International Journal of Advanced Education and Research
www.alleducationjournal.com
Online ISSN: 2349-4182, Print ISSN: 2349-5979
Received: 29-12-2021, Accepted: 13-01-2022, Published: 29-01-2022
Volume 7, Issue 1, 2022, Page No. 6-11

Application of the Kirkpatrick model in the evaluation of an in-service teacher training programme on information and communication technology (ICT) integration in teaching/learning

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Abstract
This study adopted the Kirkpatrick model to evaluate a training programme on ICT integration in teaching and learning for primary and secondary school teachers. Analysis of the data from the responses of the 40 workshop participants revealed that there was no increase in the attitude of teachers towards ICI integrated teaching and learning as a result of the training programme. It was also revealed that the training was satisfactorily organised, the teachers acquired the knowledge and skills of ICT integrated teaching/learning as presented in the workshop and they are quite predisposed to apply the acquired knowledge and skills of ICT integrated teaching and learning in their classroom teaching tasks. Based on teacher preference to collaborate with school owners in the acquisition of computer systems for the teachers, the study recommends the collaborative approach, whereby teachers are granted loan facility for 50% of the cost of acquisition of computer systems while the school owner pays the other 50%.

Keywords: evaluation, Kirkpatricks model. ICT integration

Introduction

For over two decades, teacher education programmes in Nigeria have been studded with courses that seek to equip the trainee teacher with ICT based teaching/learning skills. (Course brochure, 1996). Government education agencies also claim that primary and secondary school teachers are regularly provided in-service training programmes and workshops on ICT integrated teaching and learning. But Nzewi (2009) reported that Nigerian teachers still lack the knowledge and skills needed to integrate ICT into teaching and learning. The dearth of evaluation reports of the in-service training programmes organised for teachers also dwindles the level of reliance on the capability of such training programmes to equip teachers with the target ICT knowledge and skills. This is especially as the structure of such programmes and the level of achievement of the training objectives cannot be verified. No wonder, Noe (2010) [7] argued that "the results of a training intervention are no good if it is not evaluated upon completion". In the words of Jasson and Govender,

"Whichever means are used to conduct the training, whether in-service, off the job or organisational development intervention, accurate and relevant evaluation techniques and measuring systems are needed to obtain information, control quality and manage transfer barriers" (Jasson and Govender, 2017) [4]

Evaluation according to Salimian (2021) [8] is of benefit to the manager as well as the employee. While evaluation constitutes a mechanism of carrier development for the employee, it enables the manager identify areas of further improvement of employee skills.

The evaluation of training programmes therefore enables an organisation to ascertain whether the participants benefitted from it, whether they could perform the tasks for which they had been trained, and whether the monies of the organisation had been accountably expended (Erasmus *et al*. 2011:21) [2]

The evaluation of training programmes is actually one avenue by which an organisation is able to obtain reliable data to base decisions to improve, continue or discontinue the programme (Guerra-Lopez, 2008) [3]. Evaluation is the determination of the worth or merit of a programme (Scriven, 1967). To Guerra-Lopez (2007), the essence of determining this worth is the provision of information to guide data driven decisions for improved performance of programmes and organisations.

Discussing the evaluation of instructional programmes, Wiles and Bondi (2011) [10] noted that any good instructional programme has inbuilt provisions for periodical as well as end of programme assessment of the level of success attained. If the programme is correctly structured, the end of programme assessment would produce the expected result. But the need for programme redesign or termination would arise if the programme fails to produce the desired result. While the periodic evaluation is referred to as formative evaluation, the end of programme evaluation is known as summative evaluation, (Dike, 2015)

The Kirkpatrick evaluation model

One popular evaluation model that has served for training programmes in industrial and organisational psychology area is the Kirkpatrick's four levels of evaluation. (Cascio, 1987). Developed by Donald Kirkpatrick in 1959 (Guerra-Lopez, 2008) [3], the model has the following four sequential levels of evaluation are:

Reaction: Seeks to ascertain participant reactions indicative of level of satisfaction with the programme

Learning: Focuses on ascertaining the knowledge, skills and attitude that participants gained from the program

Behavior: Seeks to ascertain the degree of improvement in workplace performance of the participant arising from the knowledge, skills and attitude gains from the program

Results: Focuses on the level of improvement in organisational performance arising from the training programme

The Kirkpatrick evaluation model is intended as an accumulative process that builds on the data collected at each previous level, and aims to provide a more detailed layer of assessment at each successive level. This study shall apply the Kirkpatrick evaluation model to ascertain the success of a training workshop on ICT integration in teaching and learning, organised for primary and secondary school teachers in Port Harcourt municipality and its environs. By subjecting a training programme that is similar to the ones organised for primary and secondary school teachers by Government education agencies to due process of evaluation, this study seeks to ascertain the overall level of success of the workshop and to identify the actual barriers to teacher mastery of ICT integration skills.

