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BOARD # 64: An Investigation of Factors Impacting Student Achievement in Computer Literacy

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An Investigation of Factors Impacting Student Achievement in Computer Literacy

Abstract

As computers are becoming more and more significant in today's society, everyone needs to be computer literate. Knowing computer literacy is important for many reasons, such as operating computers and computer applications, keeping up with technological changes, broadening avenues for employment, problem-solving, and enhancing communication.

This research investigated whether and how gender, age, working hours per week, and attitudes toward computer usage impact student achievement in Computer Literacy courses. A non-experimental quantitative design was used to statistically collect and analyze data from classes of Intro to Computer Technology and classes of Micro Computer Applications in Business during Spring 2023 and Summer 2023 semesters. Statistical methods used in data analysis included descriptive methods, Pearson Chi-square test, and Binary Logistic regression analysis.

The results demonstrate a statistically significant relationship between students' attitudes toward computer usage and students' achievements in Computer Literacy courses. A higher attitude towards computer usage was correlated with higher passing grades in Computer Literacy courses. However, no statistically significant difference was found in students' achievements in Computer Literacy courses by age, gender, or by working hours per week. Computer literacy in education appears to have a positive effect on students' success in college, future employment, and 21st-century living. The research provided suggestions and implications that would add to the repository of knowledge in the domain of education management. Sharing the research's findings with educators can help students achieve in Computer Literacy courses. The recommendations for future research are addressed in this paper to provide a deeper understanding based on the findings of the study for further guiding how to assist students in mastering their Computer Literacy courses.

Keywords: Computer Literacy, Student Achievement, Attitudes, age, gender

Introduction

The usage of technology and new computer applications has slowly taken on a role in people's daily lives; therefore, it is necessary for them to keep abreast. The development of smartphones has significantly impacted people's lives. Everyone has progressively grown comfortable and confident with the use of smartphones over time, whereas personal computers have taken on a supporting part, and this trend is aligned with expectations of the digital future [1].

The number of undergraduates who possess computers, however, is surprisingly much lower than expected when compared to smartphone possession which was more than 80 percents of college students [2], [3]. Unquestionably, a smartphone is a handheld personal device that is utilized for tasks that a desktop computer can perform. However, computer desktops come with application software that is essential in the workplace, and education sector. Usually, the application software includes word processing, presentation, spreadsheet, email, and personal information management, among others. In contrast, mobile devices, including smartphones have limitations regarding speed, content, interface, and capability of memory [4]; as a result, it is difficult for them to incorporate the application software needed. Also, the students' attitudes are shifting away from desktop computing. Marginalized groups, such as minorities, the educated, and younger individuals, are more likely to be smartphone dependent [5].

Computer literacy involves having the skills and knowledge to use computers and related technology efficiently. Computer literacy skills are deemed essential for both academic success and workforce development. These skills empower individuals to access information, complete assignments, communicate effectively, and perform tasks efficiently in today's increasingly digital world. The ability to navigate and utilize digital tools is fundamental to thriving in educational and professional settings.

Due to challenges in both personal and professional spheres, it is now essentially required for individuals to possess some level of computer literacy, regardless of when they were born. Education, as a critical aspect of societal growth, is crucial in addressing the issue of literacy, particularly computer literacy [6].

Computer literacy has become an essential component of effective teaching and learning, particularly during the COVID-19 pandemic [19]. The sudden shift to online education highlighted the importance of being proficient in using computer software and navigating the internet. Teachers had to adapt their lesson plans and teaching methods to suit a virtual environment, often relying on various educational tools and platforms to engage students and deliver content effectively. For students, having a foundational understanding of computer literacy was crucial to accessing course materials, participating in virtual discussions, and making the most of available educational resources. Without these skills, many students faced difficulties keeping up with their studies, leading to disruptions in their learning process. The pandemic has underscored the importance of integrating computer literacy into pedagogical education to prepare both teachers and students for a future where digital learning continues to play a significant role.

