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Exploring the Perceived Influence of Mobile Learning on Environmental Awareness and Literacy among Students of Adekunle Ajasin University, Akungba-Akoko, Nigeria

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Abstract. One of the wonders of the twenty-first century is the revolution of Information Communication Technologies (ICTs), The mobile device which is used among people has the potential to support learning. Mobile learning is creating more and more space for informal learning; it becomes important to understand how the boundaries are shifting and what the implications are. The use of mobile phones in creating environmental awareness and inculcating pro-environmental behaviour have not received the necessary and adequate attention in the quest of global effort geared towards solving the myriad and life threatening environmental problems facing humanity in the 21st century. The paper ascertains students usage of mobile phone for learning; opportunities that mobile phone provide in environmental awareness and learning; the effectiveness of mobile phone on environmental awareness and learning; the usefulness of mobile phone for environmental awareness and learning; how mobile phone enhances environmental awareness and learning. Two hundred copies of questionnaire were administered and sorted; one hundred and forty six that were deemed to have been well filled were used for the study. Findings of the study revealed that students use mobile phones to perform a variety of educational tasks, are useful for creating environmental awareness, are effective learning aid for students with regard to environmental issues and are easy for creating environmental awareness. The study comes up with a framework for designing mobile learning for environmental literacy.

Keywords: Information Communication Technologies; Environmental awareness; mobile phones; Learning; Environmental literacy.

1. Introduction

One of the wonders of the twenty-first century is the revolution of (ICT) and the consequent revolution the way teaching and learning processes are being carried out. Among the ICT tools mostly owned and used among people are the mobile devices with their potential suitable learning platforms that have a lot of applications tutors and learners may use in their academic activities.

The integration of mobile phones into education carries a potential to alter traditional paradigms because they are different from traditional educational tools such as books, chalk and pencil because they enable instantaneous access to vast and growing reservoirs of information, and because they provide a growing array of permutations to communicate and share knowledge between individuals and groups independent of time and physical location (UNESCO 2012).

Mobile phone is invaluable in Adult Education as it is used to create identities, ideas and content. Massive social networking is possible via mobile phones, information is accessible and in abundance (not scarce), it modifies the role of the teacher from bank of knowledge to facilitator of learning hence the lines between formal and informal learning are being blurred (UNESCO, 2012).

Mobile learning involves the use of mobile technology, either alone or in combination with other Information Communication Technology (ICT), to enable learning anytime anywhere. Learning can unfold in a variety of ways: people can use mobile devices to access educational resources, connect with others, or create content, both inside and outside classrooms (UNESCO 2013). Mobile learning is creating more and more space for informal learning and challenging formal learning, It becomes important to understand how the boundaries are shifting and what the implications are, as well as to clarify assumptions about 21st century learning

- Devices are not procured and distributed by government (the usual top-down-elearning ICT in education approach)

-There are low levels of mobile learning initiatives in education, but outside the school walls there is massive and ever increasing uptake of the use of mobile phone in acquisition of knowledge and skills (UNESCO, 2010)

UNESCO (2013) identified the following benefits of mobile learning:

- Expand the reach and equity of education
- Mobile technologies are common even in areas where schools, books and computers are scarce. As the price of mobile phone ownership continues to decline, more and more people, including those in extremely impoverished areas are likely to own and know how to use a mobile device
- Facilitate personalised learning

Because mobile devices are generally owned by their users, highly customised and carried throughout the day, they lend themselves to personalisation in a way that shared and tethered technologies do not. Applications on mobile phones and tablets can, for example select among harder or easier texts for reading assignments depending on the skills and background knowledge of an individual user.

