Demographic Factors and Status as Predictors of Open and Distance Learning Students Academic Performance in Computer Science

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Abstract: Open and Distance modes of Learning presents more opportunities to have access to education, especially at higher levels. However, the challenges faced by students undertaking Open and Distance modes of Learning may be those associated with time, cost, physical contact, mentorship and mode of study. Therefore, it is necessary to address these challenges before a smooth and useful service delivery can be achieved in the system. The present study was designed to investigate the contributions of demographic factors, status (such as employment status, computer knowledge) and gender on the academic achievements of Computer science students in the Open and Distance mode of Learning institutions. Four hundred and thirty-five questionnaires were structured to contain both open and close-ended questions and were administered to students in some Open and Distance mode of Learning Institutions. The effects of employment status, computer knowledge, and gender of these students on their academic performance were tested with three different hypotheses. Based on the findings and results of the study, we concluded that employment status and computer knowledge are factors that are likely to affect the performance of students in the Open and Distance mode of Learning Institutions and not the demographic factors. The study however showed that gender is not a factor since there was no significant difference between the performance of the male and female students.

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1.0 Introduction

Open and Distance Learning (ODL) is a new pedagogy of learning. The system involves the separation of teacher and learner in time or place and utilizes mixed-media courseware such as print, radio, television broadcasts, video & audio cassettes, computer-based learning, and telecommunications. ODL is also called online learning, these resources have been revealed to be a technique to make the educational opportunities accessible to maximum students at any time and location (Misbah *et al.,* 2017). ODL in some cases, provide face-to-face meetings for tutorials, learner to learner interaction, library study, and laboratory or practice sessions. It is a two-way

communication that allows learners and tutors to interact as distinguished from the passive receipt of broadcast signals. Communication/teaching in ODL can be synchronous or asynchronous.

Synchronous teaching is a mode of teaching whereby both teacher and learners are present at the same time. It is more or less the same way as we are having in the case of a face-to-face environment. Synchronous teaching can take place via an online platform through the use of video conferencing and live chat or instant messaging. Learners in synchronous online teaching can ask questions in real-time just as in face to face environment. The role of the teacher in online synchronous teaching is not different from teachers' roles in a face-to-face environment. Synchronous e-learning refers to learning/teaching that takes place simultaneously via an electronic mode, it provides an opportunity for teacher/student and student/student interactions (Ayesha, 2016). Synchronous learning may feature webinars (live online lessons), group chats, or drop-in sessions where teachers are available to help at a particular time. However, teaching synchronously online will require some new skills to be developed, such as: live webinars, video conferencing, virtual classrooms and instant messaging.

Asynchronous online teaching is a kind of teaching whereby teaching materials are posted online, and learners work through them at their own convenient time, irrespective of location and time difference. It includes a variety of media such as audio and video clips. Communication among the students and teachers is taken place via discussion boards or forums, or email, WhatsApp, Facebook and other social media applications. Mayadas (1997) stated that asynchronous online teaching is "an interactive learning community that is not limited by time, place or the constraints of a classroom". Asynchronous environments provide students with readily available materials that can be accessed at any

time anywhere via Learning Management System (LMS) or other channels of the variety, in the form of audio/video lectures, handouts, articles, study pack and power point presentations (Ayesha, 2016). Learning Management System (LMS), Course Management System (CMS) and Virtual learning environment (VLE) perform the same operations, they are a set of tools that houses course content and provide a framework for communication between students and teachers like a classroom (Ayesha, 2016). Some examples of asynchronous teaching /learning are online courses, email, blogs, pre-recorded video lessons or webinars and online forums & discussion boards.

Education is the propeller of growth, development and sustainability in every society. Education enables a society habitable for the people; it permitted the co-existence of individuals of various: groups, backgrounds, cultures, languages, religions and personalities to co-exist as a single society in peace and harmony. According to Okunade *et al.*, (2018), education brings about development and this leads to peace and sustainability. The entire world including Nigeria attaches priority to the education of its citizens through the provision of various forms of learning and facilities required for good and quality education (Adagba, 2011). Quality Education equips people with the ability that will enable them to explore the world and manipulate it for their survival and establishment. Nigeria as a country is multi-ethnic with diverse cultural diversities of not less than 350 distinct ethnic groups and diverse indigenous. Nigeria, as a nation with great diversity, has the obligation of providing its citizens with quality education. Igbuzor (2006) stated that education is a human right solely because of being human. The consideration of the significance of education and the need for the various tiers of government and institutions to bring Nigerian citizens to the learning block has led to the current increase in the adoption of ODL as a new pedagogy of