Demographic factors, such as race, age, employment, ethnicity, income, and marital status, providing information about research participants are important because they make it possible for a researcher to fully comprehend the background characteristics of the target population and investigate how these factors affect computer literacy skills [7], [12], [14] [18]. Other factors also contribute to students' computer literacy skills [8], [9]. This research selected four factors to study how they affect the learning outcomes of Computer Literacy courses.

- Gender: Gender has been examined as a factor in many domains such as science, medical, and technology research. By any criterion, it is critical to examine the existence of a gender-specific

technological disparity with the significance of technological advances in everyday life and the domination of technology [18].

- Age: Age plays a pivotal role in technology research as it impacts how individuals engage with and adopt new technologies. Older adults often demonstrate distinct attitudes, capabilities, and requirements compared to younger users when it comes to technology [13].
- Working Hours: The working hours of students can affect their capacity to engage with and learn about technologies. Employment commitments can diminish the time available for studying and utilizing technology, potentially hindering their educational progress and technological proficiency [14].
- Attitude: Attitude towards computer usage is a significant factor in technological research because it directly influences how people interact with and adopt new technologies, meaning their positive or negative feelings towards computers can greatly impact on their willingness to use them, which in turn affects the success of any new technology being studied or implemented [8].

The purpose of this research was to investigate whether the factors studied (gender, age, working hours per week, and students' attitude toward computer usage) impacted students' achievements in Computer Literacy courses as reflected in their final grades.

Target samples for this research comprised students taking Computer Literacy courses (Introduction to Computer Technology, and Micro Computer Applications in Business courses) in Spring 2023 and Summer 2023 at a large, public HBCU.

Problem Statement

It is a fact that Computer Literacy courses are crucial for student success in academic settings and have been part of the undergraduate curriculum. The issue of a high failure rate in Computer Literacy courses is critical and must be addressed. This high failure rate raises the question of whether some factors (students' attitudes toward computer usage, age, gender, hours worked per week) contribute to this failure.

The results of these investigations can be used to identify students who are at risk of failing Computer Literacy courses. By focusing on these students, we can implement targeted interventions to improve their academic performance and enhance their prospects for post-academic careers. This approach ensures that all students develop the necessary skills to thrive in a digital world.

Background

Computer Literacy

Computer literacy is defined as the understanding and ability of the learners to work with applications, software configurations, and operating and programming environments [10]. Skill levels range from basic use to advanced problem-solving. As computers have been integral and essential in academic life for quite some time, students are invariably required to learn and utilize them. Avoidance is not an option, given the necessity of computer literacy in navigating their educational pursuits effectively. A significant indicator of technological advancement in a learning

environment is measured by the degree to which educators and students engage in the extent of computer usage. This factor reflects the integration of technology into educational practices and the enhancement of learning experiences through digital tools.

Developing computer literacy skills in high school is crucial for students as they prepare for college. In high school, students spending a lot of time accessing computer and application software in the classroom and at home have improved computer literacy skills and increased their computer usage effectiveness [11]. Furthermore, the results of the data analysis showed that high school students who possess computer literacy skills improved their levels of computer efficacy; however, not all students have a computer efficacy level for successful learning in college [11].

Gender

Incorporating a gender perspective in science and technology innovation research is crucial for promoting equality and ensuring diverse viewpoints are represented. To give one example, male students (81%) are significantly more likely than female students (19%) to take classes in technologically advanced courses in computer science, and this discrepancy continues in colleges and universities, where females receive just eighteen percent of computer science related degrees [12]. Because of the disparities, females are going to be under-represented in the digital workforce, a field that offers particularly skilled and lucrative employment in advanced nations.

Age

Technology has a profound impact on different age groups. Younger generations typically exhibit greater comfort and frequent use of new technologies. In contrast, older generations often encounter barriers such as lower digital literacy and heightened anxiety towards adopting new devices [13]. This disparity results in variations in how they access and utilize technology in their daily lives. However, this gap is gradually narrowing as older adults become more tech-savvy. Despite this progress, differences still exist, particularly concerning the extent and complexity of technology usage.