2. Statement of the Problem

The comprehensive plan of action endorsed by world leaders to be taken globally, nationally and locally by organisations of the United Nations system, governments and major groups in every area in which human impacts on the environment; popularly known as Agenda 21, recommended that "countries in cooperation with the scientific community, should establish ways of employing modern communication technologies for effective public outreach". It stressed the need to "use audio-visual methods especially in rural areas in mobile units", this chapter emphasised radio and television but made no reference to the ubiquitous mobile phone which has the strength of overcoming the limitations of these media. This may be as a result of the fact that the mobile phone technology had not gained prominence when the document was being packaged. This notwithstanding, the invaluable role mobile phone medium portend to play in creating environmental awareness has not been adequately harnessed. The use of mobile phones in creating environmental awareness and inculcating pro-environmental behaviour have not received the necessary and adequate attention in the quest of global effort geared towards solving the myriad and life threatening environmental problems facing humanity in the 21st century.

3. Purpose of the Study

The general purpose of the study is to explore the perceived influence of mobile learning on environmental awareness and literacy among students of Adekunle Ajasin University.

Specifically the purpose of the study is to:

- Ascertain opportunities that mobile phone provide in environmental awareness and learning
- Ascertain the effectiveness of mobile phone on environmental awareness and learning
- Ascertain the usefulness of mobile phone for environmental awareness and learning
- Ascertain how mobile phone enhances environmental awareness and learning

4. Research Questions

- What opportunities does mobile phone provide in environmental awareness and learning?
- What is the effectiveness of mobile phone on environmental awareness and learning?
- What is the usefulness of mobile phone for environmental awareness and learning?
- How does mobile phone enhance environmental awareness and learning?

5. Research Method

The population of the study is made up of students of Adekunle Ajasin University, Akungba-akoko. They are targeted because students are potential environmental extension agents, as they are availed opportunities of serving as environmental change agents in almost every endeavour they find themselves in future. The instrument used for data collection was a questionnaire adapted from Motiwalla (2007), tagged "Perceived influence of mobile learning on environmental awareness and literacy questionnaire" (QPIMLEAL). Two hundred copies of the questionnaire were administered and sorted; one hundred and forty six that were deemed to have been well filled were used for the study.

5.1 Validity of the Instrument

The instrument was subjected to face validity by giving it to experts in the Faculty of Education and Department of psychology who vetted it and the corrections were effected.

5.2 Reliability

The reliability of the instrument was ascertained using split half method. The questionnaires were administered on forty students who did not form part of the sample, the questionnaires were divided into two equal half and were correlated using pearson product moment correlation. The reliability co-efficient was 0.73.

Research Question 1: What opportunities does mobile phone provide in environmental awareness and learning?

Table 1: Summary on statement regarding opportunities provided by mobile phone in environmental awareness and learning

Questions	Response					Mean Rank	df	X^2	p
		SA	A	D	SD				
Mobile phone has the capability of enhancing environmental awareness and learning	Freq.	49	73	12	12	3.48			
	%	33.6	50.0	8.2	8.2				
	Ex. N	36.5	36.5	36.5	36.5				
Mobile phones add value to e-learning environmental issues.	Freq.	92	43	3	8	4.63			
	%	63.0	29.5	2.0	5.5				
	Ex. N	36.5	36.5	36.5	36.5				
Mobile phone allows converting idle time into productive ones with regards to environmental issues.	Freq.	62	64	10	10	3.99			
	%	42.6	43.8	6.8	6.8				
	Ex. N	36.5	36.5	36.5	36.5				
Mobile phone allows convenience in discussions related to environmental issues anywhere and anytime.	Freq.	70	54	13	9	3.98			
	%	47.9	37.0	8.9	6.2				
	Ex. N	36.5	36.5	36.5	36.5				
Mobile phones allows access to information	Freq.	68	63	5	10	4.16			

on the internet about environmental issues	%	46.6	43.2	3.4	6.8		6	43.77	< .05
	Ex. N	36.5	36.5	36.5	36.5				
Mobile phones can be used as a supplement tool for any existing course.	Freq.	47	72	21	6	3.58			
	%	32.2	49.3	14.4	4.1				
	Ex. N	36.5	36.5	36.5	36.5				
Using mobile phones with message gives users opportunity to join discussion about environmental issues without the limitation of time and space.	Freq.	72	56	10	8	4.18			
	%	49.3	38.4	6.8	5.5				
	Ex. N	36.5	36.5	36.5	36.5				
		Agree		**Disagree**					
Averaged Total	**N**	126		20			1	76.95	< .05
	%	86.3		13.7					

