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Mathematics Ability and Anxiety, Computer and Programming Anxieties, Age and Gender as Determinants of Achievement in Basic Programming

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Abstract- **Computer programming which forms the major component of most technological inventions is perceived by most computer science students as difficult. Some researchers have also reported that failure rates in programming courses are between 30% and 40%. It has therefore become necessary to study factors that could influence achievement in programming. This study therefore investigated the interaction between some selected factors (mathematics ability, mathematics anxiety, computer anxiety, programming anxiety, age and gender) and achievement in Basic programming. The study adopted a correlational design with achievement in Basic programming as the dependent variable, while mathematics ability, mathematics anxiety, computer anxiety, programming anxiety, age and gender serve as the independent variables. Three scales namely; mathematics anxiety (r = 0.82), computer anxiety (r = 0.82) and programming anxiety (r = 0.82) rating scales were used for data collection. Data collected were analysed using Pearson Product Moment Correlation (PPMC) coefficient and multiple regression analyses.The result of the analysis showed that the correlation between mathematics ability and achievement in Basic programming are positive and significant. The composite effect of the factors under study on achievement in Basic programming is 20.8%. Efforts should be made to motivate students to improve their mathematics ability so as to improve programming performance and consequently improve efficiency in programming.**

Keywords: Mathematics, Computer, Programming, Ability, Anxiety and Achievement.

Introduction

The importance of computer programming in this age of technological development cannot be over emphasized. The Nigerian Information Technology (IT) industry in particular is in dire need of indigenous programmers. Most of the software packages presently in use in Nigerian industries, schools and financial institutions are either foreign (developed outside Nigeria) or locally adapted [1]. However, computer programming which forms the major component of most technological inventions is perceived by computer science students as difficult. Many students who are proficient at other subjects sometimes fail to succeed in programming [2]. This is because programming is different from other disciplines. There have been many studies in recent years into achievement in computer programming [2,3,4,5]. Some scholars reported that failure rates in programming courses are about 30% to 40% [6,7].

Previous researches indicate that students with programming background particularly in structured programming [7,8], investigative personality [9] mathematical background [10,11,12,13] have better programming achievement. Some other researchers found that scores in aptitude tests, prior records of academic achievement (such as school GPA) and effort or self motivation explain significantly the variations in programming achievement of students [14,15,16]. Specifically studies on cognitive factors' prediction of computer programming achievement revealed that demographic, cognitive and academic variables and computer exposure strongly predicted class performance [15,16]. Other studies considered variables such as learning styles [2], self efficacy [18], comfort level [19,20], personality type [21,22], mental model [7] as positive predictors of programming achievement.

Mathematics ability has for a long time been reported to positively relate to performance in computer science courses (including programming) in many studies [10,11,12,23,24,25,26,27]. Other researchers reported that mathematics background and ability significantly predicted achievement in computer and analytical skills associated with both disciplines [2,5].

Computer anxiety was found to contribute to computer ability [28]. Computer anxiety has been defined as a fear of computers when using one, or fearing the possibility of using a computer [29]. It differs from negative attitudes towards computers which entails beliefs and feelings about computers rather than one's emotional reaction towards using computers [30]. Computer anxiety is characterised as an affective response on emotional fear of potential negative outcomes such as damaging the equipment or looking foolish [31]. From an information processing perspectives, the negative feelings associated with high anxiety detract cognition resources from task performance [32]. Thus, programming achievement of students has been seen to be negatively affected by computer anxiety.

Related to computer anxiety is mathematics anxiety which is very common among students. It was noted that many students who suffer from mathematics anxiety have little confidence in their ability to do mathematics and tend to take the minimum number of required mathematics courses which has greatly limited their career choice of opinions [33]. The findings of [34] also revealed that the correlation between mathematics anxiety and academic achievement is negatively significant. Some other studies have shown that mathematics anxiety influences negative attitude towards computers [35,36]; which in turn is likely to have great implications on computer programming achievement. Students who are more relaxed when faced with programming related activities perform better than those with

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relatively high programming anxiety in any programming course. Thus, there is every reason to believe that anxiety level (whether computer anxiety, programming anxiety or mathematics anxiety) ought to be minimal in order to obtain a good programming achievement.

