CULTIVATING EFFECTIVE PEDAGOGICAL SKILLS IN IN-SERVICE TEACHERS: THE ROLE OF SOME TEACHER VARIABLES

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Abstract: *Researchers have opined that pedagogical skill of the teacher is a powerful force. This study investigated variables that are required to cultivate effective pedagogical skills for teaching basic science and technology (BST) in Ogun State Primary Schools in Nigeria. A survey research design was adopted. A total of 148 teachers across the state were sampled. Three instruments were used: (a) Teachers' Time Management Observational Scale (r=0.81); (b) Teachers' BST Content Knowledge Test (r=0.96); (c) Teachers' Pedagogical Skills Observational Schedule (r=0.84). There was no significant difference between the original and the reproduced correlation coefficients. All the teacher variables had significant total effects on teachers' pedagogical skills.*

Keywords: basic education, pedagogical skills, teacher variables, instructional time, content knowledge, subject specialization

Introduction

The worth and potentialities of a country get evaluated in and through the work of the teacher. Gbagi (2011) blamed teachers for poor performance of candidates in public examinations in the country, noting that teachers are not doing enough to educate their students. Ayedun (2011) in line with Gbagi asserted that learners' failures are essentially the teachers' fault. Olukoya (2011), however, argued that the learners' failures were not their teachers' fault. He added that the performance of a candidate in any examination was a function of many factors: school, home, teacher, learners, government etc., and it is the totality of everybody's contribution. Teachers are just often the obvious scapegoat in a situation where a learner is underperforming because they are the visible faces of education. Teachers then need to be determined to seek better ways of educating the learners in schools in spite of all other impediments. There should be ways the teachers can go about improving the educational process and thereby enhance the success of the pupils' learning experience. Some teacher variables which could affect their pedagogical skills in teaching basic science and technology (BST) were examined in this study.

Owoeye (2000) opined that school location has a significant effect on the academic performance of the pupils. According to Reeves and Bylund (2005) students in rural schools perform less well than their urban counterparts. This result however contradicts some findings which noted that school location has no significant effect on the academic performance of pupils (Onah & Ugwu 2010; Yussuf & Adigun 2010). Research has not provided clear evidence that rural schools are inferior to urban schools.

In many primary schools, each class has a teacher who stays with them for most of the week and will teach them the whole curriculum; teachers are expected to have knowledge for multiple disciplines. According to Darling-Hammond (2000), a specific teacher characteristic such as academic major is associated with increased gains in student achievement. Goldhaber and Brewer (2000) also found that students with teachers possessing degrees in mathematics had greater gains in achievement than students with teachers

with non-mathematics degrees, but found no such results for science.

Instructional time is one of the most challenging constraints teachers face in trying to achieve curricular goals. Quality teachers need to know how to use class time effectively. Use of time can be optimized in the classroom by careful planning. There is a relationship between the amount of time pupils are actively engaged in learning activities and their achievement (Mastropieri & Scruggs, 2000). The ability of teachers to organize, manage, and spend quality portions of the allocated time for instruction may therefore affect the achievement of the pupils. Most teachers schedule and allocate the appropriate amount of time for learning, but few teachers actually ensure that their pupils are engaged and actively occupied with activities geared towards the learning of the subject during the allocated time.

In agreement with Shulman (1987), quality teachers would possess the following: content knowledge, which is the teachers' content background in the subject they teach, and pedagogical skills, which embrace the principles and strategies of classroom management and organization. Content pedagogy refers to the pedagogical (teaching) skills teachers use to impart the specialized knowledge/content of their subject area(s). Pedagogy is when the teacher selects strategies to match pupils' needs. Effective teachers display a wide range of skills and abilities that lead to creating a good learning environment. Knowledge of content must be balanced with a solid grounding in effective teaching strategies. Teachers should use a wide variety of instructional methods, experiences, assignments, and materials to ensure that learners are achieving all sorts of cognitive objectives (Eby as cited in Okpala & Ellis, 2005). While researchers tend to agree that teachers' pedagogical skills are important determining factors in influencing learners' outcomes, there is little consensus about the relationship between specific teacher attributes and teachers' effective pedagogical skills.

Statement of the Problem

The prevailing low performances in external examinations over time have been known to evolve from poor or ineffective pedagogical skills employed by teachers. Even though stakeholders in education had made efforts to improve the quality of science in terms of content delivery by retraining the teachers through various workshops and seminars, there has yet been no remarkable improvement in the learners' performance.

A number of researchers have argued that teachers' pedagogical skills are powerful predictors of learners' performance; however, researchers have not been able to conclusively and consistently agree on the specific teacher attributes that influence the effectiveness of their pedagogical skills. This study, therefore, sought to provide a causal explanation of the effectiveness of teachers' pedagogical skills in terms of teacher variables, such as, school location, subject specialization, instructional time, and content knowledge.

