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Availability and extent of use of Information and Communication Technology (ICT) facilities in the teaching of science in secondary schools in Port Harcourt, Rivers State

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Abstract

The study aimed to find out the availability and extent of use of Information and Communication Technology (ICT) facilities in the teaching of science in secondary schools in Port Harcourt L.G.A. To achieve the aim of the study, a descriptive survey design was adopted in the study. All the 61 science teachers in the study area were used as the respondents. Observation check list and questionnaire copies were used for data collection. The data collected were analyzed using mean, standard deviation and t-test. The findings showed that ICT facilities in teaching science and also location is significant factor in the teachers' use of ICT facilities in the teaching of science. By implication, practitioners should seek for intervention from government to install ICT facilities in schools irrespective of location.

Keywords: Information and Communication Technology; Teaching; Science; Secondary Schools Students

1. Introduction

In teaching l science, the teacher has many teaching methods to adopt in order to enhance effective teaching and learning. Basically, any teaching method or technique selected by the teacher should make learning activates active and practical rather than passive and theoretical. It should give students opportunity to practice what they are learning in the real context and appeal to all their language skills. There is a general belief that real context and appeal to all their language skills. There is general belief that the method or resources chosen by the Science teachers to a large extent determines students' achievement in the Science. Uzoegwu (2004) holds the view that the method of teaching is indispensable in the teaching and learning process of English as a second language. This view is supported by Bodunde (2005) that stresses that the teaching method used by the Science teacher can affect students positively because it is a weapon of enhancing the scientific ability of the students. The conventional method of teaching can also be regarded as the hitherto existing traditional method of instruction in the normal classroom setting. There exist several methods of such conventional methods of instruction, which have permeated our educational system over the years. Among such conventional methods, project and field trip, cognitive method, total physical response method etc.

These are methods that involve teachers in complete verbal instruction or expression. Communication flows from teacher to students (Anyima 2011). The concept of information communication technology (ICT) embraces the process of information processing, retrieval and dissemination. Arolasafe (2005) sees it as the computing and communication facilities and features that variously support teaching, learning and a range of activities in education. In other words, ICT is computer and telecommunication based facilities, which provide the capability for the transfer of data from one work station to another for the purpose of teaching and learning. Akintunde (2004) maintains that ICT concerns the use of computer, telephone and other technologies to process, transport and transfer voice and other signals singularly or mixed with least interference or distortion of content. From the foregoing, this researcher sees ICT as those technologies such as computer and telecommunication equipment which is used to transmit voice, text sounds and image which

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support teaching, learning, as well as the management of information. ICT consists of all technical facilities used in formation handing and communication, including computer and network hardware as well as telephony, broadcast media and all types of audio and video processing and transmission. These equipment may enhance the teaching of oral English if they are well used by teachers.

The use of ICT faculties reduces the burden of the teacher. With the ICT facilities, the teachers' role in the classroom will be shifted from being the sole provider of information to a facilitator of learning and manager of instructional resources. These modern facilities such as radio, television, telephone, language lab, microphone etc. have replaced the traditional "chalk and talk" method of teaching. In this regard, the use of ICT facilities challenges students to learn independently. Ajayi and Ekundayo (2009) submitted that learners are more highly motivated when their learning is supported by ICT facilities.

The authors maintained that students seem to be more engaged in activity process, show increased interest and demonstrate a longer attention span. knowing full well that students are at the centre of all teaching and learning process, their perspective play an important part in framing the activity that takes place in school setting. Indeed, it has been argued that young people should be seen as active participants in shaping social and educational process rather than viewed as passive recipient of them (Pollard & Tann 1993). Emphasizing on the perception of students in the use of ICT facilities in teaching, Ruddock & Flutter (2000), noted that young people are capable of insightful and constructing analysis of their experiences of learning in school and are able to comment on teaching approaches and context that are helpful in their learning. Therefore, the use of ICT facilities helps students to keep pace with the new trend in teaching of the English language as a second language. Observation has shown that traditional method of teaching is no longer adequate due to emergence of new ideas, information and even the demand of present educational system requiring modern facilities. Osakinle and Ekundayo (2010) citing Johnson, alluding to this noted that 'the traditional method of managing education and transmitting knowledge and skills are fast becoming inadequate to deal with the accelerated change in the educational system.

