Cognition and Emotions in Nigerian Undergraduates' Frustration during e-Registration

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Abstract

This study was designed to investigate the relative and combined contributions of cognition and emotion on Nigerian undergraduate students' level of computer frustration in online environments. A total of 1972 (Male=987, Female=985) students randomly selected from the two state-owned universities in Ogun State of Nigeria participated in the study. The data for the study were collected through the use of Students' Cognition Scale (SCS), Students' Emotion Scale (SES) and Students' Computer Frustration Scale (SCFS). Data analysis involved the use of mean and standard deviation as descriptive statistics as well as Pearson Product Moment Correlation and regression analysis as inferential statistics. The research findings revealed that students encountered various frustrating experiences during e-registration, when a combination of the predictor variables (cognition and emotion) significantly accounted for 2.5% to the variance of the students' level of frustration during e-registration. Meanwhile, cognition was found as the potent contributor of students' frustration during e-registration. The results of this study further indicated that there was a statistically significant difference in the level of computer frustration among students of different universities. Recommendations were made according to the findings of the study.

Keywords: Cognition; Emotion; Computers frustration; Online registration

Introduction

The rapid growth of computer networks and the evolution of Internet in the last decades have added value to the role of computers in higher institutions of learning (Miltiadou & Savenye, 2003). As the usage of Internet increases, the application of digital technology to create online environment grows rapidly in various areas of education ranging from advertisement, admission process, recruitment of staff, record keeping, general administration, uploading and downloading of course materials and students' registration (Lim, 2004; Miltiadou & Savenye, 2003). Today, there is a wide spread of interest in online registration in institutions of higher learning across the globe. In developing countries like Nigeria, the on-going transformation in educational environment based on the needs and demands of labor market makes learner's cognition a relevant indicator of success in online environment. Freese, Rivas and Hargittai

(2006) remarked that the use of World Wide Web across the globe is becoming more acceptable in education settings; hence many schools and institutions of higher learning are relying e-technology to support academic and administrative activities.

University system is increasingly becoming complex with great expectations from the students. Despite the potentials of Information and Communication Technologies (ICTs) in education, effective exploration of e-technologies by users (in education system) might be challenging, but undergraduates' perceived usefulness and attitudes to what happens while using e-technology have influence on their responses to frustrating situations (Nummenmma, 2007). e-Registration is becoming everybody's buzz that offers a promise of transactions anytime and anywhere (Mandernach, Donnelli, & Dailey-Hebert, 2006). e-Registration is an interactive online method of processing admission application forms, students' enrolment, selection of courses, payment of school fees, entry of personal data etc. via the Internet (Ojerinde & Kolo, 2009).

Registration of prospective and returning undergraduates in Nigeria had never been easy until recently when e-Registration was introduced in some higher education institutions. Online registration of students in the country began with Joint Admission Matriculation Board (J.A.M.B.) in 2002. The method was adopted by other examination bodies such as West African Examination Council (W.A.E.C.), National Examination Council (N.E.C.O) and various institutions of higher learning (Ojerinde & Kolo, 2009; Onochie, 2010), The popularity of e-Registration is gaining ground in Nigerian institutions in order to reduce students' pressure during registration, prompt un-delayed registration, curtail fraud, reduce congestion of students from offices, avoid incidents of late registration, reduce paper document, reduce students' stress generated by long queue in scorching sun etc.

The introduction and adoption of e-Registration in Nigeria was seen as the right step in the right direction towards globalization. However, Onochie (2010) reported that many admission-seeking candidates and students returning to tertiary institutions complained of the hassles and frustration they experienced in the process of online registration process in many cyber-cafes. Bessiere, Newhagen, Robinson and Shneiderman (2006) have noted that users of computers experience series frustrating situations such as program crash, inability to open e-mail attachment and non-responsive network in the process of interacting with the Internet facilities. Previous research findings indicate that there was association between class level, grades, gender and students' use of online registration.

