INVESTIGATION OF GENDER-BASED INTEREST IN COMPUTER PROGRAMMING ENGAGEMENTS AMONG STUDENTS OF FEDERAL COLLEGE OF WILDLIFE MANAGEMENT, NEW BUSSA

*[1]Irunokhai, Eric Aghiomesi., [1]Adigun, Joseph Olusegun., [1]Onihunwa John Ojo, [2]Adeniji, Oluwafemi Adebayo, [3]Wealth, Samuel Abiola, [4]Dada, Oluwatobi Silas and [1]Sada, Yusuf Abubakar

[1]Computer Science Departments, Federal College of Wildlife Management, New-Bussa Nigeria
[2]Department of Forestry and Environmental Technology, Federal College of Wildlife Management, New-Bussa Nigeria
[3]Onigambari Research Station, Forestry Research Institute of Nigeria.
[4]Department of Computer Science, Federal University of Kashere.

Corresponding authors' email: ericooleric@gmail.com

ABSTRACT

The study examined gender-based interest in computer programming engagements among students of Federal College of Wildlife Management, New Bussa. Simple random sampling technique was adopted and one hundred copies of well-structured questionnaire were distributed to students. Data analysis was performed using simple percentages, cross tabulations, and t-test statistics. The results indicated that male students exhibit a slightly higher interest in programming compared to their female counterparts ($\Delta\mu=0.41$; $p >0.05$). Factors significantly influencing students' interest in programming include support from parents and family members ($\mu=3.78$, $p < 0.05$), support from lecturers/professors ($\mu=3.72$, $p < 0.05$), quality of teaching and resources ($\mu=3.64$, $p < 0.05$). Females have an equal ability to learn programming compared to males as posited by 80.9%. Low participation of both male ($\mu=1.68$ on a rating scale of 1 to 3) and female ($\mu=1.80$ on a rating scale of 1 to 3) students in coding-related extracurricular activities also observed.

Keywords: Computer programming, Gender, Students

INTRODUCTION

Gender based has remained as old as human existence and has always goes along with different factors from the perceptive of lives, society, culture and even educational background. Gender is one of the most stable features that humans are born with it and upon which humans are classified as male and female and prejudiced (Mwaura, 2020). Gender is define to be range of physical, biological, mental and behavioural characteristics pertaining to and differentiating between the feminine and masculine (female and male) population (Adigun *et al.*, 2015). Studies showed that Gender has been identified as an influential factor in career choice behaviour, and such indicates that different trajectories may exist regarding gender stereotypes and career choice process for men and women (Rocha & Van Praag, 2020). This perceptive to Gender is known as gender stereotypes which portraits simplistic generalizations about the gender attributes, differences, and roles of individuals and/or groups (Archer & Lloyd, 2002). The role of gender stereotyping in career aspirations is historical dating back to ancient societies which had its base in patriarchy and the superior roles of men in the social, legal and political structures of those societies (Mayange and Umar, 2018). Stereotypes can be positive or negative, but they rarely communicate accurate information about others. Gender stereotypes has made certain responsibilities and roles to be ascribed to some certain gender. The roles are categorized as masculine for males and feminine for females (Anathe *et al*., 2016). Females and males are expected to perform certain duties in a particular society all based on this certain intuition of various societal mind-set. These roles such as taking care of children, cooking and engaging in food production are attached to females, while males are identified with roles such as protecting families, building houses, as well as engaging in paid employment, cash crops production and business (Archer & Lloyd, 2002), it was also reported that men have greater interest with working with tools while women prefer working with people being highly social than the male counterparts (Su, and

