INVESTIGATING THE USE OF TECHNOLOGY INTEGRATION AMONG HOME ECONOMICS STUDENTS IN FOOD AND NUTRITION PROGRAM IN COLLEGES OF EDUCATION IN ANAMBRA STATE

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Abstract
In today's digital era, integrating technology into education has become essential for enhancing learning experiences and outcomes. This study adopted a descriptive survey design to investigate the use of technology integration among Home Economics students in Food and Nutrition programs in Colleges of Education in Anambra State. A sample of 55 students was selected through proportionate stratified random sampling. Data were collected using a validated questionnaire (TIFNEQ), with Cronbach Alpha coefficients of 0.86 (awareness), 0.77 (extent of use), and 0.81 (perceived benefits). The researcher personally administered the instrument, achieving a 100% response rate. Data analysis involved descriptive statistics, ANOVA, Duncan post-hoc test, and Pearson correlation, using SPSS version 25, with significance set at the 0.05 level. The study involved 55 Home Economics students, of which (12.7%) were below 20 years, (36.4%) between 20–25 years, (27.3%) aged 26–30, and (23.6%) above 30. By level of study, (16.4%) were in Year I, (27.3%) in Year II, (38.2%) in Year III, and (18.2%) in Year IV. Females represented a majority (89.1%) compared to males (10.9%). In terms of technology availability, the overall mean scores indicated moderate access to tools (mean = 2.96, SD = 1.19), with Year I students reporting the highest availability (mean = 2.73). A significant difference was found across levels of study in technology availability ($F(3,51) = 4.03$, $p = .012$). A strong positive correlation existed between availability and extent of use ($r = .860$, $p < .001$). Similarly, extent of technology use differed significantly across levels ($F(3,51) = 3.33$, $p = .027$), with Year I students again reporting the highest use (mean = 3.11). Perceived benefits of technology also varied significantly ($F(3,51) = 3.94$, $p = .013$). A very strong correlation was found between extent of use and perceived benefits ($r = .964$, $p < .001$), confirming a meaningful link between practice and value perception. The study concludes that while some digital tools are in use, technology integration is not uniformly implemented, and its potential is underutilized. The study recommends improved provision and equitable access to digital resources to enhance learning in Home Economics.

1. Introduction

The integration of technology in education has transformed how teaching and learning processes are conducted, particularly in practical-oriented disciplines like Home Economics. In the domain of Food and Nutrition education, technology presents opportunities to enhance student engagement, practical competencies, and career readiness. In Anambra State Colleges of Education, however, the extent to which technology is integrated into Home Economics programs, especially in Food and Nutrition, remains under-researched, thus necessitating scholarly attention. Technology integration in education is defined as the effective use of technological tools to enhance teaching and learning outcomes (Jeilani & Abubakar, 2025; Okoye et al, 2023). In Home Economics, the use of multimedia, online simulations, interactive cookery software, and digital assessments can improve students' understanding of complex food preparation techniques and nutrition science (Arroz, 2024). These technologies foster interactive learning environments that promote experimentation, reflection, and skill mastery. In Food and Nutrition specifically, tools like digital thermometers, food processors, and nutrition analysis software can significantly enhance the quality of learning and efficiency of practical sessions (Karimov et al, 2024; Ositadinma & Victor, 2025).

However, research indicates that the successful integration of technology in vocational education is influenced by factors such as teacher competency, institutional support, curriculum design, and students' digital literacy (Falloon, 2020; Anaekwe et al, 2025). Technology not only enhances teaching delivery but also supports innovative food science experiments and interactive learning. However, poor service delivery and autonomy issues in educational governance often hinder smooth implementation (Mbuba, 2022). The challenge of regulatory inconsistency, as seen in broader media policy enforcement, also affects education sector policies (Mbuba, 2018a). Furthermore, the principle of federal character, if not properly applied, may lead to unequal access to educational technology across different institutions and regions (Mbuba, 2021a). Strengthening institutional regulation and ethical standards, as advocated in the public service (Mbuba, 2018b), is vital for the efficient integration of technology in the classroom. Ultimately, effective public employment frameworks and inclusive policies can drive equitable digital transformation in tertiary education (Mbuba, 2021b).

