of utilization of cognitive diagnostic assessment among secondary

school teachers in Maiduguri metropolis was found.

- There was no significant difference in the utilization of cognitive diagnostic assessment among secondary school teachers in Maiduguri metropolis by academic qualifications.
- There was no significant difference in the utilization of cognitive diagnostic assessment among secondary school teachers in Maiduguri metropolis by years of experience
- There was a significant gender difference in the utilization of cognitive diagnostic assessment among secondary school

teachers in Maiduguri metropolis in favour of female teachers.

Discussion

The findings of this study with respect to level of secondary school teachers' utilization of cognitive diagnostic assessment in Maiduguri metropolis indicated a high level of utilization as higher percentage of teachers indicated they utilize cognitive diagnostic assessment. This finding is contrary to the findings of Jimola and Ofodu (2019) who found that 100% of English Language teachers in Senior secondary schools in Ado-Ekiti local government area of Ekiti state do not use indices of diagnostic assessment such as questionnaire, misconception checks, checklist, portfolios, written pre-test or inventories for diagnostic assessment. Their study found that English Language teachers are accustomed to certain diagnostic assessment such as paper-and-pencil test avoiding other techniques. Although other classroom assessment strategies such as questionnaire, checklists, portfolios, misconception/preconception checks and pre-tests may be time-consuming, researchers have found that they are useful in identifying students' learning problems, depending on the teachers' ability to schedule their time for assessment appropriately.

The findings on difference in secondary school teachers' utilization of cognitive diagnostic assessment due to academic qualifications and years of experience indicated that there were no significant differences among teachers. The finding of this study with respect to academic qualification is contrary to that of Yaghmour et. al., (2016) who found a significant difference in level of diagnostic tests preparation skills among teachers of the first three elementary grades in Bani Kinana District, Jordan. The finding of this study with respect to difference in utilization of cognitive diagnostic assessment by years of experience is in agreement with that of Yaghmour et. al, (2016) who also found no significant statistical difference in level of diagnostic tests preparation skills among teachers by years of experience.

On gender difference in utilization of cognitive diagnostic assessment as a feedback tool



among secondary school teachers indicated a significant gender difference in favour of female teachers. This finding is contrary to that of Yaghmour et. al. (2016) who found no statistically significant differences at the sig. level of ($\alpha \leq 0.05$) in the level of mastery of the skills related to the preparation of diagnostic tests among the teachers of the first three elementary grades in the Directorate of Education in Bani Kenanah district due to the variable of gender. These findings are an indication of inconsistency in findings across research studies globally. In view of the conflicting and inconsistent findings globally, there is need to replicate the study at the local level across institutions and states in order to make generalization on research findings.

Conclusion

Based on the findings of this study it is concluded that utilization of cognitive diagnostic assessment as a feedback tool among secondary school teachers in Maiduguri Metropolis is high. It is also concluded that teachers do not differ in the utilization of cognitive diagnostic assessment by academic qualification and years of experience, however, teachers differ by gender in their utilization of cognitive diagnostic assessment as a feedback tool.

Recommendation

In view of the fact that only secondary schools within Maiduguri metropolis were studied and the few sample size it is recommended that the study should be replicated in secondary schools within Borno State so as to make generalization to the findings of the study.



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