

CAUSAL EFFECT OF PROCESS VARIABLES ON MATHEMATICS CONTINUOUS ASSESSMENT PRACTICE IN EKITI - STATE

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ABSTRACTS: *Educational assessment provides the necessary feedback we require in order to maximise the outcomes of educational efforts. Assessment of learner's learning provides objectives evidences necessary in the decision- making process in education. It has the potential to enhance mathematics learning and to provide student's interest in mathematics. However , in order to evaluate the new educational system, one policy that cuts across all educational levels throughout Nigeria is that of continuous assessment which is enquiring not only the thinking process but including behaviours personality traits and manual dexterity through various student's profile using variety of assessment instruments in assessing various components of learning. The study investigated the causal effect of process variables on mathematics continuous assessment practice in Ekiti State. The sample for the study consisted of 116 stratified random selected mathematics teachers from 20 randomly selected senior secondary schools in the state. Data collected was through self constructed questionnaire centred on process variables and mathematics continuous assessment (cognitive, affective and psychomotor domains. Result shows that the continuous assessment practice in the school system is not representing the learners in his/ her entirety because it is cognitive oriented while affective and psychomotor domains are represented with number rating.*

KEYWORDS: Process Variables, Mathematics, Continuous Assessment, Ekiti State

INTRODUCTION

Assessment forms an integral part of the teaching process which enables the teachers to introduce new innovation to their teaching. It provides the necessary feedback require in order to maximise the outcomes of educational efforts. Greaney (2001) defined assessment as any procedure or activity that is designed to collect information about the knowledge, attitude or skills of the learner or group of learners. Assessment is therefore a process through which the quality of an individual s' work or performance is judged when carried out as an on-going process, it is then known as continuous assessment. Desalegn (2004), defined continuous assessment as making observation periodically to find out what a student knows, understand and can do. That is, continuous assessment is the record of the student's performance in nearly everything a student does throughout the cause that these three interrelated categories of educational domains of learning, characterised particular objectives are assured. Continuous assessment provides the student with maximum opportunities to learn and to demonstrate from time to time the knowledge, the skills and the attitude that they have during the teaching-learning process. Continuous assessment is a mechanism whereby the final grading of learners in the cognitive, affective and psychomotor domains. Mind-Heart-Hand of learning are given due emphasis. Cognitive domain relates to the capacity to think or one's mental skills, affective domain relates to all about emotions and feelings especially in relationship to a set of values. Similarly, psychomotor domain relates to the manipulative skills. In order words, continuous assessment should be systematic when it is well planned and graded to suit the age and

experience of the learner and is given at suitable interval during the school year. It is comprehensive when it focuses not on academic skill alone but embraces cognitive, affective and psychomotor domains ie mind- heart- hand. A child is assessed as a total entity using all the psychomotor devices such as test and non test techniques. Cumulative characteristics of continuous assessment means that all information gathered on the individual has to be pooled together before a decision can be taken. To say that continuous assessment is guidance oriented means that the information so collected is to be used for educational, vocational and personal-social decision- making. Despite the central role of continuous assessment in enhancing the teaching- learning process, we do not know a great deal about how teachers' continuously assess their students in secondary schools. Kallenghan and Greaney (2001) were of the opinion that there is evidence that the quality of those practices may be deficient in many ways. This might also be one of the reasons why student's performance in mathematics has continues to deteriorate.

Evidence shows that much emphases are been laid on the test / examination as the only means of generating scores (Balogun, 2015). Some teachers have limited knowledge of different forms of assessment; some felt they have no time to create different form of assessment. Some seem not to understand the process of continuous assessment. Egbeyemi, (2002) noted that all teachers trained at the inception of the programme between 1984 and 1989 have risen to higher position and left the assignment of continuous assessment in the hand of relatively junior and inexperienced teachers who have not been formally trained. Lucky (2012) confirms that continuous assessment places much power in the hands of teachers, and this power is often abused by the teachers who awards scores even when tests are not administered. There is a problem of overemphasis on the affective and psychomotor domains of behaviour. This probably explained why Obanya (1985) described the implementation as caricature. Ayodele (2010) noted that some teachers awarded scores on test never administered, not only when the school registrars are to submit their continuous assessment scores, some seem to cook continuous assessment scores from nowhere and submit such scores.

