Enhancing Environmental Friendliness through Mobile Phone Learning

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Abstract

The study investigated the use of mobile phones to increase apprentices' use of mobile learning technology and to enhance environmental friendliness. Data were collected from a sample consisting of 30 male automobile apprentices and 30 female hair dressing apprentices in Iwaya community in Lagos using the "usefulness of mobile phone leaming"(UMPL) questionnaire. The apprentices were first trained on how to access text messages, electronic mails, jingles and photographs on mobile phones. This was followed, by a pre-test using the UMPL. The apprentices then voluntarily participated in a four -week programme using mobile phones to send text messages (SMS, MMS), e-mails and jingles warning against environmental pollution. Photographs of local environmental degradation were also transmitted and exchanged. At the end of the programme, a post-project test was conducted also using the UMPL. A paired t-test was used to compare pre-project and post-project means while an independent t-test sample was used to compare pre-project and post-project means between males and females at 0.05 level of significance. The participants learnt various ways of maintaining clean environments which increased their awareness on environmental friendliness. Responses on the questionnaire differ significantly between genders.

Keywords: mobile phone learning, environmental degradation, environmental friendliness, gender

Introduction

The term **mobile learning** or "m-leaning" has different meanings for different communities. It refers to a subset of e-leaning, educational technology and distance education that focuses on learning across contexts and learning with mobile devices. Mobile learning has developed over several years resulting in several research projects (Moura and Carvalho, 2008: Sharpies, Taylor, and Vavoula, 2007). M-leaning technologies include hand-held computers, MP3 players, notebooks, tablets and mobile phones. Mobile phone learning is a branch of mobile learning and is a relatively new concept which has attracted the interest of educators, researchers and developers of learning systems and instructional materials. This technology provides the potential for collaborative interaction and learning opportunity for geographically- dispersed persons and groups (Bristom, 2005).

In a society of knowledge, mobility and ubiquitous learning (learning anytime, anywhere), the emerging paradigm of m-leaning seems to meet the needs of the contemporary society (Edwards, Newman, Sedivy, Smith, Balfanz and Smeltters, 2002). Modem technologies, especially mobile phones have become an integral part of modern life around the world, increasingly powerful, with more and more features and services; providing access to content anywhere and anytime (Prensky, 2004). The preference for these technological devices lies in the fact that they are in the learners' hands and can, therefore, give a greater contribution to the education system. Mobile technologies potentially promote, facilitate and enhance learners' collaboration and interaction processes that serve as a means of accessing, discovering, discussing and sharing environmental concerns via multimedia messaging sendees (MMS), SMS, electronic mail or MSN messenger. Learners can converse with one another, question each other and share opinions about environmental concerns (Waycott, 2004).

Mobile phones have become one of the fastest grown communication technologies; today majority of them have the capacity of a PC of the nineties (Campbell, 2006). The common use of mobile phones for messaging facilitates friendships and socialisation, hence the role of mobile phones as a means of collaborative learning (Bauman, 2003; Taylor and Harper 2002). Mobile telephones with cameras permit learners to photograph

environmental problems, and serve as a means for sharing concerns with friends. Learners can thus pose questions related to the environment, collaborate with colleagues, acquire new knowledge and formulate plans to solve environmental problems (Usunbolu, Cavus, and Ercag, 2009).

As regards environmental friendliness, the natural environment provides the infrastructure on which human societies are built. However, human actions are now affecting these foundations in quite unprecedented ways. Environment friendliness or eco-friendliness refers to products or processes that are not harmful to the environment and people who want to protect the environment greens. The gender-environment relations have valuable ramifications in regard to the understanding of nature between men and women, the management and distribution of resources and responsibilities and the day-to-day life and well-being of people (Tondi, 2001).