Therefore, the effective use of wide range of modern facilities opens up unprecedented opportunities for invigorating teaching in the schools and improving students' achievement in course work. The above observation is a clarion call to the need for the use of ICT facilities such as radio, television, computers, telephone, internet, language laboratory, microphone etc for effective teaching of English language especially the oral skills which depend solely on sound. In spite of the obvious advantages inherent in the use of information and communication facilities in teaching English language, it is not known through research wither information and communication technology facilities are available in Afikpo North Local Government and whether teachers use them in teaching oral English in their various schools. Perhaps, this is why Tahir (1995) had observed that there is a wide gap between Nigeria and some other countries in the area of the use of information and communication technology. He viewed that while poorer countries than Nigeria have taken advantages of integrated system, CD-ROM and others to reach out to large clientele, Nigeria is still batting with paper- based instructional materials. This points to the need to investigate the availability of ICT facilities and their extent of use of ICT in the teaching of science in Rivers State, Nigeria.

1.1. Research Questions

The following research questions guided the study:

- What are the available ICT facilities for teaching Science?
- To what extent do teachers posses the required ICT skills for teaching Science?
- What is the extent to which ICT facilities are used for teaching Science in Secondary schools?
- What extent does gender influence the use of ICT facilities in teaching science?
- To what extent does location influences the use of ICT facilities for teaching science?

1.2. Research Hypotheses

Ho1: There is no significant difference in the mean scores of male and female teachers in the use of ICT facilities in teaching Science.

Ho2: There is no significant different in the mean scores of teachers based on location in the use of ICT facilities for teaching Science.

2. Methodology

This study was a descriptive survey research design. Descriptive research designs are those studies which aim at collecting data on, and describing in a systematic manner, the characteristics, feature or facts about the give population (Nworgu, 2006). Since this study was a descriptive survey research design in which the researcher used structured questionnaire to collect data from the respondents, this study, therefore, sought to observe, describe and analyze the extent of use information and communication technology (ICT) facilities in teaching Science. This choice was made by the researchers because the study involved studying and describing certain variables in relation to a given population.

There are twenty-two (22) secondary schools in Port Harcourt. From the available record in the statistics Department of the Secondary Education Board, Port Harcourt Zone, there are four hundred and forty seven (447) secondary school teachers in the local government area. Out of this number, sixty one (61) are Science teachers. The population of the study therefore consisted of the sixty one (61) Science teachers in the local government area.

In view of the fact that the population of Science teachers in the secondary schools in the local government area was small, all the Science; teachers in the school were sampled. The sixty one (61) Science teachers in the twenty two (22) secondary schools in the local government area were therefore used for the study.

The instruments for data collection were an observation checklist and a structured questionnaire entitled Use of information and communication technology (ICT) facilities for teaching and learning Science Questionnaire (UICTFTLSQ). The observation check list contains seventeen (17) items grouped into three categories A-C. Category A is on computers and internet facilities. Category B is on multimedia facilities while category C is on telecommunication and micro –A callable and Not available. The instrument for this study was personally administered by the researcher on the respondents. The researcher distributed 61 copies of questionnaire and collected 58 copies which were returned in usable condition were rate of 95%. These 58 copies which were returned in usable condition were used for the study.

The data collected for the study was analyzed using Mean ( ) and Standard Deviation (SD) for the research questions while the hypotheses formulated for the study were tested using a t-test statistics at 0.05 level of significance.

3. Results

3.1. Research Question One

What are the available ICT facilities for teaching Science?

Table 1 Available ICT Facilities for Teacher Science

S/N	Facility	Frequency	% Available	Frequency	Not available	Decision
1	Desktop computers	44	75.9	14	24.1	AGE
2	Laptop computers	39	67.2	19	32.4	AHE
3	Internet services	20	34.5	38	65.5	ALE
4	E-email	18	31.0	40	69.0	ALE
5	Power Point	18	31.0	40	69.0	ALE
6	Digital camera	21	36.2	37	63.8	ALE
7	Multimedia projector	18	31.0	40	69.0	ALE
8	Scanner	15	25.9	43	74.1	NAA
9	Audio-tape Recorder	20	34.5	38	65.5	ALE
10	DVD Recorder	43	74.1	15	25.9	AGE
11	Television	45	77.6	13	22.4	AGE
12	Handset	43	74.1	15	25.9	AGE
13	MP3	40	69.0	18	31.0	AHE

14	Overhead projector	19	32.8	39	67.2	ALE
15	Language Lab	15	25.9	43	74.1	NAA
16	Fax Machine	0	0.00	58	100.00	NAA
17	INTERACTIVE WHITE Board	0	0.00	58	100.00	NAA
18	CCTV Camera	0	0.00	58	100.00	NAA

Key: AGE= Available to a Great Extent; AHE =Available to a High Extent; ALE= Amiable to a Less Extent; ANN= Not Available at all.

