

**Blending tradition with innovation: The impact of digital approach
on Cookery Education for Grade 10 students**

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ABSTRACT

This study explored the effectiveness of integrating digital instructional approach into Cookery education among Grade 10 students at Labogon National High School. Traditional teaching methods in vocational education, while foundational, often fall short in sustaining student engagement and meeting the evolving demands of the culinary industry. To address this gap, the researcher employed a quasi-experimental design that compared the academic performance of two groups: one taught using conventional methods and the other through digital tools such as instructional videos, interactive simulations, and multimedia presentations. Findings revealed that students exposed to digital instruction attained significantly higher post-test scores, particularly in theoretical and procedural domains such as occupational health and safety practices. Moreover, data on student engagement and knowledge retention indicated that the use of digital tools enhanced motivation, critical thinking, and long-term learning. Despite these gains, both groups demonstrated limited competency in actual culinary tasks, emphasizing the continuing importance of hands-on, practical training. Overall, the study underscores the potential of digital tools to enrich Technical-Vocational-Livelihood (TVL) education. It provides valuable insights for the development of a blended learning guide that merges traditional and digital approaches to enhance student outcomes in Cookery education.

Keywords: Digital instruction, Cookery Education, Technical-Vocational-Livelihood (TVL), academic performance, quasi-experimental design, vocational education, Mandaue City, Cebu, Philippines

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INTRODUCTION

In today's rapidly evolving technological landscape, education must continuously adapt to prepare learners for the dynamic demands of the workforce. This imperative is particularly evident in vocational education, where the development of practical skills and alignment with industry standards are essential. Within the Philippine K to 12 curriculum, the Technical Vocational Livelihood track is designed to equip students with competencies necessary for employment, entrepreneurship, or further academic pursuits. Among its specializations,

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Cookery requires not only technical proficiency but also creativity and industry relevant training. Despite this, traditional teaching approaches in Cookery continue to rely heavily on textbooks, lectures, and physical demonstrations. While these methods provide a foundational basis for learning, they may not sufficiently engage students or reflect the evolving practices of the modern culinary industry.

The increasing digitalization of the food and hospitality sector underscores the need to integrate digital instructional approaches into Cookery education. Digital instruction, which incorporates multimedia tools, simulations, and online platforms, offers opportunities to enhance learning experiences, increase student engagement, and replicate real world culinary practices. In response to this need, the present study examined the impact of digital instructional approaches in comparison with traditional teaching methods on the academic performance and engagement of Grade 10 Cookery students at Labogon National High School.

Existing research supports the effectiveness of digital instruction in vocational contexts. Barrett and Sharma (2020) emphasized that digital instructional approaches enhance student engagement while aligning learning experiences with industry standards. Similarly, Schmitt et al. (2021) found that digital simulations significantly improved skill retention among vocational learners. In culinary education, Foster et al. (2022) demonstrated that the use of augmented reality and virtual simulations strengthened both hands on skills and knowledge retention. These findings collectively suggest that digital tools can bridge the gap between classroom instruction and industry expectations.

In the Philippine context, the Department of Education has actively promoted the integration of information and communication technology in Technical Vocational Livelihood education through DepEd Order No. 78, s. 2017, which advocates for technology enriched learning environments. Despite this policy direction, many schools, including Labogon National High School, continue to depend on conventional instructional methods. Reyes and Santos (2020) noted that traditional approaches, although structured, may not fully engage learners or accommodate diverse learning needs. In addition, Cruz et al. (2022) observed that the limited application of digital instructional approaches in Technical Vocational Livelihood classrooms restricts students' exposure to technology driven culinary practices.

Nevertheless, efforts to modernize Technical Vocational Livelihood education are gaining momentum. Alonzo and Medina (2021) reported that students exposed to digital simulations demonstrated higher levels of academic performance and motivation. Cruz (2022) further highlighted that digital tools such as electronic portfolios and online assessments enhanced learning outcomes and competency development. Moreover, Briones et al. (2021) found that the integration of digital platforms improved students' problem solving abilities and adaptability to industry trends. These developments indicate a growing recognition of the value of digital instruction in vocational education.