The role of education in understanding, protecting and solving environmental problems had long been recognised. Since 2000, researchers have considered the use of environmental education in schools, colleges and universities (Shin, 2000). In Iwaya community, both the automobile and hair dressing apprentices are involved in various kinds of environmental problems. Wastes from automobile workshops include worn out vehicle parts, broken glasses, used carbide, used engine oil and rubber wastes. The automobile apprentices usually drop the worn-out vehicle parts and broken glasses by the road side thus obstructing the movement of vehicles and pedestrians. The broken glasses do puncture the tyres of vehicles and are also harmful to man and animals. Carbides and engine oil are disposed into water bodies and drainages where they pollute the water. The presence of engine oil in the water deprives aquatic animals of air which can cost them their lives and deprive man and other land animals of drinking water and aquatic livestock. Carbide is a flammable and reactive chemical and a dangerous fire and explosion hazard. It blocks drainages, increasing mosquito breeding. When breathed in, carbide can irritate the lungs causing coughing and/or shortness of breath. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath. Contact can severely irritate and bum the eyes and skin causing permanent eye damage and ulcers on the skin. Exposure can severely irritate the mouth, nose and throat causing sores, cough and sneezing. The rubber and other wastes are burnt in the open which pollutes the surrounding air.

Wastes from hair dressing saloons include empty containers of hair products such as relaxers, shampoos, pink oil and conditioners. Chemicals from the hair products include threads, attachments, used weave-on, used cutex bottles, used artificial nails, dirty water and rubbers. The hair dressing apprentices either throw away the empty containers out along the road or into gutters blocking the drainages and causing environmental blight. The chemical wash outs from the hair products and dirty water are poured into water bodies and drainages endangering aquatic lives (Childs, 2000). The various means of waste disposal by the two sets of apprentices are detrimental to the environment and need to be checked. Hence, the researcher intends to use this project to educate them on how to be environmentally friendly.

Purpose of the Study

The study investigated the use of mobile phones to increase the apprentices' knowledge of mobile learning, enhance environmental friendliness and prevent damaging of the natural foundations of our society while striving for our living.

Specific Objectives

i.   To ascertain the usefulness of mobile phone in increasing the apprentices' knowledge of mobile learning.
ii.   To assess the use of mobile phone learning in enhancing environmental friendliness.
iii.   To determine the role of gender in mobile phone learning and in environmental friendliness.

Research Questions (RQ)

RQ1: Will the apprentices' exposure to four weeks programme increase their knowledge of mobile phone learning?

RQ2: Will the apprentices' exposure to four weeks programme increase their

knowledge of usefulness of mobile phone learning in enhancing environmental friendliness?

Hypotheses

Hol: There is no significant difference between male and female apprentices in their level of awareness of mobile phone learning.

Ho2: There is no significant difference between male and female apprentices in their level of awareness of usefulness of mobile phone learning in enhancing environmental friendliness.

Methodology

Research Design

This study is a descriptive survey design comparing male and female apprentices in the level of awareness of mobile phone learning and also in the usefulness of mobile phone learning in enhancing environmental friendliness in Iwaya, Lagos. Survey design was adopted because representative sample of population under study was selected and the result generated from the study was generalised to the population under study.

Sample Selection

A sample of ten automobile workshops and ten hair dressing saloons in Iwaya, Lagos was selected. Sixty apprentices volunteered to participate in the study; 30 of which are males from automobile workshops and another 30 females from hair dressing saloons. These were taken out of a population of 146 apprentices.

Participants

The participants were mainly secondary school graduates with few that could not conclude their secondary education. The age of the participants ranged from 20-27 years. Each participant completed a pre-project and post-project questionnaire. The four-week project and training which was not part of their regular training, was conducted between April and May, 2013. The language used for instruction and training on how to access the information on mobile phones was pidgin English.

Research Instruments

A package of text messages, j ingles and photographs and also a questionnaire entitled "The usefulness of mobile phone learning (UMPL)" adapted by Motiwala (2007) was used to collect data. New items were added for use in this study to measure the apprentices' satisfaction with mobile phone learning. The 18- item Likert scale questionnaire focused on the usefulness of mobile phones for enhancing apprentices' environmental friendliness. This includes functions aimed to indicate (SD)- Strongly Disagree; (D)- Disagree; (U)- Undecided; (A) -Agree and (SA)- Strongly Agree. The respondents were personally approached and briefed about the purpose as well as the significance of the study by the researcher. Some of the participants filled the questionnaires and returned immediately while the researcher visited the next day to collect from the others.

