

Self-Assessment of Teaching Effectiveness of Chemistry Teachers in Secondary Schools

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Abstract

The study investigated self-assessment of teaching effectiveness of Chemistry teachers in secondary schools. Participants were 103 teachers (male=47, female=56) selected from 86 out of 184 public secondary schools in Ekiti State using stratified random sampling technique. The instrument for collecting data was a self-constructed Teaching Effectiveness Questionnaire, divided into two parts. Part I dealt with biodata including gender (male/female) and teaching experience in years defined as Low (0–5), Average (6–15) and High (16+). Part II contained 30 items clustered into seven categories ranging from teacher's personality to teacher's evaluation skills, each item rated on a five-point scale: Excellent=5, Very Good=4, Good=3, Fair=2 and Poor=1, with reliability coefficient=0.813 using Cronbach- α . Data were analysed using means, standard deviations, t-test and One-way ANOVA tested at 0.05 level of significance. Results showed that teachers' self-assessment of teaching effectiveness in Chemistry was very good, female teachers rated their teaching effectiveness in Chemistry higher than the males while experience had no significant influence on self-assessment of teaching effectiveness. It was recommended that teachers should justify their self-assessment of teaching effectiveness by transforming their pedagogical and evaluation skills into reality for the optimum benefits of students in Chemistry.

Keywords: self-assessment, teaching effectiveness, teachers, chemistry.

INTRODUCTION

Studies on evaluation or assessment of teaching effectiveness and its related constructs have prominence in literature (e.g. Fitzpatrick, 2004; Berk, 2005; Salsali, 2005; Ross & Bruce, 2007; Barry, 2010; Maja, 2012; Oluwatayo, 2013). Teaching effectiveness itself is defined by Senate Committee on Teaching and Learning (SCOTL), York University (2000) as activity which brings about the most productive and beneficial learning experiences for students and motivates their development as learners. The crux of the matter, however, is the question of what constitutes teaching effectiveness that can bring about the most productive learning experiences and its measure.

Incidentally, in listing some categories of variables that constitute teaching effectiveness, Cruickshank (1990) includes the teacher's traits, what the teacher knows, what the teacher teaches, what the teacher expects, how the teacher teaches, how the teacher reacts to students, and how the teacher manages the classroom. Similarly, the Office for Standards in Education (OFSTED) (1995) lists some general teaching factors that are associated with teaching effectiveness including good subject knowledge, good questioning skills, an emphasis upon instruction, good time management, a balance of grouping strategies, clear objectives, effective

planning, good classroom organisation and effective use of other adults in the classroom.

Interestingly, Darling-Hammon (2000) suggests some salient attributes that are associated with teaching effectiveness, including:

1. strong general intelligence and verbal ability that helps teachers to organise and explain ideas, observe and think diagnostically;
2. strong content knowledge up to a threshold level that relates what is to be taught;
3. knowledge of how to teach others in that area, particularly, how to use hands-on learning technique such as laboratory work in science and manipulating in Mathematics, and to develop higher order thinking skills;
4. an understanding of learners and their learning and development including how to assess and scaffold learning, how to support students who have learning difficulties, and how to support the learning of language and content for those who are not already proficient in the language of instruction;
5. adaptive expertise that allows teachers to make judgment about what is likely to work in a given content in response to students' needs.

Undoubtedly, the task of engaging teachers to assess their own teaching effectiveness on the basis of the above criteria, is a complex one. The complexity

arises because teachers are not likely to assess their teaching effectiveness as being poor, even though, many of them may be deficient in both content and pedagogical knowledge of chemical concepts, lack motivating and stimulating personality, lack classroom management and control, lack assessment literacy and others. For example, Grossman (1995) reports that many teachers skip or downplay unfamiliar content areas and activities where materials are not readily available at the detriment of the students they teach. Moreover, Green and Mantz (2000) note that most teachers do not use quality assessment strategies in their classrooms that are likely to improve instruction or students' learning. Indeed, Cruickshank, Jenkins and Metcalf (2009) remark that teachers without sufficient pedagogical or teaching knowledge are forced to teach by instinct and are doomed to trial-and-error approaches. The resultant effect is that students are ill-prepared academically for the challenges in chemical education leading to abysmal performance of students in external examinations as reported by Olupohunda (2012), and culminated into a popular demand for a competency test for teachers to ascertain their competency (Salawudeen, 2012).

