

**DEMOGRAPHIC FACTORS AS CORRELATE OF PROGRAMMING SKILLS  
ACQUIRED BY COMPUTER EDUCATION LECTURERS IN SOUTH-EAST  
UNIVERSITIES, NIGERIA**

**Agbo, Linda Nwanneka & Prof. Ibezim, N.E.**

**ABSTRACT**

The study was carried out to determine the demographic factors as correlate of programming skills acquired by computer education lecturers in South-East universities, Nigeria. Three specific purposes with three corresponding research questions guided the study and four null hypotheses were formulated and tested at 0.05 level of significance. The study adopted correlational research design. The instrument for data collection was a structured questionnaire titled “Demographic Factors and Programming Skill Acquisition Questionnaire” (DeFPSAQ). The internal consistency of the questionnaire was determined using Cronbach Alpha reliability test which yielded co-efficient of 0.79. The data collected from 77 computer education lecturers were analyzed using Point Bi-serial correlation. The null hypotheses were tested using Point Bi-serial correlation for hypotheses one to three and multiple regressions for hypothesis four all at 0.05 level of significance. The findings from the study revealed a weak relationship among age, gender, educational qualification and programming skills acquisition of computer education lecturers’. In addition, the hypotheses tested revealed that there were no significant difference among computer education lecturers’ age, gender, educational qualification and their programming skills acquired. It was recommended among others that computer education department should organize more programmes on computer programming and imbibe the principle of learning through practical.

**Keywords:** Programming, Programming skills acquisition, Demographic factors, Computer education lecturers, Programming competence.

## **INTRODUCTION**

Programming is a fundamental concept in computer science and computer education. It refers to the systematic process of designing, writing, testing, debugging, and maintaining instructions (code) that direct a computer to perform specific tasks. According to the Association for Computing Machinery (ACM, 2013), programming involves algorithmic thinking, problem decomposition, abstraction, and implementation using appropriate programming languages. Similarly, the Institute of Electrical and Electronics Engineers (IEEE, 2014) describes programming as the development of executable solutions through logical structuring of instructions to solve computational problems. Programming is therefore not merely writing code; it is a cognitive and problem-solving activity that integrates logic, mathematics, and creativity.

Programming can be implemented using high-level languages such as Python, Java, C++, JavaScript, and C#, which provide abstraction from hardware architecture, or low-level languages such as assembly language and machine code, which directly interact with hardware (Dale, 2020). The increasing relevance of programming in areas such as artificial intelligence, robotics, cyber security, data science, and mobile application development underscores its centrality in modern technological advancement. As noted by Wing (2006), computational thinking, which is deeply rooted in programming, is a fundamental skill for everyone, not just computer scientists.

Closely related to programming is the concept of programming skills acquisition. Programming skills refer to the competencies required to effectively design algorithms, write syntactically correct code, debug programs, optimize performance, and apply programming knowledge to solve real-world problems. These skills include analytical thinking, logical reasoning, algorithm development, code readability, debugging competence, and software

testing (Guzdial & Soloway, 2002). Programming skills acquisition therefore involves the process through which individuals develop proficiency in these competencies through instruction, practice, experience, and continuous learning.

Research has consistently shown that programming is one of the most difficult courses in computing disciplines, with failure rates ranging between 30% and 50% in some institutions (Guzdial & Soloway, 2002; Asogwa, 2017). The difficulty often stems from abstract concepts, problem-solving demands, and the cognitive load associated with debugging and algorithm development. When students fail to acquire adequate programming skills, their academic progression and career prospects in computing-related fields are negatively affected. Since lecturers are the primary facilitators of knowledge transfer in universities, their level of programming competence plays a critical role in shaping students' learning outcomes (Salihu & Agu, 2016).

Computer Education, as a discipline, is designed to equip learners with both theoretical and practical competencies in computing and information technology. It encompasses the study of computer systems, programming, software development, database management, networking, and digital literacy (Ibezim, 2018). Universities, as apex institutions of higher learning, are mandated to produce graduates who are competent, innovative, and globally competitive. According to the National Universities Commission (NUC, 2022), Nigerian universities are expected to ensure quality assurance in teaching, research, and community service. Achieving this mandate requires competent lecturers who possess strong subject mastery, especially in skill-based areas such as programming.

