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The Relationship between Online Interaction and Academic Performance of Distance E-Learners in a Nigerian University

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Abstract
Distance e-learners are expected to participate in an e-learning environment and interact with the content, colleagues and facilitators through distance education technologies. Learning environment goes a long way to determine student's academic performance. Hence, this study tends to find out relationship between online interaction and distance e-learners. The purpose of the study was to analyze the correlation that exists between learner-content-interaction (LCI), learner-learner-interaction (LLI) and learner-instructor-interaction (LII) and academic performance of distance e-learners in a Nigerian university. Two research questions were designed to guide the study. A descriptive design of survey type was adopted for the study and a questionnaire was used to collect the quantitative data. The study was conducted in four selected study centres of National Open University of Nigeria (NOUN) and a total of 1,025 participants completed the survey-based questionnaire. The researchers used Spearman's correlation to determine if correlation exists on each type of interaction. The findings of this study revealed that learner-learner-interaction was the only factor that was significant($r = .066$, p-value = .034), with very small weak correlation out of the three types of interactions discussed in this study. Findings also revealed that all the three types of interactions were significant (LCI, $r= .121^{**}$ $p=0.009$; LII, $r=.108^{*}$, $p=0.018$; LLI, $r = .105^{*}$, $p = 0.023$) for female distance e-learners but none was significant for male distance e-learners.Based on the findings of the research, recommendations have been made which will assist Nigerian university policy makers and course developers with a view to improving the academic performance of distance e-learners.

Keywords: Analysis, Academic Performance, Influence, and Distance E-Learners.

1. Introduction

The modern world is experiencing changes in different parts of life, and the most recent decade of the twentieth century and the start of the twenty-first century have seen gigantic advances, particularly in the field of ICT, changes that keep growing at a rapid pace. The field of education is a standout among the most conspicuous zones influenced by this innovation, which has resulted in the development of different types of learning, for example, distance learning. Onasanya, Ayelaagbe and Laleye (2015) noted that the 21st century which has been regarded as century of knowledge has better prospects for adult education to move forward with globalization trends. The development of any nation depends on the quality of adults that nation has, therefore they should be exposed to the various innovations of this century. They further remarked that it is the adults who will transform the nation, not the children, therefore adult education should be a pacesetter to other professions in developmental drive of any nation. There should be radical incorporation of mobile phones (e-learning) into adult education programmes to enable the nation achieve the education for all goals.

With the development of technology, distance and online education provides a wide range of interactive learning opportunities (Donnelly, 2010). Interaction is defined from various perspectives, within different contexts, based on the participants involved and the level of their engagement (Bernard, Abrami, Borokhovski, Wade, Tamim, Surkes, & Bethel 2009). According to Allan (2008), e-learning is an interactive learning that allows the learner to interact with the content, with colleagues and the instructor, whether synchronously, through such tools as chat rooms, shared whiteboards and video conferencing or asynchronously, through e-mail and group news. Thread discussions and discussion forums also provide interactivity. This is the main feature of e-learning which can be defined as electronic interaction between the learner and instructor, learner and learner and learner and content. The purpose of this paper was to find out the influence of these types interaction on academic performance of distance e-learners in Nigeria.

Interaction has been observed to be a basic component for the general achievement and adequacy of distance education and e-learning (Sher, 2009). Shih, Martínez-Molina and Muñoz (2008) conducted an in-depth study on the role played by facilitators in e-learning and concluded that instructors can improve effectiveness of e-learning by providing constructive and prompt feedback to the students. Numerous researchers have considered interaction as the most vital part of any learning environment (Woo & Reeves, 2007), and essential in interactions in both traditional (Tirri & Kuusisto, 2013) and distance and online educational settings (Woo & Reeves 2007 & Bernard et al. 2009). Arbaugh and Benbunan-Fich (2007) viewed interaction as the key part of distance and web learning. Is interaction a major determinant of academic performance of distance e-learners in a Nigerian setting? This is the interest of this paper.