Table 1: Shows that desktop computers, audio –tape recorder, DVD recorder and television have 75.9, 74.1. 77.6 and 74.1 percentage respectively. It means that they are available for the teaching to oral English to a great extent. Laptop computers and handset have 67.2 and 67.2 and 69.0 percentages respectively. These indicate that these facilities are available to a high extent. Internet services, e-mail, PowerPoint, digital camera scanner and MSP3 have 34.5, 31.0 36.2, 31.0, 34.5 and 32.8 percentage respectively. Multimedia projection, overhead projector, language laboratory, fax machine, interactive whiteboard and close circuit camera are not available at all. These facilities have percentages ranging from 0-29%.

3.2. Research Question Two

To what extent do teachers posses the required ICT skills for teaching Science?

Table 2 Extent Teachers Possess Required ICT skills for Teaching Science

S/N	ICT Skill	x	SD	Decision
13	Keyboarding skills	3.66	0.48	VHS
14	Ability to save and retrieve documents	3.52	0.63	VHS
15	Ability to communicate with others via e-mail/internet	3.10	0.92	HS
16	Programming skill	1.53	0.80	LS
17	Ability to format document	3.03	10.03	HS
18	Ability to use projector	2.97	0.84	Hs
19	Know how to record sounds audio-tape recorder	3.60	0.62	VHS
20	Know to operate a digital camera	1.81	0.89	LS
21	Ability to use MP3 to teach pronunciation	3.81	0.89	VHS
22	Know how to boot a system	3.88	0.33	VHS
23	Know how to send text messages using handset	3.79	0.33	VHS
24	Know how to prepare slide and present PowerPoint	2.45	0.88	LS
25	Ability to import images and graphics into folders and documents	2.14	0.95	LS
Cluster Mean	3.02		.42	HS

Key**:** VHS = Very high skill; HS = High skill; LS- Less Skill

3.2.1. Results in Table II

Shows that teachers possessed skills of keyboarding, ability to save and retrieve documents, recording sounds with audio- tape recorder, use of MP3 to teach pronunciation, booting of a system booting of a system and sending text messages with handset to a very high extent skill. These items have means (x) of 3.52, 3.60, 3.81, 3.88 and 3.79 respectively with corresponding standard deviations, 48, 63, .62, 89, and .33 respectively. The respondents possessed skills of communicating with others via e-mail /internet (3.10) and use of projector (2.97) to a high extent. The respondents possessed to a less extent skills of programming, operating digital camera and importing images and graphics into folders and documents. These items have means ( ) of 1.53, 1.81 and 2.14 with standard deviation of .80, 89 and .95 respectively. The cluster mean of 3.02 and standard deviation of .42 indicate that teachers possessed ICT skill to high extent generally.

3.3. Research Question Three

What is the extent to which ICT facilities are used for teaching Science in Secondary schools?

Table 3 Extent to which ICT facilities are used for teaching Science in Secondary schools.

S/N	ICT Skill	*x*	SD	Decision
1	Desktop computers	3.47	0.57	HE
2	Laptop computers	3.64	0.64	VHE
3	Internet services	2.94	0.83	HE
4	E-mail	2.88	0.82	HE
5	PowerPoint	2.45	0.73	LS
6	Digital Camera	1.79	0.72	LS
7	Scanner	1.64	0.95	LS
8	Audio-tape Recorder	3.67	0.60	VHE
9	DVD recorder	3.60	0.70	VHE
10	Television	1.9	10.20	LS
11	Handset	3.57	0.77	VHE
12	MP3	3.53	0.80	VHE
	Cluster Mean	2.93	0.30	HS