In Nigeria, especially within Colleges of Education, the adoption of technology in classrooms remains uneven and often underfunded. Many Home Economics programs still rely heavily on traditional methods of instruction, such as chalk-and-talk and demonstration-only practicals, which limit student-centered learning and independent exploration. The Food and Nutrition component of Home Economics requires not only theoretical knowledge but also extensive practical skills. Studies suggest that when learners are exposed to technology-enhanced environments, they show better engagement and deeper understanding of dietary planning, food security, and manpower planning (Yang et al, 2015; Anaekwe et al, 2025; Chinedu et al, 2025). For instance, virtual kitchens and recipe development apps allow students to simulate cooking processes, test different food combinations, and calculate nutritional content practices that are otherwise constrained by limited classroom time and resources.

Despite the potential benefits, several challenges hinder technology integration in Anambra State. These include inadequate funding, limited access to devices and software, power supply instability, and lack of trained personnel. Home Economics teachers often lack the pedagogical training to incorporate digital tools meaningfully into Food and Nutrition instruction. As such, even when technology is available, it may be underutilized or misapplied. Another concern is the readiness of students themselves. A study by Ajayi et al, (2019) found that while many students in Nigerian tertiary institutions possess smartphones and have some familiarity with ICT tools, their use is often restricted to social media or informal communication. Few students are adequately trained to use technology for academic and vocational purposes. This gap suggests that curriculum reform and deliberate training initiatives are needed to align students' digital habits with educational objectives.

Furthermore, the attitude of both educators and students plays a critical role in technology integration. According to Byungura et al, (2018), a positive perception of technology correlates strongly with higher usage levels in instructional settings. Thus, promoting a culture that embraces innovation and digital tools is essential for systemic transformation. Additionally, partnerships between government, educational institutions, and technology providers can help bridge the infrastructural gap and offer hands-on experiences (Obi et al, 2024; Okeke and Anaekwe, 2025). Despite the growing importance of technology in education and the practical nature of Food and Nutrition programs, many Colleges of Education in Anambra State still struggle with effective technology integration in their Home Economics curriculum. There is a disconnect between the potential of digital tools to enhance food-related skills and the actual classroom practices observed. Without a clear strategy for integration, both students and educators may miss opportunities to acquire 21st-century competencies that are vital for professional success (Ajayi et al, 2019). This gap raises concerns about the quality of Food and Nutrition education being delivered and its relevance in a digitally driven world.

The inspiration for this study stems from the growing need to modernize vocational education through technology, particularly in the area of Food and Nutrition within Home Economics programs. Despite global advancements in educational technology, evidence suggests that Nigerian tertiary institutions, including Colleges of Education, lag in the effective integration of digital tools in practical-oriented courses (Karofi, 2025). In Food and Nutrition, where hands-on skills are crucial, students are often limited to outdated teaching methods, missing opportunities to enhance their competencies through simulations, nutritional analysis software, and virtual culinary labs (Lano–Maduagu & Ogbonna, 2023). This disconnect between technological potential and classroom reality raises concerns about the preparedness of graduates for modern food industries and nutritional consultancy. Furthermore, while studies have explored general ICT usage among Nigerian students, few have specifically investigated technology integration in vocational fields like Home Economics. The lack of tailored instructional strategies, inadequate digital infrastructure, and insufficient teacher training underscore the need for focused research. This study, therefore, aims to fill this critical gap by evaluating how technology is used, the challenges faced, and the potential benefits for Home Economics students in Anambra State, with the goal of proposing actionable improvements.

1.1. Hypotheses

1. There is no significant difference in the availability of technology tools to Home Economics students based on the level of study.
2. There is no significant relationship between students' awareness of technology tools and the use of those tools in their institutions.
3. There is no significant difference in the extent to which home economics students use technology for learning based on their level of study.
4. There is no significant difference in students' perceived benefits of technology integration based on gender.
5. There is no significant relationship between the extent of technology use and students' perceived benefits of technology integration in learning Food and Nutrition.