However, despite the strategic importance of programming in Computer Education, there are concerns regarding students' poor performance and limited competence in programming courses in Nigerian universities (Asogwa, 2017). Some studies suggest that lecturers' competence, instructional strategies, and personal characteristics may influence students' programming outcomes (Salihu & Agu, 2016). Among these personal characteristics are demographic factors.

Demography refers to the statistical study of human populations, particularly with respect to size, structure, distribution, and characteristics such as age, gender, educational level, marital status, and occupation (Palakurthi & Parks, 2000). In educational research, demographic factors are often examined as variables that may influence performance, skill acquisition, job effectiveness, and productivity (Oyewole & Popoola, 2015). Demographic variables of computer education lecturers refer to their quantifiable personal characteristics that define them. These characteristics according to Zahya & Farouk (2016), affects academic performance of adults. They may also shape cognitive flexibility, technological adaptability, motivation, and professional competence, and it differ from individual to individual. The quantifiable characteristics as covered in this study include age, gender and educational qualification.

Age is the length of time that a person has lived or a thing has existed. It could be a factor that may positively or negatively affect skill acquisition and performance of adults (Keith, Byerly, Floerchinger, Pence, & Thornberg, 2006; Cheesman, Simpson, & Wint, 2006; Kaur, Chung, & Lee, 2010). Age plays a role in describing how an individual changes over time and subsequently may affect how performance changes over time. Smedley and Whitten (2006) submit that differences in age could be a potential factor for work performance. Salthouse in Anne and Peter (2019) observed that age is associated with decreases in performance on tests of learning, memory, reasoning, spatial abilities, and psychomotor speed and may also affect performance through motivation. This implies that increase in age causes deterioration in abilities such as speed, adaptability, effectiveness, motor coordination and strength. Age can negatively affect worker performance due to the demands of the twenty-first century work place. Considering the complexities of today's world of work, permeated with technology that contributes to effective execution of tasks, team work that contributes to productive working relationships and outcomes demands workers with high competencies. This is a world where things change constantly and rapidly, hence, yesterday's good active workers are not today's best workers. Darwin (2014) posited that as most young workers grew up in a high technological world, having workforce with tech-savvy younger

workers would provide great advantage over the older workers. Age, for instance, has been associated with variations in cognitive speed, adaptability to new technologies, and learning patterns (Salthouse, 2012). While experience accumulated over time may enhance instructional delivery, advancing age may also affect psychomotor speed and adaptability in technology-driven environments.

Gender has also been explored as a variable influencing work performance, though findings remain inconsistent (Stone et al., 2016). Gender is the state of being male or female, especially with reference to social and cultural differences rather than biological ones (Balay & İpek, 2010). Gender is a set of characteristics distinguishing between male and female. Gender has its role on the effectiveness of lecturers (Alufohai & Ibhafidon, 2015). Researchers have continued to argue that gender is a major factor that enhance performance of the individual in the organization and as a result, certain type of work are specifically gender based. It has been proven that gender role in work performance cannot be overlooked. A study carried by Jimoh (2008) on situational judgment, emotional labour, conscientiousness and demographic factors as predictors of job performance among university administrative workers in southwestern Nigeria, shows that there was no difference in work performance of male and female. In an empirical study by Azim, Haque and Chowdhury (2013) on levels of job satisfaction of employees in Bangladesh, job satisfaction level was found to differ among employees in terms of gender. In the same vein, Yutaka and Ohzono (2013) study revealed that male had higher levels of work values than female, except for monetary rewards. In Illinois State University, Stone, Foster, Webster, Harrison and Jawahar (2016) found gender having minimal effects on job performance. Thus, there has been conflicting results in studies attempting to find gender relationship with workers' performance. From these research findings, it appears that given the opportunity and equal treatment and training, both sexes can perform any task effectively.