Key: VHE = Very high extent; HE = High extent; LS= Less Extent

Result in Table III; shows that teachers use laptop computers, audio-tape recorders, DVD recorders, handset and MPS to a very high extent in teaching oral English. These items have mean scores of 3.64, 3.67, 3.60, 3.57, 3.53 and corresponding standard deviations of .64, .60, .70 and .80 respectively. Desktop computers, internet services and e-mail, have mean scores of 3.47, 2.94, 2.88 and standard deviations of .57, .83 and .82 respectively indicating that they were used to high extent in teaching of oral English. PowerPoint, digital camera, scammer and television were used to a less extent. These items have 2.45, 1. 77, 1.64 and 1.97 mean scores and .73, .72, 95, and 1.20 corresponding standard deviations respectively. The cluster mean is 2.93 indicating that teachers use the available ICT facilities in teaching oral English to a high extent.

3.4. Research Question Four

What extent does gender influence the use of ICT facilities in teaching ?

Table 4 Gender influence on the use of ICT facilities in teaching

S/N	Facility	Male x	N=27 D	Female	N- 31
1	Desktop computers	3.48	HE	3.45	HE
2	Laptop computers	3.63	VHE	3.45	VHE
3	Internet services	2.78	HE	3.10	HE
4	E-email	2.89	HE	2.87	HE
5	Power Point	2.52	HE	2.39	LE
6	Digital camera	2.00	LE	1.61	LE
7	Scanner	1.85	LE	1.45	NA
8	Audio –tape Recorder	3.56	VHE	3.77	VHE

9	DVD Recorder	3.48	HE	3.71	VHE
10	Television	1.98	LE	2.00	LE
11	Handset	3.59	VHE	3.54	VHE
12	MP3	2.93	HE	2.92	HE
Cluster Mean		2.93	HE	2.92	HE

Key: = Mean of male teachers; D = Decision of male teacher; = Mean of female teachers X 1 X D1=Decision of female teachers.

3.5. Research Question Five

To what extent does location influences the use of ICT facilities for teaching Science?

Table 5 Extent location inferences the use of ICT facilities for teaching Science

S/N X	Facility D	Male	N=27	Female	N- 31
1	Desktopcomputers	3.68	VHF	3.2	HE
2	Laptop computers	3.81	VHF	3.44	HE
3	Internet services	3.32	HE	2.52	HE
4	E-email	3.19	HE	2.52	HE
5	Power Point	2.74	HE	2.11	LE
6	Digital camera	1.97	LE	1.59	LE
7	Scanne	1.68	LE	1.59	LE
8	Audio –tape Recorder	3.68	VHF	3.48	HE
9	DVD Recorder	3.48	HE	3.71	VHF
10	Television	1.98	LE	2.0	LE
11	Handset	3.59	VHF	3.54	VHF
12	MP3	3.58	VHF	3.48	HE
	Cluster Mean	3.06	HE	2.177	

Key: *X* = Mean of urban teachers; D= Decision of urban; teachers; 1 *X* = Mean of rural teachers D1=Decision of rural teachers

Result is Table V shows that the cluster means for both urban and rural teachers were 3.06 and 2.77 respectively. These indicate that they use ICT facilities in teaching oral English to a high extent. However, the urban teachers use these facilities more than their rural counterparts as shown in items 1, 2, 8 and 12.

3.5.1. Hypotheses

HO1: There is no significant difference in the mean scores of male and female teachers in the use of ICT facilities in teaching Science.

Table 6 Summary of the t-test Influence of gender on teachers use of ICT Facilities

Gender	N	X	df	T	Sig.	Decision
Urban	27	2.93	56	0.21	0.84	NS
Rural	31	2.92				

The summary of t-test on table VI shows that t (.21) is significant at. 84. It means that 0.05 level of probability the hypothesis was postulated, the hypothesis was not significant. Therefore, the hypothesis is accepted.

H02: There is no significant different in the mean scores of teachers based on location in the use of ICT facilities for teaching Science.

Table 7: Summary of t-test influence of influence of location the teachers' use of ICT

Gender	N	X	df	T	Sig.	Decision
Urban	31	3.06	56	0.56	0.00	S
Rural	27	2.77				

The summary of t-test on Table VII indicates that t (.56) is significant at .00 which is less than .05 probability level the hypothesis was formulated. This means that the null hypothesis as stated is rejected.