learning to comprehend the conventional system of learning, to enable people to have access to education as their own convenience. Such as the University of Lagos, Lagos State University, University of Nigeria Nsukka, University of Jos, University of Ibadan, University of Uyo, University of Ilorin, Federal University of Technology Mina, National Open University of Nigeria and many others. ODL pedagogy has been accepted as a tool to bring education closer to learners irrespective of their location. Access to education is the ability to have the opportunity to pursue a career in an institution of learning (Okunade et al., 2018), ODL has grown into an important global strategy in resolving problems of access to education (UNESCO, 2004). Therefore, the performance of science students in institutions operating solely through ODL is very challenging compared to those in conventional Universities. Consequently, the present study seeks to investigate the challenges, their causes and remedial solutions that can avert their negative impacts.

Although ODL addresses challenges associated with access to education, it generated ODL peculiar challenges (Okunade *et al.,* 2018). According to UNESCO (2004), unique challenges facing the ODL programs are high rate of student drop-out and late completion of programs.

1.1   Objectives of research

To assess the extent to which male and female students differ in sciences in Open and Distance Learning (ODL) To find out if job status can influence students' academic performance in sciences in Open and Distance Learning (ODL)

1.2   Research questions and /or yypotheses

To what extend does status affect ODL student academic performance in sciences?

To what extend does prior general Computer knowledge affect ODL academic performance in sciences?

To what extend do demographic factors affect ODL student academic performance in sciences?

1.3   The use of information and communication technologies in open and distance learning

ODL courses have been specially designed to obtain qualifications from the comfort of students' own homes or workplaces. ODL is the flexible, affordable and accessible way to gain internationally accredited qualifications. ODL is organized formal education and training in which the learner is separated in space and time from the resources that are useful in learning the instructional objectives (Berge, 2001). ICT gadgets like telephone, computer conferencing or teleconferencing are used to bridge the physical gap between the institution and the learner. Therefore, students are brought to a virtual institution. The influence of Information and Communication Technologies (ICTs) in institutions has given birth to ODL. ODL provides virtual tertiary institutions by supplying whatever educational opportunities that are needed by anyone, anywhere, at any time for those who otherwise would have been denied the opportunity to study based on barriers such as distance, nature of work, sponsorships, time range, financial status, choice of course/program, availability of lecturers/supervisor, choice of institution, method of study, contingency in the study are removed such that education is brought to the prospective student's doorstep. The importance of information and communication technologies (ICTs) in promoting open, distance and flexible education in contemporary universities cannot be overstated (deFreitas and Oliver, 2005). Therefore, ICT has enhanced the educational services as well as the quality of learning materials at the school level through distance mode (Ansari, 2002).

ODL institutions are facing great pressure to maintain their quality of education delivery and student satisfaction from student persistence (Sembiring, 2015), and formulate measures to cater for diverse student needs; it is an

educational barrier breaker (Prasenjit and Ritimoni, 2012). There are two generations of distance education. The first generation was defined by print technology. Although one can find examples of first-generation distance learning going back hundreds of years, the combination of printing press technology and postal services made what is commonly known as correspondence education widely available. The second generation is the ability to broadcast using technologies such as radio and television characterized the second generation of distance education. Interaction between the teacher and the learner, or between learners, however, remained minimal. Online education is commonly viewed as a means to increase access to knowledge and education (Dua, 2013). It is an economical and lesser risk, no travel expenses are incurred by student or teacher/lecturer (Harden, 2013). It is less stressful as the teacher/lecturer does not have to repeat the same lecture to every group of students(class). They only need to prepare the lecture once and then share it among the student groups who may not necessarily view it simultaneously (Kedem *et al.,* 2012)

2.0   Material and Methods

The research design was an analytical survey. Analytical surveys also referred to as diagnostic studies attempt to describe and explain *why* certain situations exist. In this approach, two or more variables were examined to test research hypotheses. The results allow researchers to examine the interrelationships among variables and to draw explanatory inferences. In this study, the researcher sought to establish the relationship between demographic status, job status, individual characters including age, sex, level of education, level of social exposure, parental background, prior computer skills, level of student engagement, technological phobia and many others effects on academic attainment.