2. Method

The methodology adopted for the study was the descriptive survey design. The study population consisted of all Home Economics students enrolled in the Food and Nutrition program across the three major Colleges of Education in Anambra State. These included both state and federal institutions, with an estimated total student population of 240 across the four levels of study. Using proportionate stratified random sampling, a sample of 55 students was selected to ensure equitable representation of each academic level. Data for the study were collected using a structured instrument titled *Technology Integration in Food and Nutrition Education Questionnaire (TIFNEQ)*. The questionnaire comprised four sections. Section A focused on demographic data, including gender, age, and level of study. Section B examined awareness and availability of technology tools in Food and Nutrition education. Section C addressed the extent to which students utilized these tools, while Section D assessed their perceived benefits of technology integration in the program. Items in Sections B, C, and D were measured on a four-point Likert scale ranging from *Very High Extent (4)* to *Very Low Extent (1)*. To ensure the validity of the instrument, it was subjected to face and content validation by three experts in Home Economics Education and Educational Measurement and Evaluation. Their observations helped refine the clarity, relevance, and appropriateness of the items in line with the research objectives. The reliability of the instrument was established through a pilot test conducted with 20 students from a College of Education outside the study area. The results produced Cronbach Alpha coefficients of 0.86 for Section B, 0.77 for Section C, and 0.81 for Section D, indicating acceptable to high internal consistency.

The researcher, with the assistance of trained research assistants, personally administered the questionnaires during lecture periods after obtaining informed consent from the students and approval from the faculty. The objectives of the study were clearly explained, and participants were assured of the confidentiality of their responses. All 55 copies of the questionnaire were completed and returned, yielding a 100% response rate. Data collected were analyzed using the Statistical Package for the Social Sciences (SPSS) version 25.0. Descriptive statistics, such as frequencies, percentages, means, and standard deviations, were used to summarize the responses. Analysis of Variance (ANOVA) was employed to test the hypotheses and examine differences across students' levels of study. Where significant differences were observed, Duncan Multiple Range Test was conducted as a post-hoc analysis to identify specific group differences. In addition, Pearson Product-Moment Correlation was applied to assess the relationships between the availability of technology tools, the extent of use, and perceived benefits. All statistical tests were interpreted at the 0.05 level of significance.

3. Results and Discussion

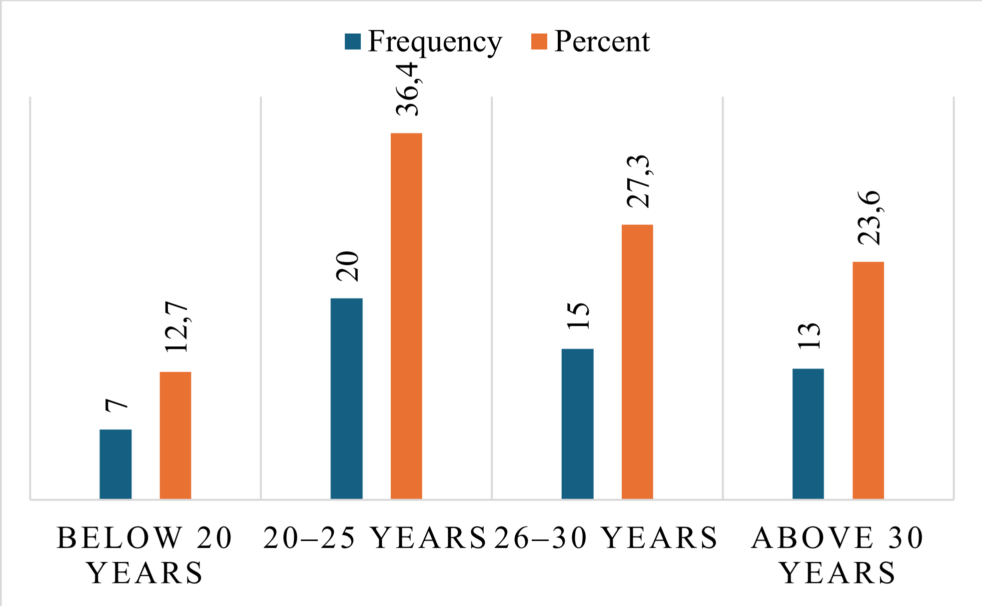

Figure 1: Age Distribution of Respondents

Figure 1 shows that most respondents were aged 20–25 years (36.4%), followed by those aged 26–30 years (27.3%). Respondents above 30 years made up (23.6%), while the least were below 20 years (12.7%). The cumulative percentage reached 49.1% by age 25, indicating nearly half the sample were young adults. The total number of respondents was 55, with a balanced spread across age groups, suggesting a diverse demographic composition.