Several researches have been conducted to show that older students are more likely to adapt and function effectively in any school settings than the younger students. [37] specifically discovered in his study of computer engineers that there was no differrence in job performance as age increases. A more comprehensive study on age and the attributes of successful students in an introductory programming class, showed that higher levels of performance is obtained with increasing age and an intention to major in computing [38].

A number of studies have considered gender as an independent factor influencing computer – related variables. Significantly, some studies revealed that boys are more interested and confident in working with computers than the girls [39,40,41,42,43].

Studies that collectively looked at the predictive abilities of mathematics ability, computer and programming anxieties, age and gender on Basic programming achievement generally and especially among Nigerian subjects seems to be very rare in literature. Given the level of demand for indigenous programmers and software developers in Nigeria, a study like this becomes imperative as it would provide the empirical data needed to suggest strategies for boosting software development activities among Nigerian computer majors. It is on this note, that this study seeks to establish the relationship between the following six variables (mathematics ability,computer anxiety, mathematics anxiety, programming anxiety, age and gender) and achievement in Basic programming.

Purpose of the Study

This study will determine:

1. The relationship between mathematics ability,computer anxiety, mathematics anxiety, programming anxiety, age, gender and achievement in Basic programming.
2. The composite effect of the six predictor variables (mathematics ability,computer anxiety, mathematics anxiety, programming anxiety, age and gender) on the academic achievement of NCE Computer / Mathematics students in Basic programming.
3. The relative effect of the six predictor variables (mathematics ability,computer anxiety, mathematics anxiety, programming anxiety, age and gender) on the academic achievement of NCE Computer / Mathematics students in Basic programming.

Research Questions

The following research questions were answered:

1. Do each of the six predictor variables; gender, age, mathematics ability, mathematics anxiety, computer anxiety and programming anxiety relate significantly with the performance of NCE computer / mathematics students in Basic programming?
2. What is the composite effect of the six predictor variables; gender, age, mathematics ability, mathematics anxiety, computer anxiety and programming anxiety on the performance of NCE computer / mathematics students in Basic programming?
3. What are the relative effects of the six predictor variables; gender, age, mathematics ability, mathematics anxiety, computer anxiety and programming anxiety on the performance of NCE computer / mathematics students in Basic programming?

Method

The study adopted a survey design with all undergraduate computer/mathematics students of the Federal colleges of education in Lagos and Ogun states of Nigeria as population for the study. The sampling procedure was purposive as students who had offered the Basic programming course in the Nigeria Colleges of Education curriculum were eligible to participate in the study. Three instruments were administered on one hundred and sixty computer/mathematics students of Federal College of Education (Technical), Akoka, Lagos state, Nigeria and Federal College of Education, Osiele, Abeokuta, Ogun state, Nigeria. The instruments included the Computer programming anxiety rating scale, computer anxiety rating scale and mathematics anxiety rating scale. To determine the mathematics ability of students, their first semester scores in a course titled “Algebra” (MAT 111) was used while their second semester scores in the Basic Programming course (CSC 125) was used for their achievement in Basic programming. The student background questionnaire was used to elicit information on age and gender of the respondents. The computer programming anxiety scale was originally designed and validated by [44]. The scale has 19 items. The respondents were given instructions to rate their anxiety levels when faced with computer programming tasks. The questionnaire was designed using a five-point Likert-scale using the following response format: Never true (0), seldom true (1), sometimes true (2), often true (3), always true (4). The reliability coefficient using cronbach alpha was found to be 0.82. The computer anxiety rating scale was originally designed and validated by [30]. The scale has 19 items. The respondents were given instructions to rate their anxiety levels when faced with computer related tasks. The questionnaire was designed using a four-point Likert-scale using the following response format: strongly agree (SA), agree (A), disagree (D) and strongly disagreed (SD). The reliability coefficient using cronbach alpha was found to be 0.82. The mathematics anxiety rating scale was originally designed and validated by [45]. The scale has 14 items. The respondents were given instructions to rate their anxiety levels when faced with mathematical concepts. The questionnaire was designed using a four-point Likert-scale using the following response format: strongly agree (SA), agree (A), disagree (D) and strongly disagreed (SD). The reliability coefficient using cronbach alpha was found to be 0.82. The resulting data were analysed with the aid of Statistical Package for Social Sciences (SPSS) version 17.0 software using correlation and multiple regression.