This study focused specifically on Grade 10 Cookery students at Labogon National High School, acknowledging their unique learning needs within a vocational setting. Although traditional instructional approaches remain valuable, they may not fully align with the technological and practical demands of the contemporary culinary industry. Digital instructional approaches, including virtual cooking demonstrations, interactive recipe simulations, and online collaborative activities, present viable alternatives that can enrich the learning experience.

By comparing digital and traditional instructional approaches, this research sought to determine which method more effectively enhances student learning outcomes, engagement, and skill acquisition in Cookery education. It also examined the challenges associated with implementing digital instruction in a resource limited school environment. The findings of this study aim to inform the development of an instructional framework that integrates digital

instructional approaches into Cookery education, thereby ensuring that students are better prepared for industry expectations and the technology driven workforce.

Although global literature has extensively examined digital instruction in vocational education, there remains a lack of localized research focusing on its application in Cookery education within Philippine schools. This study addressed this gap by evaluating the effectiveness of digital instructional approaches in the specific context of Grade 10 Cookery students at Labogon National High School. By identifying effective practices and potential implementation challenges, the study provides insights for educators, policymakers, and stakeholders seeking to enhance instructional strategies in Technical Vocational Livelihood education and to support the broader integration of digital instructional approaches in vocational learning.

The study is grounded in the assumption that digital instruction enhances the academic performance of Grade 10 students in the Cookery track by promoting deeper engagement, improving comprehension, and strengthening the retention of technical skills and knowledge. This assumption is supported by three complementary theoretical foundations, namely Constructivist Learning Theory, Cognitive Load Theory, and the Department of Education guidelines on information and communication technology integration. These frameworks collectively provide a coherent lens for understanding the instructional approach of the study.

Constructivist Learning Theory, as advanced by Piaget (1972) and Vygotsky (1978), posits that learners actively construct knowledge through meaningful experiences rather than passively receiving information. Digital instruction aligns with this perspective by enabling learners to explore, experiment, and solve problems through interactive multimedia tools. In the context of Cookery education, the use of videos, simulations, and step by step digital demonstrations allows students to engage with content in ways that foster inquiry and conceptual understanding. Furthermore, digital instructional approaches enhance personal relevance by situating learning within real world culinary scenarios, thereby strengthening students' ability to connect theoretical knowledge with practical application. This process also encourages critical thinking and reflection, as students analyze virtual cooking procedures, evaluate outcomes, and refine their techniques.

Complementing this perspective, Cognitive Load Theory developed by Sweller (1988) explains how instructional design influences the processing of information within the limits of working memory. Given that Cookery education involves complex procedures, effective instructional design must minimize cognitive overload. Digital instruction addresses this by presenting content in manageable segments through multimedia formats. Guided videos, simulations, and structured presentations allow learners to process information sequentially rather than being overwhelmed by extensive lectures or dense textual materials. In addition, multimodal learning distributes information across visual and auditory channels, enhancing comprehension and retention. For instance, observing a demonstration of knife skills while simultaneously listening to explanations of proper techniques enables students to internalize procedures more effectively. The ability to pause, replay, and review digital content further supports self-paced learning and reinforces skill mastery.

The study is also anchored in national policy frameworks that emphasize the integration of technology in education. DepEd Order No. 76, s. 2010 underscores the importance of utilizing computers and digital tools to enhance student engagement and learning outcomes. DepEd Order No. 42, s. 2016 encourages the adoption of innovative and technology supported pedagogies in lesson preparation, while DepEd Order No. 24, s. 2019 promotes personalized learning through the use of digital resources that allow students to progress according to their individual pace. Additionally, DepEd Memorandum No. 50, s. 2015 highlights the importance of teacher training in information and communication technology integration, recognizing that

effective digital instruction depends on both access to technology and the teacher's capacity to implement it meaningfully.