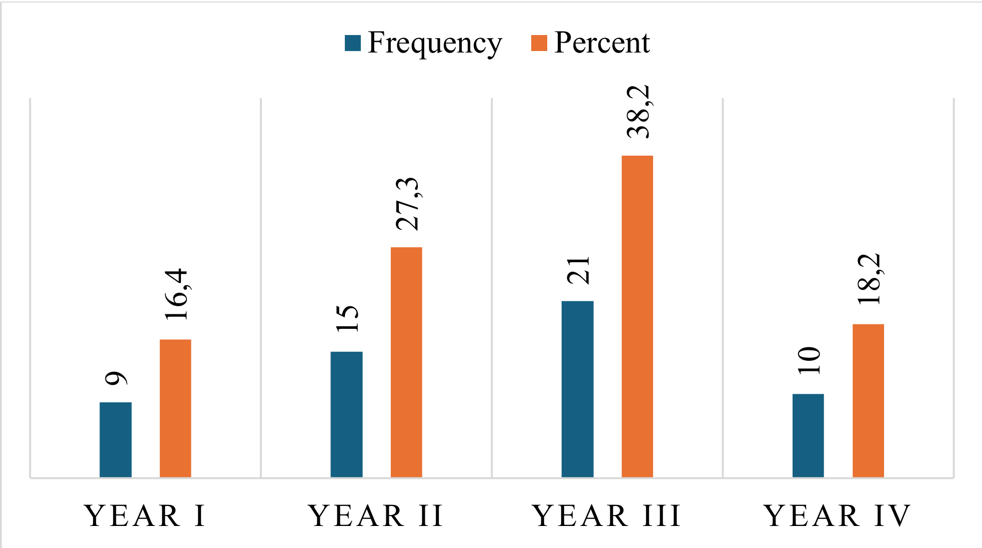

Figure 2: Distribution of Respondents According to Level of Study

Figure 2 shows that most respondents were in Year III (38.2%), followed by Year II (27.3%), and Year IV (18.2%). The least were in Year I (16.4%). Cumulatively, 43.6% were in Year II or below, while 81.8% had reached at least Year III. The total sample size was 55, indicating a strong representation of upper-level students, which may reflect greater academic exposure or interest in the study focus.

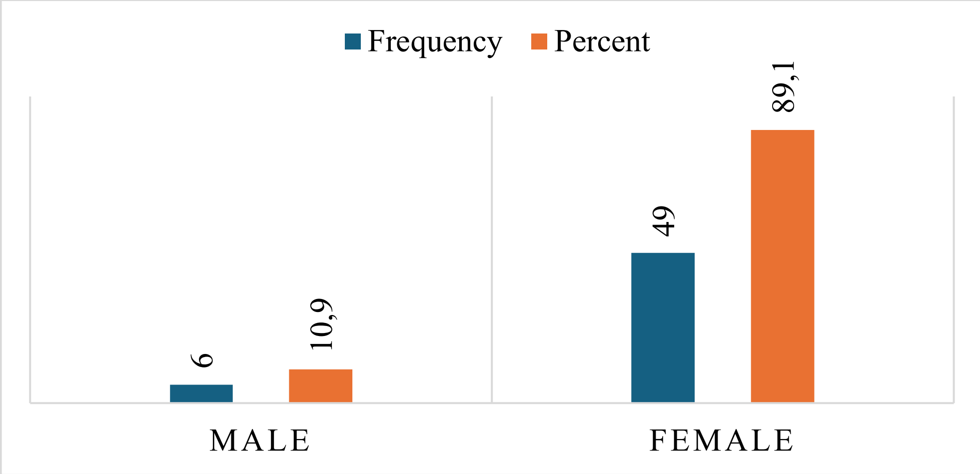

Figure 3: Gender Distribution of Respondents

Figure 3 reveals a dominant female representation (89.1%) compared to male respondents (10.9%). Out of the total (55) participants, females made up nearly the entire sample. The cumulative percent reached (100.0%) with the inclusion of females, indicating gender imbalance. This distribution may influence the study outcomes, particularly if gender-based perspectives are relevant to the research focus.