Conjecturally, teachers that have adequate knowledge of chemical concepts and pedagogical skills are likely to create the needed interest and enthusiasm for what they teach, show students how knowledge in Chemistry is developed and related to other subjects such as Biology, Physics, Agricultural Science and even Mathematics. Darling-Hammond (2000) notes that the more knowledge and skills acquired by a teacher in planning, delivering, instructing and evaluating learning, the better the students learn and achieve. Similarly, Peart and Campbell (1999) note that effective teachers tend to enable students enjoy what they are doing, supportive of students, believable and easy to trust. However, there arises a problem as to how to discern those teachers whose teaching effectiveness are desirable and those that are not since the present study is a survey and not direct observation of teachers' teaching activities.

Discreetly, self-assessment as a device for evaluating teaching effectiveness is a matter of conscience. Nevertheless, its real value is the opportunity for teachers to demonstrate their perception of teaching effectiveness and to have reflective approach for self-development. Beck, Livne and Bear (2005) note that one of the potent methods of evaluating teaching effectiveness is self-assessment as it helps teachers to learn and grow as well as helping them to reflect on their practice and data, set learning goals for students to experience high quality learning in supportive environment. The question then is, will the teachers reflect on their current teaching activities in Chemistry class and provide reliable information regarding their effectiveness or otherwise?

Meanwhile, studies on gender differences in teaching (e.g. Dunkin, 1987) indicate that male teachers' classrooms are better organised and more task-oriented than females while female teachers' classrooms are warmer and more nurturing than males. Moreover, studies on the influence of teaching experience indicate that experienced teachers are better able to attend to everything going on in the classroom and use what they observe to adjust their teaching (Ainley & Lintley, 2004). Similarly, O'Connor, Fish and Yasik (2004) report that experienced teachers practically connect new materials to be learned to what learners already know, encourage open discussion and are more flexible. However, the possibility that teachers' gender and teaching experience would influence their self-assessment of teaching effectiveness in Chemistry is speculative. Perhaps, the outcome of this study would provide credible information regarding the influence of gender and teaching experience on teaching effectiveness of the teachers in Chemistry.

STATEMENT OF THE PROBLEM

One essential element of developing as a teacher is taking time often to evaluate one's own teaching effectiveness using valid and reliable self-assessment strategy. Consequently, this study sought to find out how secondary school teachers would assess their own teaching effectiveness in Chemistry against the backdrop of deplorable standard of performance of students in the subject in external examinations conducted by West African Examinations Council and National Examinations Council.

PURPOSE OF THE STUDY

The purpose of the study was to investigate self-assessment of teaching effectiveness of Chemistry teachers in secondary schools and to determine whether gender and teaching experience would influence self-assessment of teaching effectiveness of teachers in Chemistry.

RESEARCH QUESTIONS

The following questions were generated for the study.

1. How do the teachers assess their own teaching effectiveness in Chemistry?
2. Does gender influence teachers' self-assessment of teaching effectiveness in Chemistry?
3. Does teaching experience influence teachers' self-assessment of teaching effectiveness in Chemistry?

RESEARCH HYPOTHESES

The following hypotheses were tested at 0.05 level of significance.

H₀₁: Gender has no significant influence on teachers' self-assessment of teaching effectiveness in Chemistry.

H₀2: Teaching experience has no significant influence on teachers' self-assessment of teaching effectiveness in Chemistry.

METHODOLOGY

Research Design

The study was a survey type in order to describe self-assessment of teaching effectiveness of Chemistry teachers in secondary schools.

Sample and Sampling Technique

Participants for the study were 103 Chemistry teachers (male=47, female=56) selected from 86 out of 184 public secondary schools in Ekiti State using stratified random sampling technique. The strata recognised gender (male/female) and location of schools (urban/rural).