Frustration was first introduced by Sigmund Freud as a concept related to goal attainment (Lazar, Bessiere, Ceaparu & Shneiderman, 2004). Any interruption to a successful accomplishment of a target task can be frustrating. Lazar, Feng and Allen (2006) posited that computer frustration occurs when anything obstructs users' goal attainment in the process of interacting with computers. Users' frustration with ICT has been a persistent problem. Computer frustration triggers confusion and personal dissatisfaction. Computer frustration can be likened to unexpected computers misbehavior that annoys the users and inhibit successful accomplishment of goals or tasks (Lazar, Jones and Hackley, 2004). Similarly, students get confused when confronted with unexpected obstacles that inhibit goal achievement; hence they get frustrated in view of persistent failure. On the other hand, students share moments of eureka whenever they surmount computer challenges. In addition, differences in individual's frustration level in online environment may be linked to the prevailing circumstances (Lazar, Jones and Hackley, 2004). Earlier research have shown that frustration contributes to digital divide (Bessiere, Newhagen, Robinson, & Shneiderman, 2006) and that people avoid the use of

Internet because of past frustrating experiences (Pew, 2003). Meanwhile, Bessiere, Newhagen, Robinson and Shneiderman (2006) remarked that frustration is the emotional outcome of negative technology experience.

Individual's decisions to accomplish online tasks are influenced by their emotional state of mind towards the use of computers (Creed & Beale, 2005). Hazlett (2003) and Roseman and Smith (2001) emphasized that emotion is a vital coping strategy in human endeavor and a significant element of human-computers interactions. According to Tu and McIsaac (2002), many users of computers embattled with expression of feelings and emotions of confusion and frustration; hence many of such people opt-out or withdraw while interacting with computer-technologies. D'Mello, et al (2007) remarked that online users' emotions can either be positive or negative. Negative emotions are expressed when expectations are challenged or hindered, while on the other hand, a learner may experience positive emotions when obstacles are removed, or when challenges are uncovered. Such positive emotions include delight, excitement, and display of eureka. Graesser, Chipman, King, Mc Daniel and D'Mello (2007), Hone (2006) and Picard (1997) reported that emotions expressed in form of body language also influence human-computers interactions. Based on the discrete emotions theoretical framework, Ekman (1993) identified basic facial expressions of emotions to include anger, sadness, fear, surprise and disgust. Appraisal theory of emotions connects individual's emotions to the construction and appraisal of continuous interaction with the environment (Baylor, Warren, Park, Shen, & Perez, 2005). Empirical findings have shown that self-efficacy influences individual's emotional state (Lazar, Jones, Bessiere, Ceaparu & Shneiderman, 2004).

From the cognitive framework, how humans think and find meanings to their environment is a reflection of individual's cognition (Hess, 1999). Cognition is whatever gives the cognitive systems to do what they can do. In essence, cognition is the catalyst to performance (Dror & Harnad, 2009). In other words, students do cognize while during online registration. As a matter of fact, all cognizes' performance capacities exist as a result of individual's level of cognition. Meanwhile, Freese, Rivas and Hargittai (2006) posited that the cognitive level may be a basis to individual's desire to adopting and effective use of online service. Zhu (2006) emphasized the fact that cognitive engagement is one of the critical factors during interaction in online environment. Earlier research indicated that cognitive process is influenced by one's emotion (Loiacono & Djamasbi, 2010). Tun and Lachman (2010) also found that frequent computer use is associated with cognitive performance. In the same vein, Gottfredson (2002) discovered that cognition has relationship with expectations and reality about individual's ability to use Internet effectively.