Objectives of the study

To achieve its objectives, the study shall ascertain

The level of participant satisfaction with the content of the programme and the delivery mechanisms adopted

The extent to which the participants actually imbibed the objective knowledge and skills for ICT based teaching/learning as well as the attitudinal predisposition that facilitate ICT integrated teaching and learning

The extent to which the learners are conatively disposed to exhibit the learned capabilities in task performance.

Research questions

The study shall provide answers to the following research questions

To what extent were in service teachers satisfied with the training programme on ICT integrated teaching/learning

What is the level of knowledge and skills of ICT integrated teaching that the teachers derived from the training programme

To what extent did the training programme imbue teachers with the requisite attitudinal predisposition that facilitate ICT integrated teaching/learning

To what extent are the teachers disposed to the application of the learned ICT integrated knowledge and skills in real life task performance.

What is the comparative level of male and female teachers' attitude to ICT integration arising from the training programme

How does the teaching experience of secondary school teachers affect their attitude towards ICT integrated teaching and learning.

What is the overall perspective of teachers on the strategy for teacher acquisition of computer systems.

Methods

In adopting the Kirkpatrick (1959) four –level evaluation model, the study obtained Likert-scaled pre-training data on the level of knowledge and skills the participants already have as well as their attitude towards ICT integrated teaching/learning. The study also obtained Likert-scaled post training participant responses on the following variables;

The level of satisfaction with the programme

The level of knowledge and skills gains resulting from the programme

The extent to which the participants were conatively disposed to the application of new knowledge and skills gains in real-life teaching functions.

These are the reaction, Learning and Behaviour stages of the Kirkpatrick four level evaluation model. The behaviour stage should actually assess the extent to which the participants applied their knowledge and skills gains in the performance of the teaching function in their respective schools. This implies that immediate assessment of learner behaviour is not feasible. The study therefore sought for responses on the extent to which the participants were conatively disposed to the application of their knowledge and skills gains in real life teaching tasks. The likert scaled responses are therefore indicative of the self efficacy ratings of the participants' knowledge and skills in ICT integrated teaching and learning as well as the will to perform the teaching tasks accordingly.

Analysis of data

The response data obtained from the trainees on the reaction, learning and behaviour stages of the Kirkpatrick model were subjected to descriptive statistical analysis using the SPSS statistical software. The following results were obtained as answers to the research questions.

Results

Research questions

Research question 1: To what extent were in service teachers satisfied with the training programme on ICT integrated teaching/learning when analysed according to computer provision?

Table 1: Descriptive statistic on the extent of satisfaction of in-service teachers with the training programme on ICT integrated teaching/learning when analysed according to computer provision

Computer provision	N	Mean	Std. Deviation	Std. Error	95% CI	
					Lower Bound	Upper Bound
By school owner	11	4.21	0.10	0.03	4.14	4.28
Collaborative	29	4.30	0.33	0.06	4.17	4.42

Table 1 shows that the mean satisfaction of in-service teachers with the training programme on ICT integrated teaching/learning among those who used computers provided by the school owner was 4.21±0.10 with standard error of 0.10 and the 95% Confidence interval moved from 4.14 to 4.28. The mean satisfaction of in-service teachers with the training programme on ICT integrated teaching/learning among those who used computers owned by teacher and school (collaborative) was 4.30±0.33 with standard error of 0.06 and the 95% CI moved from 4.17 to 4.42.

Research question 2: What is the level of knowledge and skills of ICT integrated teaching that the teachers derived from the training programme when analysed according to computer provision?

Table 2: Descriptive statistic on the level of knowledge and skills (learning) of ICT integrated teaching that the teachers derived from the training programme when analysed according to computer provision

Computer provision	N	Mean	Std. Deviation	Std. Error	95% CI	
					Lower Bound	Upper Bound
By school owner	11	4.18	0.77	0.23	3.66	4.70
Collaborative	29	4.22	0.62	0.11	3.99	4.46

Table 2 shows that the mean level of knowledge and skills of ICT integrated teaching that the teachers derived from the training programme among those who used computers provided by the school owner was 4.18±0.77 with standard error of 0.23 and the 95% Confidence interval moved from 3.66 to 4.70. The mean level of knowledge and skills of ICT integrated teaching that the teachers derived from the training programme (collaborative) was 4.22±0.62 with standard error of 0.11 and the 95% CI moved from 3.99 to 4.46.

