

# Innovating Education: The Role of Digital Learning in Academic Triumphs

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**Abstract**— This study investigated the role of digital learning in academic triumphs among Grade 10 students from Clarence Ty Pimentel National High School, Gamut National High School, and Purisima National High School who chose Cookery specialization in TLE, within the Tago District, Surigao del Sur. Employing an explanatory sequential mixed-methods design, the study found that Project-Based Learning (PjBL) assisted by digitized materials significantly enhanced students' digital literacy and positively impacted their academic performance in Home Economics. A strong, positive correlation was identified between the effectiveness of this approach and improvements in students' academic grades, engagement, and problem-solving/critical thinking skills. While students reported consistent access to devices, challenges such as insufficient internet connectivity and technical difficulties were noted. The integration of digitized learning materials was generally aligned with enhancing digital literacy and academic performance, though the preparedness of teachers and students varied. The findings suggest that PjBL with digitized materials is effective, but addressing connectivity and preparedness is crucial for maximizing its benefits.

**Keywords**— Digital Learning, Project-Based Learning, Digital Literacy, and Academic Performance.

## I. INTRODUCTION

The evolving educational landscape necessitates a shift towards student-centered approaches, prompting teachers to embrace technology-integrated strategies to enhance learning outcomes[1]. In Home Economics, equipping students with skills relevant to societal demands through digital learning is crucial [2]. The evolving educational landscape necessitates a shift towards student-centered approaches, prompting teachers to embrace technology-integrated strategies to enhance learning outcomes[3]. Hence, this research aims to evaluate the effectiveness of Project-Based Learning (PjBL) assisted by digitized learning materials in improving Grade 10 students' digital literacy and academic performance in the least learned competencies.

Modern education increasingly leverages engaging tools to captivate learners and optimize educational experiences [4]. To address the limitations of traditional instruction, this study introduces Project-Based Learning (PjBL) combined with digitized materials to enhance the teaching of challenging Home Economics concepts, aligning with the Department of Education's emphasis on ICT-Assisted Learning [5]. Research supports the idea that integrating technology into education can significantly boost student achievement, interest, and engagement [6][7]. Technology-enhanced learning environments have been shown to improve behavioral,

emotional, and cognitive aspects of student engagement [8]. Furthermore, the use of digital tools in PjBL contexts enriches the learning process and aligns with 21st-century learning demands, fostering students' adaptability and technological proficiency [9].

The current teaching of TLE-Cookery faces challenges such as low student interest and varying digital literacy levels, coupled with a potentially overloaded curriculum limiting hands-on practice [10] [11]. This study proposes that integrating PjBL, with its focus on real-world projects, alongside digital learning resources and basic digital literacy training, can enhance student engagement and skill development. By providing anytime access to resources, digital tools further support continuous learning, ultimately equipping students with necessary skills for academic success and future culinary endeavors [12].

## Statement of the Problem

This study aimed to determine the effectiveness of Project-Based Learning assisted with digitized learning materials in enhancing digital literacy and academic performance of the Grade 10 students in Gamut National High School, Purisima National High School, and Clarence T. Pimentel National High School for the S.Y 2023-2024. Specifically, it sought to answer the following questions:

1. How effective is the implementation of Project-Based Learning (PjBL) assisted by digitized learning materials in enhancing digital literacy among students, in terms of the following indicators:
  - 1.1 Proficiency in using digital tools and platforms
  - 1.2 Ability to evaluate and utilize online information
  - 1.3 Responsible use of technology in educational settings?
2. What is the extent of the impact of digitized learning materials on students' academic performance in terms of the following indicators:
  - 2.1 Academic grades in core subjects
  - 2.2 Engagement and participation in digital learning activities
  - 2.3 Development of problem-solving and critical thinking skills?
3. Is there a significant relationship between the effectiveness of the implementation of Project-Based Learning (PjBL) assisted by digitized learning materials and the extent of the impact of digitized learning materials?

4. What challenges are encountered by respondents in implementing Project-Based Learning (PjBL) assisted by digitized materials, in terms of the following indicators:
  - 4.1 Access to devices and stable internet connection
  - 4.2 Availability of technical and instructional support
  - 4.3 Readiness and adaptability to digital learning methodologies?
5. How does the integration of digitized learning materials align with the goals of enhancing digital literacy and academic performance, in terms of the following indicators;
  - 5.1 Curriculum relevance and alignment
  - 5.2 Student motivation and learning outcomes
  - 5.3 Overall satisfaction with the learning experience?
6. What enhanced output can be proposed based on the results from the study?