From the findings, it was noted that 86.3% of the respondents indicated that mobile phone provided opportunities for environmental awareness and learning, while just 13.7% indicated otherwise. Chi square result (df=1, X^2=76.959, $p < 0.05$) confirming the findings shows that the identified opportunities were highly rated with perceived 86.3% opportunities for environmental awareness and learning. Using the Friedman test (df=6, X^2=43.779, $p < 0.05$), it was further noted based on ranking that adding value to e-learning environmental issues was the greatest opportunity, while the least was the that mobile phone has the capability of enhancing environmental awareness and learning.

The result revealed that overall, satisfaction with mobile phones with regards to environmental issues is acceptable (83.6%). 92.5% concur that mobile phones add value to e-learning environmental issues. 86.3% agreed that mobile phone allows converting idle time into productive ones with regards to environmental issues. 84.9% agreed that mobile phones allows convenience in discussions related to environmental issues anywhere and anytime. 89.9% concur that it allows access to information from the website about environmental issues. 81.5 agreed that it could be used as a supplement tool for any existing course. In same vain, 87.7% agreed that using mobile phones with message gives users opportunity to join discussion about environmental issues without the limitation of time and space.

This is in consonance with the findings of Uzunboylu, et al. (2009) among other things that mobile learning is useful for creating environmental awareness (M = 4.00), it adds values to e-learning environmental issues (M = 4.02), it allows converting idle time into productive with regard to environmental issues (M = 4.04), it is a convenient platform to access discussions about environmental issues (M = 3.87), it allows access to information from the website about environmental issues (M = 3.87), it can be used as a supplemental tool for any existing course (M = 4.02), and it gives users the opportunity to join discussions about environmental issues without the limitation of time and space (M = 4.12). The findings of Motiwalla (2007) went along this direction. A study carried out by Vyas and Nirban (2014) 81% responded that it is possible to use mobile learning for mainstreaming education. Zengning (2011) in his study found that most students (M = 4.46) responded positively to "accessibility of mobile phones", they can employ the convenience of mobile phone for learning when they fail to use computers or textbooks, out of their homes. They also alluded to the fact that mobile phone helps in exploiting the "fragmented time" (M = 4.48) It affords adult learners who hardly find intact learning time a great advantage of learning. The opportunities provided by mobile learning, if properly harnessed, present effective method to disseminate environmental information that can help in enhancing positive environmental attitude and behaviour as well as engendering environmental literacy among people. Considering the reality that environmental education is majorly lifelong and goes beyond the formal classroom setting; the ubiquitous nature of mobile phone is a powerful channel for providing this education.

Research Question 2: What is the effectiveness of mobile phone on environmental awareness and learning?

Table 2: Summary on statement regarding effectiveness of mobile phones in environment awareness and leaning.

Questions	Response					Mean	df	X^2	p
		SA	A	D	SD				
Mobile phones are effective learning aid for students with regards to environmental issues.	Freq.	73	66	3	4	3.28	4	26.78	< .05
	%	50.0	45.2	2.1	2.7				
	Ex. N	36.5	36.5	36.5	36.5				
Mobile phone is an effective method for providing personalized information with regards to environmental issues.	Freq.	72	64	6	4	3.26			
	%	49.3	43.8	4.1	2.7				
	Ex. N	36.5	36.5	36.5	36.5				
Information sent by mobile phones via messages are more effective	Freq.	55	63	20	8	2.90			
	%	37.7	43.2	13.7	5.5				
	Ex. N	36.5	36.5	36.5	36.5				
Information regarding environmental issues set by mobile phones with MMS is more effective.	Freq.	54	58	17	17	2.73			
	%	37.0	39.7	11.6	11.6				
	Ex. N	36.5	36.5	36.5	36.5				
Information regarding environmental issues shared via chatting with mobile phones is more effective	Freq.	55	65	11	15	2.82			
	%	37.7	44.5	7.5	10.3				
	Ex. N	36.5	36.5	36.5	36.5				
		Agree		**Disagree**					
Averaged Total	**N**	125		21			1	74.08	< .05
	%	85.6		14.4					

