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ENGAGEMENT IN MOBILE LEARNING AS A CORRELATE OF ACADEMIC PERFORMANCE AMONG SCIENCE EDUCATION STUDENTS IN PUBLIC UNIVERSITIES IN ENUGU STATE, NIGERIA

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ABSTRACT: *This study determined engagement in mobile learning as a correlate of academic performance among science education students. The correlation survey research design was employed. The population of the study comprised 83(34 males and 49 females) science education level 3 students of 2017/2018 academic session in the two public universities in Enugu State. The sample was all the eighty three (83) science education level 3 students since it is manageable. Two instruments; Students' Engagement in Mobile Learning Questionnaire (SEMLQ) and Students' Academic Performance Proforma (SAPP) developed by the researchers were used to collect data. The SEMLQ was subjected to reliability analysis using Cronbach Alpha Method. Data collected were analyzed using multiple regression analysis to answer the research questions and test the hypotheses at 0.05 level of significance. The result showed that: the regression/beta coefficients (β) associated with each of the predictor variables in predicting students' academic performance was significant. A coefficient of determination (R^2) of 0.77 obtained indicated that 77% of variation in students' academic performance was attributable to students' engagement in mobile learning compositely; gender does not significantly moderate the prediction of students' academic performance*.

KEYWORDS: engagement, mobile learning, academic performance, science education students, public universities Enugu state, Nigeria

INTRODUCTION

Information and Communication Technology (ICT) is a fast growing sector around the world. The advancement in ICT has brought about several developments and produced rapid changes in society by shaping the new global economy. Modern technology creates a friendly atmosphere and engages students in active learning. Over the past decades, Information and Communication Technology (ICT) has been recognized as an added value in the classroom and, since then, efforts have been made by different stakeholders in the field of education, including scientific community and governments in order to generalize its use and consequently improve the teaching and learning process (Liu, 2010).

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Despite the emergence of ICT in education, the trend of low academic performance is not limited to secondary schools but also rampant among students of tertiary institutions. Nikana (2008) claims that students' performance may increase through the use of technological devices because students could be participating in group discussion and dialogue more often and receive quick and effective feedback, which may reinforce learning and increase memory retention. Students in higher educational institutions that engage in mobile learning may tend to perform better than those who do not.

Engagement in m-learning therefore represents active participation in learning supported by mobile devices, and typically occurs both in and beyond the boundaries of formal learning environments. For students to become engaged in m-learning, some self-direction in learning is required, whereby students participate in learning related activities with their mobile devices that extend beyond the boundaries of formal classes. In this study, consideration of students' engagement in m-learning focused on five dimensions of activities: (i) student-student activities (ii) student-teacher activities (iii) student-content activities (iv) assessment related activities and (v) outcome related activities.

Student-student activities involve engagement in m-learning whereby students are actively engaged in discussions and group work, including formal and social interactions supported by mobile devices. Student-teacher activities focus on engagement in m-learning where students use their mobile technologies to communicate, interact, and undertake meaningful learning tasks guided by their teachers. Student-content activities is a mobile learning activities where students discover learning tasks, access and explore useful learning materials independently or as a group, in order to maximize learning. Assessment related activities have an important role to play in students' academic performance; the assessment interface with mobile devices can enhance learner engagement and performance. Learners are able to assess their knowledge of learning content and through repeated assessment and high-quality feedback, close the gap between their current performance and the performance goals of the assessment. Outcome related activities describe the values, benefits or gains added to a student as a product of the use of technology. Such outcome related activities which mobile devices could be useful for include: checking of results, retrieving stored files after the class lessons, attempting study questions and so on. It is very easy to create a more useful learning environment if students either have a smart phone, tablet or some other types of mobile communication device. These devices can be used for mobile learning and can be influenced by several factors including gender.

Gender differences in mobile learning and academic performance have been studied over the years. Some of the studies reported that females made more cell phone calls and sent more SMS messages than men did (Mitra, Willyard, Platt & Parsons, 2005). Selwyn (2006) reported that females tended to study online more than males as online learning may be appropriate for women's lifestyles and they were also more likely to look for further views of education. On the other hand, in some higher education males showed higher positive attitudes toward using technology for learning than females (Li & Kirkup, 2007**).** Hence, the above arguments about gender disparities in mobile learning and academic performance call for further investigation. Based on these premises, major question answered was, to

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what extent does engagement in mobile learning correlate with academic performance of undergraduate students in public universities in Enugu State?