Armstrong, 2009). The importance of examining students' interest and performance in relation to gender is based primarily on the socio-cultural differences between girls and boys. According to Novrina & Orge, 2016). Since the fundamental role of education is the provision of skilled labour that drives economic growth (Tasi'u et al.,2024), gender stereotyping has been identified as one of the major issues that needs to be addressed in the educational system, the society has the notion with the mind-set that most people that males are typically engineers, doctors and technical workers while females are teachers, nurses and office staffs influences the choice of career of both genders in pursuing college education. These initiatives which have been established among the society as norm has taken its root and has seriously put negative effects to the student career choice especially in sciences and the field of engineering. The innovations in the ICT sector both at the academic and professional fields have its intake in stereotypes. The field of computer science is not exempted from the gender based norms especially in the aspect of computer programming. Computer programming which is an aspect of the computer science which entails communicating and utilizing the computer system resources has become a driving force since it deals with software computation. As far as computer system is concerned, computer programming is very important (Mawere *et al.,* 2018) and earning computer programming is one of the first and most challenging tasks encountered by computing students (Akinola, 2016). With the unprecedented increase in the Computer Science jobs across the globe especially in hardware capabilities, artificial intelligence (Sharma *et al., 2021*.). The male gender gets to have more employments rate compare with their female gender and there is no standard or reason that have been established that the field of computing is meant for the male gender (Spieler *et al*,, 2020) as women are underrepresented across programming languages communities (Brook, 2024).

Several research works have be presented, girls who undertake studies in science and engineering fields were

found to be disfavoured by both male and female teachers, while boys were given preference and expected to outperform the girls (O'Donnell *et al.,* 2015). Black et al. (2011) revealed that one of the major reasons for having lower participation of female gender in computer science is due to stereotype. Hansen et al. (2017) reported that elementary school students recognize a computer scientist to be male, working alone, and only use computers as a tool. The children also selected "working", "coding" and "making" as the most common tasks for a computer scientist. The findings by Giannakos et al. (2014) which examined the effect of happiness, enjoyment and anxiety via three workshop events organized for 12 years old girls revealed anxiety has negative effects, happiness has positive effects while enjoyment has a neutral effects in their future involvement in computer coding. Jie & Hayden (2019) presented Hour of Code: A Study of Gender Differences in Computing. The study established the fact that there exist gender differences in computer programming based on an Hour of Code tutorial. The work involved both pre-design which proves that males have significantly more previous exposure to computer programming and are significantly more interested in pursuing computer programming even though while the post-design reveals women significantly outperformed men demonstrating that women may have a higher aptitude for computer programming.   With the interview conducted for 26 female computer science students from Colombia University, it established that the female students prefer working together with people than gadgets (Ramírez *et al.,* 2016). The views of the girl and boy members of a computing club related to science and computer science was conducted (Vrieler, 2021) with total 115 boys and 39 girls aged 9–16 completed the survey, yielding a response rate of 16.8%. The findings identified some contributing factors such as parental support for both genders, with the female gender less likely to appreciate the choice of study of computer science while both gender have a similar perception of computer science, but their motivation for wanting to work within the field as a career varied. While Tassabehji et al. (2021) also emphasized the women absence in computer programming with the belief that men naturally have tendency to write algorithm just as the field has a hostile macho culture. Likewise the findings of Happe et al. (2020) also emphasized that girls are observed having low interest in the choice of computer science courses but extension to coding due to classroom environment professed to be inconvenient for self-expression and better understanding. Bailie (2015) identified few key challenges that has kept women to be discouraged in studying science which include lack of self-confidence, poor exposure previously to computer related materials and absence of female role model within their locality and institution. The empirical study carried out by (Akinola, 2016) where 200 level Computer Science students of the University of Ibadan with little or no prior knowledge of Java programming and were subjected to a 13-week teaching and practical classes, and the results revealed that gender difference may not come into play at all when it comes to computer programming but factors like fear or attitudes may however be responsible for the low representation of females in computing. Mawere et al. (2018) studied the effects of gender on computer programming courses offered at some Universities in Zimbabwe, thirteen universities were considered, the pre-test results showed that there was no significant difference on the gender while the post-test results established better performance of the male gender.   A qualitative approach to better understand the experiences of female Computer Science students in the United Kingdom were conducted. Female students from Eight Universities

were interviewed and the results revealed that the field of computer science tends to be more suitable for the male gender than their female counterparts. Gunasekara (2021) examined the gender differences in learning computer programming, he investigated the students' perception towards programming by conducting a survey and engaging 241 students of Sri Lanka Institute of Advanced Technological Education. The findings revealed that although both male and female students believe programming is important for future career, there is a strong gender effect in their perception on curricula and their ability of programming. Just as Lai et al. (2022) emphasized the importance for students (both gender) to perceive learning computer programming to be an important task for their future, which will aid their learning with impacts. The findings of (Baser, 2013; Altun & Mazman, 2012) underscored that negative perception of students to programming will ultimately affect their performances. Furthermore, Özyurt (2015) reported statistical significant proves connection between students learning attitude and computer programming self-efficacy. Just as student's motivation from the teachers' perspectives is considered an important factor in encouraging and making programming course lively (Nunes *et al*., 2021).

