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Introduction

This study involved teachers who participated in a short in-service training course in Data Management and Processing organized for science teachers by a private computer training school in Anambra State of Nigeria during one of the long vacations. The programme was designed to upgrade and update participants' knowledge, skills, and competence in Data Management and Processing, thereby enhancing their effectiveness and efficiency as teachers and administrators in managing school data and statistics for educational policy and programme implementation. Set objectives were expected to be accomplished at the end of the programme. To achieve this, the various units to be studied, handled by different resource persons, had the expected behavioural objectives stated beforehand in relation to instructional materials, with the evaluation of outcomes assessed through an objective test at the completion of the programme.

The rationale for this study rests on the fact that the last word has not been said about the use of behavioural objectives in curriculum design and evaluation of educational outcomes. However, educational engineers have always advocated that a good curriculum in any kind of teaching/learning situation must be supported by a sequential set of instructional objectives. Early researchers like Gagne (1967), Glaser (1967), Mager (1968) and Popham (1968) agreed that behavioural objectives clearly indicate to the learners what is required of them and consequently enhance relevant learning. But Atkin (1968) warned that educational relevance of curriculum might be reduced by strict adherence to specified behavioural outcomes of instructional activities. Reasoning with him were Arnstine (1964) and Eisner (1967) who expressed reservation on the use of behavioural objectives on the ground that they discourage learners from exploring their horizons thereby encouraging them to confine their learning to specified objectives which consequently reduce incidental learning. Incidental learning they believed is "a mother of invention". However, Melton (1978) identified a number of conditions that would determine whether or not behavioural objectives enhance relevant learning and reduce incidental learning. These include learners' awareness of and interest in the stated objectives; the clarity, difficulty and number of such objectives; whether they were inserted into text before or after related instructional materials and the frequency with which such insertions occur. These imply that the use of behavioural objectives should not be regarded as a panacea but as one of the many tools available to educators for doing their jobs effectively considering the specific and peculiar circumstances. Moreover, the collection of information for all units of a programme becomes pertinent when such information could be used for feedback to programme developers and implementers. This reflects formative product evaluation using information from internal source, which is a major task of the educational

administrator. It becomes reasonable that the content of short courses in human resource development programmes be spelt out in behavioural objectives, especially when it is focused on acquiring specific skill/competence and when some form of immediate evaluation of performance/outcome is necessary. Apart from the studies of Badmus (1991), Ebenezer (2008), Okoro (2009), and Duze (2007), there is a dearth of recent studies in Nigeria in the use of behaviourally stated objectives (BSO) in curriculum development, implementation, and evaluation.

The problem of this study therefore, was to determine the instructional objectives preference of science teachers who participated in this staff development programme in ICT, assess the effect of their qualification on the instructional objectives preference scores and their performance in the post test administered at the end of the short course in Data Management and Processing. In addition, the study was to determine the relationship between participants' instructional objectives preference scores and their performance in the programme.

Thus, the study is a combination of goal-based evaluation and goal-free evaluation. It is goal-based since development of competence is a desired goal of the programme, and goal-free in the sense that development of preference for behavioural objectives in the participants is an unintended outcome, if it is realized (Badmus, 1991). The significance of the study is therefore practical in nature. The findings of the study with reference to performance might indicate the need to develop separate in-service trainings for graduate and non-graduate teachers. Also, the finding with reference to preference in instructional objectives might draw the attention of school personnel development departments to the need to adopt different curricular approaches in designing training programmes depending on the peculiar circumstances. Furthermore, this research would contribute its own quota to what is already known and debated upon about the use of behaviourally stated objectives in curriculum design, implementation, and evaluation, in enhancing educational outcomes.

Research Question

What is the instructional objectives preference of science teachers who participated in the programme?

Hypotheses

$Ho_{1:}$ There is no significant difference between graduate and non-graduate participants on instructional objectives preference.

$Ho_{2:}$ There is no significant difference between graduate and non-graduate participants on performance at the end of the programme.

Ho_3: There is no significant relationship between instructional objectives preference and performance of participants at the end of the programme.

Method

The research design was ex-post facto with no manipulation of independent variables. The information sought from the participants had already occurred. The subjects were the thirty-five regular participants out of a total of forty-four science teachers that registered for and completed the course. This

comprised nineteen graduate and sixteen non-graduate teachers. All the graduate teachers were first degree holders. The researcher was among the seven resource persons used.