Table 1: Availability of Technology Tools Across Levels of Study in Food and Nutrition Education

Level of Study		I am aware of the use of technology in food and nutrition education.	Computers and projectors are available in our department.	I have access to internet-enabled devices for learning.	Our practical classes are supported with digital tools (videos, slides).	E-learning platforms are used in our coursework.
Year I	Mean	1.78	3.56	2.44	3.33	2.56
	N	9	9	9	9	9
	Std. Deviation	1.202	.726	1.424	.707	1.236
Year II	Mean	1.00	2.33	2.00	2.13	1.13
	N	15	15	15	15	15
	Std. Deviation	.000	1.397	1.254	1.246	.516
Year III	Mean	2.10	2.95	2.57	2.57	1.29
	N	21	21	21	21	21
	Std. Deviation	1.411	1.161	1.207	1.121	.784
Year IV	Mean	1.80	3.40	3.30	2.80	1.70
	N	10	10	10	10	10
	Std. Deviation	1.317	.843	.675	.919	1.160
Total	Mean	1.69	2.96	2.53	2.62	1.53
	N	55	55	55	55	55
	Std. Deviation	1.200	1.186	1.230	1.114	.997

Table 1 shows varying levels of technology access and awareness across study levels. Year I students reported the highest awareness of technology use (mean = 1.78) and strong availability of computers and projectors (3.56). Year IV students had the highest access to internet-enabled devices (3.30). E-learning platforms were least used across all years, especially in Year II (1.13). The overall mean scores were highest for availability of computers and projectors (2.96), but lowest for e-learning platform use (1.53), suggesting limited digital integration in coursework despite some available tools.

Table 2: Extent of Use of Technology in Learning Across Levels of Study

Level of Study		PowerPoint presentations	YouTube or instructional videos	E-books and online journals	Virtual cooking demonstrations	Educational apps for meal planning or nutrition tracking
Year I	Mean	3.22	2.22	3.33	3.44	3.33
	N	9	9	9	9	9
	Std. Deviation	.972	1.481	1.000	1.014	.500
Year II	Mean	2.13	1.00	2.13	2.20	1.87
	N	15	15	15	15	15
	Std. Deviation	1.187	.000	1.187	1.320	.915
Year III	Mean	2.71	1.86	2.57	2.62	2.43
	N	21	21	21	21	21
	Std. Deviation	1.271	1.276	1.165	1.284	1.165
Year IV	Mean	3.20	1.50	2.70	3.10	2.80
	N	10	10	10	10	10
	Std. Deviation	1.229	.850	.949	1.197	1.135
Total	Mean	2.73	1.62	2.60	2.73	2.49
	N	55	55	55	55	55
	Std. Deviation	1.239	1.114	1.148	1.283	1.103

The data in Table 2 indicates that Year I students made the highest use of PowerPoint (3.22), e-books (3.33), virtual cooking demos (3.44), and nutrition apps (3.33), suggesting strong early engagement with digital tools. Year II students consistently showed the lowest usage across all items, especially YouTube videos (1.00). Year IV students showed moderate use of all tools, with relatively high use of virtual demos (3.10). Overall, the most used tools were PowerPoint and virtual cooking demonstrations (both 2.73), while YouTube videos were the least used (1.62), indicating selective adoption of digital learning aids.

Table 3: Perceived Benefits of Technology Integration Across Levels of Study

Level of Study		Technology helps me understand concepts in food and nutrition better.	Digital learning tools make lessons more engaging.	I can prepare better for exams with the help of online resources.	Virtual demonstrations enhance my practical skills.	Technology fosters independent learning in this program.
Year I	Mean	3.67	3.89	3.56	3.89	2.22
	N	9	9	9	9	9
	Std. Deviation	.500	.333	.527	.333	1.481
Year II	Mean	2.27	2.13	2.40	2.20	1.00
	N	15	15	15	15	15
	Std. Deviation	1.335	1.187	1.454	1.424	.000
Year III	Mean	2.71	2.62	2.86	2.62	1.86
	N	21	21	21	21	21
	Std. Deviation	1.271	1.203	1.352	1.431	1.315
Year IV	Mean	3.20	3.00	3.20	3.30	1.50
	N	10	10	10	10	10
	Std. Deviation	1.229	1.155	1.229	1.252	.972
Total	Mean	2.84	2.76	2.91	2.84	1.62
	N	55	55	55	55	55
	Std. Deviation	1.259	1.217	1.295	1.385	1.147

As shown in Table 3, students in Year I reported the highest perceived benefits of technology, with high mean scores in concept understanding (3.67), lesson engagement (3.89), exam preparation (3.56), and skill enhancement (3.89). However, independent learning scored low (2.22). Year II consistently rated all benefits the lowest, particularly in promoting independence (1.00). Year IV students recognized benefits in virtual skill enhancement (3.30) and concept understanding (3.20).