## II. MATERIALS AND METHOD

This study employed an explanatory sequential mixed-method design, beginning with quantitative data collection via surveys from 90 Grade 10 students and 7 cookery teachers across three secondary schools in Surigao del Sur, Philippines (Purisma NHS, Gamut NHS, and Clarence T. Pimentel NHS). Stratified random sampling was used for student selection, while all relevant teachers were included. The survey measured pupils' academic achievement, digital literacy, and participation in digital learning activities. This was followed by qualitative data collection through Focus Group Discussions (FGDs) with a purposive sample of 15 students (5 from each school, balanced by gender) to explore their experiences and challenges with digital learning materials, providing a deeper understanding of the quantitative findings.

The research involved the development and validation of Project-Based Learning (PjBL) digitized learning materials targeting the top five least learned competencies in HE-Cookery identified from Division Office records. This process included creating PjBL activity sheets with real-life scenarios, digitizing them into interactive HTML websites with multimedia elements, and subjecting them to content validation by experts. Ethical considerations were paramount, with approval secured from relevant authorities, voluntary participation ensured, informed consent obtained from students and parents, and strict confidentiality maintained throughout the data collection and analysis processes. Quantitative data was analyzed using weighted means to assess effectiveness, impact, and challenges, and Pearson's r to determine relationships between variables. Qualitative data from FGDs was thematically analyzed to complement the quantitative findings.

## III. RESULTS AND DISCUSSION

### *Effectiveness of the implementation of PjBL assisted by digitized learning materials*

Table 1 shows the data indicates a positive perception of the digitized instructional materials, with the overall mean rating of 4.293 suggesting that respondents "Strongly Agree" with their integration. While curriculum relevance and alignment received a slightly lower "Agree" rating (4.13), student motivation, learning outcomes, and overall satisfaction

with the learning experiences were rated highly as "Strongly Agree" (4.249 and 4.501, respectively).

TABLE 1. Effectiveness of PjBL assisted by DLM

Indicators	Mean	Adjectival rating
Curriculum relevance & Alignment	4.13	Agree
Student motivation and learning outcome	4.249	Strongly Agree
Overall satisfaction with the learning experiences	4.501	Strongly Agree
<b>Over-all Mean</b>	<b>4.293</b>	<b>Strongly Agree</b>

Integrating Project-Based Learning (PjBL) with digital tools fosters students' technical proficiency and active engagement [13]. PjBL is particularly beneficial in practical subjects like Home Economics, where students apply digital skills to solve authentic problems, thereby improving both academic performance and digital literacy [14].

### *Impact of Digitized Learning Materials on Students' Academic Performance*

TABLE 2. Impact of Digitized Learning Material

Indicators	Mean	Adjectival rating
Academic Grades in core subjects	4.116	Agree
Engagement & Participation	4.172	Agree
Development of problem solving	4.128	Agree
<b>Overall Mean</b>	<b>4.139</b>	<b>Agree</b>

Table 2 shows suggests a positive impact of digitized learning materials on students' academic performance, as indicated by the "Agree" adjectival rating and an overall mean of 4.139. Specifically, students generally agreed that the materials positively influenced their academic grades in core subjects (4.116), engagement and participation (4.172), and the development of their problem-solving skills (4.128).

The results reinforce that Project-Based Learning (PjBL), when supported by well-designed digital resources, can strengthen both theoretical understanding and practical execution in technical subjects like cookery, ultimately contributing to higher student performance and deeper subject mastery [12][15].

### *Significant Relationship between the Effectiveness of the Implementation and Impact PjBL assisted by Digitized Learning Material*

TABLE 3. Significant Relationship between the Effectiveness of the Implementation and Impact PjBL

Variables Tested	r	P-value	Decision	Conclusion
Academic Grades - Proficiency in using digital tools	0.887	0.000	Reject Ho	Significant & Highly Correlated
Academic Grades - Ability to evaluate info	0.865	0.000	Reject Ho	Significant & Highly Correlated
Academic Grades - Responsible use of tech	0.839	0.000	Reject Ho	Significant & Highly Correlated
Engagement - Proficiency in using digital tools	0.868	0.000	Reject Ho	Significant & Highly Correlated
Engagement - Ability to evaluate info	0.872	0.000	Reject Ho	Significant & Highly Correlated
Engagement -	0.840	0.000	Reject	Significant &

Responsible use of tech			Ho	Highly Correlated
Development - Proficiency in using digital tools	0.872	0.000	Reject Ho	Significant & Highly Correlated
Development - Ability to evaluate info	0.890	0.000	Reject Ho	Significant & Highly Correlated
Development - Responsible use of tech	0.873	0.000	Reject Ho	Significant & Highly Correlated

The data in Table 3 demonstrates a significant positive correlation between effective PjBL implementation with digital tools and student outcomes, with correlation coefficients ranging from 0.839 to 0.890. This strong relationship, supported by p-values of 0.000, indicates that effective integration substantially enhances students' academic performance, engagement, and skill development in Home Economics. These findings suggest that meaningful integration of digital tools within PjBL frameworks promotes both academic and cognitive growth [16].