The data collected for the study included pre-test scores at the beginning and post-test scores at the end of the course. Each unit taught had the terminal objectives clearly spelt out. The instrument used to measure participants' performance was an achievement test based on the units covered in the programme and contained thirty multiple-choice questions. The content validity of the achievement test was ensured before hand by the use of a table of specification prepared by the trainers who are experts in the field of ICT. The questions were criterion-referenced in nature in the sense that they were specifically constructed to determine the extent to which the participants mastered the contents of the course units rather than to discriminate amongst them. The computed split-half reliability coefficient of 0.91 for the instrument was satisfactory.

The instrument used to assess participants' preference for instructional objectives was an attitude inventory adopted from Popham and Baker's (1970) Instructional Objectives Preference List (IOPL) also used by Badmus (1991). This has four sub-scales of Behavioural Important, Behavioural Unimportant, Non-Behavioural Important, and Non-Behavioural Unimportant. Scores for each sub-scale ranged between 5 and 25 while the total score on the whole (IOPL) ranged between 20 and 100. Scores of 50% and above in both were considered in this study to be in favour of preference for behaviourally stated instructional objectives. Scores on the sub-scale reflect preferences for the type of objective used while scores on the entire IOPL reflect preferences for behaviourally stated objectives. The validity of the IOPL has been accepted to measure what it intends to measure. However, being an attitude inventory, the reliability of the instrument will vary for each group of subjects, and for this group, it was estimated to be 0.83 by applying the ANOVA procedure on the data collected on the subjects. This instrument was administered before the post-test to ensure that their performance on the post-test would not affect their attitude towards behavioural objectives, as it was meant to assess the terminal affective behaviour of the participants.

To determine whether the qualification of the subjects had any significant effect on the instructional objectives preference or performance in the programme, the t-test statistic was applied to the data collected in each case. To make use of the robustness of t-test to violation of assumption of homogeneity of variances, three graduate participants were dropped in order to make the two groups compared of same sample size (n = 16 in each case). This was done by using the table of random numbers to select the sixteen graduate teachers. Finally, to determine whether any significant relationship existed between instructional objectives preference of participants and their performance at the end of the programme, the Product Moment Correlation Coefficient was applied to the relevant data generated.

Results

Results of data analyses were presented in Tables 1 – 6 and discussed according to how they related to the research question raised and the three null hypotheses formulated in the study.

Research Question: What is the instructional objectives preference of science teachers who participated in the programme?

To answer this question the means and standard deviations of respondents' scores on the IOPL sub-

scales were computed and the results presented in Table 1.

Table 1: Means and Standard Deviations of Science Teachers' Scores on the Sub-scales of Instructional Objectives Preference List (IOPL) (N = 32)

Sub-scales	Mean (X)	Standard Deviation (SD)
A. Behavioural Important	17.33	4.99
B. Behavioural Unimportant	17.14	5.15
C. Non-Behavioural Important	13.69	5.02
D. Non-Behavioural Unimportant	12.34	4.91

Result in Table 1 revealed that the observed mean scores of all science teachers for bebaviourally stated objectives, whether important or unimportant were generally higher than those of non-behaviourally stated objectives (important and unimportant). To test for the significant differences, a two-way mixed-effect ANOVA was applied to the data, and the summary of Analysis of Variance was presented in Table 2.

Table 2: Summary for the Two-way Mixed-Effect ANOVA with n = 1. (Single Factor Repeated Measures Design)

Source of Variance	SS	df	MJ	F
Between people	1,602.51	25	64.1004	12.62*
Within people	1,404.25	78	18.0032	
Between Scales (Treatment)	471.11	3	257.0353	
Residuals	933.14	75	12.4419	
Total	3,006.76	103		

*Significant at 0.05 level.

As shown in Table 2, the calculated value of F = 12.62 was greater than the critical value of 3.00 at 0.05 level of significance, we therefore rejected the null hypothesis that $U_1=U_2=U_3=U_4$ and concluded that there were significant differences in the sub-scale means. This indicated that the science teachers discriminated among the four types of instructional objectives investigated. We further carried out a Post hoc pair-wise comparison employing Tukey's Method to determine the direction of preferences and presented the results in Table 3.

Table 3: Differences Among Means of the Four Sub-scales Using Tukey's Honestly Significant Difference (HSD) Test.