Validity and Reliability of Instruments

The instruments for the data collection were validated by experts in educational technology. They cancelled irrelevant messages, jingles, photographs and irrelevant items from the questions, and suggested areas of modifications. Selected items, messages and jingles were revised based on their comments and recommendations to improve the quality and content validity of the instruments before administration. A trial test was conducted on a small population of 3 automobile and 3 hair dressing apprentices. The test-reset reliability method yielded reliability coefficient of 0.92. The instruments were thus considered valid and reliable to be used for enhancing environmental friendliness through mobile phone learning.

Procedure

The researcher through the union executives of both automobiles and hair dressers in Iwaya community, Yaba - Lagos announced the need for apprentices to volunteer to participate in the study using mobile phones to enhance environmental friendliness. After deliberation on this project by both unions, the researcher was given positive feedback to go ahead with their full consent on participation. The researcher later met with the

interested apprentices and enrolled them. The purpose and expectation of the study were explained to the potential participants. During this preliminary, the group discussed the environment and its related concerns. The researcher explained that the apprentices did not rate the environment as high as expected.

In the first one week, the apprentices were trained on how to access text messages, electronic mails, jingles and photographs on mobile phones. In the next one week following, a pre-test was conducted to access the level of the apprentices' awareness of mobile learning and usefulness of mobile learning in enhancing environmental friendliness.

During the four weeks that followed, the researcher exposed the participants to text messages, jingles and photographs on mobile phones. Each week, the researcher forwarded a minimum of five photographs to the participants via MMS and electronic mails. The photographs were sent to the participants with environmentally friendly massages and jingles. The participants used their mobile phones to view the photographs after which they sent their comments to the researcher through SMS and electronic mails. The participants met for discussion every week during which they reviewed the photographs and suggested possible ways for overcoming the environmental problems with the help of the researcher.

At the end of the project the apprentices, the last one week was used to conduct a post-test during which the participant completed the questionnaire a second time. The participants meet for discussion every week during which they reviewed the photographs and suggested possible ways for overcoming the environmental problems with the help of the researcher.

Samples of Pictures of some Environmentally- Degraded Areas Used for the Training:

Fig. 1: Waste being sorted for Recycling from a Refuge Dumping Site in Iwaya, Lagos

Fig. 2: Refuge Carrier Dumping Refuge in Iwaya Community, Yaba-Lagos

Fig. 3: Refuge Disposal with Carts in Iwaya

Fig. 4: Filling of Swampy Landscape with Refuse

Samples of text messages used for the training:

i.   "Please be reminded of the weekly cleaning of our workshops and environment"
ii.   "Members try and keep your workshop and environment clean because the Local Government Chairman will be visiting our area soon"
iii. "We will meet tomorrow to discuss how best to keep our canals and gutters clean"
iv.   "Try and keep the cleaning habit of our workshops, please don't relent"

Analysis of Data

The questionnaire (UMPTL) was used to access learners' attitudes towards mobile phone learning and their awareness of environmental degradation problems. A paired t-test was used to compare pre-project and post-project means while an independent t-test sample was used to compare pre-project and post-project means between males and females at 0.05 level of significance. The mean score of the five- scaled Likert items was computed as 5+4+3+2+1 = 15/5=3.00. Using the interval score of 0.05, the limit cut-off was determined as 3.00 ± 0.05 giving the upper and lower limits as 3.05 and 2.95 respectively. On the basis of this, mean score (MS) below 2.95 (i.e. <2.95) were ranked 'low', those between 2.95 and 3.04 were considered 'medium' (i.e. 2.95 £MS ^3.04), while the mean score greater than or equal to 3.05 (i.e. MS £3.05) were considered 'high'.

Results

RQ1: Will the apprentices' exposure to four weeks programme increase their knowledge of mobile phone learning?