Research question 3: To what extent did the training programme imbue teachers with the requisite attitudinal predisposition that facilitate ICT integrated teaching/learning when analysed according to computer provision?

Table 3: Descriptive statistic on the extent did the training programme imbue teachers with the requisite attitudinal predisposition that facilitate ICT integrated teaching/learning when analysed according to computer provision

		Pretest		Posttest		Gain	
Computer provision	N	Mean	SD	Mean	SD	Mean	SD
By school owner	11	4.24	0.41	4.47	0.30	0.23	0.20
Collaborative	29	4.25	0.45	4.46	0.36	0.21	0.21

Table 3 shows that the mean Pre-workshop survey attitude score of participants who used computers owned by the school was 4.24±0.41 whereas that of their counterparts who used computers provided collaboratively was 4.25±0.45. The mean Post-workshop survey attitude score of participants who used computers owned by the school was 4.47±0.30 whereas that of their counterparts who used computers provided collaboratively was 4.46±0.36. The mean gain in attitude of participants who used computers owned by the school was 0.20±0.20 whereas that of their counterparts who used computers provided collaboratively was 0.21±0.21.

Research question 4: To what extent are the teachers disposed to the application of the learned ICT integrated knowledge and skills in real life task performance when analysed according to computer provision?

Table 4: Descriptive statistic on the extent teachers are disposed to the application of the learned ICT integrated knowledge and skills in real life task performance (behaviour) when analysed according to computer provision

Computer provision	N	Mean	Std. Deviation	Std. Error	95% CI	
					Lower Bound	Upper Bound
By school owner	11.00	3.65	0.74	0.22	3.15	4.15
collaborative	29.00	3.86	0.75	0.14	3.57	4.14

Table 4 shows that the mean application of the learned ICT integrated knowledge and skills in real life task performance (behaviour) among those who used computers provided by the school owner was 3.65±0.74 with standard error of 0.22 and the 95% Confidence interval moved from 3.15 to 4.15. The mean application of the learned ICT integrated knowledge and skills in real life task performance (behaviour) among those who used computers owned by teacher and school (collaborative) was 3.86±0.75 with standard error of 0.14 and the 95% CI moved from 3.57 to 4.14.

Research question 5: What is the comparative level of male and female teachers' attitude to ICT integration arising from the training programme?

Table 5: Descriptive statistic on the comparative level of male and female teachers' attitude to ICT integration arising from the training programme

		Pre-Attitude		Post-Attitude		Gain-Attitude	
Gender	**N**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Male	9	4.07	0.38	4.33	0.34	0.27	0.26
Female	31	4.30	0.44	4.50	0.34	0.20	0.19

Table 5 shows that the mean Pre-workshop survey attitude score of male participants was 4.07±0.38 whereas that of their female counterparts was 4.30±0.44. The mean Post-workshop survey attitude score of male participants was 4.33±0.34 whereas that of their female counterparts was 4.50±0.34. The mean gain in attitude of male participants was 0.27±0.26 whereas that of their female counterparts was 0.20±0.19.

Research question 6: How does the teaching experience of secondary school teachers affect their attitude towards ICT integrated teaching and learning?

Table 6: Descriptive statistic on how teaching experience of secondary school teachers affect their attitude towards ICT integrated teaching and learning

		Pre-Attitude		Post-Attitude		Gain-Attitude	
Experience	**N**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
<5 yr	15	4.43	0.36	4.61	0.30	0.18	0.25
6 - 10 yrs	17	4.15	0.42	4.38	0.33	0.23	0.15
11 - 15 yrs	4	3.87	0.55	4.30	0.43	0.44	0.12
> 20 yrs	4	4.37	0.49	4.46	0.38	0.09	0.15

Table 6 shows that the mean Pre-workshop survey attitude score of participants with less than 5 years of experience was 4.43±0.36, that of those 6-10 years experience was 4.15±0.42, those with 11-15 years of experience had mean score of 3.87±0.55 and those with more than 20 years of experience had 4.37±0.49. The mean Post-workshop survey attitude score of participants with less than 5 years of experience was 4.61±0.30, that of those 6-10 years experience was 4.38±0.33, those with 11-15 years of experience had mean score of 4.30±0.43 and those with more than 20 years of experience had 4.46±0.38. The mean gain in attitude score of participants with less than 5 years of experience was 0.18±0.25, that of those 6-10 years experience was 0.23±0.15, those with 11-15 years of experience had mean score of 0.44±0.12 and those with more than 20 years of experience had 0.09±0.15

Research question 7: How does the educational qualification of secondary school teachers affect their attitude towards ICT integrated teaching and learning?