Sub-scales	Means (X)	X_1	X_2	X_3	X_4
A. Behavioural Important	X_1 = 17.33	-	0.26	3.43*	5.02*
B. Behavioural Unimportant	X_2 = 17.14		-	3.18*	4.79*
C. Non-Behavioural Important	X_3 = 13.69			-	1.63
D. Non-Behavioural Unimportant	X_4 = 12.34				-

*Significant at 0.05 level, r = 4.

Results in Table 3 showed that the observed differences of 3.18, 3.43, 4.79, and 5.02 were all greater than the calculated Tukey's HSD of 2.61, we therefore concluded that differences between sub-scales A and C, A and D, B and C, and B and D were all significant. This means that the following findings hold:

- That Behavioural Important was a preferred option to Non-Behaviuoral Important.
- That Behavioural Important was a preferred option to Non-Behavioural Unimportant.
- That Behavioural Unimportant was a preferred option to Non-Behavioural Important.
- That Behavioural Unimportant was a preferred option to Non-Behavioural Unimportant.

From these findings, we concluded that the science teachers preferred any type of behaviourally stated objective, whether important or unimportant, to any type of non-behavioually stated objective.

Ho$_1$: There is no significant difference between graduate and non-graduate science teachers in their instructional objectives preference.

To test this null hypothesis, the means of overall scores of graduate and those of non-graduate participants were computed and compared using the t test statistic. Result of the data analysis was presented in Table 4.

Table 4: Comparison of Means of Overall Scores of Graduate and Non-Graduate Science Teachers on IOPL (N = 32)

Group	Sample Size (n)	Mean	SD	t-critical	t-calculated
Graduate Participants	16	71.74	11.40	1.960	2.239*

Non-Graduate participants	16	62.85	7.72		

*Significant at p > 0.05, df = 30.

Since the calculated value of t = 2.239 was greater than the critical value of t = 1.960, the null hypothesis was rejected indicating that graduate science teachers tended to prefer behaviourally stated objectives than non-graduate science teachers.

Ho_2: There is no significant difference between graduate and non-graduate science teachers in their performance at the end of the programme.

To test this hypothesis, the mean scores of the graduate and non-graduate participants in the post tests were separately computed and then compared using the t test statistic. The result was presented in Table 5.

Table 5: Qualification of Science Teachers and Performance in the Programme (N = 32)

Group	Sample Size (n)	Mean	SD	t-critical	t-calculated
Graduate Participants	16	58.26	5.18	1.960	5.398*
Non-Graduate Participants	16	51.03	5.82		

*Significant at p > 0.05, df = 30.

The result in Table 5 showed that the calculated t-value of 5.398 was greater than the critical t-value of 1.960. The null hypothesis was therefore rejected. This means that graduate science teachers performed significantly better than non-graduate science teachers at the end of the programme.

Ho_3: There is no significant relationship between instructional objectives preference and performance of participants at the end of the programme.

To test this hypothesis, the scores of participants on IOPL and post tests were collated and the Product Moment Correlation Coefficient (r) between the mean scores was computed. The result was presented in Table 6.

Table 6: Pearson Product Moment Correlation Coefficient (r) Between Instructional Objectives Preference and Performance of Science Teachers in Data Management and Processing.

Variables	N	Ex/Ey	Ex^2/Ey^2	Exy	r-value
Instructional objectives preference	32	425.7	614.3	596.1	0.713
Performance		441.3	666.3	664.6	

The calculated value of r was 0.713 which was greater than the critical r value of 0.404 at p = 0.05 and df = 30. The null hypothesis was therefore rejected indicating that a significant positive relationship existed between instructional objectives preference and performance of participants in the programme.

Discussion

The results and findings in this study have revealed a number of interesting and important issues which have implications for school administration. On the completion of the short in-service course in Data Management and Processing, all the science teachers who effectively participated in the programme exhibited substantial preference for behaviourally stated objectives. Their responses, irrespective of qualification, captured by their high mean scores on overall scores in IOPL (71.74 for graduates and 62.85 for non-graduates), showed that all the thirty-two participants were highly in favour of study situations where the instructional objectives of each unit of the course outline were behaviourally stated (whether important or unimportant) before the related instructional materials. This finding tallied with that of Badmus (1991) who studied a similar case with technical educators at the University of Benin. In his study, all the twenty-four participants in a training programme organized in modules indicated substantial preference for behavioural objectives to be stated beforehand in each module of the training programme in Educational Technology with an average mean score of 67.29. The studies of Duze (2007), Okoro (2003) and Ebenebe (1995), did not follow the same procedures like were used by Badmus (1991) and this author in specific training programmes for adults, but used the normal classroom instruction situation, also revealed preferences of younger school children for objectives to be stated and made known to the students before engaging in actual teaching and learning of the units to be covered and examined.

