PARADIGM SHIFT IN EDUCATIONAL TECHNOLOGY: TEACHER EDUCATION RESPONSE TO THIS TREND

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Abstract

The study investigated pre-service teachers ICT literacy skills, and knowledge and skills of programmed learning at the University of Port Harcourt. All final year regular students in 2007/2008 academic sessions constituted the population. Design was survey based on stratified random sampling technique. 350 final year undergraduates constituted the sample. Three research questions and three hypotheses directed the conduct of the research. A questionnaire named "ICT Literacy Skills for Education" (ICTLSE) with 4 sections was used for collecting data for the study. The ICTLSE was face validated by experts in Educational Measurement and Evaluation, and are expert in Educational Technology. The reliability co-efficient obtained for the three sections was 0.71, 0.73, and 0.72 respectively. The response format was 'Yes' or 'No'. 'Yes' attracted one point and 'No'. zero. Three research assistants helped in the distribution and collection of the instrument: Data were analyzed through the application of mean, standard deviation, and one-way-analysis of variance (ANOVA). The null hypotheses were tested at 0.05 level of significance. Analyses and results were recorded for each section. Results showed that pre-service teachers do not possess ICT related skills, and basic fundamentals of programmed learning, with the exception of those who are specializing in computer science. Based on these findings, recommendations were made for urgent steps to be taken by the University.

Introduction

Changes in information-based society have given rise to new resources and techniques for teaching/learning (Ellington, Percival and Race, 1993; Dike, 2008). Heininch, Molenda, Russell and Smaldino (2002) posit that the homes have become a classroom for all with the unification of media formats through the use of computer and Internet. Teachers can create well-designed technology-enhanced instructional materials which computer cans singly "chun out in a variety of ways", once the correct input and commands are entered.

This break–through must have necessitated the review of the definition of Educational Technology by the Association of Education and Communication Technology (AECT). The new definition is:

> Educational Technology is the study and ethical practice of facilitating learning and improving performance by creating; using and managing appropriate technological processes and resources.

(Richey, 2008: 24)

According to Janusizewski and Molenda (2008), the focus now is on "using and managing appropriate technological processes and resources". Using

the knowledge and skills of operating systems, application programmes and exploring cyberspace for "creating", for "facilitating learning", in order to "improve performance", these words echoes constructivist approach to constructing knowledge and understanding. This requires the ability to operate computer, and use computing skills; ability to process information and use such information in constructive ways to solve problems.

Technology itself does not necessarily improve students' ability to learn, the teachers' skill in the use and application in different subject areas are of utmost importance (Bereiter and Scardamalia, 2006; Molenda and Boling (as in Januszewski and Molenda, 2008). However, the integration of computing and cognitive competencies into the curriculum must match up with the profile of teachers' learning needs for professional development, Nnabuo, (2008).

Ely (2002), Santrock (2008), and White and Hubbard (1988) note that education in the information age has expanded to include – diversification of the teaching profession, and redefinition of basic literacy skills. With the introduction of Information and Communication Technology (ICT) into the school system in Nigeria (NPE 2004), pre-service teachers have to learn about computer, how to operate it and its practical application in education.

Computer Assisted Instruction (CAI) makes teachers' observers, users, and possibly writers of instructional programmes. They will come across various kinds of commercial instructional packages: tutorial, drill and practice, simulation and demonstration, games, interactive video and problem solving skills, as sources of educational improvement. Teachers will also find themselves selecting, organizing, and evaluating software packages for various subjects in the curriculum (Lathrop and Goodson, 1983). Apart from CAI, important learning occurs from the use of such computing tools as word processing, spreadsheet, and filing programmes. Educators use information and instructional materials to lead students through programming techniques as many educational software programmes follow the same design as programmed instruction (Romiszowski, 1997). Romiszowski, states that CAI programmes suffer same setbacks as programmed instructions. It is often repetitive and it reduces learning to discrete units that sometimes observe the relationships between ideas.

With computer- based resources there is a move from pure academic activities to a powerful creative learning environment and activities for every student (Sadker and Sadker, 2003). Some studies suggest that student use of computer-based resources is correlated to a rise in standardize test scores, that such increase can only occur when teachers are well trained; and comfortable with technology (Penuel, Bascardine, Masy and Crawford, 2006). Research in developed and some developing countries have investigated trained teacher's computing and cognitive capabilities in ICT. The results showed positive re-orientation (Markauskaite, 2007; Hew and Brush, 2007). The purpose of this study therefore, was to find out ICT literacy level, knowledge and skills of programmed learning of pre-service teachers; based on literature review and

identified rational of ICT literacy in education. The study addressed three research questions and three hypotheses:

Research Questions

1. To what extent do pre-service teachers' possess computing skills?
2. To what extent do pre-service teachers' possess cognitive capabilities?
3. To what extent do pre-service teachers' possess knowledge/skills of programmed learning?