Table 1: Paired t-test for Pre-project and Post-project Means on the UMPTL

UMPL	Mean	N	SD	Mean difference	t	Significance (two-tailed)
Pre-project	52.4	60	22.56	-42.3	1.67	0.05
Post-project	94.7	60	11.48			

*Significant at 0.05 level of significance; SD = Standard Deviation

The pre-project mean of 52.4 (SD = 22.56) and a post-project mean of 94.7 SD = 11.48) was recorded on the UMPL. The mean difference was 42.3 Table 1). The results from the paired sample comparison of the means differed significantly ($t_{60} = 1.67$, $p = 0.05$). Generally, the apprentice's knowledge of mobile phone learning increased significantly at the end of the training.

RQ2: Will the apprentices' exposure to four weeks programme increase their knowledge of usefulness of mobile phone learning in enhancing environmental friendliness?

S/N	Items	Pre-project		Post-project		Mean difference
		M	SD	M	SD	
1	MPL is an effective learning aid for learners with regard to environmental issues.	1.67	0.85	3.76	0.68	2.09
2	MPL adds values to e - learning environmental friendliness.	1.85	0.96	4.35	0.73	2.5
3	MBL is an effective method of providing information concerning environmental friendliness.	2.22	1.33	3.89	0.98	1.67

4	MPL allows converting idle into productive time in respect to environmental issues.	1.76	1.04	4.08	0.84	2.32
5	MPL allows convenient time for discussions related to environmental friendliness anywhere at any time	1.98	1.27	3.21	1.06	1.23
6	Information sent by MPL via message is very effective.	1.72	1.20	3.44	1.01	1.72
7	MPL has the potential to become a good learning tool with respect to environmental issues.	2.15	0.98	3.88	0.85	1.73
8	MPL allows instant access to environmental issues regardless of your location.	2.18	0.90	3.92	0.78	1.74
9	MPL is useful for enhancing environmental friendliness.	2.15	0.98	3.88	0.58	1.73
10	MPL is a good discussion tool for enhancing environmental friendliness.	1.89	1.05	3.74	0.94	1.85
11	MPL is an easy way for enhancing environmental friendliness.	1.93	1.29	3.90	1.04	1.97
12	MPL made is easier to understand environmental friendliness.	2.31	1.40	3.80	0.09	1.49
13	MPL makes a good forum for interaction.	2.29	1.37	3.73	1.02	1.44
14	MPL makes it easier to discuss environmental issues with colleagues.	2.44	0.99	3.86	9.87	1.42
15	MPL makes it easier to discuss environmental issues with the researcher.	2.69	1.36	3.99	1.10	1.30

16	MPL is a good platform to access information about the environment.	1.59	1.07	3.69	0.92	2.10
17	Overall satisfaction with MPL with regards to environmental friendliness is encouraging.	1.64	1.06	3.81	0.91	2.17
18	MPL can be used as a supplementary tool for any proposed project.	1.93	1.09	4.13	0.92	2.20

Table 2 shows the pre-project-post-project means and standard deviations for each UMPL items. On the post-project survey, a mean of 4 or above was obtained for items 2, 4, 9 and 18. Item 2; "MPL adds values to e-leaning environmental friendliness" the post-project mean (M = 4.36) was significantly higher than the pre-project mean (M = 1.85). Before the commencement of the project, the participants did not associate the use of mobile phone with environmental friendliness. At the end of the project, mobile phone learning increased their knowledge of environmental friendliness.

Hypotheses

Ho 1: There is no significant difference between male and female apprentices in their level of awareness of mobile phone learning after exposure to four-week program.

The descriptive statistics collected from the UMPL regarding gender are shown in Table 3. From the sample t-test of the independent sample, the mean post-project score for females was 95.25 compared to 90.88 for males. There is no significant difference between genders (P=0.05). The pre-project difference between the genders was, however, significant (P=0.05).

Table 3: Pre-project - Post-project Scores on UMPL Gender

Gender	N	Pre-project		Post-project	
		M	SD	M	SD
Male	30	56.80	18.46	90.88	7.98
Female	30	42.15	16.98	95.25	9.66

Ho2: There is no significant difference between male and female apprentices in their level of awareness of usefulness of mobile phone learning in enhancing environmental friendliness.