Result

To answer research question one, a correlation matrix (Table 1) showing the correlation coefficient between the performance of NCE computer / mathematics students in Basic programming and the six predictor variables is presented.

Table 1: Correlation Matrix Showing Relationship Between Performance in Basic Programming and Predictor Variables.

	Gender	Age	MA	MARS	CARS	CPARS	CPA
Gender	1.000						
Age	-0.148	1.000					
MA	-0.30	-0.077	1.000				
MARS	-0.078	-0.015	0.096	1.000			
CARS	0.017	0.072	0.043	0.272	1.000		
CPARS	0.129	-0.126	-0.103	-0.082	-0.076	1.000	
CPA	0.077	-0.082	0.450**	0.100	0.123	-0.144	1.000

KEY: MA = Mathematics ability; MARS = Mathematics Anxiety Rating Scale; CARS = Computer Anxiety Rating Scale; CPARS = Computer Programming Anxiety Rating Scale; CPA = Computer Programming Achievement

** = Correlation is significant at the 0.01 level (2-tailed)

* = Correlation is significant at the 0.05 level (2 tailed)

The results showed that not all the six predictor variables (gender, age, mathematics ability, mathematics anxiety, computer anxiety and computer programming anxiety) related positively with the performance of NCE computer / mathematics students in Basic programing. The predictor variables which related positively are gender, mathematics ability, mathematics anxiety and computer anxiety while age and computer programing related negatively. The relationship between mathematics ability and the performance of NCE computer / mathematics student in Basic programing is statistically significant at an alpha level of 0.01.

Table 2: Multiple Regression of the Predictor Variables on the Performance of NCE Computer / Mathematics Students in Basic Programming.

Parameter	Value
Multiple Regression (R)	0.488
R – Square	0.238
Adjusted R – square	0.208
Std. Error of Estimate	11.648

Predictors: (Constant), Gender, age, MA, MARS, CARS and CPARS.

Table 2 above presents the multiple regression of the predictor variables on the performance of NCE computer / mathematics students in Basic programming. The multiple regression correlation coefficient (R) showing the linear relationship between the six predictor variables (gender, age, mathematics ability, mathematics anxiety, computer anxiety, and computer programming anxiety) and the students' performance in Basic programing is 0.488. The adjusted R square value is 0.208. This implies that the variation in the performance of NCE computer / mathematics students in Basic programing accounted for by the stated predictor variables is 20.8%

Table 3: Multiple Regression ANOVA

Model	Sum of squares	Df	Mean square	F	Sig.
Regression	6405.220	6	1067.537	7.869	0.000[a]
Reside	20485.767	151	135.667		
Total	26890.987	157			

a. Predictors: (Constant), Gender, age, MA, MARS, CARS and CPARS.
b. Dependent variable: CPA

Table 3, above shows the Multiple Regression ANOVA of the predictor variables on the performance of NCE Computer / Mathematics students in Basic programming. Further verification using multiple regression ANOVA however produced F-ratio =7.869, $p<0.05$. This implies that there is a significant linear relationship between the above stated predictor variables and the performance of NCE Computer / Mathematics students in Basic programing.

Table 4: Coefficients Indicating Relative Effects of the Predictor Variables on the Performance of NCE Computer/Mathematics Students in Basic Programming

	Unstandardized coefficients		Standardized coefficient			
Model	**β**	**Std. Error**	**Beta**	**T**	**Sig.**	**Remark**
Constant	29.843	10.014		2.980	0.003	S
Gender	2.811	1.895	0.108	1.484	0.140	N.S
Age	-1.149	1.447	-0.058	-0.794	0.428	N.S
MA	0.294	0.049	0.430	5.973	0.000	S
MARS	0.059	0.139	0.031	0.422	0.674	N.S
CARS	0.171	0.137	0.093	1.247	0.214	N.S
CPARS	-0.102	0.066	-0.113	-1.554	0.122	N.S

a. Dependent variable: CPA
S: Significant at 0.05 alpha levels.
N.S: Not significant at 0.05 alpha levels.