Taken together, these theoretical and policy frameworks establish a strong foundation for the integration of digital instructional approaches in Cookery education. Constructivist Learning Theory explains how learners actively construct knowledge through digital engagement, while Cognitive Load Theory clarifies how well designed multimedia instruction enhances retention and prevents cognitive overload. At the same time, national educational policies provide institutional support for the use of technology in teaching and learning. Through the synthesis of these perspectives, digital instruction emerges as a pedagogically sound and contextually relevant approach that enhances engagement, comprehension, and skill development, ultimately contributing to improved academic performance in the Technical Vocational Livelihood Cookery track.

Statement of the problem

This study compared the effectiveness of traditional and digital instructional approaches in enhancing academic performance among Grade 10 Cookery students at Labogon National High School for the School Year 2024 to 2025 as a basis for a Learning Guide.

1. What is the demographic and academic profile of the TVL Cookery students in terms of age, gender, academic performance in cookery related subjects, and access to digital learning tools and resources?
2. What is the pretest performance of students under both traditional and digital instructional approaches in teaching competencies related to practicing occupational health and safety procedures, performing workplace safety practices for the operation of equipment and processes, and preparing meat dishes using appropriate culinary techniques and food safety practices?
3. What is the posttest performance of students under both traditional and digital instructional approaches in teaching competencies related to practicing occupational health and safety procedures, performing workplace safety practices for the operation of equipment and processes, and preparing meat dishes using appropriate culinary techniques and food safety practices?
4. What are the performance differences between students exposed to traditional and digital instructional approaches in terms of pretest results, posttest results, comparison of pretest and posttest performance of students taught with traditional approaches, and comparison of pretest and posttest performance of students taught with digital instructional approaches?
5. How do factors such as student engagement, practical application skills, and retention of knowledge influence the effectiveness of digital instructional approaches in improving academic performance?
6. Based on the findings, what Learning Guide can be designed to enhance academic performance in TVL education?

METHODOLOGY

The study employed a quasi-experimental research design to compare the effectiveness of traditional and digital instructional methods in enhancing academic performance among Technical Vocational Livelihood students. Specifically, a pretest and posttest control group design was utilized, wherein students were assigned to two groups: one exposed to traditional instruction as the control group and the other exposed to digital instruction as the experimental group. This design enabled the measurement of student performance before and after the

instructional intervention and allowed for a systematic comparison of outcomes based on the different instructional approaches.

The methodological process of the study followed a structured sequence beginning with the formulation and finalization of research questions, followed by the development of a research instrument designed to evaluate students' competencies in occupational health and safety procedures and related Cookery skills. Data collection was conducted through the administration of pretests and posttests to both control and experimental groups, each receiving their respective instructional approaches. The collected data were then organized, processed, and analyzed using descriptive statistics and an Independent Samples t Test to determine significant differences between the two groups. This process provided a clear comparison of the impact of digital and traditional instructional approaches on students' academic performance. The findings of the analysis served as the basis for the development of a proposed learning guide, which outlined strategies for integrating digital instruction into the Cookery curriculum to enhance student engagement, strengthen practical application skills, and improve overall academic performance in Technical Vocational Livelihood education.

The research was conducted at Labogon National High School located in Labogon, Mandaue City. This public secondary school, operating under the Department of Education, offers both Junior High School and Senior High School programs with specialized tracks including Sports Strand, Accountancy Business and Management, General Academic Strand, Humanities and Social Sciences, Technical Vocational Livelihood Home Economics, and Technical Vocational Livelihood Information and Communications Technology. Established in 1999, the school serves the educational needs of the local community and maintains a commitment to excellence in academics, sports, and co-curricular activities.

The participants of the study consisted of Grade 10 Cookery students from Labogon National High School for the School Year 2024 to 2025. Two sections of Grade 10 students were selected, with one section assigned as the control group receiving traditional instruction through textbook based lessons, demonstrations, and hands on activities, while the other section served as the experimental group exposed to multimedia enhanced instruction incorporating instructional videos, interactive presentations, and gamified learning activities. Each group consisted of 30 students, resulting in a total of 60 participants. Stratified sampling was employed to ensure comparability between the two groups in terms of gender, prior academic performance, and skill level. This sampling technique minimized bias and ensured balanced representation, thereby strengthening the validity of the study.