Part-time Jobs (Working Hours)

Having a part-time job has become a significant factor in students' lives since the changes to the higher education student funding system. Students were negatively affected by working part-time in addition to full-time academic coursework [14]. Students who put in longer hours at work, generally become less engaged in their studies and have a lower chance of success in their classroom [14].

Attitudes Toward Computer Usage

The cognitive component is defined as the process of seeing or the mental process that includes judging, reasoning, remembering, and problem-solving, and it pertains to ideas, beliefs, and information that affect a person's attitude toward an item or person of interest [15]. This point of view implies that students' attitudes have affected the students' responses toward computer usage. It is widely known that students who have used a computer before tending to attend college with positive thinking or attitudes toward computers [16].

Students' attitudes toward computer usage are crucial behavior factors that may affect how often they use computers. Regular practice is an excellent strategy to improve one's existing computer skills and gain more confidence in learning new computer skills.

Methodology

Sampling Design

The convenience sampling approach, a non-probability sampling strategy, was used by the researcher, due to the researcher's ease of access to these groups of students and their openness to participate in this study. The availability of participants and the ease with which the data could be collected for analysis are two obvious benefits of this sampling method. It was inexpensive as well.

Research Design

This study utilized a non-experimental quantitative design to respond to the proposed research questions because of the distinctive features of the quantitative approach, beginning with particular hypotheses, gathering the numerical data necessary to support those hypotheses, and utilizing statistical techniques to examine and make conclusions from the data. The research design is nonexperimental research in which the researcher investigates two variables and determines the statistical relationship between them without manipulating or controlling these variables [17].

Data Collection

The Attitudes Toward Computer Usage Scale v2.0 (ATCUS v2.0) survey was used to collect the student attitude toward computer usage data. It was designed to use a five-point Likert Scale. A "strongly disagree" response was equal to a one on the scale, and a "strongly agree" response was equal to a five. The ATCUS v2.0 consisted of four factors being labeled: (1) using a computer as a Tool, (2) Confidence, (3) Negative Attitudes, and (4) Positive Attitudes.

The electronic survey was developed using Moodle feedback activity and distributed to participants in Intro to Computer Technology classes and Micro Computer Applications in Business classes during the Spring 2023 and Summer 2023 semesters. Participants responded to a survey that had two components: a student demographic part (age, gender and working hours) and the Attitudes Toward Computer Usage part (ATCUS v2.0). There were 266 responses to the online survey. All collected data elements were stored in a secure place.

The participant characteristics are shown in Tables 1 – 3. Table 4 shows the final grades of students who participated in this study.

Table 1. Students by Age

Student Age Groups	Student Number	Percentage
18 – 20 years old	161	60.5
21 – 23 years old	76	28.6
Older than 23 years old	29	10.9
Total	266	100.0

Table 2. Students by Gender

Genders	Student Number	Percentage
Male	93	35.0
Female	173	65.0
Total	266	100.0

Table 3. Students by Working Hours

Working Hours	Student Number	Percentage
Less than 5 hours	99	37.2
5 – 10 hours	28	10.5
11 – 15 hours	25	9.4
16 – 20 hours	41	15.4
More than 20 hours	73	27.5
Total	266	100.0

Table 4. Students by Final Grade (Pass/Fail)*

Grades	Student Number	Percentage
Fail	55	20.7
Pass	211	79.3
Total	266	100.0

* Final grades: pass (A, B, and C) / fail (D, F, and W)

Data Analysis

The data was coded and input into SPSS 23.0 and diverse statistical techniques were performed as specified in Table 5.