It is however that the practice of continuous assessment in schools has been fraught with some problems which include the fact that teachers are not adequately educated in continuous assessment. It is observed that a good number of teachers do not know how to factor affective and psychomotor domains into the overall performance of the students (Idowu \$ Esere 2009). Abubakar (2010) affirmed that a good number of teachers are not competent in the practice of continuous assessment, perhaps due to their inadequate knowledge of its techniques methodology since the teaching of mathematics should be done to help the learner to see, evaluate and appreciate the beauty and inherent universal usefulness in all sphere of the economy. It could be seen that continuous assessment being practiced in schools are not comprehensive. Comprehensive continuous assessment refers particularly to enquiring into the learner's competence, knowledge, attitude and skill through various students profile using different assessment method to improve learning.

Despite the practice of continuous assessment, it is observed that the rate at which students fail mathematics is high, there has been persistence failure of students in mathematics in internal and external examinations. This observation could be supported by the public criticism over the inconsistency in the practice of the system. Students continued to lose interest in the subject. Student's negative attitude towards mathematics affects the teaching and learning as well as assessment. The assumption that continuous assessment will elicit the interest of students in

mathematics appears to be failing because of the continuous assessment in being implemented in our secondary schools.

Alonge (1988) affirmed that even leakages have been rampant in this country, if the system of continuous assessment is vigorously and honestly pursued, such temptation would be eradicated. In addition, it helps to remove laissez – fare attitude on the part of the teachers. It is hypothesized that teacher’s ability to measure what the learners has gained from learning ability, interest and attitude as well as students’ skill in mathematics with the use of different assessment techniques causally depends on teachers’ qualities, experience, sound knowledge or mathematics ability to adequately deliver the instruction to the learners to motivate the learners to learn mathematics speedily and also improve their performance.

METHODOLOGY

The study adopted causal-comparative research design to describe the extent to which process variables are prior determinants of mathematics continuous assessment practice in Senior Secondary Schools. The study used path analytic model to decompose and interpret the linear relationship among process variables and mathematics continuous assessment practice. The sample for the study involved 116 Senior Secondary School Mathematics teachers in Ekiti State using multi stage sampling technique in selecting four local government areas in the state educational zones, with 20 Senior Secondary Schools and 29 mathematics teachers were selected from each of the zone. Six mathematics teachers were selected from four senior secondary schools while five mathematics teachers were selected from the five Senior Secondary Schools using simple and stratified sampling techniques. A structured questionnaire was used to elicit responses on process variables and continuous assessment practice with reliability coefficient of 0.84 and construct validity of 0.65. The data collected were analyzed using descriptive and inferential statistics. Frequency counts and percentage was used to answer the question raised. Interpret the causal effect among the variables, path analysis were used for the hypotheses. All the hypotheses were tested at 0.05 level of significance.

RESULTS

Question 1: What are the prevalent process variables in the determinant of Mathematics Continuous Assessment in Schools?

Table 1: Frequency counts and percentages showing the prevalent process variables on mathematics continuous assessment practice in schools.

	ITEMS	NO		YES	
		Freq.	%	Freq.	%
	In my school we have:				
1	Qualified mathematics teachers	1	0.9	115	99.1
2	Enough specialist mathematics teachers	31	26.7	85	73.3
3	Professionally trained mathematics teachers	6	5.2	110	94.8
4	Experienced mathematics teachers that will enhance effective teaching as well as assessment	2	1.7	114	98.3
5	Experienced mathematics teachers who can try out other forms of assessment techniques	12	10.3	104	89.7
6	Mathematics teachers with a broad educational background and professional competence	9	7.8	107	92.2
7	Mathematics teachers that varies the teaching- learning process to encourage active participation	7	6.0	109	94.0
8	Knowledgeable mathematics teachers that is able to choose different assessment methods for different purposes	3	2.6	113	97.4
9	Knowledgeable mathematics teachers that brings abstraction into concrete for better understanding	4	3.4	112	96.6
10	Mathematics teachers who can diagnose student's personal need and difficulties	16	13.8	100	96,2
11	Mathematics teachers who can take care of student's personal need and difficulties	23	19.8	93	80.2
12	Mathematics teachers who listen to students, observe them and make sense of what they say or do	6	5.2	110	94.8
13	For the practice of continuous assessment, attention should be shifted from assessing students' achievement to assessing student's learning progress	18	15.5	98	84.5
14	Shift attention from undue emphasis on the covering of syllabus at the expense of meaningful learning of mathematical concept.	23	19.8	9	80.2