The primary research instruments used in the study were pretest and posttest questionnaires originally developed by Aniceta S. Kong and Anecita P. Domo from the Home Economics Cookery Manual, particularly Module 2 and assessments aligned with Cookery competencies in the K to 12 Curriculum Guide. These instruments were modified to align with the specific learning outcomes for Grade 10 Cookery, focusing on preparing, cooking, and presenting basic dishes. The instruments were designed to measure student performance before and after exposure to the instructional approaches. In addition, a rubric adapted from Parker and Herrington (2022) was utilized to assess students' performance in practical tasks, emphasizing technical accuracy, creativity, and adherence to proper cooking techniques.

Data gathering commenced with the submission of a formal request letter to the school head of Labogon National High School, followed by coordination with subject teachers to ensure the proper administration of research activities. Prior to the instructional intervention, a pretest was administered to both the control and experimental groups to establish baseline performance in Cookery competencies. During the instructional phase, the control group received traditional instruction consisting of lectures, demonstrations, and textbook based lessons, while the experimental group was exposed to multimedia enhanced instruction

incorporating videos, interactive presentations, and digital resources tailored for Cookery education. Upon completion of the instructional period, a posttest was administered to both groups to measure changes in performance. The resulting data were then analyzed statistically, and a comprehensive report was prepared to present findings and recommendations for improving instructional practices in Cookery education.

Student responses from both the pretest and posttest were evaluated using a rubric designed to assess proficiency in Cookery competencies based on content, presentation skills, and practical application. The analytic scoring for essay responses followed five levels. A score of 5 described an excellent response that is comprehensive, accurate, and well explained with key details. A score of 4 indicated a good response that is mostly accurate with minor gaps in explanation. A score of 3 represented a fair response that is generally accurate but lacks clarity or detail. A score of 2 described a satisfactory response that addresses the question but lacks depth and sufficient detail. A score of 1 indicated a response that needs improvement, characterized by limited and unclear points. In terms of organization, a score of 5 reflected a well-structured and logical response, while lower scores indicated decreasing levels of clarity and coherence, with a score of 1 representing disorganized responses. In terms of depth, a score of 5 represented in depth analysis with strong reasoning, while a score of 1 reflected minimal explanation with little detail.

The study also measured students' confidence in cookery skills using a Five Point Likert Scale. A scale value of 5 corresponded to a range of 4.21 to 5.00 and was interpreted as Very Confident, indicating a very high level of confidence. A value of 4 with a range of 3.41 to 4.20 was interpreted as Confident, reflecting a high level of confidence. A value of 3 with a range of 2.61 to 3.40 indicated Moderately Confident, representing an average level of confidence. A value of 2 with a range of 1.81 to 2.60 was interpreted as Slightly Confident, indicating a low level of confidence. A value of 1 with a range of 1.00 to 1.80 was interpreted as Not Confident, reflecting a very low level of confidence.

Academic performance in cookery related subjects was interpreted using the Department of Education K to 12 grading scale. Scores ranging from 90 to 100 were categorized as Advanced, indicating outstanding mastery of concepts and skills. Scores from 85 to 89 were classified as Very Proficient, indicating a high level of mastery. Scores from 80 to 84 were labeled Approaching Proficiency, reflecting adequate understanding. Scores from 75 to 79 were categorized as Developing, indicating basic understanding with the need for improvement. Scores from 0 to 74 were classified as Beginning, indicating limited understanding requiring further instruction.