There is a link between the way we cognize the world and things around the environment and people's emotional responses towards the environment and the world (Dagleish & Power, 1999). Ratner (2000), cited in Glazer (2008), observed that emotions and cognition are in-separable twins. Glazer (2008) further emphasized that the recognition of a solid association between emotion and cognition enhances individual's effectiveness in learning environment. It therefore follows that the centrality of emotion and cognition in activating attention, response to environment and performance cannot be under-estimated. Cognition and emotion relations within the spectrum of ICT illustrates that computer users who have high level of cognitive computer skills are likely to be less anxious, depressed in moods while using online service (Dagleish & Power, 1999). Moreover, O'Regan (2003) remarked that emotion forms the basis for functioning in the cognitive domain. Meanwhile, some users of World Wide Web often display elements of anxiety (Hemby, 1998). Such apprehension according to Rozell and Gardner (2000) emanates from stress, lack of basic knowledge of computers skills and Internet

search engines, unclear instruction on the use of Internet for specific tasks, uncertainty about the system's performance and many others. Apprehensive situations sometimes expose computer users to shame, embarrassment, incompetence, confusion and discouragement. D'Mello et. al (2007) highlighted cognitive activities which include deliberation, goal appraisal, causal reasoning and planning process as being functional throughout the experience of emotion.

Researchers seem to have not given adequate fundamental attention to the emotion people encounter from the use of computers (Creed & Beale, 2005), while majority of studies on emotion in computers are targeted at adult users (Yildirim, Lee, Potamianos & Narayanan, 2005). Attitude, perceptions and disposition to online environment have been well researched with various groups of students; nevertheless there still appears that research work on the undergraduates' frustration during e-registration as influenced by cognition and emotion is yet to receive proper attention. There is therefore the need to examine whether undergraduates' cognitive ability and emotions are contributors to frustration or success during e-registration. Furthermore, despite the increasing acceptance and use of computers and Internet in education sector of developing countries such as Nigeria, many students still encounter series of difficulties with e-Registration process. It is thus apparent that the flexibility and convenience of e-Registration may not sustain students in online environment. Meanwhile, with the increasing popularity of e-Registration across the globe, research is needed to determine how emotion and cognition contribute to learners' frustration during registration in online environment. This study was therefore set to examine the combined and relative contributions of emotion and cognition to undergraduate students' computer frustration during e-Registration, as well as the degree of students' frustration during online registration in different institutions.

Research Questions

To achieve the objective of this study, three research questions were formulated:

1. What are the various frustrating experiences encountered by undergraduates during e-Registration exercise?

2. What is the relative and combined contribution of cognition and emotion to the prediction of students' computer frustration during e-Registration?

3. To what extent does students' computer frustration during e-registration differ based on institution?

Methodology

Participants

All undergraduates of the state-owned universities in Ogun State, Nigeria, i.e. Olabisi Onabanjo University, Ago-Iwoye (OOU) and Tai-Solarin University of Education, Ijagun, Ijebu-ode (TASUED) constituted the population of this study. A total of 1972 (987 Males, 985 Females) undergraduates from the faculties/colleges of Education, Sciences, Social and Management Sciences and Arts were selected as the sample of the study from the two universities through

simple random sampling technique. 998 students (546 Males, 452 Females) were selected from TASUED, while 974 students (441 Males, 533 Females) were selected from OOU. The mean age and the standard deviation of the respondents were 23 and 7.9 respectively.

Instruments

Data gathering instruments used for the study were Students' Cognition Scale (SCS), Students' Emotion Scale (SES) and Computer Frustration Scale (CFS). Each of these instruments was described below.

Students' Cognition Scale (SCS)

Students' cognition was measured by a self-reported cognition scale developed by the researchers. The instrument was divided into sections A and B. Section A elicited respondents' bio-data, while section B contained 18 statements that required respondents' indication of agreement or disagreement to each of the items. Examples of the items included "I prefer simple problems to complex ones", "I engage in critical thinking as much as possible", I find it more comfortable thinking the way I know best" etc. The instrument was rated using a 4-point Likert scale (from strongly agree = 4, to strongly disagree = 1). The instrument was given to two educational psychologists and an educational technologist in order to ascertain its validity. Comments of the experts were dully considered before producing the final draft of the instrument. The Cronbach alpha reliability coefficient of the instrument was .81.