Overall, online resources aiding exam prep had the highest total mean (2.91), while technology's role in promoting independent learning was least rated (1.62), suggesting a gap in self-directed learning support.

Hypothesis 1: There is no significant difference in the availability of technology tools to Home Economics students based on the Level of Study.

Table 4: ANOVA Summary of Availability of Technology Tools Based on Level of Study

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.571	3	2.524	4.028	.012
Within Groups	31.954	51	.627		
Total	39.524	54			

The ANOVA result in Table 4 shows a statistically significant difference in the availability of technology tools across levels of study, with a p-value of (.012), which is less than the standard threshold of (.05). The between-group variance (Sum of Squares = 7.571) and F-value (4.028) indicate that students' level of study influenced their access to technology tools. This means the null hypothesis is rejected. Students at different levels, particularly Year I (mean = 2.73) and Year II (mean = 1.72), experienced differing levels of tool availability, possibly due to course design or departmental priorities.

Table 5: Post Hoc Test (Duncan) for Availability of Technology Tools Across Level of Study

Level of Study	N	Subset for alpha = 0.05	
		1	2
Year II	15	1.7200	
Year III	21	2.2952	2.2952
Year IV	10		2.6000
Year I	9		2.7333
Sig.		.078	.202

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 12.293.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

The Duncan post hoc analysis in Table 5 reveals that Year II students reported the lowest availability of tools (mean = 1.72), forming a distinct group. Year III students (mean = 2.30) share overlap with both lower and higher availability levels. Meanwhile, Year IV (2.60) and Year I (2.73) students reported the highest availability and were grouped in a separate subset. The significance values (.078 and .202) show that while differences exist, the clearest contrast is between Year II and the upper levels. This suggests that more technology resources are concentrated in the early and final years of study.

Hypothesis 2: There is no significant relationship between students' use of technology tools and the availability of those tools in their institutions.

Table 6: Correlation Between Availability and Extent of Use of Technology Tools

		Availability of Technology Tools	Extent of Use of Technology in Learning
Availability of Technology Tools	Pearson Correlation	1	.860**
	Sig. (2-tailed)		.000
	N	55	55
Extent of Use of Technology in Learning	Pearson Correlation	.860**	1
	Sig. (2-tailed)	.000	
	N	55	55

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

The Pearson correlation result in Table 6 shows a strong positive relationship between the availability of technology tools and their extent of use in learning, with a correlation coefficient of (.860) and a significance value of (.000), which is less than (.01). This indicates a statistically significant correlation at the 1% level. As availability increases, usage also rises. Since the p-value is below the threshold, the null hypothesis stating that there is no significant relationship is rejected. This means that institutions providing more technological resources likely encourage higher levels of usage among Home Economics students.

Hypothesis 3: There is no significant difference in the extent of technology use for learning among Home Economics students based on their level of study.

Table 7: ANOVA Summary of Extent of Technology Use for Learning Based on Level of Study

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.465	3	3.155	3.333	.027
Within Groups	48.276	51	.947		
Total	57.741	54			

The ANOVA test in Table 7 shows a significant difference in how students across levels of study use technology for learning, with a p-value of (.027), which is less than (.05). This means the null hypothesis is rejected. The F-value of (3.333) suggests that the extent of technology use varies notably across levels. Year I students reported the highest usage (mean = 3.11), while Year II students had the lowest (mean = 1.87). These differences may reflect changes in course content, instructor approaches, or access to resources across academic levels.

Table 8: Post Hoc Test (Duncan) for Extent of Technology Use Across Level of Study

Level of Study	N	Subset for alpha = 0.05	
		1	2
Year II	15	1.8667	
Year III	21	2.4381	2.4381
Year IV	10	2.6600	2.6600
Year I	9		3.1111
Sig.		.060	.111

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 12.293.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

The Duncan post hoc test in Table 8 reveals that Year II students (mean = 1.87) formed a distinct subset with the lowest extent of technology use. Year III (2.44) and Year IV (2.66) shared a middle subset, while Year I students (3.11) formed the highest group. The significance values (.060 and .111) indicate some overlap, but Year I distinctly used more technology tools. This suggests that technology use is most emphasized at the entry level, likely to spark interest, but less consistent in higher years where integration may taper off.