2.1   Population of the study

In this study, the populations of interest are the four hundred and thirty-five (435) Computer Science Undergraduate Students of Open and Distance Learning that were supplied with the questionnaire.

2.1.1   Sample and sampling techniques

According to Mugenda and Mugenda (2003) units of analysis are units that are designed for purposes of aggregating their characteristics to describe some larger group or abstract phenomenon. Nachmias and Nachmias (1996) describe the units of analysis as the most elementary part of the phenomenon to be studied. Computer Science Students were selected randomly across the three Lagos state study centers of the National Open University of Nigeria: Apapa study center, Mushin Study center and Ikeja study center for the research.

2.1.2   Instrument for data collection

The instrument used in data collection for the research was a questionnaire.

2.1.3   Validity of the instrument

The process used in the validation of the instrument is content validity

2.1.4   Reliability of the instrument

The instrument of data collection was because about 600 questionnaires were deployed to the students' study centers and disbursed to students' one on one, two hundred per study Centre. Out of which four hundred and thirty-five were returned.

2.1.5   Procedures for data collection

The main instrument of data collection in this study was questionnaires. The items in the questionnaire were structured (closed-ended) and unstructured (open-ended). The structured questions measured the subjective responses to clarify the objective responses and at the same time, enhance the formulation of recommendations of the study.

2.1.6   Method of data analysis

Data analysis consists of three activities: Data reduction, Data display, and Conclusion drawing/verification. Data reduction is applied to qualitative data and focused on the selection, simplification and transformation of data. In this continuous process, the data is organized throughout the research to draw and finalize a

conclusion. In this research, the data was reduced from critical elements in the implementation of Computer Science of Open and Distance Learning students' academic performance. The data was displayed and organized in an order that permitted the ease of drawing out conclusions.

3.0   Results

The results of the study are presented following the research question and hypotheses.

Answers to the research questions

Research question 1

To what extent does job status affect ODL student academic performance in science?

Hypothesis I: Job status is not significantly affecting academic achievements of students in an Open and Distance mode of Learning Institution.

The total number of students that are employed (A) = 187

The total number of students that are self-employed (B) = 105

The total number of unemployed students (C) = 143

Based on this classification the hypothesis is tested with the current or graduated cumulative grade point average (CGPA) of students in 200 level and above.

Table 1: Observed Versus Expected Counts of Employment Status Affecting Academic Achievement of Students

	1ST Class	2¹	2²	3RD Class	TOTAL
A	0 (0)	19 (56.31)	63 (123.38)	11 (7.31)	**187**
B	0 (0)	38 (31.62)	102 (69.28)	4 (4.10)	**105**
C	0 (0)	74 (43.06)	122 (94.35)	2 (5.59)	**143**
TOTAL	**0**	**131**	**287**	**17**	**435**

The null hypothesis (H_0), states that there is no association between job status and academic achievement of students in an Open and Distance mode of Learning Institution. The alternate hypothesis (H_1) states that job status has an association with the academic achievement of students in an Open and Distance mode of Learning Institution. The hypothesis is tested considering students that are employed, self-employed and unemployed. The observed versus expected counts is shown in Table 1.

The expected values are calculated using the following equation:

Expected value $E_{ij} = (T_i \times T_j)/N$ (1)

where E_{ij} is the expected value for a cell at row i and column j, T_i is the sum total of values for row I, T_j is the sum total of values for column j

and N is the total number of students The Chi-square values were calculated using the following equation:

$$X_{ij}^2 = \frac{(O - E)^2}{O}$$ (2)

where X_{ij}^2 is the Chi-square value for a cell at row i and column j, O is the observed value for a cell at row i and column j, E is the expected value for a cell at row i and column j,

Values of Ch0square for each of the cell were also calculated

$X_{A1}^2 = 0 \quad X_{A2}^2 = 24.72 \quad X_{A3}^2 = 29.55 \qquad X_{A4}^2 = 1.86$
$X_{B1}^2 = 0 \quad X_{B2}^2 = 1.29 \quad X_{B3}^2 = 15.45 \qquad X_{B4}^2 = 0$
$X_{C1}^2 = 0 \quad X_{C2}^2 = 22.23 \quad X_{C3}^2 = 8.10 \qquad X_{C4}^2 = 2.30$