Research Instrument

The instrument for collecting data was a self-constructed Teaching Effectiveness Questionnaire, divided into two parts. *Part I* contained biodata including respondents' gender (male/female) and teaching experience in years, defined as Low (0—5), Average (6—15) and High (16⁺). *Part II* contained 30 items teaching effectiveness variables, clustered into seven major categories namely: Teacher's personality (3 items), Teacher's content knowledge (3 items), Teacher's pedagogical (Teaching) knowledge (7 items), Teacher's class control and management (5 items), Teacher's relationship with students (4 items), Teacher's motivational skills (3 items), and Teacher's evaluation skills (5 items). Each item was rated on a five-point scale: Excellent (5), Very Good (4), Good (3), Fair (2) and Poor (1). The face, content and construct validity procedures of the instrument were ensured using experts in Tests and Measurement, Faculty of Education, Ekiti State University, Ado-Ekiti as well as experienced Chemistry teachers in secondary schools who scrutinised each item and suggested its conformity with the principle of unidimensionality (items facing the same direction for easy analysis). The reliability procedure of the instrument was carried out by administering 20 copies on respondents not included in the final analysis and the reliability coefficient was estimated at 0.813 using Cronbach- α .

Data Collection and Analysis

Data were collected using research assistants, mainly the postgraduate students in Tests and Measurement, Faculty of Education, Ekiti State University, Ado-Ekiti in collaboration with the Head of Science Department in each of the schools sampled. Data were analysed using means, standard deviations, t-test and one-way Analysis of Variance, tested at 0.05 level of significance. The assumption in the use of means was that the range of means from 1.00—1.49 (Poor), 1.50—2.49 (Fair), 2.50—3.49 (Good), 3.50—4.49 (Very Good) and 4.50—5.00 (Excellent).

RESULTS

Question 1: How do the teachers assess their teaching effectiveness in Chemistry?

Data were analysed using means and standard deviations (SD) as presented in table 1.

Table 1: Means and standard deviations of teachers' self-assessment of teaching effectiveness in Chemistry

S/N	Categories	Mean	SD	Interpretation
1.	Teachers' personality	4.04	±0.52	Very Good
2.	Teachers' content knowledge	3.52	±0.67	Very Good
3.	Teachers' pedagogical knowledge	3.46	±0.61	Good
4.	Teachers' classroom control and management	3.78	±0.71	Very Good
5.	Teachers' relationship with students	3.61	±0.53	Very Good
6.	Teachers' motivational skills	3.72	±0.54	Very Good
7.	Teachers' evaluation skills	3.41	±0.61	Good
	Overall Mean of Teaching Effectiveness	3.65	0.59	Very Good

Table 1 shows that the mean scores and standard deviations of teachers' self assessment of personality, content knowledge, pedagogical knowledge, class control and management, relationship with students, motivational skills and evaluation skills were 4.04 (±0.52), 3.52 (±0.67), 3.46 (±0.61), 3.78 (±0.71), 3.61 (±0.53), 3.72 (±0.54) and 3.41 (±0.61) respectively. The overall mean and SD of self-assessment of teaching effectiveness were 3.65 and ±0.59 respectively. These results showed that teachers' self-assessment of teaching effectiveness in Chemistry was very good.

Hypotheses Testing

H₀1: Gender has no significant influence on teachers' self-assessment of teaching effectiveness in Chemistry

Data were analysed using t-test comparison as presented in table 2.

Table 2: t-test comparison between gender and self-assessment of teaching effectiveness in Chemistry

Variables	N	Mean	SD	df	t-cal	t-value
Male	47	117.8	10.4	101	3.34	2.00
Female	56	124.3	9.15			
Total	103					

$\rho < 0.05$ (Significant result)

Maximum score = 150, Minimum score = 30

Table 2 shows that the mean scores and standard deviations of self-assessment of teaching effectiveness of male and female Chemistry were 117.8 (±10.4) and 124.3 (±9.15) respectively. The t-calculated was 3.34 while its corresponding table value at 0.05 level of significance was 2.00. Since $t_{cal} > t_{tab}$, there existed significant difference between self-assessment of male and female teachers' teaching effectiveness in Chemistry. By comparison,

female teachers rated their teaching effectiveness in Chemistry higher than their male counterparts.