4. Discussion Of The Findings

4.1. Available ICT facilities for teaching of Oral English

The results of the findings as shown in table 1 reveal that ICT facilities are available in secondary schools in Port Harcourt L.G.A to a high extent. Desktop computers, DVD recorder, television, audio- tape recorder, laptop computers and handset are the ICT faculties that are available for teaching of Science. These findings contradict an earlier study by Ukoha (2010) which revealed that the extent of availability of computers for Science teaching was not encouraging.

Two reasons mainly may account for the above findings. First, Ukoha study was conducted in 2010 while the presents study is coming six years after. This length of limit may be responsible for the consciousness, on the parts of government for the provision of ICT in schools. Secondly since secondary schools are under the state governments and the resources available to the states are not equal, it is likely to affect the fund made available by different states for the provision of ICT facilities in various schools for use by teachers of various subjects. It is also important to note that the present study was conducted in Port Harcourt L.G.A State education zone in Rivers State

4.2. ICT skills for teaching of Science

From the findings of the study as depicted in table 2 it is very clear that teachers possessed skills on the use of ICT facilities for teaching Sciences in secondary schools in Port Harcourt L.G.A. to a high extent. This findings show that teachers possessed the required skills in the following areas, keyboarding, ability to save and retrieve documents, recording of sounds with audio-tape recorder, booting of a system and sending text messages using handsets. They also possessed the skills of communicating with others via e-mail and internet and use of projector.

The above findings contradict an earlier research by Okoye (2012) on the relevance of Science teachers' knowledge and senior secondary school students' performance in learning skills. Okoye study showed that Science teachers neither had ICT skills nor the pedagogical knowledge for the case ICT in teaching secondary schools. However, the present study supports an early study by Slaouti and Barton (2007) on opportunity for practice and development of newly qualified teachers and the use of ICT in teaching Sciences in secondary schools contexts.

The result of the present study is very important because of the role ICT plays in all fields of human endeavours. The need for teachers to possess the necessary skills in the use ICT facilities for teaching of Sciences is supported by Alazam et al (2012) who had earlier observed that ICT enhances the teaching and learning process by sharpening teaching skills and by increasing students' motivations.

4.3. ICT facilities use in teaching of Sciences

The findings in table 3 reveal that teachers utilize the available ICT facilities for teaching Sciences to a high extent. Desktop computers, Laptop computers, internet services, E-mail, Audio-tape recorder, DVD recorder Handset and MP3 are the ICT facilities which teachers utilize to a high extent for teaching Sciences in secondary schools in Port Harcourt L.G.A.

The facilities of the present study contradict the study carried by Slaouti and Barton (2007). Against the findings of the present research Slaouti and Barton revealed that the ICT facilities most commonly used by teachers for teaching were words processing, PowerPoint and worldwide web. The reason for this contradiction may be as a result of the location where the studies were carried out. Slaouti and Barton (2007) carried out their research in the United States of America whereas the present study was conducted in Port Harcourt Local Government in Rivers State of Nigeria.

4.4. Influence of Gender on the use of ICT facilities for teaching of Sciences

As shown on table IV, both male and female teachers use ICT, facilities to a high extent in teaching Sciences in secondary schools in Port Harcourt Local Government Area of Rivers

State. However, they differed on their uses of such ICT facilities as PowerPoint, Scanner, DVD and handset. All the same, a hypothesis testing on the influence of gender on the teachers' use ICT facilities at 00.5 probability levels in table 6 shows no significant difference. This means that gender do not influence teachers ICT facility use in teaching Sciences in secondary schools. This findings support previous studies as reviewed in this study. For instance, the present findings are in line with the study conducted by Bazos (2014) in Turkey on the effectiveness of computer assisted instruction on students' achievement, in which gender was one of the variables in the study that revolved that gender had no significant effect on students' academic achievement. The present study also agrees with the study conducted by Lindner (2013) which aimed at finding out teachers' attitude towards the use of ICT as a teaching tool in Sweden which also found no significant difference in the attitude of the respondents on the use of ICT as a teaching tool based on gender.