*Challenges Encountered by Respondents in Implementing (PjBL) assisted by DLM*

TABLE 4. Challenges Encountered by Respondents in Implementing (PjBL) assisted by DLM

Indicators	Mean	Adjectival rating
Access to devices & stable internet connection	4.179	Agree
Availability of tech & instructional support	4.126	Agree
Readiness & Adaptability	4.147	Agree
<b>Overall Mean</b>	<b>4.151</b>	<b>Agree</b>

The challenges encountered in implementing Project-Based Learning (PjBL) assisted by Digital Learning Materials (DLM) were generally perceived as "Agree" based on the overall mean of 4.151. Specifically, access to devices and a stable internet connection had a mean of 4.179, while the availability of tech and instructional support was rated at 4.126. These findings are consistent OECD reports, which underscore the continuing digital divide in education, especially in areas with limited infrastructure [17].

*Digitized Learning Materials Alignment with the Goals of Enhancing Digital Literacy and Academic Performance*

TABLE 5. Digitized Learning Materials Alignment with the Goals of Enhancing Digital Literacy and Academic Performance

Indicators	Mean	Adjectival rating
Curriculum relevance & Alignment	4.13	Agree
Student motivation and learning outcome	4.249	Strongly Agree
Overall satisfaction with the learning experiences	4.501	Strongly Agree
<b>Over-all Mean</b>	<b>4.293</b>	<b>Strongly Agree</b>

Table 5 presents the alignment of digitized learning materials with the goals of enhancing digital literacy and academic performance with an overall mean of 4.293, corresponding to "Strongly Agree." Specifically, student motivation and learning outcome (mean of 4.249) and overall satisfaction with the learning experiences (mean of 4.501) both received "Strongly Agree" ratings, indicating a strong

positive alignment. While curriculum relevance and alignment received a slightly lower rating of "Agree" (mean of 4.13), the general consensus suggests that the digitized materials effectively contribute to the intended educational goals. Digital tools are most effective when they align with curriculum standards and learning goals [18]. When it's integrated with problem-solving and critical thinking exercises, it promotes essential 21st-century skills, thereby leading to improved academic performance [19][20].

*Proposed Enhancement for the Digitized Learning Material*

To enhance the digitized learning materials developed in the study, several key improvements are proposed based on the findings. Addressing internet connectivity challenges, the materials should incorporate offline accessibility through downloadable content or hybrid designs. To further engage students and improve learning, richer interactive and multimedia elements like virtual simulations and augmented reality could be integrated, alongside features promoting critical online information evaluation. Lastly, to address preparedness concerns, user-friendly tutorials, embedded support, and adaptive learning pathways should be included, with feedback mechanisms for continuous improvement.

IV. CONCLUSION

The study concludes that Project-Based Learning (PjBL) assisted by digitized learning materials effectively enhances Grade 10 students' digital literacy, specifically their proficiency in using digital tools, evaluating online information, and practicing responsible technology use. Digitized materials also positively impact academic performance in Home Economics, improving grades, increasing engagement, and developing problem-solving and critical thinking skills. A strong positive relationship exists between effective PjBL implementation with digitized materials and these positive student outcomes.

However, challenges such as unstable internet connectivity and technical difficulties hinder seamless implementation. While technical and instructional support is generally adequate, there is room for improvement in its accessibility and responsiveness. The integration of digitized materials aligns with enhancing digital literacy and academic performance, boosting student motivation and satisfaction. Ensuring adequate preparedness for both teachers and students is crucial for maximizing the benefits of this integration.

*Recommendations*

To support educators and learners, implementing more readily available and responsive technical support systems is recommended, along with developing comprehensive tutorials, guides, and FAQs for navigating digital tools and platforms. Offering targeted professional development for teachers, focusing on effective integration of PjBL and digitized learning materials, pedagogical strategies, technical troubleshooting, and maximizing student engagement in digital environments, is also crucial. Enhancing the digitized materials with more interactive elements, multimedia resources, and user-friendly access features, and ensuring clear

alignment with curriculum competencies and practical assessments, is also recommended.

Furthermore, the study suggests continuing to emphasize and integrate lessons on the responsible and ethical use of technology within PjBL activities, and implementing strategies to enhance the preparedness of both teachers and students for digital learning methodologies through workshops, training sessions, and ongoing support. Further research is recommended to explore the long-term impact of PjBL assisted by digitized learning materials on student outcomes and to investigate effective strategies for addressing the identified challenges across various contexts.

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