The research conducted by Zaidi et al. (2017) after exposing some fifth-grade students to programming established that computing will be both easy and difficult for the male and female genders. The quality and distinct problem of the teaching materials for computer programming was presented by Medel and Pournaghshband (2017), the findings established that the teaching resources does not support diverse interests or address activities preferred by women.

The aim of this study is to investigate into gender-based interest in computer programming engagements among students of Federal College of Wildlife Management, New Bussa. The objectives are:

i.   To determine the level of gender based interest in computer programming among computer science students in the college
ii. To examine the factors that influence interest in computer programming among computer science students in the college?
iii. To examine the gender based differences in self-efficacy and confidence levels in computer programming among students at the school?
iv. To explore whether there are any gender based differences in participation rates in coding related extra-curricular activities, clubs or coding competitions?
v.   To determine whether male and female students perceive programming as suitable career choice?

MATERIALS AND METHODS
This study employed a quantitative research design to investigate gender-based interest in computer programming engagements among students of the Federal College of Wildlife Management, New Bussa, Niger State. Simple random sampling was used to select a representative sample of students from the college. A total of 100 students was purposively determined for the study. A well-structured questionnaire was designed and distributed to the students to gather data on their interest in computer programming, factors influencing their interest, and their participation in coding-related activities. The questionnaire was administered to the students, and completed questionnaires were collected and analyzed. Descriptive statistics (simple percentages) were used to summarize the data, while inferential statistics (cross-tabulations and t-test) were used to analyze the data and test the hypotheses. Informed consent was obtained from the participants, and confidentiality and anonymity were ensured.

RESULTS AND DISCUSSION
Data Analysis and Presentation of Results
Research Question 1: What is the level of gender based interest in computer programming among computer science students in the college?

Table 1(a): Interest of the respondents in computer programming

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not interested at all	3	4.4	4.6	4.6
	Slightly interested	4	5.9	6.2	10.8
	Moderately interested	13	19.1	20.0	30.8
	Very interested	12	17.6	18.5	49.2
	Extremely interested	33	48.5	50.8	100.0
	Total	65	95.6	100.0	
Missing	System	3	4.4		

Table 1(a) shows the students' interest in computer programming. It shows that higher percentage (48.5%) were extremely interested in computer programming, 17.6% were very interested, 19.1% were moderately interested, 5.9% were slightly interested, 4.4% were not interested at all while 4.4% supplied no response. As such, it could be inferred that computer science students of the college are interested in computer programming.

Table 1(b): Interest level of respondents in computer programming

	N	Minimum	Maximum	Mean	Std. Deviation
Interest Level	65	1	5	4.05	1.178
Valid N (listwise)	65				

Table 1(b) further corroborate table 1(a) by showing a high interest level ($\mu=4.05$) of the computer science students in computer programming on a rating scale of 1 to 5.

Table 1(c): Male and female respondents interest levels in computer programming

Sex	Mean	Mean Difference	Std. Deviation	p-value
Male	4.11	0.41	1.212	0.316
Female	3.70		0.949	

Table 1(c) further shows the difference of mean interest levels of male ($\mu=4.11$) and female ($\mu=3.70$) respondents on a rating scale of 1 to 5. It shows that the male students have slightly higher interest in computer programming compared with their female counterparts ($\Delta\mu=0.41$). However, the difference in interest levels was found to be insignificant ($p >0.05$).

Research Question 2: What are the factors that influence interest in computer programming among computer science students in the college?