Students' Emotion Scale (SES)

In order to measure the students' emotion, SES was developed by the researchers to elicit the participants' responses about their affects based on three sub-scales of emotions (perception, expression and management). The instrument was divided into two sections. Section A elicited the demographic information of the participants, while section B contained 13 items of three components of emotions (items 1, 2, 5, 7, 9 and 11 for perception, items 3, 6, 12 and 13 for expression and items 4, 8 and 10 for management). The items of the instrument were rated using a 4-point Likert scale of Strongly Agree = 4, Agree = 3, Strongly Disagree = 2 and Disagree = 1. The instrument was given to two educational technologists and a psychometrician for validity assessment. Suggestions of these experts were given due consideration before the production of the final draft of the instrument. The Cronbach alpha reliability coefficient of this instrument was .79.

Computer Frustration Scale (CFS)

The CFS was developed by the researchers to measure the students' level of frustration while using computers during online registration. The instrument contained 22 items that elicited respondents' computer frustrating experiences and the degree of frustration, disposition during frustration and actions taken to manage the frustrating situations. Participants were required to place a tick in front of each of the items to indicate the relevance of the item(s) to their frustrating experiences encountered while using online service. The degree of frustrating experience was measured on a scale of 1 (not very frustrating) to 9 (very frustrating). The

initial version of the instrument was given to experts for review. Experts' comments and suggestions were considered before the final draft of the instrument was produced. The Cronbach alpha reliability coefficient of the instrument was .77.

Procedure for Data Collection

Data for the study were collected within a period of four weeks during the 2009/2010 registration exercise at the two universities involved in this study. The instruments were distributed to volunteered-students randomly at the e-Learning centre of Tai-Solarin University of Education, Multi-media library of Olabisi Onabanjo University and the various cyber-cafes within the universities' campuses where many of the students were engaged in online registration exercise. Voluntary participation of the students was individually sought; hence the willing-to-participate students were involved in the study. Five research assistants who have been adequately trained on how to ensure participants' effective responses to the items were involved in the administration of the instruments.

Results

Descriptive analysis of the Mean and Standard Deviation of students' computer frustration, cognition and emotion revealed (Mean = 19.288; SD = 6.584); (Mean = 46.791, SD = 4.779); and (Mean = 36.357, SD = 5.104) respectively. The results of the correlations matrix for the relationship between the predictor variables and the outcome variables showed that students' computer frustration negatively and significantly correlated with cognition (-.157), but positively and significantly correlated with emotion (.139).

Research Question 1

The first question of the study was: What are the various frustrating experiences encountered by undergraduates during e-Registration exercise? Results are presented in Table 1.

Table 1. Undergraduates frustrating experiences during e-registration

SN	Item	Frequency	Percentage
1	Malfunctioning of computer parts	1678	85.1
2	Too long time computers took to respond to commands	1554	78.8
3	Delay in downloading and uploading files	1465	74.3
4	Booting problems	1278	64.8
5	Files/data infected by virus	845	42.8
6	Loss of data	688	34.9
7	Poor computer networking,	678	34.4
8	Computer crash	567	28.8
9	Printer problem	456	23.1
10	Erratic power supply	1465	74.3
11	System complexity	431	21.9

From the results above, it is apparent that most students engaged in e-registration are often frustrated by malfunctioning of computer parts which is orchestrated by low/bad quality of computer technology accessories available in computer laboratories, multimedia rooms and cyber cafes. Consequently, students were hindered from having smooth and hitch-free online registration because many of the computers took too long time to respond to commands, delayed computer booting as well as downloading and uploading problems. However, printing problem and system complexity were reported as the least experienced-frustrating situations to students during e-registration.

Research Question 2

The second question of the study was: What is the combined and relative contribution of cognition and emotion to the prediction of students' computer frustration during e-Registration? Results related to this question are shown in Table 2.

Table 2. Model summary, coefficient and t-value of multiple regression analysis of the predictor variables (cognition and emotion) and the criterion measure (computer frustration)

Model	Un-standardized Coefficients		Standardized Coefficients	t	p
	B	Std. Error	β		
(constant)	28.924	3.359		8.612	.001
Cognition	-.218	.062	-.158	-3.515	.003
Emotion	.016	.058	.012	.271	.787

Model Summary
Multiple R (Adjusted) =   .157
Multiple R^2 (Adjusted) = .025
Stand Error Estimate = 6.516

a. Dependent Variable: Students' computer frustration.