H₀₂: Teaching experience has no significant influence on self-assessment of teaching effectiveness of Chemistry teachers

Data were analysed using one-way Analysis of Variance as presented in table 3.

Table 3: One-way ANOVA: Experience versus self-assessment of teaching effectiveness in Chemistry

Source	Df	SS	MS	F _{cal}	F _{tab}
Between Group	2	334.5	167.25	3.04	3.09
Within Group	100	5502	55.02		
Total	102	5836.5			

$\rho > 0.05$ (Not Significant result)

Low (N=13, $\bar{X}=118.4$, SD=10.9), Average (N=49, $\bar{X}=120.2$, SD=11.6),

High (N=41, $\bar{X}=123.4$, SD=8.3)

Table 3 shows that the F-calculated was 3.04 while its corresponding table value at 0.05 level of significance was 3.09. Since $F_{cal} < F_{tab}$, there existed no significant difference in self-assessment of teaching effectiveness of low, average and high experience Chemistry teachers.

DISCUSSION

The results in table 1 showed that teachers assessed their teaching effectiveness in Chemistry as being good or very good in the identified variables constituting teaching effectiveness. This result is envisaged because similar investigations in this area (e.g. Seldin, 1999, Berk, 2005) contend that individuals tend to provide overly positive self-appraisal in self-assessment in comparison to other data sources and hence, assessment may be inaccurate, overstretched or self-serving especially when it comes to summative decisions. However, the result concurs with the study of Oluwatayo (2013) who found that students rated teaching behaviour of their Chemistry teachers as being good or very good. Nevertheless, the real value of self-assessment device in evaluating teaching effectiveness is to help teachers that are over-achievers reflect on what they taught, how they taught certain concepts in Chemistry and how effective their teaching strategies were (Beck, Livne & Bear, 2005).

The results in table 2 showed that female teachers assessed their teaching effectiveness in Chemistry higher than their male counterparts as the analysis of result was significant and the mean score of female teachers was higher than males. The reason for the difference is difficult to interpret, may be the female teachers were more generous in their assessment or a true reflection of their commitment to teaching

effectiveness variables or the error of central tendency usually observed in rating scales and questionnaires. Notwithstanding, since the female teachers had higher mean score in self-assessment of teaching effectiveness than their male counterparts, it is assumed that the female teachers were more effective in teaching Chemistry than the male teachers.

The results in table 3 showed that teaching experience had no significant influence on self-assessment of teaching effectiveness of Chemistry teachers. The non-significant results obtained did not provide information to allow reasonable conclusions to be drawn about teaching effectiveness of Chemistry teachers in relation to differential teaching experience. May be the result was accidental or that teachers were cautious about their assessment though opinions from the teachers might be prone to subjectivity.

CONCLUSION

It could be concluded in this study that teaching effectiveness of Chemistry teachers was good based on their self-assessment. Moreover, gender of teachers had significant influence on their self-assessment of teaching effectiveness in Chemistry as female teachers had higher self-assessment than their male counterparts. However, teaching experience had no significant influence on self-assessment of teaching effectiveness of teachers in Chemistry which disallowed a reasonable conclusion to be drawn about their teaching effectiveness.

RECOMMENDATIONS

Based on the findings and conclusion, the following recommendations were made:

1. Teachers should justify their self-assessment of teaching effectiveness in Chemistry by transforming their content and pedagogical knowledge of Chemistry into reality for the optimum benefits of students in Chemistry.
2. Both male and female Chemistry teachers should constantly reflect on their teaching using self-assessment tool to provide internal motivation and personal accountability.
3. All categories of teachers: low, average and high experienced teachers should embrace self-assessment device as a means of monitoring teaching for self-correction and self-improvement in Chemistry teaching.

LIMITATION OF THE STUDY

The limitation of the study centred on the reliability of information supplied by the respondents since the instrument used was questionnaire which could be influenced by error of central tendency.

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