Table 2: Factors that influence interest in computer programming among computer science students

Items	Mean	Mean Difference	Std. Deviation	p-value
Media (radio, TV, social) representation	3.32	0.316	1.352	0.083
Prior exposure to coding	3.15	0.148	1.172	0.357
Quality of teaching and resources	3.64	0.642	1.226	0.000
Support from parents and family members	3.78	0.782	1.357	0.000
Support from lecturers or professors	3.72	0.720	1.179	0.000
Peer influence and encouragement	3.44	0.436	1.344	0.019
School-sponsored coding events or clubs	2.87	-0.132	1.428	0.504
Access to coding labs or facilities	3.00	0.000	1.373	1.000

Table 2 shows the contributing factors that influence students' interests in computer programming. The contributing factors in order of influence on a rating scale of 1 to 5 are support from parents and family members ($\mu=3.78$, $p < 0.05$), support from lecturers or professors ($\mu=3.72$, $p < 0.05$), quality of teaching and resources ($\mu=3.64$, $p < 0.05$), Peer influence and encouragement ($\mu=3.44$, $p < 0.05$), Media (radio, TV, social) representation ($\mu=3.32$, $p > 0.05$), Prior exposure to coding ($\mu=3.15$, $p > 0.05$), Access to coding labs or facilities ($\mu=3.00$, $p > 0.05$) and School-sponsored coding events or clubs ($\mu=3.15$, $p > 0.05$). From the foregoing it could be inferred that factors that significantly influence the students' interests in computer programming are support from parents and family members, support from lecturers or professors, quality of teaching and resources and Peer influence and encouragement. The other factors have no significant influence.

Factors such as support from parents and family members, support from lecturers or professors, quality of teaching and resources and peer influence and encouragement are significant, other factors have no significant difference.

Research Question 3: What are the gender based differences in self-efficacy and confidence levels in computer programming among students at the school?

Table 3(a): Believe in equal ability of female to learn computer programming as compared with their male counterparts

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	9	13.2	13.6	13.6
	Undecided	2	2.9	3.0	16.7
	Yes	55	80.9	83.3	100.0
	Total	66	97.1	100.0	
Missing	System	2	2.9		

Table 3(a) shows the respondents' believe in equal ability of female to learn computer programming as compared with their male counterparts. It shows that 80.9% of the respondents believe in equal ability of female to learn computer programming as compared with their male counterparts while only 13.2% did not believe this assertion.

Table 3(b): Perspective of male and female students towards computer programming as a course meant for the extremely brilliant students

Item		Sex	
		Male	Female
	Yes	59.6%	90.0%
Section_A_10	Undecided	7.1%	0.0%
	No	33.3%	10.0%

Table 3(b) shows the perspective of male and female students towards computer programming as a course meant for the extremely brilliant students, it shows that the higher percentage (90%) of the female students perceive programming as a course meant for the extremely brilliant students while 59.6% of the male students perceive computer programming as a course meant for the extremely brilliant students. As such, more female students view computer programming as a course meant for the extremely brilliant students.

Research Question 4: What are the gender based differences in participation rates in coding related extra-curricular activities, clubs or coding competitions?

Table 4: Gender based differences in participation rates in coding related extra-curricular activities, clubs or coding competitions

Items	Gender	Mean	Mean Difference	p-value
Participation in coding-related extracurricular activities, clubs, or coding competitions	Male	1.68	0.12	0.716
	Female	1.80		
Development of any computer program been proud of	Male	2.11	0.11	0.75
	Female	2.00		

Table 4 shows gender based differences in participation in coding related extra-curricular activities, clubs or coding competitions vis-à-vis participation in coding-related extracurricular activities and development of any program the students have been proud of. In terms of coding-related extracurricular activities, both male and female respondents were shown to possess low participation in coding-related extracurricular activities ($\mu < 2.0$ on a rating scale of 1 to 3), further, there was no significance difference in the students rate of participating in coding-related extracurricular activities ($p > 0.05$). When asked whether the respondents have developed any program they were proud of, the male and female respondents were shown to be slightly affirmative ($\mu >= 2.0$ on a rating scale of 1 to 3) with the male been more affirmative, that is, more male respondents affirmed that they have developed any computer program they were proud of. However, the higher affirmative response of the male students was not significantly higher than that of the female respondents ($p > 0.05$).

Research Question 5: How do male and female students perceive programming as suitable career choice?