The total Chi-square $X^2 = \sum X_{ij}^2$ (3)

Therefore,

$X^2 = 0 + 24.72 + 29.55 + 1.86 + 0 + 1.29 + 15.45 + 0 + 0 + 22.23 + 8.10 + 2.30 = 105.5$

The degree of freedom (df) = (number of row – 1) x (number of column – 1) = (3 -1) X (4-1) = 6

The standard probability level used is $p < 0.05$ and this is represented by the 5% column in the Chi square table. The probability value for the calculated Chi square is taken in the 6 d.f. row of the 5% column of the Chi square table. The calculated value (105.5) is much larger than the critical value of 12.59 in the table. This result implies that there is a negligible probability ($p < 0.05$, i.e. less than 5%) that the observed value occurred by chance. The observed frequencies are significantly different from the frequencies that would be expected if there were no association among the categories tested. In other words, job status is associated with the academic achievement of students in an Open and Distance mode of Learning Institution. The null hypothesis is therefore rejected while the alternate hypothesis is accepted.

Research question 2

To what extent does Computer knowledge affect ODL student academic performance in science?

Hypothesis II: Computer knowledge and academic performance of Science students in an Open and Distance mode of Learning Institution.

The null hypothesis (H_0), states that computer knowledge does not have any association with the academic performance of Computer Science students in an Open and Distance mode of Learning Institution. The alternate hypothesis (H_1) states that computer knowledge can influence the academic performance of Science students in an Open and Distance mode of Learning Institution. The hypothesis is tested considering students that have computer knowledge and students without computer knowledge.

The total number of students with computer knowledge (A) = 374

The total number of students without computer knowledge (B) = 61

Based on this classification, the hypothesis is tested by asking these two categories of students their current or graduated class of degree.

Table 2 shows the observed versus expected counts:

Table 2: Observed Versus Expected Counts of Students' Computer Experience

	1ST Class	2^1	2^2	3RD Class	TOTAL
With Computer Experience (A)	0	121	243	0	374
	(0)	(112.63)	(246.75)	(14.62)	
Without Computer Experience (B)	0	0	44	17	61
	(0)	(18.37)	(40.25)	(2.38)	
TOTAL	**0**	**131**	**287**	**17**	**435**

Using the Chi-square formula, the Chi-square value was calculated for each of the cells.

$X_{A1}^2 = 0$ $X_{A2}^2 = 2.996$ $X_{A3}^2 = 0.057$ $X_{A4}^2 = 14.62$
$X_{B1}^2 = 0$ $X_{B2}^2 = 18.37$ $X_{B3}^2 = 0.349$ $X_{A4}^2 = 89.81$
$X^2 = 0 + 2.996 + 0.057 + 14.62 + 0 + 18.37 + 0.348 + 89.81 = 126.20$

df = (2 -1) X (4-1) = 1 X 3 = 3

The probability value for the calculated Chi square is taken in the 3d.f. a row of the 5% column of the Chi square table. The calculated value (126.20) is much larger than the critical value of 7.82 in the table. This result implies that there is a negligible probability ($p < 0.05$, i.e. less than 5%) that the observed value occurred by chance. The observed frequencies are significantly different from the frequencies that would be expected if there were no association among the categories tested. This indicates that computer knowledge is associated with the academic achievement of

students in an Open and Distance mode of Learning Institution. The null hypothesis is therefore rejected while the alternate hypothesis is accepted.

Research question 3

To what extent do demographic factors affect ODL student academic performance in science?

Hypothesis III: demographic factors effect in discussing the academic performance of Science students in an Open and Distance mode of Learning Institution

The null hypothesis (H_0), states that demographic factors have nothing to do with the academic performance of Computer Science students in an Open and Distance mode of Learning Institution. The alternate hypothesis (H_1) states that demographic factors determine the academic performance of Computer Science students in an Open and Distance mode of Learning Institution.