The pretest and posttest consisted of 30 items including multiple choice, identification, and essay questions designed to assess students' knowledge in cookery and food safety. Each correct answer in the multiple choice and identification sections was assigned one point, while incorrect answers received zero points. Essay responses were rated using a five point rubric based on completeness, accuracy, clarity, and organization of ideas. The total raw scores were converted into percentage scores and interpreted using the Department of Education K to 12 grading system under DepEd Order No. 8, s. 2015. Score intervals of 90 to 100 were interpreted as Excellent, 85 to 89 as Very Satisfactory, 80 to 84 as Satisfactory, 75 to 79 as Fairly Satisfactory, and 0 to 74 as Did Not Meet Expectations, each corresponding to specific descriptions of mastery in cookery and food safety competencies.

To assess student engagement, critical thinking, and retention of knowledge, a Four Point Likert Scale was employed. A value of 4 with a range of 3.25 to 4.00 was interpreted as Strongly Agree, indicating that the statement was observed to a very high extent. A value of 3 with a range of 2.50 to 3.24 was interpreted as Agree, reflecting a high extent. A value of 2 with a range of 1.75 to 2.49 was interpreted as Disagree, indicating a low extent. A value of 1 with a range of 1.00 to 1.74 was interpreted as Strongly Disagree, reflecting a very low extent.

The data collected were analyzed using several statistical techniques. The mean was computed to determine the average scores of students in both pretest and posttest, providing a measure of central tendency. The standard deviation was calculated to determine the variability or dispersion of scores from the mean, indicating the consistency of performance within each group. A Paired Sample t Test was used to compare pretest and posttest scores within the same group to determine whether there was a statistically significant improvement after the intervention. An Independent Sample t Test was employed to compare posttest scores between the control and experimental groups to determine whether the difference in performance was statistically significant. Effect size was measured using Cohen's d to determine the magnitude of differences between the groups, indicating whether the effect was small, medium, or large. A significance level of $\alpha = 0.05$ was used as the criterion for statistical significance, such that if the p value was less than 0.05, the null hypothesis was rejected, indicating a meaningful difference or relationship. The formula for the Paired Sample t Test was expressed as $t = \frac{d}{\frac{sd}{\sqrt{n}}}$, where d represents the mean difference between pretest and posttest scores, sd represents the standard deviation of the differences, and n represents the number of paired observations. This formula enabled the determination of whether the observed differences in scores were statistically significant within each group.

RESULTS AND DISCUSSION

The results and discussion presented in this study are based on data collected from 60 Grade 10 Cookery students at Labogon National High School for the School Year 2024 to 2025, with 30 students assigned to the control group and 30 students assigned to the experimental group. The study employed a quasi-experimental pretest and posttest control group design using stratified sampling to ensure comparability between groups. Data were gathered through validated pretest and posttest instruments and analyzed using descriptive statistics, mean, standard deviation, paired sample t test, and independent sample t test at a significance level of $\alpha = 0.05$. The discussion is grounded in the empirical data obtained and all results are interpreted directly in relation to the study's objectives of comparing traditional and digital instructional approaches in Cookery education.

The demographic profile of the respondents indicates that both groups were comparable in age distribution, thereby minimizing potential bias. In the traditional group, 18 students or 60.00% were 15 years old, 9 students or 30.00% were 16 years old, and 3 students or 10.00% were 17 years old. Similarly, in the digital group, 18 students or 60.00% were 15 years old, 10 students or 33.33% were 16 years old, and 2 students or 6.67% were 17 years old. This distribution confirms that the participants fall within the typical age range for Grade 10 students and suggests that age is unlikely to significantly influence differences in performance outcomes. These findings are consistent with Korlat et al. (2021), who emphasized that age within this developmental range does not substantially affect learning outcomes when instructional design is appropriate, while Prensky (2001) highlighted that learners in this age group are generally familiar with digital environments, supporting their adaptability to technology enhanced instruction.

In terms of gender, the traditional group consisted of 16 males or 53.33% and 14 females or 46.67%, whereas the digital group consisted of 11 males or 36.67% and 19 females or 63.33%. Although there is a higher proportion of females in the digital group, both groups demonstrate adequate gender representation. The higher female participation in the digital group aligns with findings by Wang et al. (2021), which indicate that female students often exhibit stronger engagement with interactive digital platforms. Conversely, the slight predominance of males in the traditional group is consistent with David and Soriano (2021),

who reported that male students may prefer direct instruction and hands on activities. Despite these differences, the balanced representation ensures that gender does not significantly confound the interpretation of instructional effectiveness.