From the result in Table 2, it was noted that 85.6% of the respondents indicated that mobile phone had effectiveness on environmental awareness and learning, while just 14.4% indicated otherwise. Chi square result (df=1, X^2=74.082, $p < 0.05$) confirming the findings showed that the identified areas of effectiveness at which mobile phone affect environmental awareness were about 85.6%. Using the Friedman test (df=4, X^2=26.784, $p < 0.05$), it was further noted based on ranking that the use of mobile phone as effective learning aid or assistant for students with regards to environmental issues was the highest rated , while the least was effectiveness of the use of information regarding environmental issues with MMS.

On the effectiveness of mobile phone on environmental awareness and literacy the result shows that majority of the respondents agreed that mobile phones are effective learning aid or assistant for students with regards to environmental issues. 93.1% concur that it is an effective method for providing personalized information with regards to environmental issues. 80.9% concur that information sent by mobile phones via message are effective, 76.7% says that information regarding environmental issue sent by mobile phones with MMS are effective. Lastly, 82.2% agreed that information regarding environmental issues shared via chatting with mobile phones is more effective. This confirms the findings of Uzunboylu, et al. (2009) that mobile phone is an effective learning aid or assistant for student on environmental issues (M = 3.78), mobile learning is an effective method for providing personalised information with regard to environmental issues (M = 3.80), information sent MLS via messages is more effective (M = 3.70), information regarding environmental issues shared via chatting with MLS is more effective (M = 4.07). These findings were also in consonance with those of Motiwalla (2007). Zengning (2011) along the same direction found that majority of respondents in his study (M = 4.00) opined that "instant vocabulary text messages can remind the adult learners of vocabulary tasks when they lack the initiative to learn new concepts or ideas. Environmental information, messages and directives are not in most cases general, as they differ from individual to individual, community to community and nation to nation. Mobile phone constitutes an effective channel of reaching these different groups with information that suit their unique purpose.

Research Question 3: What is the usefulness of mobile phone for environmental awareness and learning?

Table 3: Summary on statement regarding usefulness of mobile phone in environmental awareness and learning.

Questions	Response					Mean	df	X^2	p
		SA	A	D	SD				
Mobile phones are useful for creating environmental awareness.	Freq.	105	38	-	3	3.46	4	53.23	< .05
	%	71.9	26.0	-	2.1				
	Ex. N	48.7	48.7		48.7				
Mobile phones is a good discussion tool for creating environmental awareness	Freq.	78	62	4	2	3.00			
	%	53.4	42.5	2.7	1.4				
	Ex. N	36.5	36.5	36.5	36.5				
Mobile phones makes a good forum for information	Freq.	92	50	1	3	3.24			
	%	63.0	34.2	.7	2.1				
	Ex. N	36.5	36.5	36.5	36.5				
Mobile phones has the potentials to become a good learning tool with regard to environmental issues	Freq.	68	64	7	7	2.74			
	%	46.6	43.8	4.8	4.8				
	Ex. N	36.5	36.5	36.5	36.5				
Mobile phone is useful as a supplement to environmental issues.	Freq.	61	64	13	8	2.57			
	%	41.8	43.8	8.9	5.5				
	Ex. N	36.5	36.5	36.5	36.5				
		Agree		**Disagree**					
Averaged Total	**N**	136		10			1	108.74	< .05
	%	93.2		6.8					

From the result in Table 3, it was noted that mobile phone is useful for environmental awareness (df=1, X^2=108.740, $p < 0.05$). This was with 93.2% indicating its usefulness on environmental awareness, while 6.8% indicated that it was not useful. Thus it could be concluded that mobile phone has 93.2% usefulness on environmental awareness. Using the Friedman test (df=4, X^2=53.234, $p < 0.05$), it was further noted based on ranking that the usefulness of mobile phone for creating environmental awareness was the highest rated , while the least was its usefulness as a supplement to environmental issues.