The implication of this finding for the school administrator lies mainly in the area of instructional supervision and evaluation. Heads of schools must ensure that teachers are supervised and encouraged to teach their subjects in line with the objectives they have indicated in their lesson notes/plans as well as intimate the students before hand on the expected outcomes from them. This would arouse the interests of the learners as observed by Melton (1978) and thereby enhance both specified learning and incidental learning. The stated objectives must cover as much as possible the three domains of learning – cognitive, affective, and psychomotor. The undue emphasis laid on cognitive behaviours in Nigeria should be played down while the affective and psychomotor behaviours should also be seen as very important behavioural outcomes of learning situations that induce incidental learning too. This would boost entrepreneurial thoughts, creativity, and innovativeness in learners of all ages.

Furthermore, this study revealed that there was a significantly positive relationship between the science

teachers' preference for behaviourally stated instructional objectives and their performance in Data Management and Processing. This was indicated in the computed correlation coefficient (r) of 0.713). This finding agreed with the work of Duze (2007) with computed r = 0.621. Also, Badmus's (1991) study found r = 0.578, Ebenebe's (1995) r = 0.627, and Okoro's (2003) r = 0.744. The implication is that learners who knew what was expected of them at the end of the teaching of a particular aspect of each item in their syllabus would tend to perform better in all the domains of learning than those who were unaware and who never cared.

However, the tests for significant differences on the effect of qualification of participants on instructional objectives preference and performance revealed interesting issues. In both cases, university graduate science teachers exhibited higher preference for behaviourally stated instructional objectives as well as better performance in Data Management and Processing than their non-graduate counterparts. In other words, graduate science teachers who tended to prefer behaviourally stated instructional objectives than non-graduate science teachers also tended to perform better in the post tests given at the end of the training programme. This revealed that qualifications of participants could boost their level of performance in such short in-service courses and also their intuitiveness in making learning choices. These findings also tallied with those of Badmus (1991) who worked with different categories of educational technologists holding different kinds of educational qualifications.

The implication of this finding for the school administrator could be tied to choice of staff for specifically organized in-service courses. It may pay better to send staff of the same qualification category to attend staff development programmes from time to time instead of lumping them together in one single run in developing cognitive and affective behaviours. Besides, the graduate and non-graduate science teachers could be made to develop preferences in behaviourally stated instructional objectives and in turn reflect them in their teaching. This is crucial for enhanced outcomes in science and technology lessons that demand high skill/competence acquisition. Moreover, this will be a way of reducing teachers' resistance to educational changes often associated with rational deductive thinking and decision making.

Conclusion

On the completion of the relevant units for beginners in Data Management and Processing in an in-service course for staff development of science teachers in ICT, it was observed that:

1. Where the instructional objectives of each unit were behaviourally stated before the related instructional materials, science teachers indicated preference for behaviourally stated instructional objectives of any type.

2. Though all the science teachers indicated preference for behaviourally stated instructional objectives, graduate science teachers showed significantly higher preference for behaviourally stated instructional objectives than their non-graduate counterparts.

3. Qualifications of science teachers yielded significant effect on performance in the programme with the graduate science teachers showing better performance than the non-graduates.

4. There was a significantly positive relationship between instructional objectives preference and performance of science teachers in Data Management and Processing.

Recommendations

Based on the outcome of this study, we recommend that teachers of all subjects at all levels and types of education should begin to see the need to prepare their lessons and present them to students with the expected behavioural objectives clearly spelt out and made known to the learners before the actual teaching begins. There is nothing to lose but much to gain in even educating the learners on what is specifically expected of them at the end of a course in terms of their earnings in cognitive, affective, and psychomotor behaviours. Heads of schools who carry out instructional supervision should encourage teachers as well as learners to develop preference for behaviourally stated instructional objectives as well as evaluate outcomes for greater improvement. Curriculum developers, evaluators, planners and implementers should as a matter of need in the present Nigerian educational circumstance of falling standards, harness this useful instructional tool to retrieve what was lost, what is being lost, and prevent what will be lost in the administration of the educational sector.

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