Educational qualifications on the other hand, are the degrees, diplomas, certificates, professional titles and so forth that an individual has acquired whether by full-time study,

part-time study or private study, whether conferred in the home country or abroad and whether conferred by educational authorities, special examining bodies or professional bodies. Educational qualification is widely regarded as a predictor of expertise and professional competence, as higher educational attainment may enhance analytical ability and subject mastery (Schmidt & Hunter, 1998). The level of education is likely to have a positive or negative association with organizational commitment (Khan, Khan, Khan, Nawaz, & Naseem, 2013). The level of education attainment of an individual employee is also another major factor that may or may not enhance the effectiveness of an employee in the chosen work place. Educational attainment refers to the academic credentials or degrees an individual has obtained. Furthermore, Schmidt and Hunter (1998) found that cognitive ability was strongly related to job performance and was an important contributor to success on virtually every job. According to Sonnentag and Frese (2002), workers' performance is not stable over time. Variability in a workers' performance overtime reflects learning processes other long term changes. Dudley, Orvis, Lebiecki, and Cortina (2006) study showed that years of education were positively related to conscientiousness, even when controlling for other socio-demographic variables. In a related study, Iranzo and Peri (2006) concluded that as the level of education increased up to secondary level; it had little effect (less than 2 per cent) on total factor productivity for every additional year of education. Thomas and Feldman (2009) meta-analysis showed that highly educated workers tend to displayed greater creativity and demonstrate more citizenship behaviours than less educated workers. They further stressed that highly educated workers appear to engage in fewer counterproductive work behaviours like workplace aggression, workplace substance use, and absenteeism. Hence, it could be succinctly said that education at any point is a screening device in selecting employees and also a human capital device that may induce greater performance.

The nature and character of different demographic factors which have the potential for influencing teachers' prospect has occupied the centre stage of the theory and practice of teaching and learning in Nigerian universities. Consequently, a research conducted by Aminul, Rahim, Liang, and Momtaz (2011) shows that demographic factors determine the

strength or inconsistency of university lecturers' in discharging their duties. Also, computer education lecturers in universities who are supposed to be imparting this programming skill in students do not seem to show adequate dexterity, resulting to students/graduates not acquiring necessary competencies. This attitude may be as a result of demographic factors of the lecturers. This study therefore, intends to determine the relationship between skills acquisition of Computer Education lecturers in programming and demographic factors.

Given the dynamic and technology-intensive nature of programming, it is plausible that demographic variables could influence lecturers' programming skills acquisition and competence. In the context of South-East Nigerian universities, where Computer Education programmes are expanding, it becomes necessary to empirically examine whether age, gender, and educational qualification correlate with programming skills possessed by lecturers. Understanding these relationships will provide evidence-based insights for staff development, recruitment, and professional training policies.

### **Statement of the Problem**

Programming is a very useful skill and can be a rewarding career. In recent years, the demand for programmers and student's interest in programming have grown rapidly, and introductory programming courses have become increasingly popular. Acquiring and developing programming knowledge and skills is a highly complex process that involves a variety of cognitive activities, and mental representations related to program design, program understanding, modifying, debugging and documenting.

The usefulness of programming made it imperative for its integration into the curriculum of computer education in Nigerian tertiary institutions. The goal of teaching computer programming is to develop in students the capabilities required of a professional software developer. Programming course enhances logical reasoning and problem-solving skills. The ability to understand and implement the programming language is an important skill for students to become self-reliant or even secure a job and succeed in it.

However, studies have shown that universities in south-east Nigeria are faced with increased dropout rate from computing degrees due to the high failure rate in programming courses (Sarpong, Authur & Awusu, 2013). This increased dropout rate, could lead to relatively low demand/enrolment of students into computing degrees. With the decreasing number of computer graduates entering the workforce, the computing programmes may be missing out on the wealth and breadth of innate student ability and skills that are instead being channeled into non-computer related fields. Research has also shown that one major cause of the low interest and high dropout rate in computer science degree programs is the difficulty in learning programming courses (Seyal, Mey, Matusin, Norzainah and Rahman, 2015). It is further recorded that one of the factors that contribute to student's failure in programming courses is the poor lecturers' programming skills (Salihu & Ago, 2016). More worrisome is the fact that these lecturers have undergone trainings that qualified them to be teachers at the university level. The study begs to ask "Could there be factors that influence the lecturers' inadequate acquisition of programming skills, despite the level of training they have acquired"?