Table 7: Descriptive statistic on how educational qualification of secondary school teachers affect their attitude towards ICT integrated teaching and learning

		Pre-Attitude		Post-Attitude		Gain-Attitude	
Qualification	**N**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
NCE	12	4.34	0.35	4.52	0.33	0.18	0.13
B. Ed	24	4.19	0.48	4.43	0.36	0.24	0.24
MEd/PhD	4	4.33	0.44	4.51	0.36	0.18	0.18

Table 6 shows descriptive statistic on how educational of secondary school teachers affect their attitude towards ICT integrated teaching and learning. It shows that the mean Pre-workshop survey attitude score of participants with NCE was 4.34±0.35, that of those with B.Ed was 4.19±0.48 and those with MEd/PhD had mean score of 4.33±0.44. The mean Post-workshop survey attitude score of participants with NCE was 4.52±0.33, that of those with B.Ed was 4.43±0.36 and those with MEd/PhD had 4.51±0.36. The mean gain in attitude score of participants with NCE was 0.18±0.13, that of those with B.Ed was 0.24±0.24 and those with M.Ed/PhD had mean gain of 0.18±0.18

Summary of findings

Participants who used computers owned collaboratively were more satisfied with the training programme on ICT integrated teaching/learning than those who used the computers provided by school

Teachers who used computers owned collaboratively slightly derived more knowledge and skills (learning) of ICT integrated teaching from the training programme than those who used the computers provided by school

There appears to be no difference in the extent the training programme imbue teachers with the requisite attitudinal predisposition that facilitate ICT integrated teaching/learning when compared by computer provision

Teacher disposition to the application of the learned ICT integrated knowledge and skills in real life task performance were found to be slightly in favour of those who used computers provided collaboratively.

Comparative level of male and female teachers' attitude to ICT integration arising from the training programme was somewhat equivalent Teachers with 11 - 15 years working experience gained most from the workshop in terms of attitude, followed by those who had 6-10 years of experience and the least learning gain was found among those with over 20 years of work experience.

The highest gain in attitude was found among teachers with B.Ed whereas those with NCE and those holding MEd/PhD had equivalent level of attitudinal gain.

Discussion/Conclusion

One major complaint of teachers concerning impediments to ICT integrated teaching and learning is the fact that most teachers lack access to computer systems of their own. The study sought the opinion of teachers on the preferred option of teacher ownership of computer systems. This is especially as they also complained of inability to undertake the huge financial investment required for purchase of a computer system. The data indicate that 27% of the teachers in the study felt that the government and owners of private schools should buy laptops and donate to the teachers to facilitate ICT integrated teaching and learning. But 73% of the teachers opined that the government and private school owners should collaborate with the teachers to acquire the computer systems. Each teacher should contribute 50% of the cost while the owner of the school contributes 50%.

The two approaches in the acquisition of computer system was projected into the analysis of the other aspects of learner responses in the training data. The results indicate that:

Attitude

The responses of the workshop participants revealed that there was no increase in the attitude of teachers towards ICT integrated teaching and learning as a result of the training programme. This is indicative of the fact that teacher attitude towards ICT integrated teaching and learning has improved over the years.

Satisfaction

The reaction stage of this evaluative study revealed that the participants were generally satisfied with the training programme. More specifically however, the participants whose computer systems were collaboratively acquired were more satisfied with the content of the programme, the delivery strategies, the expertise of presenters etc, than those whose computer systems were donated by the owner of the school

Learning

The learning stage of the evaluative study revealed that the participants achieved mastery of the knowledge and skills objectives of the training programme. The participants whose computer systems were collaboratively acquired however achieved higher mastery of the knowledge and skills of ICT integrated teaching and learning than those whose computer systems were donated by the owner of the school.

Behaviour

The behaviour stage of the study also revealed that the participants were duly predisposed to apply their knowledge and skills gains to the performance of their teaching function. And that those participants whose computer systems were collaboratively acquired have higher predisposition to apply the ICT integration knowledge and skills gains in their classroom teaching tasks.

Recommendations

This study hereby recommends that the owners of schools and their teachers should implement the collaborative approach in teacher acquisition of computer systems. This can be facilitated by granting the teachers a loan facility for 50% of the cost of the computer system, while the owner of the school then shoulders the rest 50%. The teachers can then pay back the loan at feasible monthly instalments.

Secondly, evaluative mechanism should be structured into training programmes. This would enable proper identification of the level of success achieved as well as any impediments to the transfer of learned skills into real life problem solving situations.

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