Table 5. Research Questions and Statistical Analyses Used in the Study

Research Question	Statistical Analyses
RQ1: Is there a relationship between students' ages and students' achievements in Computer Literacy courses?	• Conduct a Chi-square test for independence • Independent variable: age • Dependent variable: Computer Literacy course final grade (0 - fail and 1 - pass)
RQ2: Is there a relationship between gender and students' achievements in Computer Literacy courses?	• Conduct a Chi-square test for independence • Independent variable: gender • Dependent variable: Computer Literacy course final grade (0 - fail and 1 - pass)
RQ3: Is there a relationship between students' working hours and students' achievements in Computer Literacy courses?	• Conduct a Chi-square test for independence • Independent variable: working hours per week • Dependent variable: Computer Literacy course final grade (0 - fail and 1 - pass)
RQ4: Is there a relationship between students' attitudes toward computer usage and students' achievements in Computer Literacy courses?	• Conduct a Logistic Regression test for a relationship between variables • Independent variable: students' attitudes toward computer usage • Dependent variable: Computer Literacy course final grade (0 - fail and 1 - pass)

Findings

The Chi-Square test of independence and Logistic Regression test were performed to determine whether there was a statistical association between independent variable and dependent variable. Th common 0.05 significance level (α) for statistical tests was used. Table 6 shows the summary of the research findings.

Table 6. Research Questions and Statistical Analyses and Results

Research Question	Statistical Analyses	Findings
RQ1: Is there a relationship between students' ages and students' achievements in Computer Literacy courses?	• Conduct a Chi-square test for independence • Independent variable: age • Dependent variable: Computer Literacy course final grade (0 - fail and 1 - pass)	• $\chi^2(2) = 0.344$, $p = .842$ • $p > 0.05$ (α) • Can not Reject null hypothesis
RQ2: Is there a relationship between gender and students' achievements in Computer Literacy courses?	• Conduct a Chi-square test for independence • Independent variable: gender • Dependent variable: Computer Literacy course final grade (0 - fail and 1 - pass)	• $\chi^2(1) = 1.078$, $p = .299$ • $p > 0.05$ (α) • Can not Reject null hypothesis
RQ3: Is there a relationship between students' working hours and students' achievements in Computer Literacy courses?	• Conduct a Chi-square test for independence • Independent variable: working hours per week • Dependent variable: Computer Literacy course final grade (0 - fail and 1 - pass)	• $\chi^2(4) = 7.703$, $p = .103$ • $p > 0.05$ (α) • Can not Reject null hypothesis
RQ4: Is there a relationship between students' attitudes toward computer usage and students' achievements in Computer Literacy courses?	• Conduct a Logistic Regression test for a relationship between variables • Independent variable: students' attitudes toward computer usage • Dependent variable: Computer Literacy course final grade (0 - fail and 1 - pass)	• $p = 0.032$ • $p < 0.05$ (α) • Rejected null hypothesis • Exp(B) or Odds ratio = 1.003

In response to research questions:

- RQ1: The finding shows that there was not a statistically significant relationship between the student's age and the students' achievements in Computer Literacy course, $\chi^2(2) = .344$, $p = .842$, with $\alpha = 0.05$.
- RQ 2: The finding shows that there was not a statistically significant relationship between the student's gender and the students' achievements in Computer Literacy course, $\chi^2(1) = 1.078$, $p = .299$, with $\alpha = 0.05$.
- RQ 3: The finding shows that there was not a statistically significant relationship between students' working hours per week and the students' achievements in Computer Literacy course, $\chi^2(1) = 1.078$, $p = .299$, with $\alpha = 0.05$.

- RQ 4: The finding shows that there was a statistically significant relationship between students' attitudes toward computer usage and the students' achievements in Computer Literacy course, ($p < \alpha$; "Sig" column of Variables in the Equation), $p = 0.032$, and $\alpha = 0.05$. See Table 7. The table also shows the odds ratio or Exp(B) which is the predicted change in odds for a unit increase in the predictor which means that the odds of passing the Computer Literacy course ("pass" category) is 1.034 times higher than those failing Computer Literacy course ("fail" category), with a 95% CI of 1.003 to 1.065.

Table 7. Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Attitude	.033	.015	4.608	1	.032	1.034	1.003	1.065
	Constant	-1.220	1.191	1.050	1	.306	.295		

a. Variable(s) entered on step 1: Attitude.