Table 1 that the most prevalent process variable in the determining of mathematics assessment practice in Senior Secondary School is teacher's experience, followed by teacher's personality, teacher's qualification and then teacher's knowledge.

Question 2: what is the continuous assessment practice based on in senior secondary schools?

Table 2: Frequency counts and percentages showing what Continuous assessment practice in schools are based on.

	Items: In my school assessment is based on;	No		Yes	
		Freq	%	Freq	%
1	Periodic tests only	108	93.1	8	6.9
	Periodic test plus:				
2	rating of students' performance	6	5.2	110	94.8
3	students' assignment scores	105	90.5	11	9.5
4	rating of students' interest	105	90.5	11	9.5
5	rating of students' attitude to Mathematics	82	70.7	34	29.3
6	quality of students' Mathematics notes	67	57.8	49	42.2
7	students attendance at Mathematics lesson	28	24.1	88	75.9
8	students' positive interaction during Mathematics lesson	100	86.2	16	13.8
9	students' project scores	101	87.1	15	12.9
10	students' Mathematical skills	97	83.6	19	16.4
11	Student's hand writing	99	85.3	17	14.7
12	Creativity in drawing	43	37.1	73	62
13	Handling of mathematical tools	104	89.7	12	10.3
14	Scores awarded by the school	105	90.5	11	9.5
15	Scores awarded by the teacher	105	90.5	11	9.5
16	Scores vetted by the school	108	93.1	8	6.9

Table 2 shows that teachers used periodic tests, rating of student's performance, student's attendance in mathematics class and creativity in drawing to assess the cognitive domain while the other items that assessed the affective and psychomotor domains were rated low.

Hypotheses Testing

Hypothesis 1: Path coefficients of process variables and mathematics cognitive continuous assessment practice are not significant.

Table 6: Path coefficients of process variables and cognitive continuous assessment

Paths	Path Coefficients	Decision
c_1Z_1	.278*	Retained
$P_{c_2}Z_2$	-.145*	Retained
$P_{c_3}Z_3$	-.168*	Retained
$P_{c_4}Z_4$	-.023	Deleted

* $P \geq 0.05$

Table 3 shows the path coefficients of teacher's personality and cognitive continuous assessment practice. It shows teachers' personality path coefficient of (.278), teacher's knowledge of (-.145) and teacher's experience of (-.168) and teacher's qualification of (-.023). This shows that teacher's personality, knowledge and experience path coefficients had significant causal effects and therefore were retained. While the significant causal effect of teacher's qualification was deleted. This shows that path coefficients of process variables and mathematics cognitive continuous assessment are significant.

Hypothesis 2: Path coefficients of process variables and mathematics affective continuous assessment practice are not significant.

Table 4: Path coefficients of process variables and affective continuous assessment practice.

Paths	Path Coefficients	Decision
$P_{a1}Z_1$	.009	deleted
$P_{a2}Z_2$	.044	Deleted
$P_{a3}Z_3$	-.208*	Retained
$P_{a4}Z_4$	.028	Deleted

* $P \geq 0.05$

Table 4 shows the paths among process variables and affective continuous assessment practice. It shows path coefficients of teacher's personality of (.009), teacher's knowledge of (.044), teacher's experience of (-.208) and teacher's qualification of (.028) on the assessment of affective domain in mathematics. It could be seen from the table that only one path had significant causal effect and therefore were retained while 3 paths that had insignificant causal effect were deleted. Hence, it can be concluded that path coefficients of the process variables and mathematics affective continuous assessment practice are insignificant.