This research therefore seeks to discover if demographic factors, such as age, gender and educational qualification affect the programming skill acquisition of computer education lecturers in South-East universities, Nigeria.

**Specifically, the study sought to determine;**

1. The relationship between age and programming skills acquired by computer education lecturers in south-east universities, Nigeria.
2. The relationship between gender and programming skills acquired by computer education lecturers in south-east universities, Nigeria.
3. The relationship between educational qualification and programming skills acquired by computer education lecturers in south-east universities, Nigeria.

**Research Questions**

1. What is the relationship between age and programming skills acquired by computer education lecturers in south-east universities, Nigeria?
2. What is the relationship between gender and programming skills acquired by computer education lecturers in south-east universities, Nigeria?
3. What is the relationship between educational qualification and programming skills acquired by computer education lecturers in south-east universities, Nigeria?

### **Hypotheses**

The following null hypotheses guided the study and tested at 0.05 level of significance.

H<sub>01</sub>: There is no significant difference in the mean responses of computer education lecturers in South-East universities on the relationship between age and programming skills acquisition.

H<sub>02</sub> There is no significant difference in the mean responses of computer education lecturers in South-East universities on the relationship between gender and programming skills acquisition.

H<sub>03</sub> There is no significant difference in the mean responses of computer education lecturers in South-East universities on the relationship between educational qualification and programming skills acquisition.

H<sub>04</sub> There is no significant difference in the mean responses of computer education lecturers in South-East universities on the relationship among age, gender, educational qualification, and programming skills acquisition.

### **METHODOLOGY**

This study adopted a co-relational survey research design. The area of the study is South-East Nigeria, which consists of Abia, Anambra, Ebonyi, Enugu and Imo. The population for the

study is seventy-seven (77) computer education lecturers from six (6) federal and state universities that offer computer education in South-East, Nigeria.

Total population sampling was used to select the entire 77 lecturers in the public universities under study. Data for the study was collected using a structured questionnaire titled “Demographic factors and programming skill acquisition questionnaire” (DEFPSAQ). The research instrument was subjected to face validation by three experts all from the Department of Computer and Robotics Education, University of Nigeria Nsukka. The reliability of the instrument was established using Cronbach Alpha reliability test. The data collected were analyzed using Point Bi-serial Correlation. The null hypotheses were tested using Point Bi-serial correlation for hypotheses one to three and multiple regressions for hypothesis four. Any item that has a correlation of 0.00 – 0.19 was interpreted as Very Weak Relationship, 0.20 – 0.39 was interpreted as Weak Relationship, 0.40 – 0.59 was interpreted as Moderate Relationship, 0.60 – 0.79 was interpreted as Strong Relationship, and 0.80 – 1.00 was interpreted as Very Strong Relationship. For the hypothesis, the null hypothesis was rejected for any item whose significance value is less than 0.05 while the null hypothesis was upheld for any item whose significance value is greater than or equal to 0.05.

## FINDINGS

**Table 1: Point-Biserial Correlation of the relationship between age and programming skills acquisition of computer education lecturers in South-East universities, Nigeria and hypothesis of no significant difference in the mean responses of computer education lecturers in South-East universities, Nigeria on the relationship between age and programming skills acquisition.**

Age	Programming skills acquisition	N	$r_{pb}$	Sig.	Decision	Remark
-----	--------------------------------	---	----------	------	----------	--------

Age	1	-0.64	77	-0.59	0.57	NS	Moderate Negative Relationship
<b>Programming Skills Acquisition</b>	<b>-0.64</b>	<b>1</b>					

The study found a moderate negative relationship ( $r_{pb} = -0.59$ ) between age and programming skills acquired by computer education lecturers in South-East universities, Nigeria. This implies that as age increases, programming skills acquisition tends to decrease moderately. However, the relationship was not statistically significant ( $p = 0.57 > 0.05$ ). Therefore, the null hypothesis ( $H_0$ ) was upheld, indicating no significant difference in the mean responses of lecturers regarding the relationship between age and programming skills acquired by computer education lecturers in South-East universities, Nigeria.