Table 4 above shows the relative effects of the predictor variables on the performance of NCE Computer / Mathematics students in Basic programming in the order of absolute magnitudes as indicated by standardized Beta (B) weights. Mathematics Ability (MA) contributed most and directly to the performance of NCE computer / mathematics students in Basic programming ($B = 0.430$; $t = 5.973$; $p < 0.05$). The contributions of other predictor variables to the performance of NCE Computer / Mathematics students in Basic programming are: computer anxiety ($B = 0.093$; $t = 1.247$; $p > 0.05$), mathematics anxiety ($B = 0.031$; $t = 0.422$; $p > 0.05$), Age ($B = -0.058$; $t = -0.794$; $p > 0.05$), Gender ($B=0.108$; $t = 1.484$; $p > 0.05$), and computer programming anxiety ($B = -0.113$; $t = -1.554$; $p > 0.05$). This implies that only the Mathematics ability in table 4 above have significant relative effect on the performance of NCE Computer / Mathematics students in Basic programming.

Discussion of Findings

The results from the analysis revealed that not all the predictor variables (gender, age, mathematics ability, mathematics anxiety, computer anxiety and computer programming anxiety) related positively with the performance of NCE Computer / Mathematics students in Basic programming. While some predictor variables related positively, others related negatively. The predictor variables which related positively are gender, mathematics ability, mathematics anxiety and computer anxiety, while age and computer programming anxiety related negatively.

The result showed that the combined effect of the six predictor variables (gender, age, mathematics ability, mathematics anxiety, computer anxiety and computer programming anxiety) on students'computer programming achievement is 20.8% and the relationship is significant.

The results also revealed that only one of the predictor variables (that is, mathematics ability), have positive "significant" relationship with the performance of NCE Computer / Mathematics students in Basic programming. This result is consistent with the findings [8] where it was discovered that students who have good background in mathematics are more likely to succeed in programming subject. This result also supports the findings of [2 and 5] where success in Mathematics was found to be a good predictor of success in computer science. Moreso, other researchers suggested that mathematics background related significantly to students' performance in College computer science courses [10,11,12,13]. The reason why good mathematics ability encourages good performance in programming could be as a result of the fact that both Mathematics and Programming involves the ability to understand abstract concepts in solving problems. [46] stated that:

> "*In solving problem through programming, the students are required to develop the abstract representation of the problems and express them in a logical structure and detailed realization in programming language*".

Conclusion

The relationship between mathematics ability and the performance of NCE computer / mathematics students in Basic programming is statistically significant. The composite effect of the six predictor variables on the performance of NCE computer / mathematics students in Basic programming is 20.8%. Only one of the six predictor variables (mathematics ability) has significant relative effect on the performance of NCE computer / mathematics students in Basic programming.

Recommendations

College computer science students should be motivated to improve in their mathematics ability and develop more positive attitude towards mathematics, since good mathematics ability enhances good academic achievement in computer programming.

References

[1] P.O Jegede(2009) . Predictors of JAVA Programming self-Efficacy among engineering Students in Nigeria University. *International Journal of Computer Science and information security* (IJCSIS), available at http:/site.google.com/site/ijcsis/.

[2] P. Byrne and G.Lyons (2001). The effect of students Attributes on success in programming. ACMSIGSE Bulletin of the proceedings of the 6th Annual conference on Innovation and Technology in computer science Education 33(3) pp 49-52.