Hypothesis 4: There is no significant difference in students perceived benefits of technology integration across levels of study

Table 9: ANOVA Summary of Perceived Benefits of Technology Integration Across Level of Study

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.484	3	4.161	3.942	.013
Within Groups	53.833	51	1.056		
Total	66.317	54			

The ANOVA result Table 9 shows a statistically significant difference in students perceived benefits of technology integration across study levels, with a p-value of (.013), which is below the (.05) threshold. This leads to the rejection of the null hypothesis. The F-value of (3.942) and between-group sum of squares (12.484) indicate that perceptions of technology benefits vary meaningfully by level. Year I students reported the highest perceived benefit (mean = 3.44), while Year II students reported the lowest (mean = 2.00). These differences may stem from variations in exposure or enthusiasm across academic years.

Table 10: Post Hoc Test (Duncan) for Perceived Benefits of Technology Integration Across Level of Study

Level of Study	N	Subset for alpha = 0.05	
		1	2
Year II	15	2.0000	
Year III	21	2.5333	
Year IV	10	2.8400	2.8400
Year I	9		3.4444
Sig.		.060	.151

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 12.293.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

The Duncan post hoc test in Table 10 identifies clear group differences. Year II students (mean = 2.00) form the lowest subset, indicating minimal perceived benefit from technology. Year III (2.53) and Year IV (2.84) fall into a middle category, showing moderate perceived benefits. Year I students (3.44) stand out with the highest perceived benefits and form their group. The significance values (.060 and .151) suggest some overlap. Still, the general trend reflects greater appreciation of technology's impact among newer students, possibly due to more recent or engaging digital experiences in their curriculum.

Hypothesis 5: There is no significant relationship between the extent of technology use and students' perceived benefits of technology integration in learning Food and Nutrition.

Table 11: Correlation Between Extent of Technology Use and Perceived Benefits of Technology Integration

		Extent of Use of Technology in Learning	Perceived Benefits of Technology Integration
Extent of Use of Technology in Learning	Pearson Correlation	1	.964**
	Sig. (2-tailed)		.000
	N	55	55
Perceived Benefits of Technology Integration	Pearson Correlation	.964**	1
	Sig. (2-tailed)	.000	
	N	55	55

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

The Pearson correlation coefficient of (.964) in Table 11 reveals a very strong positive relationship between the extent of technology use and students' perceived benefits of technology integration in learning Food and Nutrition. The significance value (.000) is far below the.01 level, indicating a statistically significant relationship. This means that as students use technology more, their perception of its benefits also increases. Given the high correlation and low p-value, the null hypothesis is rejected. Therefore, the data suggests that increased use of technology leads to greater recognition of its positive impact on learning.

The use of technology in education continues to evolve globally, and its integration into Food and Nutrition education in Nigerian Colleges of Education is becoming increasingly relevant. This study investigates the availability, usage, and perceived benefits of technology tools among Home Economics students across different years of study in Anambra State. Five hypotheses were tested, revealing significant differences and relationships that align or contrast with current research.

Availability of Technology Tools Across Levels of Study: The results in Table 1 showed that the availability of technology tools varied across levels. Year I students indicated high awareness of technology in Food and Nutrition (mean = 1.78) and the highest availability of computers and projectors (3.56), while Year II students consistently reported the lowest availability (1.00 for awareness). This finding aligns with Mélon and Spruk (2020) who reported that early-year students tend to benefit from newly procured institutional resources due to restructured curricula, while in contrast, Zekanović-Korona et al, (2022) noted that upper-year students often benefit more from institutional prioritization. Furthermore, the ANOVA result (p = .012) and Duncan post hoc test confirmed significant differences in tool availability, particularly between Year II and Years I and IV.

In a related study, Adekoya et al, (2024) emphasized that uneven access to ICT tools across academic levels in Nigerian tertiary institutions affects students' engagement in digital learning.