Nesliha and Mustapha (2016) remarked that teachers and students of the modern age encountered a new challenge of meeting up with the 21st century demands. This challenge can be overcome by creating student-centered learning environments. Distance learning environments are quite much more student-centered learning environments entailing students' self-propelled actions to acquire knowledge. Nesliha and Mustapha (2016) noted that it is a big challenge for graduates of conventional mode of education to become accustomed with distance learning programs heavily based on learner to content, learner to instructor, or learner to learner interaction. Under conventional methods of learning and before the incorporation of ICT into teaching and learning, many studies have reported that interaction between students and teachers has influenced their academic performance. The present study therefore examined the influence of interaction between student and instructor, student and content, student and student on academic performance of distance e-learners.

Garrison and Anderson (2003) mentioned that that all types of learning happen as interactions between instructors, learners and content. They recommended six sorts of interaction, of which the three most imperative are learner-instructor, learner-learner, and learner-content. These three vital types of interaction in e-learning are considered in this paper.

2. Review of Literature

2.1 Learner-Content Interaction

The learners' interaction with the content, through website links, e-libraries and laboratories, and the influence on their academic performance was one focus of the present study. In Turkey, Nesliha and Mustapha (2016) found that learner-content interaction has positive effect on achievement and the success of distance education. According to them, this was determined by the structure and the quantity and quality of interaction between instructor and learner. In the USA, Ramos and Yudko (2008) applied a stepwise multiple regression analysis to explore whether the count of page hits, discussion posts and/or discussion reads (as proxies of student-content and student-student/instructor interactions) could predict learning outcomes. Analysing trace data collected by LMSs from two online courses, Ramos and Yudko (2008) revealed that the count of page hits (the frequency in which each student viewed the content pages at the class site) as the only and dependable indicator of academic success. This finding has resulted in the conclusion that student-content interaction was crucial in predicting learning outcomes. The final regression model in the above study showed that the best predictors of students' final grades were the count of forum postings, the count of messages sent and the count of assessments completed. Agudo-Peregrina et al. (2014), in their study done in Spain, suggested a framework for the investigation of the impacts of the interaction types measured through the use of trace data on academic performance in both online and mixed learning courses. In the USA, Alstete and Beutell (2004) found that the strongest predictor of student performance in online classes was discussion board usage. This finding was supported by the way that the quantity of student sessions emphatically and essentially identified with general course performance. The literature above showed that these studies were conducted in developed countries, mainly the USA, where ICT is more mainstream, which enable the students to have access to ICT facilities in order to participate in online discussion and engage with course contents online. Will similar results surface in a developing country like Nigeria, where technology development and ICT use is relatively new? It is on

this ground that the present study attempts to determine if learner-content-interaction affect academic performance of distance e-learners. The results of the finding revealed what the outcome was in a Nigerian setting.

2.2 Learner-Learner Interactions

Interactive environments replaced direct human interaction. The relevance of this to the academic achievement of learners was one concern of this study. In London, it was discovered imperative that ICT utilisation in education gives proper consideration regarding each available form of interactivity (Garrison & Anderson, 2003). Tirri and Kuusisto (2013) noted in their study done in Finland that learning happens when a student interacts with different students or with a situation, paying little respect to a subject area, instructional design or the innovation in place as a part of the learning process. Gutierrez et al. (2007) reported in their study conducted at the University of the Philippines-Diliman that the learners' interaction with their companions gives more noticeable benefits to the achievement of learning outcomes. It is interesting to note that these studies were conducted in both developed and developing countries with different cultural backgrounds, but with similar findings. The reason could be that in an online discussion forum, students were privileged to exchange knowledge and ideas with their peers, instructors, faculty members and engage with the learning environment. Is this applicable to distance e-learners that interact on i-learning or Internet learning discussion forums where they interact with their colleagues, course content and facilitator? This study suggested answers to this question and made a finding. The above literature clearly showed that these studies were conducted outside the Nigerian context but the present study was keen to determine if learner-learner interaction is a key factor in academic performance, as postulated in research question. The results of the finding revealed what the outcome was in a Nigerian setting.