[3] S. Mc Namarah and R Pyne (2004). Teaching a first level programming course: strategies for improving students performance, journal of Art Science and Technology, 1, 42-49

[4] M. Begum (2003). An Ontology for Teaching Programming. Association for computer machinery, 36(3), 49-52.
[5] L Fowler, V. Campbell, D. McGill and G. Roy (2002). An innovative approach to teaching first year proigramming supported by learning style investigation. A paper presented at the Australasian Association for Engineering Education, Melbourne
[6] Z.Shukur, M. Alias, S.A Hanawi, and A. Arshad (2003). "Faktor-faktor Kegagalan: Pandangan pelajar Yang mengulang Kursus Pengaturcaraan C", Paper presented in Bengkel Sains Pengaturcaran (ATUR03). Kuala Lumpur.
[7] N.M Norwawi, C.F Hibadullah, and J. Osman. (2005). "Factors Affecting Performance in Introductory programming". [CDROM]. In Proceedings of the International Conference on Qualitative Sciences and Its Applications (ICOQSIA)
[8] Y. Ma, B. Liu, C.K. Wong, P.S Yu and S.M Lee (2000). Targeting the Right studies using Data Mining. In proceedings of the knowledge and Data Discovery (KDD 2000), Boston, U.S.A. pp 457 – 464.
[9] C.F. Hibadullah and M.N Norwawi (2007). Classification of student's performance in programming course using decision tree. The fifth international conference on information Technology in Asia, Kuching, pp 315- 317.
[10] D.F .Butcher and W.A Muth (1985). Predicting performance in an introductory computer science course communications of the ACM, 28 (3), 263– 268.
[11]S. Dey and Mand, L.R (1986). Effects of mathematics preparation and prior language exposure on perceived performance in introductory computer science courses. SIGSCE bulletin, 18(1), 144 – 148.
[12] S.C. Renk (1986). Factors affecting academic success in introductory computer programming. Doctoral dissertion, university of Iowa. Dissertation Abstracts International 48(3), 579 – A
[13] R.M. Thronson (1985). Achievement as a function of learning style preference in beginning computer programming courses. Doctoral dissertion, Montana State University.Dissertion Abstracts international, 45(10),3100– A.
[14] R.K Eskew and R.H Faley (1981). Some Determinants of student's performance in the First – college-level Financial Accounting course. The Accounting Review, 11(1), 137-147.
[15] T.R Hostetler,(1983). Predicting students success in an introductory programming course, ACM SIGCSE Bulletin 15(3), 40-49.
[16] A.. Goold and R. Rimmer (2000). Factors affecting performance in First Year Programming, ACM SIGCSE bulletin, 32, 39-43
[17] L.S. Corman (1986). Cognitive style, personlity Type, and Learning Ability as factors in predicting the Beginning programming student, Association for computer machinery 18, 80-89
[18] V. Ramalingam., D. LaBelle. And S. Wiedenbeck . (2004). Self- Efficacy and Mental models in learning to program, the 9th Annual SIGCSE conference an innovation and technology in computer science, Leeds, United Kingdom, 171-175.
[19] S. Bergin and R. Relly (2005). Programming: Factors that influences Success. Proceedings SIGCSE' 05. Feb 23 – 27. Missouri, US pp 411 – 415
[20] E. Holden and E.Weeden (2004). Prior experince and New IT students. Issues in informing science and information Technology vol 2.
[21] A.P.. Calitz, M.B. Watson and De Kock, G de V. (1997). Identification and selection of successful Future IT Personnel in a changing Technological and Business Environment. In proceedings of the 1997 ACM SIGCPR conference on computer personnel research. California, USA pp 31-35.
[22] W. Haliburton., M. Thweat. and N.J Wahl (1998). Gender Differences in Personality Components of computer science students: a test of Holland's Congruence Hypothesis. In Proceedings of the 1997 ACM SIGSCE 98, Atlanta, USA pp 77 – 81.
[23] V.A Dixon (1987). An investigation of prior source of difficulties in learning university computer science. Paper presented at the National Educational computer science. Paper presented at the National educational computer conference. Philadelphia, PA (ERIC Documentation Reproduction service No. ED295596)