The hypothesis is tested by considering the number of male and female students that use social media and think that there is a measure of effects in the usage of social media on the academic achievements of students. Table 3 below shows the observed versus expected counts:

Table 3:Observed Versus Expected Counts of Gender Affecting Academic Achievement of Students

	1ST Class	2^1	2^2	3RD Class	TOTAL
Male	0	78	**172**	**10**	**260**
(A)	(0)	(78.30)	**(171.54)**	**(10.16)**	
Female	0	53	**115**	**7**	**175**
(B)	(0)	(52.70)	**(115.46)**	**(6.84)**	
TOTAL	**0**	**131**	**287**	**17**	**435**

Using the Chi-square formula, the Chi-square value was calculated for each of the cells.

$X_{A1}^2 = 0.347$ $X_{A2}^2 = 0.001$ $X_{A3}^2 = 0.001$ $X_{A4}^2 = 0.003$

$X_{B1}^2 = 0.506$ $X_{B2}^2 = 0.002$ $X_{B3}^2 = 0.002$ $X_{B4}^2 = 0.004$

$X^2 = 0 + 0.001 + 0.001 + 0.003 + 0 + 0.002 + 0.002 + 0.004 = 0.013$

d.f. $= (2 -1)$ X $(4-1) = 3$

The probability value for the calculated Chi square is taken in the 3d.f. a row of the 5% column of the Chi square table. The calculated value (0.013) is much smaller than the critical value of 7.82 in the table. This result implies that there does not appear to be a significant association between the two variables males and females because they have a statistically similar pattern of CGPA as observed in their academic performance. The observed frequencies are significantly the same as the frequencies that would be expected if there were no association among the categories tested. Therefore, gender is not associated with the academic achievement of computer science students in an Open and Distance mode of Learning Institution. The null hypothesis is therefore accepted while the alternate hypothesis is rejected.

Discussion

This study investigated the link between employment status, computer knowledge, demographic factors and academic performance of Science students in an Open and Distance mode of Learning Institution under three hypotheses.

Hypothesis I

The result of this research shows that there is a link between employment status and academic achievements of science students in an Open and Distance mode of Learning Institution. In the survey as shown in Figure 1, out of one hundred and thirty-one students that are in the class of second class upper, 56.4% (74 students) are unemployed, 29% (38 students)
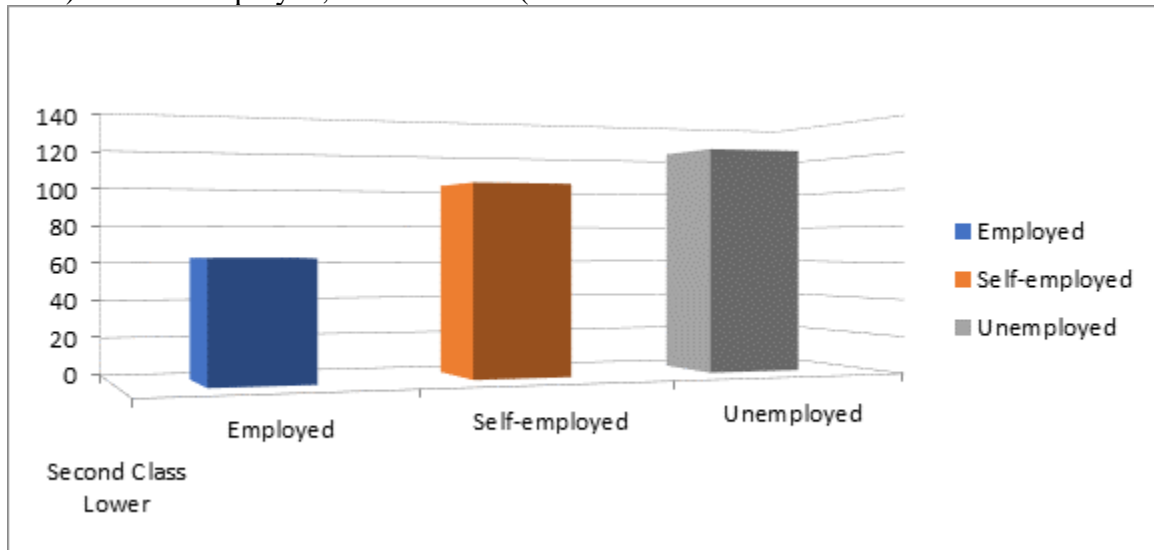
are self-employed while 14% (19 students) are employed.
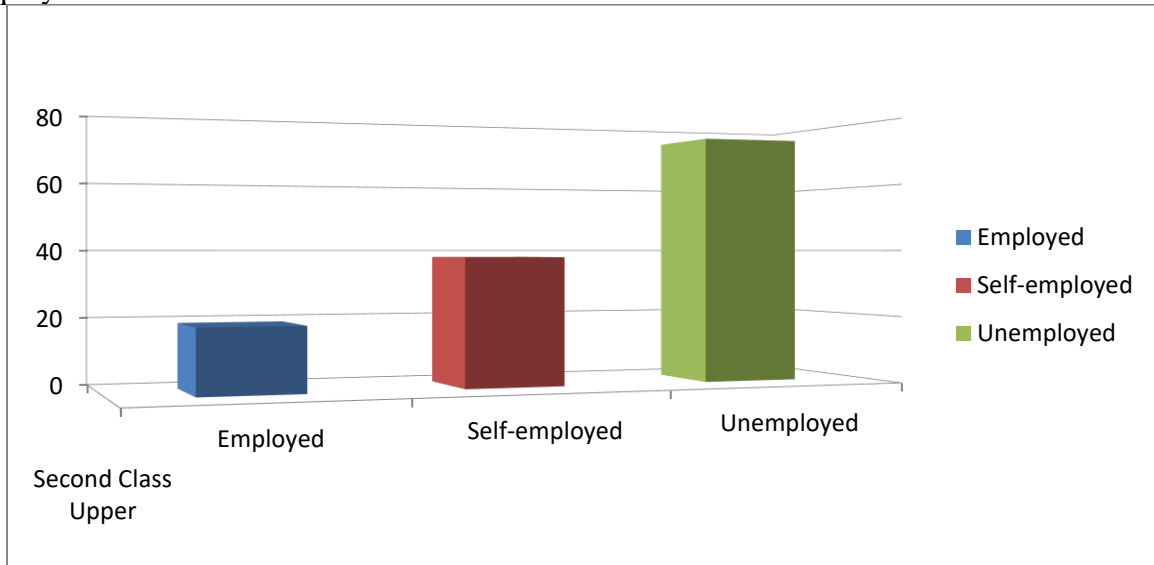
Fig. 1: Employment Status of Students in Second Class Upper Category