Research Questions

The following research questions were posed to guide this study:

1. What is the amount of variation in students' academic performance that is attributable to the predictor variables- (student-student activities, student-teacher activities, student-content activities, assessment related activities and outcome related activities)?
2. What is the amount of variation in students' academic performance that is attributable to students' engagement in mobile learning compositely?
3. What is the regression model that can be used to predict students' academic performance by their engagement in mobile learning?
4. What is the amount of variation in students' academic performance that is attributable to their engagement in mobile learning as moderated by gender?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance.

Ho_1: The regression coefficients associated with the predictor variables- (student-student activities, student-teacher activities, student-content activities, assessment related activities and outcome related activities) in predicting students' academic performance is not significant.

Ho_2: Gender does not significantly moderate the prediction of students' academic performance by their engagement in mobile learning.

METHODOLOGY

This study adopted a correlation survey research design. According to Nworgu (2015) correlation survey research design is a design that seeks to establish what relationship, association or co-variation exists between two or more variables. The population of the study consisted of the 83 (34 males and 49 females) science education level 3 students of 2017/2018 academic session in public Universities in Enugu State. The sample for this study comprised all the eighty three (83) science education level 3 students since it is manageable

The researchers developed instruments titled "Students' Engagement in Mobile Learning Questionnaire (SEMLQ) and Students' Academic Performance Proforma (SAPP) were used to collect data for the study. The SEMLQ and SAPP were face validated by three experts in Department of Science Education (Measurement and Evaluation) all from University of Nigeria, Nsukka. The internal consistency of the SEMLQ was established using Cronbach Alpha reliability method and reliability coefficient of .76, .70, .78, .80 and .85 were obtained for cluster A, B, C, D and E respectively. For the overall reliability a coefficient of .93 was obtained. Cronbach alpha was considered appropriate because the items were polytomously scored. The SEMLQ was administered directly to the sampled respondents in science education department. The researchers administered the instrument

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on the spot and collected on the spot, this was done in order to ensure a high return rate. The data collected were analyzed using multiple regression analysis. All the hypotheses were tested at 0.05 level of significance. Multiple regression was considered appropriate because in this study, more than one predictor variable against one criterion variable was used.

RESULT

Table 1: Amount of variation in students' academic performance that is attributable to the predictor variables

Variables	N	R	R^2
Student-Student Activities	83	.86	0.74
Student-Teacher Activities	83	.67	0.45
Student-Content Activities	83	.72	0.52
Assessment Related Activities	83	.68	0.46
Outcome Related Activities	83	.51	0.26

N = Number of respondents, R= Correlation coefficient, R^2= Coefficient of determination

From the result presented in Table 1, it was deduced that student-student activities with a coefficient of determination (R^2) of .74 (74%) best-predicted students' academic performance. It was followed by student-content activities with R^2 of .52 (52%), then assessment related activities with R^2 of .46 (46%), followed by student-teacher activities with a R^2 of .45 (45%) and lastly outcome related activities with R^2 of .26 (26%).

Table 2: Amount of variation in students' academic performance that is attributable to students' engagement in mobile learning compositely

Model	R	R^2	Adjusted R^2
1	.88	.77	.76

The result as presented in Table 2 shows that a correlation coefficient (R) of .88 with associated coefficient of determination (R^2) of .77 was obtained between students' academic performance (criterion variable) and all the students' engagement in mobile learning (predictor) variables. This coefficient of determination (R^2) indicated that 77% of variation in students' academic performance (criterion variable) is attributable to students' engagement in mobile learning (predictor) variables compositely. This implies that 23% of variation in students' academic performance can be attributable to other variables not investigated by this study.