[24] L. Goodwin and J.M Wilkes, (1986). The psychological and background characteristics influencing students'success in computer programming AEDS Journal, 19(1), 1-19
[25] J. Konvalina. S.A, Wileman, and L.J Stephens (1983) Math proficiency: a key to success for computer science students. Communications of ACM 26(5), 377-382
[26] P.W Oman(1986). Identifying student characteristics influencing success in introductory computer science courses. AEDS JOURNAL
[27] P. Ramberg, and S.V Caster,(1986). A new look at an old problem: keys to success for computer science students. SIGCSE bulletin, 18(3), 36-39
[28] B.L. Marcolin, C.M. Malcoln and O.C Kevin (1997). End use ability, impact of job and individual differences. Journal of End user computing 9(2), 3-12.
[29] S.L. Chua, D.,Chen, and A.F.L Wong, (1999). Computer anxiety and its correlates: a meta – analysis. Computers in Human Behaviour, 15, 609 – 623.
[30] R.K Heinssen, C.R Glass,and L.A. Knight (1987) Assessing computer anxiety: Development and validation of the computer anxiety rating scale. Computer in Human Behaviour, 3, 49-59.
[31] K.S. Hong, E, Abang,., O. Abang, and S.N Zaimuarifuddin(2005). Computer self-Efficacy, computer anxiety and attitudes towards the internet: a study among undergraduates in Unimas. Educational Technology and society, 8(4), 205 – 219
[32] R. Kanfer, R and E.D Heggestad (1997). Motivational traits and skills: a person-centred approach to work motivation. Research in organizational Behaviour, 19, 1-56.
[33] V.S Garry (2005). The effects of mathematics Anxiety on the course and career choice of high school Ph.D thesis (unpublished), philadelphia: Drexel University.
[34] M.H. Ashcraft AND E.P Kirk (2001). The relationships among working memory, math anxiety and performance. J Experimental psychology, 130(2): 224-237.
[35] C. Gressard and B.H. Loyd(1984). Reliability and factoral validity of computer attitude scale. Educational and psychological measurement, 44(2), 501-505
[36] J.S. Lindbeck and F. Dambrot (1986). Measurement and reduction of math and computer anxiety. School science and mathematics volume 86(7). Pp 567-577
[37] W.J. Underwood (1986). The relationship between Age and performance of Engineers: a replication and extension. Engineering management international, 3(4), 245 – 252.
[38] T. Mclennan, S. Clemes, J. Young, and E. Kamikubo- Gould(2000). Age and Expectations? Attributes of successful students in an introductory programming class revisted. Paper presented at the WIC 2000: 6th Australian Workshop on Women in computing, July 20-22, Brisbane Australia: available: Http://www.sqi.gu.edu.au/wic2000/.accessed:6/25/01.
[39] L. Shashani(1994). Gender – based differences in attitudes towards computers, computers and education, 20 pp 169 – 181.
[40] K. Krendle, M.C Broihier and C. Fletwood (1989). Children and computers: do sex-related differences persist 3 Journal of communication, 29, pp 85 – 93.
[41] S.L Massoud (1991). Computer attitudes and computer knowledge of Adult students. Journal of educational computing research, 7, 269-291
[42] J. Voogt(1987). Computer Literacy in secondary Education: the performance and Engagement of Girls, computer and Education, 11 pp 305 – 312.
[43] S.C Chen (1986). A study of predicting the supply and demand of information professionals in ROC at the year 2000. Unpublished doctoral dissertion, National Sun Yat– Sen University, Kaoshung, Taiwan.
[44] L.C. Mooi and K.C. Cheung(1990). On meaningful measurement: Junior College Pupil's Anxiety towards Computer Programming. Chapter 4 of a collection of research works titled "Meaningful measurements in the classroom using Rasch Model: some examplars" published in October 1990 by the Institute of Education (Singapore).
[45] M. Baloglu and P.F. Zelhart(2007). Psychometric Properties of the Revised Mathematics Anxiety Rating Scale. *The Psychological Record 57, 593-611.*
[46] J. Bennedsen and M.E Caspersen(2005). Revealing the programming process. Proceedings of the 36th SIGCSE technical symposium on Computer science education volume 37, 186-190

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