In the Second Class lower category, 42.5% (122 students) are unemployed, 35.5% (102 students) are self-employed, while 21.9% (63 students) are employed. This is illustrated in Fig. 2.

Fig.2: Employment Status of Students in Second Class Lower Category

If the total number of students with a minimum of second class lower which is regarded as the minimum benchmark of academic success is considered, the unemployed have the highest percentage of 46.8% (196 students) followed by self-employed with 33.5%(140 students) and employed with only 19.6% (82 students). This is shown in Fig. 3.

As shown in Fig. 4, the largest percentage of students in the third class category is employed students with 64.7% (11 out of 17 students), followed by self-employed with 23.5% (4 out
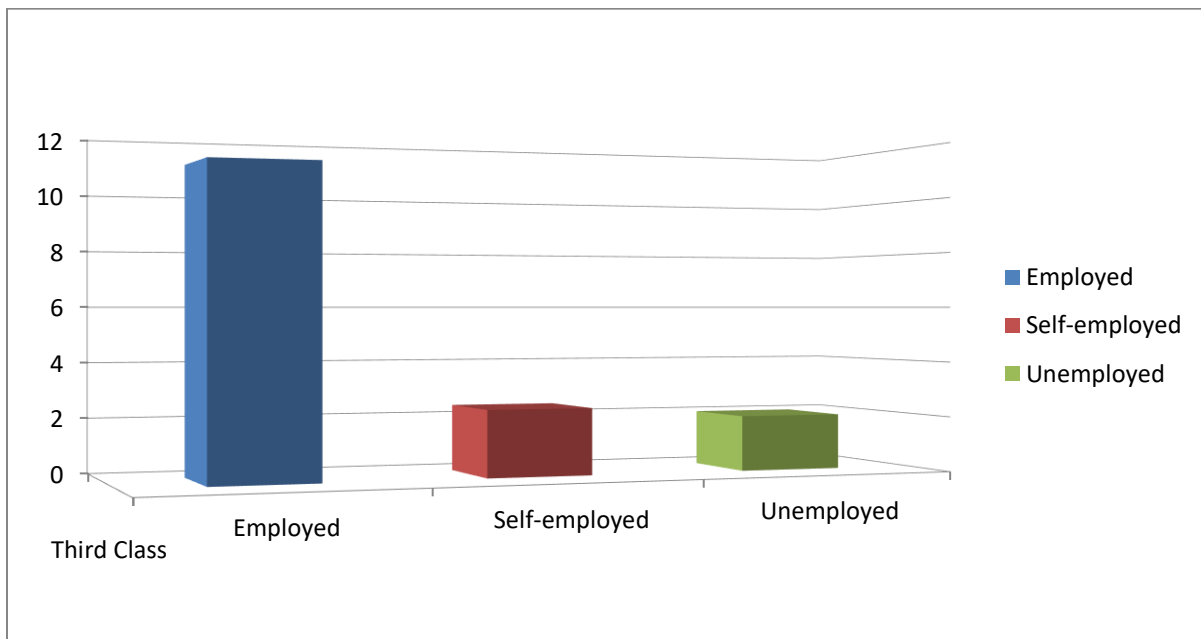
of 17 students) and unemployed with 11.7% (2 out of 17 students). This is also an indication that an employed student may likely have a