97.9% respondents agreed that mobile phones useful for creating environmental awareness. 95.9% agreed that mobile phone is a good discussion tool for creating environmental awareness. Also 97. 2% agreed that mobile phones make a good forum for information. 90.4% concur that mobile phone has the potentials to become a good learning tool with regard to environmental issues. 85.6% concur that mobile phone is useful as supplement to environmental issues. The responses were all significantly confirmed by the chi square analysis. Uzunboylu, et al. (2009) confirmed that mobile learning is useful for creating environmental awareness (M = 4.00), mobile learning is a good discussion tool for creating environmental awareness (M = 3.92), mobile learning is useful as a supplement to environmental issues (M = 3.78). The findings also corroborated that of Motiwalla (2007). Zhang, et al. (2006) further lend credence when they found that 65% of their respondents opined that they record environmental information better when they use mobile devices. Effective environmental literacy and awareness creation require interaction among different stakeholders and call for dishing out varying and diverse information targeted at diverse targets. An effective medium for carrying out these tasks is the mobile phone, with its capability of disseminating a wide array of information that it can deliver to varying segment of the society. For example environmental NGOs, Government agencies, International organisations and activists can send out environmental information to the public and the public can send feedback to them for the purpose of protecting the environment or enhance environmental awareness.

Research Question 4: How does mobile phone enhance environmental awareness and learning?

Table 4: Summary on statement regarding how mobile phone enhances environmental awareness and learning.

Questions	Response					Mean	df	X^2	p
		SA	A	D	SD				
Mobile phones is easy to use for creating environmental awareness and literacy	Freq.	69	63	10	4	3.63			
	%	47.3	43.2	6.8	2.7				
	Ex. N	36.5	36.5	36.5	36.5				
Mobile phones made it easy to understand environmental literacy	Freq.	76	59	6	5	3.70			
	%	52.1	40.4	4.1	3.4				
	Ex. N	36.5	36.5	36.5	36.5				
Mobile phone makes it easier to discuss environmental issues with other learners.	Freq.	66	66	8	6	3.54			
	%	45.2	45.2	5.5	4.1				
	Ex. N	36.5	36.5	36.5	36.5				
Mobile phone makes it easier to discuss environmental issues with other stakeholders.	Freq.	64	50	21	11	3.32			
	%	43.8	34.2	14.4	7.5				
	Ex. N	36.5	36.5	36.5	36.5		5	25.45	< .05
Mobile phone is a convenient plat form to access discussions about environmental issues.	Freq.	50	73	10	13	3.07			
	%	34.2	50.0	6.8	8.9				
	Ex. N	36.5	36.5	36.5	36.5				
Mobile phones allow instant access to environmental issues regardless of your location.	Freq.	82	45	9	10	3.74			
	%	56.2	30.8	6.2	6.8				
	Ex. N	36.5	36.5	36.5	36.5				
		Agree		**Disagree**					
Averaged Total	**N**	127		19			1	79.89	< .05
	%	87.0		13.0					

Table 4 shows that majority of the respondents affirmed that mobile phone enhanced environmental awareness and learning (df=1, X^2=79.890, $p < 0.05$). This was such that 87% of the respondents indicated how mobile phone enhanced environmental awareness and literacy, while 13% said otherwise. From the Friedman test (df=5, X^2=25.450, $p < 0.05$), it was further noted based on ranking that the highest rated on the usefulness of mobile phone was that it allow instant access to environmental issues regardless of their location. The least was the usefulness of mobile phone as a convenient platform to access discussions about environmental issues.