Table 5: Perception of male and female students of programming as suitable career choice

Table 5(a): Perspective of male and female students towards suitability of computer programming as a career choice for both genders

Item		Sex	
		Male	Female
	No	14.0%	0.0%
Section_A_7	Undecided	1.8%	0.0%
	Yes	84.2%	100.0%

About considering a career in the tech industry or a computer programming-related field after completing their studies, table 5(a) shows the perspective of male and female students towards suitability of computer programming as a career choice for both genders, it shows that the entire female respondents (100%) perceive programming as a career choice while 84.2% of the male respondents sees programming as a suitable career choice.

Table 5(b): Consideration for a career in the tech industry or a computer programming-related field after completion of studies

		Sex	
		Male	**Female**
	No	5.4.0%	10.0%
Section_A_8	Undecided	10.7%	10.0%
	Yes	83.9%	80.0%

Similarly table 5(b) shows that as much as 80% of the female respondents are considering a career in the tech industry or a computer programming-related field after completion of studies. Meanwhile as much as 83.9% of the male respondents also stated that they are considering a career in the tech industry or a computer programming-related field after completion of studies.

Discussion

According to table 1, the male students have slightly higher interest in computer programming compared with their female counterparts ($\Delta\mu$=0.41). though not that significant (p >0.05) which supports the findings of Vrieler et al. (2021) and Gunasekara (2021) that the female gender in the Computer Science club under study had lesser interest. For factors significantly influencing students' interests in computer programming, according to table two the study identified support from parents and family members, support from lecturers or professors, quality of teaching and resources and Peer influence and encouragement. This is in agreement with the study of Hamer et al. (2023) which identified family support. Though the report identified other contributing factors like being a boy and having a parent in computing which wasn't considered just as Denner (2011) study also corroborated that parents and family members, peer influence and encouragement plays significant roles especially for female gender. Alshahrani et al. (2018) agreed with the support from teachers as a vital factor. Meanwhile, the study of Akinola & Nosiru (2014); Gunasekara (2021); Medel & Pournaghshband (2017) and Garneli & Chorianopoulos (2019) supported quality of teaching and resources as a significant factor.

According to table the gender self-efficacy and confidence levels in computer programming, the findings established equal ability of female to learn computer programming as compared with their male counterparts which is in agreement with the findings of Price & Price-Mohr (2021) and negates (Gunasekara, 2021; Frieze & Quesenberry, 2015; Kallia and Sentance 2018) which identified that male students tend to resolve programming related issues on their own and the findings of Aivaloglou and Hermans (2019) where the females have more significant confidence than the male gender while Alvarado et al. (2017) reported the females having lower confidence level in programming courses. Furthermore, the study findings revealed that more female students view computer programming as a course meant for the extremely brilliant students which is in agreement with (Spieler et al., 2020).

According to table 4 which revealed that gender based differences in participation in coding related extra-curricular activities, clubs or coding competitions both male and female revealed low participation in coding-related extracurricular activities (μ<2.0 on a rating scale of 1 to 3), with no significance difference (p > 0.05), this negates the findings of Aivaloglou and Hermans(2019) which reported higher participation of male compared to the female gender. The result of table 5 affirm that both genders has significant consideration for a career in the tech industry or a computer

programming-related field after completion of studies though the male gender has a higher affirmation which is in support with (Vrieler et al., 2021;, Beyer, 2014) findings.

CONCLUSION

The study concluded that while male students show a slightly higher interest in computer programming than female students, the ability to learn and excel in programming is equal among both genders. Key factors influencing students' interest include support from family, lecturers, quality of teaching, and peer encouragement. Despite these influences, participation in coding-related extracurricular activities remains low among both male and female students. This indicates a need for improved support systems and opportunities to enhance engagement in computer programming outside the classroom.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations should be considered:

i.   Enhance family and academic support: There is need to develop program that engage parents and family members in the educational journey of students, highlighting the importance of computer programming skills.

ii. Improve teaching quality and resources: The government and other concerned stakeholders are encouraged to invest in training for lecturers and provide quality teaching materials and resources to support effective learning.

iii. Promote peer influence and encouragement: There is need to create peer mentoring programmes and collaborative projects to foster a supportive learning environment.

iv. Increased extracurricular opportunities: Establishment and promotion of coding clubs, hackathons, and other extracurricular activities that encourage active participation and practical experience in computer programming should be encouraged

v.   Gender-specific interventions: Implementation of initiatives aimed at encouraging female students to pursue computer programming and ensuring equal access to opportunities and resources.

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