poorer grade compared with unemployed or self-employed students.
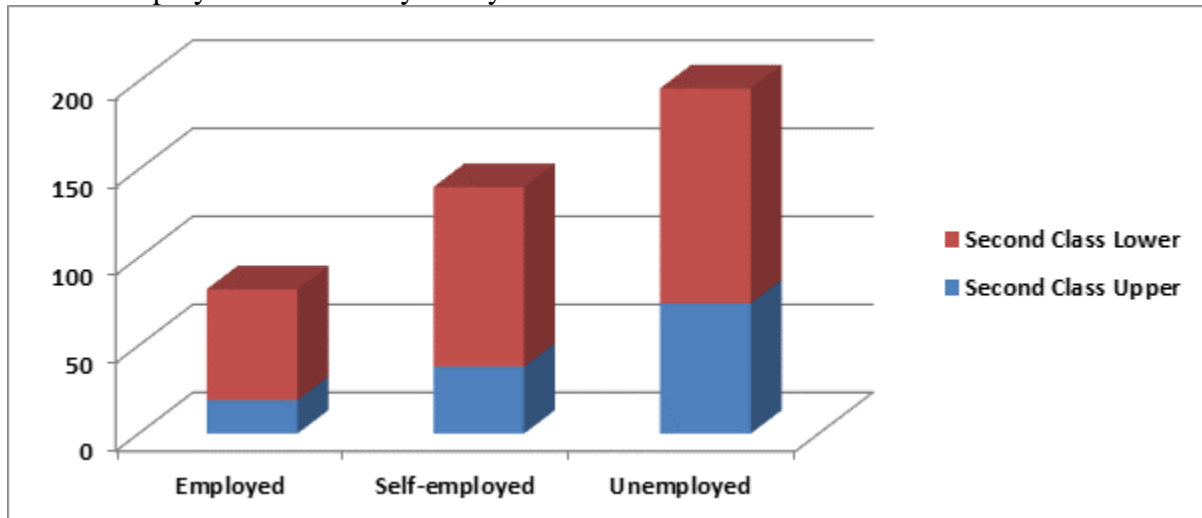
Fig. 3: Employment Status of Students with a minimum of Second Class Lower

Fig. 4: Employment Status of Students in Third Class Category

The distribution of the class of degree among the different categories of employment status shows that there is an association between employment status and academic achievements of students in an Open and Distance mode of