The academic performance of students in cookery related subjects prior to the intervention was high in both groups. The traditional group obtained a mean score of 90.97 (SD = 3.70) with scores ranging from 82 to 96, categorized as Advanced. The digital group obtained a mean score of 91.40 (SD = 3.50) with scores ranging from 85 to 96, also categorized as Advanced. The small difference in mean scores indicates that both groups possessed comparable levels of prior academic competence. These results support the findings of Cao et al. (2023) and Güngör et al. (2022), which suggest that both traditional and digital instructional contexts can support high academic achievement when instructional structures are well designed.

Access to digital learning tools was also high across both groups. In the traditional group, 28 students or 93.33% reported having access to digital tools, while 2 students or 6.67% reported no access. In the digital group, 29 students or 96.67% reported access, while only 1 student or 3.33% reported no access. These findings indicate that technological access was not a limiting factor in the implementation of digital instruction. This observation is consistent with UNESCO (2023), which emphasized that high accessibility to digital tools supports effective implementation of technology enhanced learning. However, the presence of a small proportion of students without access highlights ongoing concerns regarding equity, as noted by Güngör et al. (2022).

The pretest performance of students revealed low baseline competency across all three areas. In occupational health and safety procedures, the traditional group obtained a mean of 74.33 (SD = 1.61) categorized as Did not Meet Expectations, while the digital group obtained a mean of 82.00 (SD = 1.64) categorized as Satisfactory. In workplace safety practices, the traditional group obtained a mean of 8.00 (SD = 1.50) categorized as Did not Meet Expectations, while the digital group obtained a mean of 1.67 (SD = 0.38) also categorized as Did not Meet Expectations. In meat preparation, the traditional group obtained a mean of 14.33 (SD = 1.17) and the digital group obtained a mean of 21.67 (SD = 0.70), both categorized as Did not Meet Expectations. These results indicate that students in both groups began with limited knowledge and skills, although the digital group showed slightly higher initial performance in selected competencies, which may be attributed to prior exposure to digital learning resources. These findings align with Cao et al. (2023) and David and Soriano (2021), who reported that digital exposure can enhance conceptual understanding prior to formal instruction.

Analysis of pretest performance differences using independent sample t test revealed that in occupational health and safety procedures, the mean difference was 0.421 with a test statistic of -1.821 and a p value of 0.0737, which is greater than 0.05, leading to the decision to fail to reject H_0 and indicating no significant difference between groups. In workplace safety practices, the mean difference was 0.282 with a test statistic of 2.2494 and a p value of 0.0283, which is less than 0.05, leading to the rejection of H_0 and indicating a significant difference. In meat preparation, the mean difference was 0.248 with a test statistic of -2.956 and a p value of 0.0045, also less than 0.05, leading to the rejection of H_0 and indicating a significant difference. These findings suggest that while baseline knowledge was generally low, certain competencies showed statistically significant differences, supporting the assertion that prior exposure to instructional modalities influences initial learning outcomes.

Following the instructional intervention, the posttest results demonstrated substantial improvements in both groups, with markedly higher performance in the digital group. In occupational health and safety procedures, the traditional group obtained a mean of 85.00 (SD = 1.50) categorized as Very Satisfactory, while the digital group obtained a mean of 93.00 (SD

= 0.92) categorized as Outstanding. In workplace safety practices, the traditional group obtained a mean of 64.33 (SD = 2.94) categorized as Did not Meet Expectations, while the digital group obtained a mean of 90.67 (SD = 1.48) categorized as Outstanding. In meat preparation, the traditional group obtained a mean of 25.67 (SD = 1.31) and the digital group obtained a mean of 57.00 (SD = 1.58), both categorized as Did not Meet Expectations, although the digital group showed substantially higher improvement. These results indicate that digital instructional approaches were more effective in enhancing both conceptual and procedural competencies, particularly in safety related domains. These findings are consistent with Hernandez et al. (2023) and Garcia et al. (2021), who emphasized the effectiveness of multimedia and simulation based learning in improving procedural knowledge.