2.3 Learner-Instructor Interaction

In Finland, Hargreaves et al. (2010) recommended that viable interactive teaching, which is recognised by consistent mutual interaction between the teacher and the learner, involves the exchange of thoughts and not conventional methods of dictation, response and feedback which results from a teacher's questions. Muijs and Reynolds (2010) in their study conducted in Australia distinguished interactive learning in terms of the nature and efficacy of the interaction between the teacher and the students. They recommended that interaction empowers the instructor to affirm that the learner comprehends the content that has been taught. It helps the students to practise and master target skills and obviously highlights the way they think. It additionally helps the instructor to offer focused learning support. Many studies conducted at the State University of New York, the University of Central Florida and the University of Nebraska (Diedrich, 2010; Nugent, 2009; Knoell, 2012) revealed that students-teacher interactions are significant to students' academic performance. Agudo-Peregrina et al. (2014) found that academic performance mostly depended on student-instructor and student-student interactions in internet learning settings at Universidad Politechnica de Madrid in Spain. Miyazoe and Anderson (2010) in their study conducted at the Universities of Tokyo and Taipei found that the learner-instructor interaction was the most effective in distance learning situation. All the studies reviewed above were conducted mostly in advanced countries and they all reported that student-teacher interaction influenced academic performance in either traditional or distance education. The reason may be that the mode of teaching in advanced countries encourages teacher and students' interaction and probably discourages a teacher-dominated approach, which in turn reflects in their academic performance. It is pertinent therefore to determine if learner-instructor-interaction affect academic performance of distance e-learners in Nigeria as a developing country. The results of the finding revealed what the outcome was in the Nigerian setting.

Marks, Sibley & Arbaugh (2005) investigated the significance of student-student, student-instructor and student-content interaction types as predictors of perceived learning and satisfaction with an online course at the University of Wisconsin. They included perceived advantages of online courses, students' personal characteristics and experience with online learning environments as variables in the structural equation modelling analysis. Their findings revealed that student-instructor interactions were the strongest predictors of perceived learning. Interactions among students were also positively associated with perceived learning, but the strength of the association was much lower than in the case of student-instructor interactions. Only certain student-content interactions (i.e., individual and group projects) were significantly associated with perceived learning and students' satisfaction (Marks et al., 2005). Marks et al.'s study was carried on outside Nigeria and with on-campus students but the present study was carried out in Nigeria to investigate the influence of student-student, student-instructor and student-content interaction on academic performance of distance e-learners. The present study is also in invariance with Mark et al.'s study because interaction as predictors of academic performance is the interest of study.

2.4 Gender and e-learning

Gender has been viewed as a determinant of academic achievement in the distance learning environment. The relationship between gender and the academic achievement of students has been discussed for a considerable length of time (Eitle, 2005). Nur-Mustafa (2014) remarked that in recent years studies on gender have revealed an aspect of life which gains huge benefits from the utilization of technology. Many researchers such as (Funmilayo, 2013;

Gargallo-Castel, Becta, 2008) remarked that gender differences have been recorded in terms of classroom interaction, teaching practice, skills acquisition, information literacy behavior, professional development and reading habits in the extensive educational domain. Odufuwa (2012) found that female usage of computers in Nigeria to be between one-third and one-quarter that of their male counterparts. Mahmood(2009) reported that males to be more likely to use computer technologies than their female counterpart. Wong & Horvat, Oreski and Markic (2011) reported no differences in male and female usage of ICT. Nesliha and Mustapha (2016) who found that there was no statistically significant difference between the interaction and academic performance of male and female students and the reason may be due to the background of the students. Coldwell, Craig, Paterson and Mustard (2008) and Kunhi Mohamed (2012) reported female students were more actively engaged in online discussions and outperformed than their male counterparts in online courses. Fink (2007) found males to be more actively engaged in online discussions by comparison to females. Chinyamurindi, & Shava (2015) reported a female dominance in hardware, software, mobile and internet usage, and e-learning usage for educational purposes while (Ikolo and Okiy, 2012) reported a male dominance in their study. The present study therefore examined the influence of online interaction on academic performance of male and female distance e-learners.