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Table 3: Regression model used in predicting students' academic performance by their engagement in mobile learning

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.93	.136		-6.855	.000
	Student-Student Activities (SSA)	.15	.010	.87	14.640	.000
	Student-Teacher Activities (STA)	-.03	.009	-.18	-3.511	.010
	Student-Content Activities (SCA)	.05	.009	.26	5.334	.000
	Assessment Related Activities (ARA)	-.03	.009	-.14	-2.899	.030
	Outcome Related Activities (ORA)	.02	.006	.11	3.406	.010

a. Dependent Variable: Students' Academic Performance (SAP)
b. Predictors: (Constant), Student-Student Activities (SSA), Student-Teacher Activities (STA), Student-Content Activities (SCA), Assessment Related Activities (ARA), Outcome Related Activities (ORA)

From the result in Table 3, the regression model that can be used in predicting students' academic performance by their engagement in mobile learning in raw score form is:

$$SAP = 0.15SSA + 0.05SCA + (-0.03STA) + (-0.03ARA) + 0.02ORA + (-0.93)$$

While the regression model in standard score form is:

$$Z_{SAP} = 0.87Z_{SSA} + 0.26Z_{SCA} + (-0.18Z_{STA}) + (-0.14Z_{ARA}) + 0.11Z_{ORA} + (-0.93)$$

The regression model shows that one unit change in student-student activities contributed 0.87 units change in students' academic performance, while one unit change in student-content activities produced 0.26 units change in students' academic performance. Also, one unit change in student-teacher activities accounted for -0.18 change in students' academic performance, whereas one unit change in assessment related activities produced -0.14 change in students' academic performance. And lastly, one unit change in outcome related activities contributed 0.11 change in students' academic performance, while -0.93 is the level of students' academic performance without the influence of the predictor variables.

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Table 4: Amount of variation in students' academic performance attributable to their engagement in mobile learning as moderated by gender

Model		Variable (Gender)	N	R	R^2	Adjusted R^2
1	1.	Male	34	.88	.77	.77
	2.	Female	49	.89	.80	.79

The result in Table 4 shows that correlation coefficients (R) of .88 and .89 with associated coefficients of determination (R^2) of .77 and .80 were obtained for male and female students respectively between their academic performance (criterion variable) and engagement in mobile learning (predictor) variables. These coefficients of determination (R^2) indicated that 77% variation in students' academic performance was due to engagement in mobile learning for male while 80% was due to engagement in mobile learning for female. The difference in the variation of male and female students' academic performance as predicted by their engagement in mobile learning jointly was 3% in favour of female.

Hypothesis 1:

T-test analysis of the significance of the regression coefficients associated with the predictor variables in predicting students' academic performance

The result in Table 3 above shows that t-values of 14.64, -3.51, 5.33, -2.90 and 3.41 with associated probabilities of 0.00, 0.01, 0.00, 0.03 and 0.01 were obtained for student-student (β= .87) student-teacher (β= -.18), student-content (β= .26), assessment related (β= -.14) and outcome related (β= .11) respectively. The student-teacher and assessment related had a negative regression coefficients of -.18 and -.14 respectively. This means that as student-teacher and assessment related activities increases, students' academic performance decreases. Since the associated probabilities were less than 0.05 level of significance, the null hypothesis which stated that the regression coefficients associated with the predictor variables in predicting students' academic performance are not significant was rejected. The conclusion drawn was that the regression coefficients associated with each of the predictor variables in predicting students' academic performance were significant.

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Hypothesis 2:

Table 5: t-test analysis of the significant difference between the correlation coefficients of male and female students in the prediction of students' academic performance by their engagement in mobile learning

Variable (Gender)	R	N	Df	S. E	t-cal	t-crit
Male	0.878	34	77	0.100	-0.160	1.960
Female	0.894	49				

Key: R = Correlation coefficient, N = Number of respondents, Df= Degree of freedom, S.E=Standard Error, t-cal= t-calculated, t- crit= t-critical/ table.

The result as presented in Table 5 indicated that a calculated t-value of -0.160 was obtained, while the t-critical value at 0.05 level of significance and **77 degree of** freedom was 1.960. The decision rule was to reject H_{O2} if the calculated t-value is greater than the critical value of t, otherwise do not reject. Thus, since the calculated value of t (-0.160) was less than the t-critical value (1.960), H_{O2} which stated that gender does not significantly moderate the prediction of students' academic performance by their engagement in mobile learning was not rejected. Therefore, the conclusion drawn was that gender does not significantly moderate the prediction of students' academic performance by their engagement in mobile learning. Any observed difference could be attributable to chance factors or sampling errors.