Discussion and Implications

The current study revealed the attitude toward computer usage impacting students' achievement in Computer Literacy courses at HBCUs. Regarding how college students learn to use computers, one important characteristic has been linked to their attitudes. Different aspects of literacy affect people's attitudes toward using technology to achieve their goals and performance in the jobs they carry out at work or school. Their attitudes to utilize technologies will depend on how they utilize technologies and how essential they think they are.

According to this study's findings, there was no relationship between students' ages and students' achievements in Computer Literacy courses. However, students more than twenty-three years old possessed the lowest failing percentage and the highest passing percentage compared to students of a younger age group. This implies that the older students have more computer literacy skills than the younger students. Educators can assist younger students struggling with computer literacy by offering essential support and resources. This includes personalized one-to-one tutoring, targeted small group interventions, and ensuring access to vital resources such as educational materials, technology, and funding.

Even though the student's gender was not associated with students' achievements in Computer Literacy courses, female students had a lower failing percentage, and a higher passing percentage compared to male students. This can suggest to the instructors who teach "Intro to Computer Technology", and "Micro Computer Application in Business" courses to focus more on male students. To enhance computer literacy among male students, educators should employ cooperative strategic learning techniques. This approach emphasizes building self-confidence and practical skills through engaging hands-on activities.

To delve deeper into the relationships between factors (age, gender, and working hours) and achievement in computer literacy course, it is crucial to consider the sample size. A sample that is either unrepresentative or too small may not accurately reflect the true connections between these factors and achievement. By addressing these considerations, future study can offer a more nuanced and comprehensive understanding of how age, gender, and working hours impact student achievement.

Attitudes toward computer usage are associated with students' achievement in Computer Literacy courses. Positive attitudes and confidence in computer usage continue to produce outstanding learning outcomes.

Sharing the study's findings with the faculty in the Department of Computer Science can help students achieve academic success. Faculty can mentor students who are in difficulty, particularly those whose attitude toward computers appears to be negative. Faculty plays a pivotal role in changing students' attitudes toward computer usage. By emphasizing the importance of computer literacy, they can help students understand how crucial these skills are.

The Curriculum Committee can enhance the curriculum by incorporating interactive and hands-on activities that enable students to apply their knowledge in real-world scenarios. This approach will help create an engaging and practical learning experience for students, fostering better understanding and retention of the material.

The insights gained from this research can be extended to a wider range of educational environments, not just HBCUs, ultimately enhancing student achievement and engagement in Computer Literacy courses and beyond.

Recommendations for Future Research

Several techniques may provide a deeper understanding based on the findings of the study research, which may help guide how to assist students in mastering their Computer Literacy courses. Initially, a replication of this study using a comparable cohort and a random sample size from a larger group of participants to increase reliability is suggested to determine if the findings are reproducible.

A qualitative or mixed method may be advantageous in learning more about the relationship between studied factors and students' achievement in Computer literacy courses. Interviewing students about computer literacy skills and asking them about their perspectives on how their abilities are related to their overall learning and their experience utilizing digital applications may be necessary.

Conclusion

The implementation of the new technologies has reformed students' surroundings where students must learn and develop the skills of computer literacy needed to achieve academic success in college and future careers; however, many students miss these chances because of the negative attitudes towards computer usage which can indeed hinder students from taking full advantage of

opportunities to improve their computer literacy. In fact, computer literacy has been widely known as a required skill, and students' effectiveness in computer usage depends on individual experience.

This study's focus on the relationships between the factors (age, gender, working hours per week, and attitude toward computer usage) and students' achievement in Computer Literacy courses at an HBCU may be describing an area of academic deficiency that has not received enough attention.

This quantitative study was used and the results suggested that there was a relationship between students' attitudes toward computer usage and students' achievements in Computer Literacy courses. Computer literacy is crucial for students as it provides them with the essential skills to navigate the digital world, access information, communicate effectively, complete academic tasks, and prepare for future careers in an increasingly technology-dependent society

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