Extent of Use of Technology in Learning: As seen in Table 2, Year I students reported the highest use of various tools such as PowerPoint (3.22), virtual cooking demonstrations (3.44), and educational apps (3.33), whereas Year II showed the lowest use across all tools. This finding agrees with Byungura et al, (2018) who found that first-year students demonstrate early enthusiasm for new technologies. However, Msafiri et al, (2023) observed that such initial engagement may taper in later years due to institutional or instructional constraints. ANOVA results ($p = .027$) confirmed significant differences across levels, and the Duncan test showed Year I distinctly reported the highest technology usage. In contrast, Hong et al, (2022) reported consistent usage across levels in institutions with well-structured ICT policies. The present study, however, points to inconsistency in implementation, likely due to differences in instructor training or curriculum emphasis.

Perceived Benefits of Technology Integration: In Table 3, Year I students again reported the highest perceived benefits across most indicators (e.g., understanding concepts = 3.67, engagement = 3.89), while Year II students reported the least (e.g., independent learning = 1.00). This trend confirms the observation of Carabregu-Vokshi et al, (2024) who found that students' early exposure to interactive digital tools enhances learning perception. However, in contrast, Lucas et al, (2022) noted that perceived benefits increase over time as students become more proficient. The ANOVA results ($p = .013$) and post hoc analysis showed significant differences in perceptions, especially between Year I and II. Ji et al, (2024) also found that students with more access to visual and practical technology reported enhanced understanding and motivation, validating the findings of this study.

Relationship Between Availability and Usage of Technology Tools: Table 6 reveals a strong positive relationship between availability and extent of use ($r = .860$, $p = .000$). This aligns with Jeilani and Abubakar (2025) who argued that students' use of technology is directly tied to institutional provision. Similarly, Akram and Li (2024) found a significant correlation between tool access and student motivation to use them. In contrast, Ben-Youssef et al, (2022) found that students may underutilize available tools due to lack of training, a gap not significantly noted in this study where availability clearly encouraged use.

Extent of Technology Use and Perceived Benefits: Table 11 presented an extremely strong correlation ($r = .964$, $p = .000$) between extent of use and perceived benefits, suggesting that increased interaction with digital tools improves students' appreciation of their value in learning Food and Nutrition. This agrees with Albalawi (2024) who highlighted that practical engagement through videos, e-books, and nutrition apps significantly boosts comprehension. In a related study, Zahid et al, (2023) confirmed that students using mobile-based nutrition applications demonstrated improved academic performance. In contrast, Lucas and Vicente (2023) argued that without instructor guidance, students may not fully perceive the educational benefits of these tools. The present study suggests otherwise, especially for Year I students who reported high benefits alongside high use, pointing to the importance of supportive instructional design.

Across the hypotheses, three key patterns emerge. First, early-year students (especially Year I) are more positively engaged with technology both in terms of access and usage than their senior counterparts. This may reflect efforts to introduce digital learning early in the program, but could also indicate a lack of continuity in later years. Second, Year II students consistently reported the least access, use, and perceived benefits, suggesting a systemic gap that needs policy attention. A strong correlation between tool availability, use, and perceived benefits points to the centrality of infrastructure in successful technology integration.

4. Conclusion

This study investigated the use of technology integration among Home Economics students in the Food and Nutrition program in Colleges of Education in Anambra State, revealing critical insights into access, utilization, and perceived benefits of digital tools across different academic levels. The findings indicated that while some technological infrastructure, such as computers, projectors, and internet-enabled devices, is moderately available, their effective utilization remains uneven, with Year I students reporting the highest levels of awareness and usage. In contrast, Year II students consistently exhibited the lowest engagement and perceived benefits. The results of the ANOVA and post hoc tests established significant differences in technology availability, usage, and perceived benefits based on students' level of study. Notably, the strong positive correlations between technology availability and usage, as well as between usage and perceived benefits, highlight the essential role of access in promoting digital engagement and enhancing learning outcomes. However, the generally low adoption of e-learning platforms and minimal emphasis on tools that support independent learning indicate gaps in the holistic integration of educational technologies in the curriculum. Although the study shows promising levels of technology engagement at the entry-level, there is an urgent need for consistent and structured integration of digital tools across all levels of the program. This calls for institutional support in the form of improved infrastructure, faculty training, and curriculum alignment to maximize the potential of technology in enhancing students' understanding, engagement, and performance in Food and Nutrition education.

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