Learning Institution. This is because the distribution is not even. A student with unemployment status is likely to perform better than any student with another employment status.
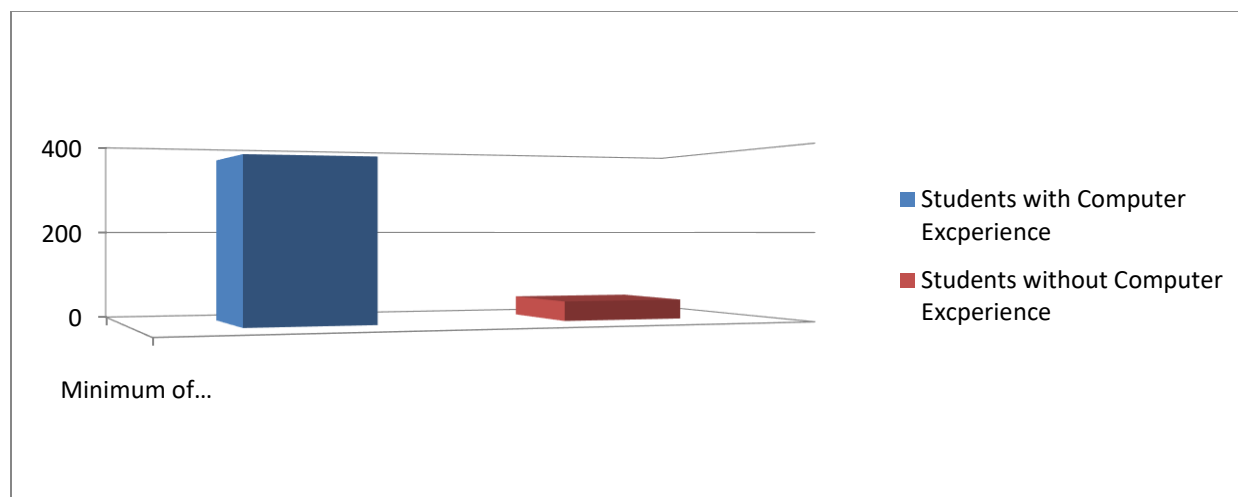
Hypothesis II

The study also reveals that computer knowledge has a significant influence on the academic achievements of students in an Open and Distance mode of Learning Institution. The number of students with computer knowledge in an Open and Distance mode of Learning Institution is much higher than students without computer knowledge as shown in Table 4.

The survey report shown in figure 5 shows that all the students with computer knowledge have a minimum of second class lower and this constitutes about 86% (374 students) of the total number of students surveyed. Students without computer knowledge constitute about 14% (61 students). None of the students without computer knowledge are in the second class upper while seventeen of them are in the third class. This shows that students with computer knowledge are most likely to perform better than students without computer knowledge.

Table 4: How Computer Knowledge Influence Academic Performance of Computer Students

	1ST Class	2^1	2^2	3RD Class	TOTAL
With Computer Experience	0	121	243	0	**374**
Without Computer Experience	0	0	44	17	**61**
TOTAL	**0**	**131**	**287**	**17**	**435**

Fig. 5: Classification of students with a minimum of second class considering computer experience

Hypothesis III

This study shows that gender is not related to the academic achievements of students in an Open and Distance mode of Learning Institution. This survey found that 30% (78 out of 260) of the male respondents are in the second class upper, 66.2% (172 out of 260) of them are in the second class lower while others (10 out of 260) which constitute 3.8% are in third class. This is not different from the female respondents which have 30.2% (53 out of 175) of them in the second class upper, 65.7% (115 out of 175) of them in second class lower and 4% (7 out of 175) of them in third class.

Table 5: How Gender Influence Academic Performance of Computer Science Students

	1ST Class	2^1	2^2	3RD Class	TOTAL
Male (A)	0	78	172	10	**260**
emale (B)	0	53	115	**7**	**175**
TOTAL	**0**	**131**	**287**	**17**	**435**

Therefore, there is no significant association between gender and the academic achievements of students in an Open and Distance mode of Learning Institution.

4.0 Conclusion

The study presents a general trend of the effects of employment status, computer knowledge and demographic factors on academic performance of Computer science students of Open and Distance mode of Learning Institutions. It was found that the employment status of students may likely affect their academic performance as the study showed that students with unemployment status are likely to perform better than another employment status. Also, computer knowledge of students of Open and Distance modes of Learning Institutions was found to likely affect their academic performance. This is because the study revealed that students with computer knowledge performed better compared with students without computer experience. The study however showed that demographic factors are not a factor in determining the performance of Computer Science students of Open and Distance mode of Learning Institutions. This is because the result showed no significant variation in the distribution of performance of Computer science female students and that of male students and age. Based on the results of this research, it is therefore concluded that employment status and computer knowledge are factors likely to affect the performance of Computer science students of Open and Distance mode of Learning Institutions and not the demographic factors of the students.

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Conflict of Interest
The authors declared no conflict of interest