The independent variables (cognition and emotion) combined to contribute a coefficient of multiple regression of 0.157 and a multiple correlation square of 0.025. By implication, 2.5% of the total variance of the undergraduates' computer frustration was accounted for by the combination of the two variables. In addition, the table also reveals that the analysis of variance of the multiple regression data produced an F-ratio value significant at 0.05 level [$F(2,1972)=6.202$; $p<0.05$].

Results also show that cognition [$β=-.158$, $t=-3.515$, $p<.05$] was the main predictor of undergraduates' level of computer frustration. Furthermore, the results indicated that emotion [$β=012$, $t=.271$, $p=.787$] did not make any significant contribution to the prediction of the dependent variable. This step of the analysis was done to show evidence of relative relevance of the independent variables in accounting for the variations in undergraduates' level of computer frustration during e-Registration. By implication, it is evident that students' computer frustration is dependent of their cognition level. It therefore follows that the higher the cognitive level, the lesser the computer frustration levels of the students are likely to be.

Research Question 3

The last question do the study was: To what extent does students' frustration level during e-registration differ based on institution? Results are depicted in Table 3.

Table 3. Comparison of students' frustration level during e-registration based on institution

Institution	N	Mean	Standard deviation	df	t-cal	Sig	Remarks
TASUED	998	17.122	6.302	1970	-6.78	.001	Significant (p<.05)
OOU	974	21.414	6.245				

The results in Table 3 show that there exists a significant difference in the students' computer frustration level during e-registration in Olabisi Onabanjo University and Tai-Solarin University of Education (t=-6.78, p<.05). The results in the Table 3 also suggest that students of Olabisi Onabanjo University experienced more computer frustration during online registration.

Discussion and Conclusion

That students encountered a series of experiences culminating into frustration during e-registration as an outcome of this study lends credence to the research outcome of Lazar, Jones, Hackley and Shneiderman (2006) which indicated that students and workplace computer users reported series of frustrating experiences. Similarly corroborating the outcome of this study, O'Regan (2003) and Preece, Rogers and Sharp (2002) found that computer users were often frustrated at events of computer crash, unclear error message, pop-up advertisement, and confusing interface as they surf the Internet. Advancements in computer technology evolve regularly; hence, Tatum and Morote (2006) also found that teachers' acquisition of appropriate knowledge and skills are more or less impetus to effective utilization of instructional technology.

It is quite interesting to note from the findings of this study that computer complexity was the least frustrating experience among undergraduates. This probably shows that undergraduates in developing countries such as Nigeria are striving to meeting up with the challenge of literacy in technology and technology usage. On the other hand, it might be that students who had low level of computer self-efficacy and self-concept might have engaged the services of friends and colleagues in order to avoid embarrassment. Meanwhile, the issue of malfunctioning computer parts may linger for years and thereby subject students to perpetual frustration in online environment if efforts are not geared towards discouraging government agencies, cyber-cafes' owners, educational stakeholders and university administrators/management from relying on, procuring and installing fairly-used computer software and hardware. We are prompted to infer that the degree of students' frustrating experiences during e-registration was aggravated by their lack of necessary skills, appropriate techniques involved in exploring various computer and Internet applications.

The results revealed that the two predictor variables combined to predict students' computer frustration during e-registration. The observed F-ratio of 6.202 significant at .05 level is a reliable evidence that the combination of the independent variables (cognition and emotion)

in the prediction of students' computer frustration during e-registration was not by chance. It is evidently clear that the coefficient of multiple regression of .157 and a multiple R square of .025 indicate the magnitude of the relationship that exists between the independent variables and the criterion variables. Inferring from the results available in Table 2, the linear relationship of the two predictor variables accounted for 2.5% of the total variance in the students' computer frustration during e-registration. It is pertinent to note that the strength of the joint predictive power of the independent variables on the dependent variable of this study is weak at 2.5% but significant. It therefore implies that there are other strong predictors of students' frustration during e-registration which needs further investigation.