**Table 2: Point-Biserial Correlation of the relationship between gender and programming skills acquisition of computer education lecturers in South-East universities, Nigeria and hypothesis of no significant difference in the mean responses of computer education lecturers in South-East universities, Nigeria on the relationship between gender and programming skills acquisition.**

	Gender	Programming skills acquisition	N	$r_{pb}$	Sig.	Decision	Remark
Gender	1	-0.02	77	-0.02	0.85	NS	Very Weak Negative Relationship
Programming Skills Acquisition	-0.02	1					

The result showed a very weak negative relationship ( $r_{pb} = -0.02$ ) between gender and programming skills acquired by computer education lecturers in South-East universities, Nigeria. The probability value ( $p = 0.85 > 0.05$ ) indicated that the relationship was not statistically significant. Thus, the null hypothesis ( $H_{02}$ ) was upheld. This implies that gender does not significantly influence programming skills acquisition among computer education lecturers.

**Table 3: Point-Biserial Correlation of the relationship between educational qualification and programming skills acquisition of computer education lecturers in South-East universities, Nigeria and hypothesis of no significant difference in the mean responses of computer education lecturers in South-East universities, Nigeria on the relationship between educational qualification and programming skills acquisition.**

	Educational qualification	Programming skills acquisition	N	$r_{pb}$	Sig.	Decision	Remark
Age	1	-0.08	77	-0.08	0.46	NS	Very Weak Negative Relationship
Programming Skills Acquisition	-0.08	1					

Findings revealed a very weak negative relationship ( $r_{pb} = -0.08$ ) between educational qualification and programming skills acquisition. The result was not statistically significant ( $p = 0.46 > 0.05$ ). Consequently, the null hypothesis ( $H_{03}$ ) was upheld. This indicates that educational qualification does not significantly affect programming skills acquisition among computer education lecturers.

**Table 4: Multiple Regression of the relationship among age, gender and educational qualification on programming skills acquisition of computer education lecturers in South-East universities, Nigeria. And the hypothesis of no significant difference in the mean responses of computer education lecturers in South-East universities, Nigeria on the relationship among age, gender, educational qualification, and programming skills acquisition.**

	Pro.	Skills	B	Beta	Tolerance	Sig	Decision
Programming Skill Acquisition							
Age			-0.12	-0.21	-1.13	0.26	NS
Gender			0.04	0.07	0.60	0.55	NS
Educational Qualification			0.00	0.01	0.05	0.97	NS

  

Model	Sum of Square	Df	Mean Square	R	R <sup>2</sup>	Adj. R <sup>2</sup>	Adjusted R square	Sig	Decision	Remark
<b>Regression</b>	0.22	3	0.07	0.21 <sup>a</sup>	0.05	0.01	0.05	0.34 <sup>b</sup>	NS	Weak Relationship
<b>Residual</b>	4.66	73	0.06							
<b>Total</b>	4.87	76								

The multiple regression analysis revealed a weak positive correlation ( $R = 0.21$ ) between the combined demographic variables (age, gender, and educational qualification) and programming skills acquisition. The adjusted  $R^2$  value of 0.01 and  $R^2$  value of 0.05 indicate that these variables jointly explained only 5% of the variance in programming skills acquisition. Furthermore, the probability value ( $p = 0.34 > 0.05$ ) showed that the combined influence of age, gender, and educational qualification was not statistically significant. Therefore, the null hypothesis was upheld.

In terms of relative contribution (Beta weights), age had the highest influence among the three variables, followed by gender and educational qualification, although none of them significantly predicted programming skills acquisition.

### **Discussion**

The findings revealed that demographic factors (age, gender, and educational qualification) have minimal influence on programming skills acquisition among computer education lecturers in South-East universities, Nigeria.