DISCUSSION OF FINDINGS

Based on the findings of the study, the following discussions were made;
The findings in Table 1 showed the amount of variation in students' academic performance that is attributable to students' engagement in mobile learning. The result of the corresponding hypothesis as presented in Table 3 revealed that the regression/beta coefficients (β) associated with each of the predictor variables; student-student activities (β= .87), student-teacher activities (β= -.18), student-content activities (β= .26), assessment related activities (β= -.14) and outcome related activities (β= .11) in predicting students' academic performance were significant. This result conforms with the findings of Chaka and Govender (2017) who found that student-student activities in mobile learning had significant effect on students' academic performance. Also, this result is in consonance with the findings of Andrews and Rockson (2015) whose findings revealed that 82% of the students use mobile phone to support coursework. Molood and Seyedjamal (2012) further supported the findings of this study, that mobile learning facilitates direct communication between teachers and students which enhances students' academic performance.

The finding of the study as presented in Table 2 revealed that a coefficient of determination (R^2) of 0.77 was obtained, indicating that 77% of variation in students' academic performance (criterion variable) was attributable to students' engagement in mobile learning (predictor) variables compositely, which implied that 23% of the variation in students' academic performance was attributable to other variables not investigated by this study. In essence, the finding of this study was an indication that students' engagement in

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mobile learning such as student-student, student-teacher, student-content, assessment related and outcome related activities can enhance students' academic performance significantly. This coincides with Abdellah and Thouqan (2016) whose findings showed that mobile learning had quite significant effect on students' academic achievement.

The regression model as presented in Table 3 showed that one unit change in student-student activities contributed 0.87 units change in students' academic performance, while one unit change in student-content activities produced 0.26 units change in students' academic performance. Also, one unit change in student-teacher activities accounted for -0.18 change in students' academic performance, whereas one unit change in assessment related activities produced -0.14 change in students' academic performance. And lastly, one unit change in outcome related activities contributed 0.11 change in students' academic performance, while -0.93 was the level of students' academic performance without the influence of the predictor variables. The student-teacher and assessment related activities had a negative regression coefficients of -.18 and -.14 respectively. This means that as student-teacher activities and assessment related activities increases, students' academic performance decreases.

The findings of the study as shown in Table 4 revealed that the difference in the variation of male and female students' academic performance as predicted by their engagement in mobile learning jointly was 3% in favour of female students. The result of the corresponding hypothesis (H_{O2}) as presented in Table 5 revealed that gender does not significantly moderate the prediction of students' academic performance by their engagement in mobile learning. The finding is in agreement with the findings in predictive studies by Hilao and Wichadee (2017) who found that male and female students do not differ significantly in their usage and attitude towards mobile phones for their learning performance. Also, this result is in consonance with the findings of Umar, Yagana, Hajja and Mohammed (2015) whose result showed that gender does not significantly affect students' academic performance. The finding is also in line with Junco, Merson and Salter (2010) submission that there were no differences in how males and females used mobile devices for learning.

CONCLUSION

The study therefore concluded that student-student activities with a coefficient of determination (R^2) of .74 (74%) best-predicted students' academic performance. The regression/beta coefficients (β) associated with each of the predictor variables in predicting students' academic performance was significant. Also, 77% of variation in students' academic performance (criterion variable) was attributable to students' engagement in mobile learning (predictor variables) compositely. The regression model that can be used in predicting students' academic performance by their engagement in mobile learning in raw score and standard score form were also identified. The difference in the variation of male and female students' academic performance as predicted by their engagement in mobile learning jointly was 3% in favour of female students. However, the corresponding

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null hypothesis revealed that gender does not significantly moderate the prediction of students' academic performance.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made.

1. Students should engage actively in mobile learning, discover learning task and communicate with other students more often about class instruction through their mobile devices both inside and outside of class in order to enhance their performance.
2. Education administrators and government should encourage and support programmes that will duly consider teaching and assessment of students' engagement in mobile learning, in order to promote performance in school and life generally.

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