Hypothesis 3: Path coefficients of process variables and mathematics psychomotor continuous assessment practice are not significant.

Table 8: Path coefficients of process variables and psychomotor continuous assessment practice.

Path	Path Coefficients	Decision
$P_{p1}Z_1$	.051*	Retained
$P_{p2}Z_2$	-.129*	Retained
$P_{p3}Z_3$	-.065*	Retained
$P_{p4}Z_4$	.119*	Retained

* $P \geq 0.05$

Table 4 shows the paths among process variables and psychomotor continuous assessment practice. Teacher's personality had a path coefficient of (.051), teacher's knowledge of (-.129), teacher's experience of (-.065) and teacher's qualification of (.119). It could be seen from the table that teacher's personality and teachers' qualification had negative significant causal effects on the assessment of psychomotor domain while teachers' knowledge and teachers' experience had positive significant causal effects and were therefore retained. This shows that path coefficients among process variables and psychomotor continuous assessment practice are significant.

Hypothesis 4: Path coefficients of process variables and mathematics total continuous assessment practice are not significant.

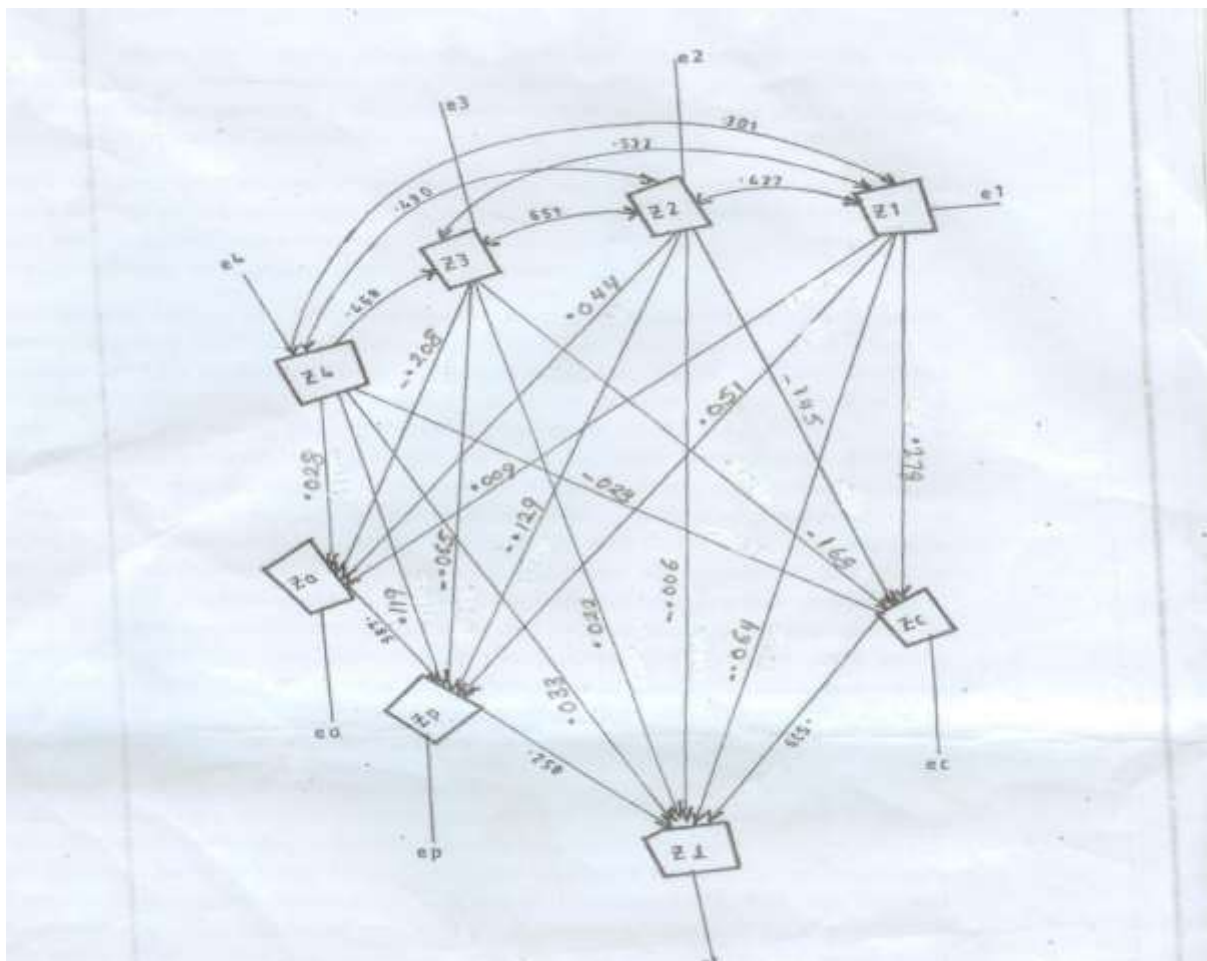
Table 5: Path coefficients of process variables and total continuous assessment practice.