There seems to be a dearth of research on the combination of the two independent variables of this study (cognition and emotion) to predict students' frustration during e-registration. However, Hess (1999) reported that lack of in-depth knowledge about the use of search engines caused students' frustration in online environment, while Lazar, Feng and Allen (2006), Baylor and Rosenberg-Kima (2006) found that association exists between computer users' level of frustration and their emotion. Similarly, Rozell and Dusick (1998) cited in Rozell and Gardner (2000) indicated that emotion was an indicator of the degree of efforts computer users exerted on specific tasks. That cognition and emotion jointly contributed to students' frustration during e-learning is not a surprise since cognition and emotion have been identified as Siamese twins. It therefore follows that a good knowledge about computer applications, software and hardware as well as positive affective state of students are most likely to be effective mitigating factors and/or antidotes to frustration during e-registration. In addition, it likely that if students are less anxious and exercise more patience, their mood may be better regulated to enhance smooth sail when interacting with Internet facilities.

That cognition was the only significant contributor to students' frustration during e-registration, while emotion did not make any significant contribution was at variance with earlier research findings which indicated that learning process is not independent of learners' emotion (Vince, 2001 cited in Glazer, 2008);   computer mediated communication is socio-emotional (Glazer, 2008) and that emotion was the potent differentiator in computer users' experiences (Cristescu, 2008). Meanwhile, one would have thought that students' feelings should have great impact on what they think, what they choose to do, how they choose to do it and the decisions taken when there are challenges limiting their success in what they choose to do. However, that emotion did not contribute significantly to students' frustration during e-learning in this study seems quite surprising despite the degree of varying frustrating experiences encountered by students during e-learning. It therefore follows that whether students' emotion is positive or negative, the degree of frustration during e-registration counts on their level of cognition.

Another finding of this study indicated that there was a statistically significant difference in computer frustration during e-registration between students of TASUED and those of OOU. The outcome of this study was said to be in favor of students of TASUED. Computer access and frequent computer use have been researched as good indicators of computer proficiency. This reason might account for the undue privilege TASUED students had over those of OOU because the former have easy access to multiple number of computers within in the institution's e-learning center and reasonable number of cyber-cafes within the immediate environment of the institution. The e-learning center and the available cyber-cafes provide regular access-to-Internet facilities services to students at affordable costs. The experience of TASUED students was not at variance with those of their counterparts in OOU who were not chanced to explore privileges that would have enable them to access officially-provided

professional technical assistance and web sites through high Internet browsing speed available at the e-learning center. However, there seems to be little or no earlier research findings as regards the differences that exist in frustration level during e-learning among students of different institutions of learning.

The results reported in this study underscored the need for researchers and educational technologists to use a combination of the two independent variables of this study (cognition and emotion) or more as predictors of learners' frustration in online environment-related issues in education. In order to reduce frustration experiences encountered by students in developing countries while interacting with Internet, authorities of various higher education institutions may need to see the need to make competence-test in computer skills as a major pre-requisite to admitting students into universities and other higher education institutions. Furthermore, schools and institutions of higher learning should not only be equipped with appropriate number of computers and Internet facilities that could serve the students' population, but should also provide commensurate human-power services that will make available the necessary technical supports and assistance to the students. This will not only reduce the negative affective state of students when they encounter problems while interacting with Internet, but also give them increased access to computers which may improve their knowledge and skills in using computer-technologies.

Recommendations for Further Research

This study is limited to the two state-owned universities in Ogun State, Nigeria, while only the prediction of emotion and emotion on frustration in online environment were investigated in the study; thus it has not covered all possible information on the prediction of university students' frustration during e-registration. Thus, the researchers urge academics to conduct further research on this subject focusing on other variables, private higher institutions of learning, and wider geographical coverage within and outside Nigeria. There is also the need to research into and other regions aside Ogun state and South-Western part of Nigeria. More importantly, there is the need to research into how computer users' location at the time of frustration affects their mood, emotion and cognitive performance in schools.

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