Hypotheses

1. There is no significant difference among pre-service teachers who posses computing skills.
2. There is no significant difference among pre-service teachers who posses cognitive skills.
3. There is no significant difference among pre-service teachers who posses knowledge / skills of programmed learning.

Method

A stratified non-proportional random sampling of 350 pre-service teachers were used to survey final year regular students ICT literacy and basic skills of programmed learning, in Faculty of Education of the University of Port Harcourt, Port Harcourt in 2007/2008 academic session. The sample distribution covered students in 5 teaching subject areas- Computer Science (70), Economics (70), Political Science (70), Accounting (70), and English Studies (70), designated as groups 1-5. All respondents took a course titled "Computer in Education". Three research questions and three hypotheses guided the study. The instrument used was a questionnaire with 'Yes' and 'No' format, titled "ICT Literacy Skills for Education" (ICTLSE). A 'Yes' response attracted a point, and a 'No' response got zero. The questionnaire was divided into 4 sections with 30 items statements: Section A–Personal Information, B – Computing Skills (11), C – Cognitive Capabilities (9), and D – Knowledge / Skills of Programme Learning (10). The maximum scores for each section were 11, 9 and 10 points respectively; and the minimum was 5.5, 4.5, and 5 points respectively. The reliability co-efficient obtained for the three sections was 0.71, 0.73, and 0.72. Two experts in Educational Measurement and Evaluation, and one expert in Educational Technology validated the instrument. Three research assistants helped in the distribution and collection of the instrument. Data were analyzed through the application of mean, standard deviation, and one-way-analysis of variance (ANOVA). The null hypotheses were tested at 0.05 level of significance. Analyses and results were recorded for each section.

Results

The results obtained after analyzing the data of this study are presented here according to the research questions and hypotheses.

Table a Research Question 1 and Hypothesis One

a. Mean ($\overline{X}$) and standard deviation (sd) of section B (Computing skills) for the 5 groups (N – 350)

Group	Number	Computing skills	
		Mean ($\overline{X}$)	Sd
1	70	8.50	1.200
2	70	3.20	2.061
3	70	2.21	1.67
4	70	5.44	1.83
5	70	3.80	1.87
Total	350	4.63	2.81

Note: Criterion mean = 5.5

Table 1a: The mean score ranged in this order: Group 1 (Computer Science) 8.50; 4 (Accounting) 5.44; 5 (English Studies) 3.80; 2 (Economics) 3.20; and 3 (Political Science) 2.21. With the criterion mean of 5.5 as the minimum score for this section, only group 1 accepted that they possess computing skills.

1b: ANOVA Summary of Scores Obtained from the Reactions of Pre-Service Teachers for Section B for the Five Groups

Section	Source of variance	Sum of squares	df	Mean square	Calculated F-ratio	Tabulated F-ratio	Decision
B	Between groups	1694.497	4	423.624	137.494	2.37	Rejected
	Within groups	1062.957	345	3.081			
	Total	2757.452	349				

When all the group's observations on table 1a were subjected to one-way ANOVA test, the F-ratio calculated was 137.494 and the tabulated F-ratio was 2.37 at 0.05 level of significance df 4/345, showed that there was a statistical differences among the scores obtained from the five groups, because the calculated F-ratio was statistically greater than the tabulated - ratio. The null hypothesis was rejected.

Table 2: Research question 2 and hypothesis 2

a. Mean ($\overline{X}$) and Standard Deviation (SD) of section C (Cognitive Capabilities) (N=350).

Group	Number	Cognitive capabilities	
		Mean ($\overline{X}$)	Sd
1	70	1.88	1.41
2	70	1.48	.912
3	70	1.42	.713
4	70	2.81	1.506
5	70	4.75	1.254
Total	350	2.47	1.725

Note: Criterion mean = 4.5

An observation of the results in table 2a showed that respondents in group 1, 2, 3, and 4 accepted that they do not posses cognitive capabilities with means scores below the criterion mean of 4.5 for the 9 items on this section. The table indicated mean score of 4.75, which is above the criterion mean for group 5 (English Studies).