Paths	Path Coefficients	Decision
P _{T1} Z ₁	-.064*	Retained
P _{T2} Z ₂	-.006	Deleted
P _{T3} Z ₃	.022	Deleted
P _{T4} Z ₄	.033	Deleted

* $P \geq 0.05$

Table 5 shows the paths among process variables and mathematics total continuous assessment practice, with teacher’s personality path coefficient of (-.064), teacher’s knowledge of (-.006), teacher’s experience of (.022) and teacher’s qualification of (.033). This implies teachers’ personality had negative significant causal effect while the remaining path coefficients had significant causal effects on comprehensive continuous assessment in mathematics. Hence, the hypothesis is not rejected.

The path model below was used to summarize the four hypotheses.



Summary of the Hypothesized Causal Path Model among Process Variables; Cognitive, Affective, Psychomotor and Total Continuous Assessment practice in schools.

DISCUSSION

The findings showed that the most prevalent process variable in the determinant of mathematics assessment practice in Senior Secondary School is teacher's experience, followed by teacher's personality, teacher's qualification and then teacher's knowledge. It is hypothesized that the ability of the teacher to carry out the practice of continuous assessment in mathematics i.e to assess the mental, personality traits and the manipulative skills of students in mathematics causally depend on the teacher's knowledge, skills, teacher's personality, experience and educational qualification retain and attract hardworking teachers and boost the morale and productivity of dedicated teachers. The finding supports William (2005) stressed that teacher's performance in the classroom is a combination many factors such as teacher's knowledge, skills and experience. MOEST and MIE (2003) described mathematics teachers as a knowledgeable facilitator of teaching and learning, who guides all learners to achieve their potential and as a role model.

Teacher's factor is very critical to improving mathematics continuous assessment practice, so that the assumption that continuous assessment will elicit the interest of students in studying mathematics will be achieved. Though teachers possessed these qualities, evidence from the study revealed that continuous assessment is based mainly on the assessment of cognitive domain. Idowu and Esewi (2009) declared that most of the teachers are familiar with the assessment of the cognitive domain alone; some do not know how to factor affective and psychomotor domains into the overall performance of the students. Comprehensiveness in continuous assessment is not just about intellectual ability; it is about acquisition of interpersonal skills, right character, traits, discipline, aptitude and skills. All these are to be factored in the overall performance of the students and used for guidance and career purposes. Abubakar (2010) confirmed that a good number of teachers are not competent in the implementation of continuous assessment, perhaps due to their inadequate knowledge of its techniques and methodology. For successful implementation of the continuous assessment approach, teachers need to give more tests, which mean more marking. They assess need to observe the learner more keenly to assess their affective and psychomotor outcomes.