Independent sample t test results for posttest performance confirmed significant differences between groups across all competencies. In occupational health and safety procedures, the mean difference was 0.321 with a test statistic of -2.4901 and a p value of 0.0157, leading to rejection of H_0 . In workplace safety practices, the mean difference was 0.602 with a test statistic of -4.3747 and a p value of 0.0001, leading to rejection of H_0 . In meat preparation, the mean difference was 0.374 with a test statistic of -8.3788 and a p value of 0.0000, leading to rejection of H_0 . These results confirm that the digital instructional approach produced statistically significant improvements compared to the traditional approach across all competencies.

Within group comparisons using paired sample t test further demonstrated significant improvements. For the traditional group, occupational health and safety procedures improved from 74.33 (SD = 1.61) to 85.00 (SD = 1.50) with a test statistic of 5.4063 and a p value of 0.0000, workplace safety practices improved from 8.00 (SD = 1.50) to 64.33 (SD = 2.94) with a test statistic of 9.3625 and a p value of 0.0000, and meat preparation improved from 14.33 (SD = 1.17) to 25.67 (SD = 1.31) with a test statistic of 5.1912 and a p value of 0.0000. Similarly, for the digital group, occupational health and safety procedures improved from 82.00 (SD = 1.64) to 93.00 (SD = 0.92) with a test statistic of 3.8053 and a p value of 0.0007, workplace safety practices improved from 1.67 (SD = 0.38) to 90.67 (SD = 1.48) with a test statistic of 31.221 and a p value of 0.0000, and meat preparation improved from 21.67 (SD = 0.70) to 57.00 (SD = 1.58) with a test statistic of 10.897 and a p value of 0.0000. In all cases, the null hypothesis was rejected, indicating statistically significant improvements within each group.

The effectiveness of the digital instructional approach was further supported by perceptual data on engagement, critical thinking, and retention of knowledge. The overall mean score of 3.51 categorized as Strongly Agree indicates that students perceived digital tools as highly effective. Engagement indicators ranged from 3.27 to 3.90, all categorized as Strongly Agree, with the highest value of 3.90 reflecting strong motivation to learn through digital tools. Critical thinking indicators ranged from 3.43 to 3.83, also categorized as Strongly Agree, with a value of 3.83 indicating enhanced analytical thinking through digital resources. Retention indicators ranged from 3.27 to 3.60, all categorized as Strongly Agree, demonstrating that digital tools reinforced memory and application of learning. These findings align with Güngör et al. (2022), Cao et al. (2023), and Wang et al. (2021), who reported that digital learning environments significantly enhance engagement, cognitive processing, and retention.

Overall, the results demonstrate that while both instructional approaches significantly improved student performance, the digital instructional approach yielded higher gains across all competencies and significantly influenced engagement, critical thinking, and retention of knowledge. The findings confirm that digital tools are particularly effective in enhancing conceptual and procedural understanding, especially in safety related competencies, while also highlighting that practical skills such as meat preparation still require additional hands on

experience. These results contribute to the growing body of evidence supporting the integration of digital instruction in Technical Vocational Livelihood education and provide a strong empirical basis for the development of a learning guide that incorporates both digital and traditional instructional strategies. The study thus establishes a foundation for advancing instructional practices in Cookery education and sets the stage for subsequent discussions on instructional design and implementation.