2b: ANOVA Summary of Scores Obtained from the Reactions of Pre-Service Teachers for Section C for the Five Groups

Section	Source of variance	Sum of squares	Df	Mean square	Calculated F-ratio	Tabulated F-ratio	Decision
B	Between groups	542.097	4	135.524	94.044	2.37	Rejected
	Within groups	497.171	345	1.441			
	Total	1039.269	349				

Subjecting that observation to ANOVA test: table 2b revealed that the Calculated F-ratio was 94.04 and the tabulated F-ratio was 2.37 at 0.05 level of significance, df 4/345. Because the calculated F-ratio was statistically greater than the tabulated F-ratio, the null hypothesis was rejected.

Table 3: Research Question 3 and Hypothesis 3

a. Mean ($\overline{X}$) and Standard Deviation (SD) of section D (Knowledge/skills of Programmed Learning) (N=350).

Group	Number	Knowledge/skills of Programmed Learning	
		Mean ($\overline{X}$)	Sd
1	70	5.34	1.127
2	70	1.31	1.48
3	70	.685	.986
4	70	1.57	1.565
5	70	.671	1.003
Total	350	1.917	2.110

Note: Criterion mean = 5

The results in table 3a revealed that the respondent's in-group 1 accepted that they possess knowledge/skills of programmed learning with a mean of 5.34 which was above criterion mean of 5 for the 10 items on this section. On the other hand 4 groups (2, 3, 4, and 5) rejected the notion that they possess the skill.

b: ANOVA Summary of Scores Obtained from the Reactions of Pre-Service Teachers for Section D for the Five Groups

Section	Source of variance	Sum of squares	df	Mean square	Calculated F-ratio	Tabulated F-ratio	Decision
D	Between groups	1070.069	4	267.517	190.481	2.37	Rejected
	Within groups	484.529	345				
	Total	1554.597	349				

Subjecting the observations on table 3a to ANOVA test (table 3b) revealed that the F-ratio calculated was 190.481 as against the tabulated F-ratio of 2.37. The calculated F-ratio was statistically greater at 0.05 level of significant, df 4/345. This indicated a rejected of the null hypothesis of 'no difference' among the scores yielded by the responses from all the groups.

Discussion

These findings as stated above are very serious and it should be a source of concern to educators; more so when computer science has been introduced into primary and secondary school curriculum already. This is a peculiar subject because it is integrated into all subjects. The subjects of the study were would be

teachers who are still in the university with ample opportunities for the acquisition of ICT skills at their disposal. The fact that they have to register for courses on-line, process documents, have 'computer appreciating and application' as a university wide course, and 'computer in education' as a faculty course is sensitizing enough to gear-up trainee teachers towards hands-on-experiences.

In this study, computer science based group ranked highest in the possession of computing, and programmed learning skills (Tables 1a and b, 3a and b). This trend may be attributed to their area of specialization which would have exposed them to computer education, programming, and problem-solving techniques, using flow-charts and symbols which are aids to understanding CIA programmes (Remiszowski, Lathrop and Goodson), English studies-based trainee teachers ranked highest in cognitive capabilities (Tables 2a and b). This again may be attributed to the skills of reading informational materials, which they may have acquired in their teaching subjects. Since ICT has been introduced at all levels of education, it is mandatory for pre-service teachers to seize the opportunities now that they are still in the University to acquire these skills.

For computer and Internet to become a force for educational improvement, in-service teachers (Olele, 2006), and trainee teachers must be sensitized on this global trend. They must acquire hands-on and minds-on experience in operating computer, office application programmes, and presentation tools as "tools for thinking and working more productively" with these, they can design instructional packages for teaching and learning (Janusizowski and Molenda; Bereiter and Scardamalia, Romiszowski; Sadker and Sadker; Penuel, Bascardina, Masy, and Crawford; Markauskaiter; Hew and Brush). As they acquire these skills, they will begin to appreciate the emergence of new occupations and careers for teaching profession, redefinition of basic literacy skills, and the changing role of the teacher through the ability to 'create, use and manage appropriate technological processes and resources.

Recommendations

The following recommendations were put forward and perhaps they will, if implemented improve the situation:

- Computer laboratories with full Internet service should be made available specifically for teacher education.

- Experts in ICT should work with pre-service teachers as resource persons for training in computing skills.
- Teacher education curriculum should be reviewed to include such relevant courses like basic programming and problem solving skills that can help trainee teachers to acquire the ability to write simple educational programme and design simple educational games, and instructional materials.

Conclusion

The demands of information-based society are enormous. Pre-service teachers must be adequately prepared for these challenges. They must possess the necessary skills for them to be better prepared as would be users, observers, and possibly writers of educational programmes in collaboration with programmers based on the principles derived from various aspects of education courses. All these are very important for 'no education system may rise above the quality of its teachers' (NPE, 2004).

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