These studies done in USA, Spain and Turkey (Lim & Morris, 2009; Martínez-Caro, 2011; Tello, 2007; Yukselturk & Bulut, 2007) indicated that gender has no significant effect on students' online learning performance. This may suggest that the success of students depend on their ability to adjust faster and comfortably in an online learning environment. Interestingly, these studies were done in those countries that had online learning systems in place for a long period and where students are believed to be comfortable with an online learning environment. However, the current study was done in Nigeria where online learning was introduced recently.

3. Purpose of the study

The purpose of this research was to determine the influence of online interaction on academic performance of distance e-learners in a Nigerian university. More specifically, the researcher wanted to find out if variable like learner-content-interaction, learner-learner-interaction and learner-instructor-interaction influence academic performance of distance e-learners.

4. Research Questions

The following research question were asked with the view to achieving the overall aim of the study:

- What correlations exist between learner-content-interaction, learner-learner-interaction and learner-learner-interaction and academic performance of distance e-learners?
- Is there any correlation between learner-content-interaction, learner-learner-interaction and learner-learner-interaction and academic performance of distance e-learners when splitting the data by gender?

5. Research Methodology

This study adopted a descriptive design of survey type and a questionnaire was used to collect the quantitative data. The South-West geopolitical zone of Nigeria was the focus of this study. The population was the total number of distance learners in different faculties and different years of studies in all the study centres in NOUN in the geopolitical zone. This geopolitical zone is made up of six states – Lagos, Ekiti, Oyo, Osun, Ondo and Ogun, with 13 different study centres. The study was conducted in the four selected study centres of the university and a total of 1,025 participants completed the survey-based questionnaire. In total, the researcher retrieved 1050 from the four study centres out of 1400 distributed. There were 25 questionnaires that were considered to be spoilt because they were partially completed, illegible, or contradicted entries. At the end of the exercise, the researcher used data from 1025 questionnaires for data analysis. This study applied convenience sampling for the quantitative aspect because it was an easy way to contact participants and collect information within a short period of time. The questionnaire for this study was adapted from Aboderin (2011), Algahtani (2011), Martha (2009) and Owino (2013) in order to meet the needs of this research. Experts in Educational technology and Computer Education concurred that the items in the questionnaire were appropriate to measure the intended variable and therefore concluded that it had validity. The reliability was determined by computing the Cronbach's Alpha coefficient for each construct's items in the instrument and it was found to be 0.95 for the whole scale which indicated that the questionnaire tool was highly reliable. The retrieved questionnaire were analysed using Spearman's Correlation Coefficient.

6. Research Findings

Research Question one: What correlations exist between learner-content-interaction, learner-learner-interaction and learner-learner-interaction and academic performance of distance e-learners?

Table 1: Spearman's Correlation Coefficient on Interactive Learning

			ACADPERF	**LCI**	**LII**	**LLI**
Spearman's Rho	ACADPERF	Correlation Coefficient	1.000	.050	.017	.066*
		Sig. (2-tailed)	.	.110	.581	.034
		N	1025	1025	1025	1025
	LCI	Correlation Coefficient	.050	1.000	.452**	.412**
		Sig. (2-tailed)	.110	.	.000	.000
		N	1025	1025	1025	1025
	LII	Correlation Coefficient	.017	.452**	1.000	.554**
		Sig. (2-tailed)	.581	.000	.	.000
		N	1025	1025	1025	1025
	LLI	Correlation Coefficient	.066*	.412**	.554**	1.000
		Sig. (2-tailed)	.034	.000	.000	.
		N	1025	1025	1025	1025
*. Correlation is significant at the 0.05 level (2-tailed).						
**. Correlation is significant at the 0.01 level (2-tailed).						

For **learner-content interaction (LCI),** Table 1 illustrates that the Spearman's Rho correlation coefficient r = .050 computed for learner-content interaction and academic performance (ACADPERF) was positive with significance or p-value = .110 which is greater than Alpha = 0.01 or Alpha = 0.05. This implies that no correlation exists between LCI and academic performance.

For **learner-instructor interaction (LII),** Table 1 illustrated that the Spearman's Rho correlation coefficient r =.017 computed for learner-instructor-interaction and academic performance was positive with significance or p-value = .581 which is greater than Alpha = 0.01 but less than Alpha = 0.05. This implies that no correlation exists between LII and academic performance.