Research Questions

The following research questions guided the study:

1. What is the pattern of relationships (cor relations) in the model?
2. Is the model describing the causal effec ts among the variables consistent with t he observed correlations among these v ariables?
3. If the model is consistent, what are the estimated direct, indirect, and total caus al effects among the variables?
4. What is the relative importance of each exogenous and endogenous variable on teachers' pedagogical skills?

Research Design

The study employed a non-experimental, survey design. Correlations among the variables of study were assessed testing theoretical propositions about cause and effect without manipulating variables.

Population, Sampling Technique, and Participants

The study population was the 14,751 public primary school teachers in the twenty local government areas of Ogun State, Nigeria. Multi-stage sampling method was used to get the required respondents for this study. Proportionate to size and stratified sampling techniques were used to obtain the sample. A total of 148 BST teachers spread all over the state were participants in the study.

Instrumentation

The study made use of three validated instruments:

a. BST Teachers' Management of Time Observational System adapted by the researcher to estimate the proportion of the subjects' scheduled time spent on facilitating knowledge in BST by the teachers. Content validity and reliability of this instrument determined using Lawshe's method and Scott pi gave 0.77 and 0.81 respectively.
b. BST Teachers' Content Knowledge Test, a forty-item instrument drawn from the BST curriculum by the researcher to test the teachers' BST content knowledge. Content validity and reliability of this instrument determined using Lawshe's method and Kuder Richardson 20 (KR-20) because of the dichotomous scoring, gave 0.74 and 0.96 respectively.
c. Pedagogical Skills Observational Schedule adopted by the researcher has four sections to rate teachers' behaviours in the BST classroom, on items such as, lesson plans, presentation of lessons, and class management/ control among others. Content validity and reliability of this instrument determined using Lawshe's method and Scott pi gave 0.73 and 0.84 respectively.

Data Collection Procedure

Both observation instruments were used by the researcher and one research assistant on each of the 148 BST teachers in one BST lesson. Audio-video recording of the lesson also went on at the same time. Finally, the BST Teachers' Content Knowledge Test was administered on the teachers.

Results

The research questions were answered using multiple regression and path analysis. Table 1 reveals high significant relationships among the variables ($p<.05$). The highest correlation ($r = 0.735$) is between instructional time and pedagogical skills. The different variables as listed on the table are as follows: Z_1 = school location; Z_2 = teachers' subject specialization; Z_3 = instructional time; Z_4 = teachers' BST content knowledge; and Z_5 = teachers' pedagogical skills.

Table 1
The Original and Reproduced Correlation Matrix for the Five Variables

Variables	Z_1	Z_2	Z_3	Z_4	Z_5
Z_1	1.00	.080	.126	.046	.159
Z_2	.080	1.00	.048	-.052	.222
Z_3	.134	.048	1.00	.197	.735
Z_4	.034	-.030	.197	1.00	.259
Z_5	.065	.222	.734	.259	1.00

Of the eleven paths, nine with values higher than 0.05 were retained. Only in two cases did the values fall below the criterion. This accounted for 22% below the 40% criterion level. This implies that the hypothesised model fits the empirical data. Therefore, the obtained model is consistent with the observed correlations.

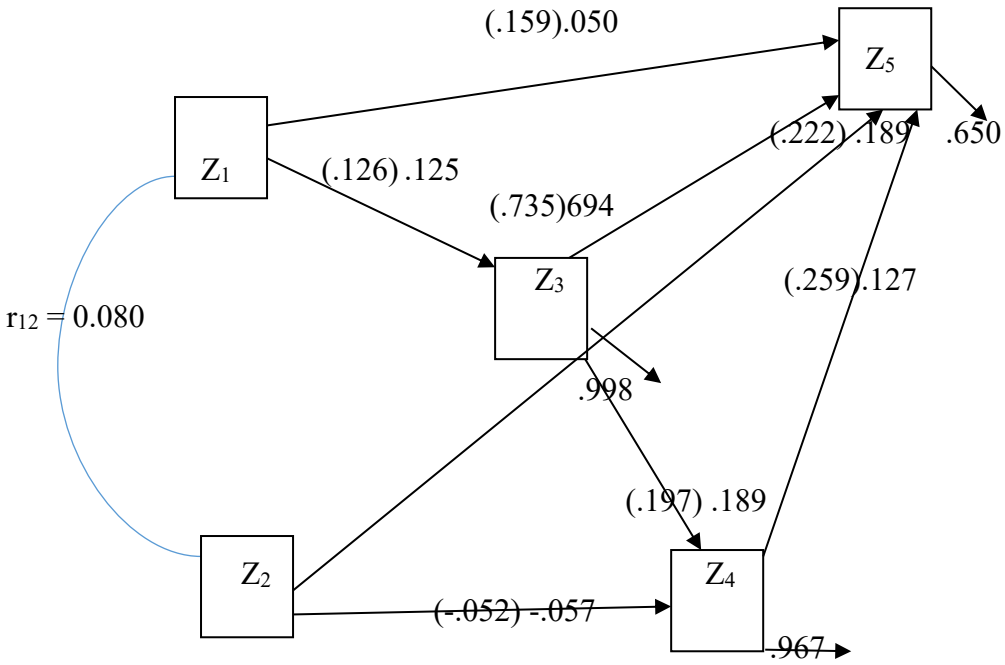

Figure 1. Re-specified (parsimonious) path model of the 5 variable system.