It was noted that 90.5% agreed that mobile phones is easy to use for creating environmental awareness. 92.55% agreed that mobile phones made it easy to understand environmental awareness. Majority greed that mobile phone makes it easier to discuss environmental issues with other students (90.4%), and the distributor (78%). It was also confirmed by majority (84.2%) opined that mobile phone is a convenient platform to access discussion about environmental issues. Lastly, 87% concur that mobile phones allow instant access to environmental issues regardless of your location. The results were all significantly confirmed by the chi square result. This lend credence to Uzunboylu, Cavus & Ercag (2009) who found that mobile learning is easy to use for creating environmental awareness (M = 3.75), it makes it easy to understand environmental awareness (M = 3.90), it makes it easier to discuss environmental issues with other students (M = 3.80), it is a convenient platform to access discussion about environmental issues (M = 3.87), it allows instant access to environmental issues regardless of location (M = 3.850). The findings did not depart from those of Motiwalla (2007). Environmental issues are somehow complex and confusing, understanding them for the purpose of exhibiting pro-environmental behaviour requires reducing them to the level of the least knowledgeable in the society; those who can read and write and those who cannot, those who are exposed and those limited in learning and knowledge, the old and young including children. There is therefore the need to

disseminate environmental awareness and literacy in such a manner that the simplicity it requires is taken into consideration. Mobile phone can be used to achieve this, as it avails learners the opportunity to access, discover, discuss and share environmental issues through multimedia messaging services (MMS), short message services (SMS), electronic mail, whatsapp, video calls, voice calls and online social media (facebook, likendin, etc) .

6. Conclusion and Implication.

The challenge of environmental degradation to human survival is enormous and complex. This calls for concern and requires devising means by which every individual will be mobilised to take action geared towards saving the planet. Mobile learning promises to help in this direction; as it is readily accessible, easy to use, flexible, simplifies learning and removes the impediment to learning and more so people see it as an effective device for learning and are willing to use it for learning. Environmental education goes beyond learning in the formal sector, it is more pronounced in the non-formal sector because environmental problems are occurring on daily basis and take new dimensions over time, therefore effective environmental education is the one that individuals can be exposed to throughout their lifetime and can be accessed anytime, anywhere. Environmental issues and problems like flooding, desertification, ocean encroachment, deforestation, pollution, waste disposal, ozone depletion and others can be packaged through mobile learning to promote reflection levels for environmental degradation and the need to protect the environment. It will also go a long way to resolve the inadequacies and problems arising from the use of the common didactic approach to environmental education and education for sustainable development.

7. Recommendations

- Given the educative potentials of mobile phone in environmental education, government and other stakeholders should come up with policies that will ensure the availability of phones to all the citizens of Nigeria.
- International organisations concerned with environmental issues and education should give recognition to mobile phone as a channel for disseminating environmental education.
- Government should partner with phone manufacturing industries on mass production through recycling and reuse of mobile phones.
- Communication service providers should design applications environmental issues and problems like early warning signals, environmental feedback mechanisms, coping with environmental disasters, mitigating environmental problems like climate change and so on.
- Efforts should be coordinated for further development of mobile pedagogies that are targeted toward environmental education.
- Researches should be endowed on long term and large scale research on environmental mobile learning; this should focus on out of school environmental learning.
- Government should work in collaboration with educational institutions to develop environmental mobile learning policies.
- Government should collaborate with communication service providers on the possibility of coming up with more flexible or lower cost or free access.
- A mobile learning professional development programme should be set up which according to Ferry (2009) includes –a technological aspect and a pedagogy aspect. The technology aspect includes a basic understanding of telecommunication networks and providers, sufficient for participants to know to know the cost implications of approaches they may adopt, an understanding of the mobile phone functionality and ability to send, receive and manage messages using a SMS. The pedagogy aspect includes some understanding of the mobile phone

communication culture of young and elderly people, and some understanding of the learning of these segments of people. This needs to be supported by a professional learning framework, such as action learning in order for teachers and facilitators to develop the skills and knowledge needed to successfully integrate mobile learning into teaching and training programmes.

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