For **learner-learner interaction (LLI),** Table 1 illustrates that the Spearman's Rho correlation coefficient r = .066 computed for learner-learner interaction and academic performance (ACADPERF) was positive with significance or p-value = .034 which is greater than Alpha = 0.01 but less than Alpha = 0.05, This implies that a positive correlation exists between LLI and academic performance although the strength of the correlation was weak.

Research Question two: Is there any correlation exists between learner-content-interaction, learner-learner-interaction and learner-learner-interaction and academic performance of distance e-learners based on gender?

Table 2: Spearman's Correlation Coefficient on E-Interactive Learning by Splitting Based on Gender

	Gender			**ACADPERF**	**LCI**	**LII**	**LLI**
Spearman's Rho	Female	ACADPERF	Correlation Coefficient	1.000	.121**	.108*	.105*
			Sig. (2-tailed)	.	.009	.018	.023
			N	474	474	474	474
		LCI	Correlation Coefficient	.121**	1.000	.484**	.401**
			Sig. (2-tailed)	.009	.	.000	.000
			N	474	474	474	474
		LII	Correlation Coefficient	.108*	.484**	1.000	.569**
			Sig. (2-tailed)	.018	.000	.	.000

			N	474	474	474	474
		LLI	Correlation Coefficient	.105*	.401**	.569**	1.000
			Sig. (2-tailed)	.023	.000	.000	.
			N	474	474	474	474
	Male	ACADPERF	Correlation Coefficient	1.000	-.013	-.067	.034
			Sig. (2-tailed)	.	.756	.114	.430
			N	551	551	551	551
		LCI	Correlation Coefficient	-.013	1.000	.421**	.418**
			Sig. (2-tailed)	.756	.	.000	.000
			N	551	551	551	551
		LII	Correlation Coefficient	-.067	.421**	1.000	.536**
			Sig. (2-tailed)	.114	.000	.	.000
			N	551	551	551	551
		LLI	Correlation Coefficient	.034	.418**	.536**	1.000
			Sig. (2-tailed)	.430	.000	.000	.
			N	551	551	551	551
**. Correlation is significant at the 0.01 level (2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

For **learner-content interaction (LCI),** Table 2 revealed that a positive correlation does exist between LCI and academic performance of female distance e-learners although the strength of the correlation was weak. But no significant correlation exists between LCI and academic performance of male distance e-learners.

For **learner-instructor- interaction (LII),** Table2 further revealed that a positive correlation does exist between LII and academic performance of female distance e-learners, although the strength of the correlation was weak. But no significant correlation exists between LII and academic performance of male distance e-learners.

For **learner-learner interaction (LLI),** Table 2 further revealed that a positive correlation does exists between LLI and academic performance of female distance e-learners although the strength of the correlation was weak. But no significant correlation exists between learner-learner interaction and academic performance of male distance e-learners.

7. Discussion

Previous studies (Nesliha & Mustapha, 2016; Ramos & Yudko, 2008) revealed that LCI plays a significant role in academic performance of distance or online students. However, this study showed there was no statistically significant correlation between LCI and academic performance of distance e-learners as shown in Table 1. This may be because the interaction between distance e-learners and their course contents online do not play a significant role in academic performance of distance e-learners. This may also be because the amount of interaction that learners have with the content does not reflect in their academic performance. This result of the current study is in disagreement with Bernard, Abrami, Borokhovski, Wade, Tamim, Surkes and Bethel, (2009) who reported that learner-content interaction has a greater influence on learning outcomes in asynchronous settings.

Many studies (Diedrich, 2010; Nugent, 2009; Knoell, 2012) revealed that student-teacher interactions are significant to students' academic performance. However, the result of this study showed that no statistically significant correlation exists between learner-instructor interaction and academic performance of distance e-learners as shown in Table 1. This may be because LII is not efficient enough to bring about effective learning that the learners need. This study is not in line with Agudo-Peregrina et al. (2014) who recommended that academic performance mostly depended on student-instructor and student-student interactions in Internet learning settings. This study is also in contrast to Miyazoe and Anderson (2010) who revealed that the LII type of interaction is the most effective in distance learning situation.