Table 4: t-test Analysis of the Differences in Awareness of Usefulness of Mobile Phone Learning in Enhancing Environmental Friendliness between Male and Female apprentices

Gender	N	Sum	Mean(X)	SD	t-Value Calc.	t-Value Crit.	DF	Remark
Male	30	88	1.12	0.12				
Female	30	67	2.20	0.68	2.28	1.67	60	S

*S= Significant at 0.05 level of significance

Table 4 shows the t-test comparison for the two groups. From the table, there is a statistically significant difference between the mean score of the males (1.12) and the females (2.20). The calculated t-value of 2.28 is greater than the critical value, 1.67 ($P<0.05$). There is thus a significant difference between the awareness of usefulness of mobile phone learning in enhancing environmental friendliness of male and female apprentices. The calculated t- value is greater than the critical value, therefore Ho2 is rejected.

Discussion

Apprentices' Knowledge of Mobile Phone Learning

Generally, the apprentices' knowledge of mobile phone learning increased significantly at the end of the training. The difference between the pre-project and post-project mean was high which is an indication of a marked improvement. The initial training given to the apprentices on how to access text messages, electronic mails, jingles and photographs on mobile phones contributed immensely to the success of the programme. This is in agreement with the findings of Sharpies et al. (2007) and Prensky (2004) that mobile phone learning is increasing powerfully with more and more features and services, providing access to content anywhere and anytime.

Usefulness of Mobile Phone Learning in Enhancing Environmental Friendliness

The participants now observe the environment more carefully with the use of mobile technologies (SMS, MMS and electronic mail) and this increased their awareness of environmental degradation. The participants are now highly regarding the benefits the mobile technologies and their use for considering environmental issues. Item 4;" MPL allows converting idle into productive time in respect to environmental issues" (Table 2). The participants evaluated the use of free time and its use to address environmental problem giving a post-project mean of 4.08. Item 9; "MPL is useful for enhancing environmental friendliness"; before the project commenced, the participants did not relate the use of mobile technologies with environmental friendliness (M=1.40). However, at the end of the project, their attitude changed such that they became more conscious of environmental degradation by observing the environment carefully (M= 4.21). Item 18; "MPL can be used as a supplementary tool for any proposed project." At the end of the project, the participants appreciated the potential use of mobile technologies for undertaking any research work.

Participants expressed satisfaction with using mobile phones to enhance environmental friendliness. This is in agreement with the findings of Van't Hooft and Swan (2004). The majority of the sample of 217 students liked using mobile devices, regarding ML as fun and a vulnerable learning tool.

The Role Gender Plays in Mobile Phone Learning and Environmental Friendliness

Results showed a pre-project significant difference between genders (P=0.05). There was also a significant difference between the awareness of usefulness of mobile phone learning in enhancing environmental friendliness of male and female apprentices. This result indicated that female apprentices with the mean score of 2.20 are more aware of the usefulness of mobile phone learning in enhancing environmental friendliness than male apprentices with the mean score of 1.12. This is in line with the findings of Rees and Noyes (2007) who found that females and males used mobile phone differently, males using voice callings more than females, but females using SMS more than males. It was found that females approach environmental

issues more sensitively while males use mobile technologies such as SMS, MMS and electronic mails more than females. Several researchers had also found that a greater percentage of females than males are more concerned about environmental degradation (Gardos and Dodd, 1995).

Conclusion

Mobile phone was used in this study to increase apprentices' knowledge of mobile learning and to enhance environmental friendliness. The project allowed participants to observe the deteriorated environment and to comment on them. At the end of the project, their environmental friendliness and attitude towards maintaining clean environments devoid of pollution increased. Mobile phone provided the means to engage males and females in environmental friendliness. The participants expressed satisfaction with their capability of using mobile phone to learn anywhere and anytime. They were satisfied with the technology used and it is hoped that similar projects will be carried out by other researchers.

Recommendations

From the findings of the study, the following recommendations are made:

i.   The use of mobile phone as a means of enhancing environmental friendliness should be encouraged.
ii.   The participants should be given the opportunity to engage in other activities that involve mobile learning.
iii.   Mobile phone providers should sponsor educational projects.
iv.   More research work should be carried out in mobile learning to increase its knowledge.

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