The findings on cognitive assessment shows that, teacher's personality had positive significant causal effect, teacher's knowledge and teacher's experience had negative significant causal effects while teacher's qualification had insignificant causal effect and was therefore deleted. It could be seen from the findings that teacher's knowledge and teacher's experience had negative significant causal effects on cognitive assessment. The negative and the insignificant causal effects might be as result of their inexperienced and lack of training on the implementation of continuous assessment with the use of varieties of assessment techniques. Similarly, teacher's qualification had insignificant causal effect. This is an indication that the skills and competent to be possessed by mathematics teachers to be able to assess cognitive behaviour of the learners are not adequately demonstrated as confirmed by Abubakar.

The findings on affective assessment indicate that teacher's personality, teacher's knowledge and teacher's qualification had insignificant causal effects while teacher's experience had negative significant effect. Research evidence shows that teacher's are diagonistian and

determine the learner's weakness, strength, needs, interest, punctuality and ways of assisting them to develop their learning rate (Ausubel, 1998). Iji and Uka (2012) stressed that no matter how good a course curriculum is, if one do not have well trained, knowledgeable, qualified, experienced and intellectual teachers, we may not achieve the desired goal. As important as mathematics is many students are thinking that they are cut out for mathematics ends up by rejecting the subject. High indices of academic failure in the area of mathematics demand assessment of affective in mathematics. The result of the study shows that teachers are not well equipped with skill required to assess affective domain. No wonder, teachers equate the addition of periodic tests to be continuous assessment.

Furthermore, the findings on the assessment of student's manipulative skills revealed that, teacher's personality and teacher's qualification had positive significant causal effects while teacher's knowledge and experience had negative significant causal effects. Assessment of the manipulative skills involved a lot of observation and interaction of the teacher with the taught either outside or in the classroom. Though teacher's personality and teacher's qualification had positive significant causal effect on the assessment of the psychomotor domain but in practice this is not demonstrated. More so, the negative significant causal effects of the teacher's knowledge and experience may be as a result of their lack of training on the implementation of continuous assessment. Anikweze (1991) confirmed that some failed to properly assess affective and psychomotor domains of learning and in the case when some teachers assessed these areas, very good, fair and so on are only recorded and never interpreted.

The findings on total continuous assessment practice, shows that teacher's personality had negative significant causal effect while teacher's knowledge, experience and qualification had insignificant causal effects. Comprehensiveness (total) continuous assessment practice means that it does not focused on academics skills alone, it embraces the cognitive, affective and psychomotor domains. A child is assessed as a total entity using the psychometric devices such as test and non test techniques. The overall performance according to Okpala et al (1993) involves looking at a student in his totality to ensure an all round development of the intellectual skills, attitude, interest and manipulative skills of the students. If only one of the three domains of educational objectives is assessed, there will be problem in decision making. Similarly, teacher's personality had positive significant causal effects on the assessment of cognitive and psychomotor domains and negative significant causal effect on the assessment of total continuous assessment practice. Teacher's knowledge had negative significant causal effect on the assessment of the cognitive and psychomotor domains. Teacher's experience had negative significant causal effect on the assessment of cognitive, affective and psychomotor domains while teacher's qualification had positive significant causal effect on the assessment of psychomotor domain. The negative significant causal effects may be as a result of their lack of adequate knowledge of its implementation as Egbeyemi confirmed.

CONCLUSION

Based on the findings of the study, evidence shows that continuous assessment are not implemented in its full measure because majority of the teachers focused their greatest attention on measuring cognitive attainment rather than affective and psychomotor behaviours. This shows that all assessment used in schools are cognitive oriented which shows that continuous assessment being practiced in schools are not comprehensive.

Recommendations

Based on the findings the following recommendations were made:

1. In addition to the assessment of students' achievement, attention should also be paid to the assessment of students' learning progress.
2. Training should be organised for the teachers on the comprehensive assessment of continuous assessment (cognitive, affective and psychomotor domains) with the use of various assessment techniques
3. Seminar and workshop should be organised for the teachers where they would be taught how to factor affective and psychomotor behaviours to the overall assessment of the performance of the students.
4. Affective education should be provided in schools to correct the anti-social behaviour of the students and also observe the learners more keenly to assess their affective outcomes.

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