CONCLUSION

The findings of this study collectively demonstrate that the integration of digital instructional approaches in Cookery education significantly enhances the academic performance, engagement, and learning outcomes of Grade 10 students at Labogon National High School during the School Year 2024 to 2025. The study, which utilized a quasi-experimental design with pretest and posttest measures, established that both traditional and digital instructional approaches contributed to improvements in student performance; however, the magnitude of improvement was consistently higher among students exposed to digital instruction. The demographic profile of the respondents confirmed that the participants were within the typical age range of 15 to 17 years old and exhibited balanced gender representation, while both groups demonstrated advanced levels of prior academic performance with mean scores of 90.97 for the Traditional group and 91.40 for the Digital group. Furthermore, the high level of access to digital learning tools and resources among the majority of students created a favorable environment for the implementation of technology enhanced instruction.

The results revealed that students in both groups initially exhibited low levels of competency in occupational health and safety procedures, workplace safety practices, and meat dish preparation, as reflected in their pretest performance. Despite these initial limitations, both groups showed measurable improvement following the instructional intervention, with the experimental group consistently outperforming the control group across all competencies in the posttest assessments. The digital instructional approach was particularly effective in enhancing students' understanding of safety protocols and procedural knowledge, as evidenced by higher performance gains in competencies related to kitchen safety and workplace practices. Although both groups continued to encounter challenges in the more technical aspects of meat preparation, the digital group demonstrated greater progress, indicating that multimedia tools such as instructional videos, simulations, and interactive resources can support the development of practical skills when integrated appropriately with instruction.

In addition to improvements in academic performance, the study established that digital instruction significantly influenced student engagement, motivation, and retention of knowledge. Students exposed to digital tools reported higher levels of interest, active participation, and collaboration in learning activities, which contributed to improved comprehension and sustained attention during lessons. The use of multimedia resources, including simulations and digital recipes, facilitated deeper understanding and enabled students to connect theoretical concepts with practical applications. These findings underscore the capacity of digital instructional approaches to create interactive and learner centered environments that support critical thinking and reinforce knowledge retention.

While the effectiveness of digital instruction was clearly demonstrated, the study also affirmed the continued relevance of traditional instructional methods, particularly in the development of hands on culinary skills and the provision of immediate feedback. The results indicate that traditional approaches remain essential in skill based learning contexts, especially in competencies that require physical practice and direct supervision. However, when combined with digital tools, traditional instruction becomes more impactful, suggesting that a

blended approach that integrates both methods offers the most comprehensive and effective instructional strategy in Cookery education.

The study further contributed to instructional innovation through the development of a digital learning guide designed to support the integration of digital tools into the Cookery curriculum. This guide incorporates multimedia simulations, instructional videos, practical application activities, and reflective tasks aimed at enhancing both conceptual understanding and skill mastery. It also includes provisions for low technology alternatives to ensure equitable access for all learners, thereby addressing potential disparities in digital resource availability.

In light of these findings, it is evident that the consistent integration of digital instructional approaches within the Technical Vocational Livelihood curriculum is essential for improving student outcomes in Cookery education. The adoption of structured learning guides that utilize digital tools can assist teachers in delivering more engaging and effective instruction across various competencies. Moreover, the provision of continuous professional development opportunities for teachers is necessary to strengthen their capacity to design and implement multimedia rich and learner centered instructional strategies that maximize student engagement and performance.

The study also highlights the potential for expanding the application of digital instruction beyond Cookery to other areas within the Home Economics strand and across different Technical Vocational Livelihood specializations. Such expansion aligns with the evolving demands of industry based education and supports the development of a more dynamic, inclusive, and future oriented teaching model. Additionally, further research is recommended to examine the long term effects of digital instruction on students' employability skills, creativity, and real world application of culinary techniques, as well as its adaptability in learning environments with limited access to digital resources.

Finally, the study emphasizes the importance of encouraging students to actively engage in the creation of digital content as part of their learning process. By participating in project based activities such as producing cooking tutorials, recipe demonstrations, or digital safety guides, students can further develop their creativity, deepen their subject mastery, and enhance essential competencies such as communication, collaboration, and digital literacy. Overall, the study establishes that the integration of digital instructional approaches, when combined with traditional methods, provides a robust and effective framework for advancing academic performance and preparing students for the demands of modern culinary education and practice.

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