For teachers' pedagogical skills, the primary determinants were school location, subject specialization, instructional time, and content knowledge with adjusted R = .578. This model explained approximately 57.8% of the variances in pedagogical skills. The direct effect, indirect effect and total effect of each independent variable on the criterion variable pedagogical skills are shown in Table 2. It follows therefore that in the model in which pedagogical skill was the criterion variable, instructional time was the most important, followed by subject specialization; school location and teachers' content knowledge.

Table 2
Summary of Causal Effect for Re-specified Model (Pedagogical Skills)

Outcome	Determinants	Effects		Total
		Direct	Indirect	
Pedagogical Skills (Z_5)	School location (Z_1)	.050	.090	.140
	Subject Specialization (Z_2)	.189	-.007	.182
	Instructional time (Z_3)	.694	.024	.718
Adj R^2 = .578	Content knowledge (Z_4)	.127	--	.127

Discussion

This study found a significant direct effect of school location on effective use of instructional time. This finding is in agreement with the opinion of Howley, Howley, and Shamblen (2001) that compared to their colleagues in urban located schools, their rides to and from their schools tended to be more arduous. According to Amusan (2014) many teachers were not usually on grounds in rurally located schools, and many students come in very late for their classes.

The findings of this study points to the fact that the teachers' subject specialization had just a slight significant effect on teachers' BST content knowledge. This is not in agreement with the findings of Wayne and Youngs (2003) or Schwartz and Gess-Newsome (2008) who opined that science specialists typically have greater science content background, perhaps even holding a degree in a science area and specializing in science teaching. The study's findings however agree with those of Abuseji, (2007) who found little or no significant relationship between teacher qualification and pupils' achievement.

The study revealed that teachers' effective use of instructional time had influence on their BST content knowledge. This is in agreement with Okpala and Ellis (2005) who emphasized that lack of content knowledge is an inhibition to effective instruction. The primary teachers made poor use of the instructional time because their BST content knowledge was low.

Of the four variables predicting teachers' pedagogical skills, school location, subject specialization, and instructional time had both direct and indirect effects while content knowledge had only direct effect on pedagogical skills. This study found significant direct effect of school location on pedagogical skills. Moulton (2001) noted that in many school locations instructional materials were not available. Amusan (2014) also observed that learning aids were absent in many schools; however, improvisation was done in some urban schools, probably because they are closer to the inspectorates.

BST teachers' subject specialization has a significant effect on teachers' pedagogical skills. Science specialists are more likely to know and apply different science-related pedagogical skills in the teaching of BST. This finding agrees with Schwartz and Gess-Newsome (2008) who noted that those schools with specialists seem to have a more consistent use of the science curriculum and a better understanding of what inquiry-based science looks like; therefore, their students are exposed to a greater amount of effective pedagogical skills. Amusan (2014) opined that teachers who had their specialties in the science and technology based courses displayed better topic-related pedagogical skills.

Effective use of instructional time had high predictive effect on teachers' pedagogical skills. Teachers who had proper plans for their BST classes were found to make more effective use of the class instructional time (Amusan, 2014).

The study also revealed a significant relationship between teachers' content knowledge and pedagogical skills. Teachers' BST content knowledge has effect on their application of good pedagogical skills in the classroom. Appleton and Harrison (2001) also opined that teachers' limited subject content knowledge does manifest itself as limited pedagogical skills. Amusan (2014) discovered that teachers who had poor BST content knowledge did actually have poor pedagogical skills. The low content knowledge of the BST teachers manifested itself in the poor pedagogical skills of the teachers, quite a few teachers even taught wrong content.

Recommendations

The following recommendations are made

a. Teachers should use the classroom instruction time effectively for academic work.
b. Educational stakeholders should endeavor to train in and expose teachers to the use of different and relevant teaching methods in science.
c. Government should endeavor to provide enabling school environment that could allow for near uniformity in the performance of teachers across rural and urban locations.
d. Teachers should be encouraged to come to BST classes better prepared to teach. This would redirect the classes from the present teacher-oriented classroom to pupil-oriented ones.

This study should serve to encourage some other researchers to look into other variables which could influence pedagogical skills in teaching basic science and technology on one hand and others which could affect learners' performance in BST. More still needs to be done in form of research to improve the performances of learners in the fields of science.

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