Many studies (Kolloff, 2011, Algahtani 2011) have shown that LLI has positive impact or influence on academic performance of students. Interestingly, the results of this study showed that positive and statistically significant correlation exists between LLI and academic performance of distance e-learners although the strength of the correlation was very weak, as shown in Table 1. This may be because the online discussion forums among the learners play a role on the academic performance of distance e-learners. This may also be because the amounts of

interaction that distance e-learners have with the course content reflect in their academic performance. This study is in agreement with Rugendo (2014) who found that learner-to-learner interaction influenced academic performance of distance learners. This study is in line with Agudo-Peregrina et al. (2014) who reported that academic performance mostly depends student-student interactions in Internet learning settings. This study is also in agreement with Algahtani (2011) who found there was a statistically significant correlation (at 0.01 level) in learning interaction through e-learning and academic performance of distance learners.

There was a statistically significant correlation ($r= .121^{**}$ $p=0.009$) between learner-content-interaction and female distance e-learners' academic performance (see Table 2). This implies that a positive correlation does exists between LCI and academic performance of female distance e-learners although the strength of the correlation was weak. This may be because female distance e-learners are more actively engaged with course contents online than their male counterparts. It may also be that female distance e-learners improve productivity through LCI than their male counterparts. This may because the female learners prefer to discuss their course contents with their colleagues while the male counterparts prefer to learn on their own. It is worthy of note that this result is in disagreement with the study carried out in a developed country by Nesliha and Mustapha (2016) who found that there was no statistically significant difference between the interaction and academic performance of male and female students and the reason may be due to the background of the students.

The result also revealed there was a statistically significant correlation ($r=.108^{*}$, $p=0.018$) between LII and female distance e-learners' academic performance (see **Error! Reference source not found.**). This may be because female distance e-learners built a productive relationship with the instructor under an e-learning setting. This may also suggest that the female distance e-learners communicate and enjoy contacting their instructors online than their male counterparts. This result was consistent with another study by Coldwell et al., (2008) and KunhiMohamed (2012) who found that students who participated more frequently in discussion forums obtained significantly higher grades. It is interesting to find out that although the above study was conducted in Australia, a developed country, a similar finding surfaced in a developing country like Nigeria.

The result revealed further that there was a statistically significant correlation ($r = .105^{*}$, $p = 0.023$) between LLI and female distance e-learners' academic performance (see Table 2). This implies that a positive correlation does exists between LLI and academic performance of female distance e-learners, although the strength of the correlation was weak. This may suggest that female distance e-learners prefer to interact with their colleagues on the discussion forum and build a productive relationship with their colleagues but their male counterparts prefer to learn on their own. This may also suggests that female distance learners with similar goals and objectives study together, which resulted in better academic performance because this brought about better understanding of course materials. Interestingly, this result was quite consistent with another study by Coldwell et al., (2008) and Kunhi Mohamed (2012) who reported female students were more actively engaged in online discussions and outperformed than their male counterparts in online courses despite the fact that the study was carried out in Australia. This finding is in contrast to Fink (2007) who found males to be more actively engaged in online discussions by comparison to females.

8. Conclusion

The study concluded that learner-learner-interaction was the only factor that was significant, with very small weak correlation out of the three types of interactions discussed in this study. However, when the sample was split into male and female, all the three types of interactions were significant for female distance e-learners but none was significant for male distance e-learner as explained (see Table 2).

9. Recommendation

The findings revealed that interactive learning affects academic performance of female distance e-learners. The researcher therefore recommends that the university should improve on the existing e-learning interactive forum (i-learn) and students should be encouraged to fully participate in the discussion forum. Educational stakeholders, policy makers and planners should equally establish an e-learning interactive forum for other higher institutions. This will assist distance e-learners and other students to meet for discussions based on their studies and this should be monitored by university management to ensure effectiveness. For i-learn currently existing in the university to be successful live teleconferencing facilities should be made available to all the study centres across the nation. The researcher also recommends that instructional designers and curriculum developers should employ the modern technologies to increase the interactive system of delivery that are supposed to take learner characteristics and needs into account.

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