The above findings are not surprising because in the present time, method of imparting knowledge and teaching has changed. The teacher now helps the students to discover things rather than telling them everything in the classroom. ICT facilities play key role in this participatory learning environment and make the work of the teacher easier. As a result, both male and female teachers should know how to make use of ICT and at the same time use them for teaching especially Sciences.

4.5. Influence of location on the use ICT Facilities for teaching Sciences

The findings of the study as indicated in table 5 shows that teachers in urban areas and those in rural locations are ICT facilities in teaching oral English to a high extent. However, urban teachers use desktop computers, laptop computers audiotape and MO3 more than their rural counterparts. However, a testing of hypothesis on the influence of location on the teachers' use of ICT facilities at 0.05 probability levels in table 7 shows significant factor in the teachers' use of ICT facilities in teaching Sciences.

The findings of this study on the influence of location on the use of ICT facilities for teaching oral English contradict the earlier study by Yusuf and Adigun (2010) which concluded that location has no influence on students' academic performance. The findings of Yusuf and Adigun are surprising because observation and other studies strongly show that location is a significant factor in students' academic performance.

Conversely, the findings of the present study support earlier studies by Lackney (1994) and Umu (2001) which concluded that location significant influence on teaching outcome and students' performance. The findings of the present study is not surprising because it is a common knowledge that in developing countries. Nigeria inclusive, urban schools are better equipped than rural schools. In other words, ICT facilities are likely to be more available in the urban schools than in the rural schools. Furthermore most ICT need electricity for supply to function which more often are unavailable in rural locations hence the use of ICT facilities for rural schools would be limited.

The above finings have implications for the government, school authority and the teachers themselves. Government should map out a sustainable strategy for short- course training programme for teachers in the state on various ICT applications to make the teachers more useful in the present dispensation. The various school authorities should organize regular hands- on training on the use of ICT for their teachers to enhance their skills. The teachers on their parts should not wait for the authorities. Personal efforts are very important if they must remain relevant in today's world of ICT. The teachers can use their weekends and holiday periods to attend private lessons on the use different ICT facilities as well as ICT packages. This study does not claim to have examined comprehensively all that need to be known about availability and extent of use of ICT facilities for teaching Sciences. As a result, there is room for further studies in the area. The researchers therefore suggests for further studies to investigate the effect of ICT facility utilization of teachers on students performance in Sciences. Practitioners in the field of ICT and Science should explore the effectiveness of academic qualifications on teachers' use of ICT in teaching Sciences and impediments of ICT use by teachers in Sciences teaching in secondary schools.

5. Conclusion

Sciences is an essential aspect of teaching. This is because it enables the learners to solve life problems speakers to communicate their feelings, emotions and thoughts thereby contributing to the growth of the human society. It therefore becomes necessary that sciences should be taught in secondary schools. The utilization of information and communication technology (ICT) has proven to be a veritable tool for the effective teaching of science Education. In view of this it is important that the nation's schools especially secondary schools where the reaching of science begins, should be adequately equipped with the necessary ICT facilities. In order to utilize ICT facilities to a very great extent, Science teachers need to possess ICT skills to a great extent. To achieve this requires the attention of governments at all levels that should ensure adequate funding of the education sector. Sciences teachers also need to be regularly sent on trainings in order to acquire the necessary skills that will enable them to utilize the available ICT facilities to a very great extent for reaching Sciences in the nation's secondary schools.

A disturbing revelation of the study was the ICT skills possessed by the teachers, which was not to a very great extent. Effective utilization of ICT facilities requires very great skills. It therefore means that some of the teachers cannot effectively utilize the available ICT facilities for teaching Sciences. One wonders how such teachers cope in era in which ICT has permeated all aspects of human endeavour including Science teaching.

Recommendations

Based on the findings and implications of the study, the following recommendations are made:

- Increased funding of education by the government to ensure that enough money is available for the procurement of ICT facilities required in schools for teaching Sciences.
- Local government authority should also partner with private individuals and organizations in order to make these ICT facilities available in schools.
- Government should come up with programmes that will enable the teachers to embark on short- term courses of ICT skills acquisition.
- The various school authorities in the Port Harcourt L.G.A should organize regular hands- on training to enhance teachers ICT skills and knowledge in ICT packages.
- The teachers should take it upon themselves to acquire the necessary ICT skills by attending computer lessons in private computer outfits on weekends and during holidays.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest exist among authors.

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