The moderate negative relationship between age and programming skills acquired by computer education lecturers, suggests that younger lecturers may adapt more readily to emerging programming tools and technologies. This aligns with studies that suggest younger professionals often demonstrate higher adaptability to technological innovations due to early exposure to digital environments (Prensky, 2001; Czaja & Sharit, 2013). However, the non-significant result indicates that age alone is not a strong determinant of programming competence. Research has shown that continuous professional development and deliberate practice are more critical predictors of technological proficiency than chronological age (Darling-Hammond et al., 2017).

The very weak and non-significant relationship between gender and programming skills acquisition suggests that programming competence is not inherently gender-dependent. This finding supports earlier research indicating that when equal access to training and resources is

provided, gender differences in computing performance become negligible (Hyde, 2014; Stoet & Geary, 2018). The result reinforces the argument that socio-cultural and institutional factors, rather than biological sex, explain variations in computing-related skills.

Similarly, the finding that educational qualification has a very weak and non-significant relationship with programming skills acquisition implies that possession of advanced academic degrees does not automatically translate into higher practical programming proficiency. This agrees with the position that skill mastery in technical disciplines is largely influenced by hands-on experience, problem-solving practice, and engagement with real-world programming tasks rather than certification alone (Ericsson, Krampe, & Tesch-Römer, 1993; Robins, Rountree, & Rountree, 2003).

The multiple regression analysis further revealed that age, gender, and educational qualification jointly explained only 5% of the variance in programming skills acquisition. This suggests that other variables not examined in this study may account for a greater proportion of variance. Previous studies have identified factors such as access to ICT facilities, institutional support, motivation, years of programming experience, and opportunities for continuous training as stronger predictors of technological competence (Tondeur et al., 2012; OECD, 2019).

Overall, the findings indicate that demographic characteristics are weak predictors of programming skills acquisition among computer education lecturers. The study therefore underscores the importance of strengthening professional development programmes, improving institutional ICT infrastructure, and promoting continuous skills upgrading rather than focusing primarily on demographic attributes.

## **Conclusion**

Based on the findings of the study, it was revealed that there was a moderate negative correlation between age and programming skills acquired by computer education lecturers in South-East universities. This entails that as computer education lecturers advance in age, their

programming skills acquisition and relevance also reduces, but in moderate extent. In addition, the study ascertained that there was a very weak negative correlation between gender, educational qualification and programming skills acquired by computer education lecturers in South-East universities. It is therefore important to know that as lecturers, there is every possibility of acquiring skills in programming irrespective of any demographic factors. Lecturers' demographic factors like age, gender and educational qualification should not be a hindrance to their programming skills acquisition and as a result, lecturers of all ages, gender and qualification can acquire knowledge and skills required for effective instructional delivery in programming.

### **Recommendations**

The following recommendations have been proffered based on the findings of this study.

1. The computer education department should organize more programmes on computer programming and imbibe the principle of learning through practical.
2. There should be re-training programmes for all the staff in department of computer education especially in cases of development of new programming languages.
3. It is recommended that professionally trained staff/programmers be employed over time in the department of computer education.
4. Government should deploy trained personnel (professional programmers) that should be on ground to assist both lecturers and students in the acquisition of programming skills in the universities.

### **Acknowledgements**

The researchers thank the lecturers of the universities that participated in this study. They also thank the authors whose works were consulted during the process of this research and all those who contributed in one way or the other to the success of this study.

### **Conflict of Interest Declaration**

No conflicting interest.

## REFERENCES

- Alufohai, P. J., & Ibhafidon, H. E. (2015). Gender influence on lecturers' effectiveness in Nigerian universities. *Journal of Educational Studies*, 8(1), 112–121.
- Aminul, I., Rahim, R., Liang, L., & Momtaz, S. (2011). Demographic factors and academic staff performance in universities. *International Journal of Educational Management*, 25(3), 234–246.
- Anne, S., & Peter, H. (2019). *Age, cognition and work performance*. Routledge.
- Asogwa, B. E. (2017). Challenges in teaching and learning programming in Nigerian tertiary institutions. *Journal of Computer Science Education in Africa*, 5(2), 45–58.
- Asogwa, U. D. (2017). Challenges of teaching and learning programming in Nigerian universities. *Journal of Computer Education Research*, 4(2), 45–58.
- Association for Computing Machinery (ACM). (2013). *Computer science curricula 2013*. ACM Press.
- Association for Computing Machinery. (2013). *Computer science curricula 2013: Curriculum guidelines for undergraduate degree programs in computer science*. ACM Press.
- Azim, M. T., Haque, M. M., & Chowdhury, R. A. (2013). Gender differences in job satisfaction: Evidence from Bangladesh. *Journal of Human Resources Management*, 1(1), 1–7.
- Balay, R., & İpek, C. (2010). Teachers' perception of organizational culture and organizational commitment. *Educational Sciences: Theory & Practice*, 10(1), 363–373.
- Cheesman, J., Simpson, N., & Wint, A. G. (2006). Age, skills, and productivity in the workplace. *Human Resource Development Quarterly*, 17(3), 273–295.
- Czaja, S. J., & Sharit, J. (2013). *Designing training and instructional programs for older adults*. CRC Press.
- Dale, N. (2020). *Programming and problem solving with C++ (8th ed.)*. Jones & Bartlett Learning.
- Darling-Hammond, L., Hyster, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute.

- Darwin, S. (2014). Workforce age diversity and organizational performance. *Journal of Organizational Studies*, 6(2), 89–101.
- Dudley, N. M., Orvis, K. A., Lebiecki, J. E., & Cortina, J. M. (2006). A meta-analytic investigation of conscientiousness in the prediction of job performance. *Journal of Applied Psychology*, 91(1), 40–59.
- Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, 100(3), 363–406. <https://doi.org/10.1037/0033-295X.100.3.363>
- Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, 100(3), 363–406.
- Guzdial, M., & Soloway, E. (2002). Teaching the Nintendo generation to program. *Communications of the ACM*, 45(4), 17–21. <https://doi.org/10.1145/505248.505261>
- Guzdial, M., & Soloway, E. (2002). Teaching the Nintendo generation to program. *Communications of the ACM*, 45(4), 17–21.
- Hyde, J. S. (2014). Gender similarities and differences. *Annual Review of Psychology*, 65, 373–398. <https://doi.org/10.1146/annurev-psych-010213-115057>
- Hyde, J. S. (2014). Gender similarities and differences. *Annual Review of Psychology*, 65, 373–398.
- Ibezim, N. E. (2018). *Foundations of computer education in Nigeria*. University Press.
- Institute of Electrical and Electronics Engineers (IEEE). (2014). *Software engineering body of knowledge (SWEBOK)*. IEEE Press.
- Institute of Electrical and Electronics Engineers. (2014). *Software engineering body of knowledge (SWEBOK guide) (Version 3.0)*. IEEE Computer Society.
- Iranzo, S., & Peri, G. (2006). Education, productivity, and growth. *Review of Economics and Statistics*, 88(3), 536–550.
- Jimoh, A. M. (2008). Demographic factors as predictors of job performance among university workers. *African Journal of Educational Research*, 12(2), 45–56.
- Kaur, S., Chung, J., & Lee, M. (2010). Age differences in learning and job performance. *Educational Gerontology*, 36(4), 321–336.

- Keith, N., Byerly, R., Floerchinger, D., Pence, S., & Thornberg, K. (2006). The role of age in skill acquisition. *Journal of Applied Psychology*, 91(3), 621–632.
- Khan, A., Khan, S., Khan, M., Nawaz, A., & Naseem, S. (2013). Education level and organizational commitment. *International Journal of Academic Research in Business and Social Sciences*, 3(3), 116–127.
- National Universities Commission (NUC). (2022). Benchmark minimum academic standards for undergraduate programmes in Nigerian universities. Abuja: NUC.
- National Universities Commission. (2022). Benchmark minimum academic standards for undergraduate programmes in Nigerian universities. NUC.
- OECD. (2019). *OECD skills outlook 2019: Thriving in a digital world*. OECD Publishing. <https://doi.org/10.1787/df80bc12-en>
- OECD. (2019). *Teachers and school leaders as lifelong learners*. OECD Publishing.
- Oyewole, B. K., & Popoola, S. O. (2015). Personal characteristics and job performance among university lecturers. *International Journal of Academic Research in Business and Social Sciences*, 5(2), 1–12.
- Oyewole, G. O., & Popoola, S. O. (2015). Personal factors and job performance. *International Journal of Educational Research*, 3(1), 12–20.
- Palakurthi, R., & Parks, M. (2000). The effect of selected demographic characteristics on organizational commitment. *Journal of Business Research*, 8(2), 45–58.
- Palakurthi, R., & Parks, M. (2000). The effect of selected socio-demographic factors on lodging demand. *Journal of Hospitality & Leisure Marketing*, 7(4), 75–89. [https://doi.org/10.1300/J150v07n04\\_05](https://doi.org/10.1300/J150v07n04_05)
- Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon*, 9(5), 1–6.
- Robins, A., Rountree, J., & Rountree, N. (2003). Learning and teaching programming: A review and discussion. *Computer Science Education*, 13(2), 137–172.
- Salihu, A., & Agu, E. (2016). Lecturers' competence and students' academic performance in programming courses. *Journal of Educational Technology Research*, 8(1), 23–35.

- Salihi, M., & Agu, P. (2016). Lecturer competence and students' academic performance in programming. *Nigerian Journal of Technical Education*, 5(1), 60–72.
- Salthouse, T. A. (2012). Consequences of age-related cognitive declines. *Annual Review of Psychology*, 63, 201–226. <https://doi.org/10.1146/annurev-psych-120710-100328>
- Salthouse, T. A. (2012). Consequences of age-related cognitive declines. *Annual Review of Psychology*, 63, 201–226.
- Sarpong, D., Arthur, K. N. A., & Owusu, A. (2013). Causes of failure in programming courses. *International Journal of Computer Applications*, 77(12), 27–31.
- Schmidt, F. L., & Hunter, J. (1998). The validity and utility of selection methods in personnel psychology. *Psychological Bulletin*, 124(2), 262–274. <https://doi.org/10.1037/0033-2909.124.2.262>
- Seyal, A. H., Mey, Y. C., Matusin, H., Norzainah, B., & Rahman, N. A. (2015). Understanding students' performance in introductory programming courses. *International Journal of Information and Education Technology*, 5(6), 441–446.
- Smedley, B. D., & Whitten, P. (2006). Improving workforce performance across age groups. National Academies Press.
- Sonnentag, S., & Frese, M. (2002). Performance concepts and performance theory. *Psychological Management of Individual Performance*, 3–25.
- Stoet, G., & Geary, D. C. (2018). The gender-equality paradox in STEM education. *Psychological Science*, 29(4), 581–593. <https://doi.org/10.1177/0956797617741719>
- Stoet, G., & Geary, D. C. (2018). The gender-equality paradox in STEM education. *Psychological Science*, 29(4), 581–593.
- Stone, P., Foster, L., Webster, B., Harrison, D., & Jawahar, I. (2016). Gender differences in job performance. *Journal of Applied Psychology*, 101(2), 233–245.
- Stone, T., Foster, L., Webster, B., Harrison, D., & Jawahar, I. (2016). Gender differences in job performance. *Journal of Applied Psychology*, 101(2), 233–245.
- Thomas, W. H., & Feldman, D. C. (2009). Age, experience, and job performance. *Journal of Organizational Behavior*, 30(5), 629–650.

Tondeur, J., van Braak, J., Siddiq, F., & Scherer, R. (2012). ICT integration in education: A systematic review. *Educational Technology Research and Development*, 60(2), 239–261.

Tondeur, J., van Braak, J., Siddiq, F., & Scherer, R. (2012). Time for a new approach to prepare future teachers for educational technology use. *Computers & Education*, 59(4), 134–144.

Wing, J. M. (2006). Computational thinking. *Communications of the ACM*, 49(3), 33–35.  
<https://doi.org/10.1145/1118178.1118215>

Zahya, A., & Farouk, S. (2016). Adult learners' demographic characteristics and academic performance. *Journal of Continuing Education*, 10(1), 55–66.