

## **Blending tradition and technology: Enhancing learning outcomes on cookery education for Grade 10 students**

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### **ABSTRACT**

This study explored the effectiveness of integrating digital instructional tools alongside traditional teaching methods to enhance learning outcomes in Grade 10 Cookery education at Lo-ok National High School for the 2024 – 2025 academic year. The primary issue addressed was the limited effectiveness of purely traditional methods in developing students' competencies in occupational health and safety, workplace safety practices, and meat dish preparation. A quasi-experimental design was employed, involving 60 students divided into two groups: a control group, which received instruction through conventional lectures, demonstrations, and textbook-based activities; and an experimental group, which was taught using multimedia-enhanced instruction such as interactive videos, presentations, and gamified digital content. Both groups underwent a pre-test and post-test to assess their academic performance across targeted competencies. Results revealed that students in the experimental group significantly outperformed their peers in safety-related competencies, demonstrating improved knowledge retention, critical thinking, and engagement. The findings also indicated that digital instruction provided more interactive and personalized learning experiences compared to traditional approaches. However, both groups showed only modest progress in the practical preparation of meat dishes, highlighting the need for hands-on kitchen experience to reinforce technical skills. The study concluded that a blended instructional approach combining digital tools with practical application is more effective in promoting both conceptual understanding and motivation in Cookery education. It recommended the strategic integration of digital resources, along with teacher training, to enhance instructional delivery and improve learning outcomes in Technical-Vocational-Livelihood (TVL) settings.

**Keywords:** Vocational education, digital instruction, blended learning, cookery education, Technical-Vocational-Livelihood (TVL), quasi-experimental design, student engagement, academic performance, Lapu-Lapu City, Cebu, Philippines.

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## INTRODUCTION

Technology is evolving at a rapid pace, and this progress has transformed multiple sectors, including education. As the business landscape continues to change, it has become imperative to integrate digital tools into educational systems alongside traditional teaching methods to prepare students for the demands of the twenty first century workforce. This need is particularly evident in the Technical Vocational Livelihood track, where learners are required to acquire both theoretical knowledge and practical competencies. In Cookery education, the combination of traditional instruction and digital tools presents an opportunity to enhance learning experiences by increasing student engagement and improving comprehension and performance among learners.

Existing research supports the effectiveness of digital tools in vocational education. Barrett and Sharma (2020) found that multimedia based instruction and simulations improve student focus and replicate real world application of skills. Similarly, Schmitt et al. (2021) reported that digital instruction enhances students' ability to retain newly acquired skills, while Anderson (2021) demonstrated that it fosters critical thinking and problem solving abilities. These findings underscore the importance of integrating traditional hands on instruction with modern digital resources in vocational training programs.

In the Philippine context, the Department of Education emphasizes the integration of Information and Communication Technology across the K to 12 curriculum, particularly within Technical Vocational Livelihood programs. DepEd Order No. 78, s. 2017 highlights that technology enriched learning environments promote creativity, innovation, and digital competence among students. Despite these directives, many institutions in rural areas continue to rely heavily on traditional teaching methods. While these approaches provide structured learning, they often fail to address diverse student needs effectively or sustain learner engagement, as noted by Reyes and Santos (2020).

At Lo ok National High School, the implementation of digital instruction is constrained by limited resources and inadequate infrastructure. In the context of Cookery education, teachers must balance instructional effectiveness with practical limitations. Although traditional teaching remains essential, digital tools such as virtual simulations, multimedia presentations, and online tutorials offer interactive learning experiences that can enhance mastery and deepen understanding. However, research on the effectiveness of digital instruction in Philippine vocational education remains limited. In particular, there is a lack of comprehensive analysis on how digital integration affects student engagement, academic performance, and skill development in rural settings. Challenges such as insufficient infrastructure, limited teacher training, and unstable internet connectivity further complicate implementation.

This study addresses these gaps by examining the impact of blending traditional and digital instruction on learning outcomes in Cookery education at Lo ok National High School. By evaluating student engagement, academic performance, and skill development under both instructional approaches, the study seeks to identify effective strategies for improving teaching practices in the Technical Vocational Livelihood track. It contributes to the growing body of knowledge on educational technology by proposing context appropriate approaches for integrating digital tools in resource constrained environments.

The findings of this study are expected to have significant implications for teachers, policymakers, and stakeholders in vocational education. By identifying effective methods for combining traditional and digital instruction, the study aims to enhance teaching practices and improve student readiness for industry demands in a technology driven world. Ultimately, it seeks to align educational practices with industry requirements and equip students with competencies necessary for both local and global employment opportunities.

The study is anchored on several theoretical frameworks, including Constructivist Learning Theory, Cognitive Load Theory, and national policies on ICT integration. Constructivist Learning Theory, developed by Piaget (1972) and Vygotsky (1978), posits that learners actively construct knowledge through meaningful experiences. Learning occurs most effectively when students interact with content, reflect on their experiences, and connect new knowledge to prior understanding. Digital instruction aligns with this perspective by providing opportunities for exploration, experimentation, and problem solving. In Cookery education, interactive multimedia tools such as videos, simulations, and digital demonstrations enable learners to engage deeply with concepts and develop practical understanding. These tools also enhance personal relevance by allowing students to connect learning experiences to real world culinary contexts.

Digital instruction further supports the development of critical thinking and reflective skills. Learners can analyze cooking processes, identify errors, and compare techniques, thereby fostering higher order thinking essential for mastering culinary practices and safety procedures. While constructivism emphasizes active learning, Cognitive Load Theory, introduced by Sweller (1988), explains how instructional design influences the processing of information. The theory suggests that working memory has limited capacity, and instructional materials must therefore be structured to avoid cognitive overload, particularly when teaching complex skills such as those in Cookery education.

Digital instruction supports Cognitive Load Theory by presenting content in manageable segments. Multimedia presentations, guided videos, and simulations allow learners to process information step by step rather than being overwhelmed by extensive lectures or dense textual materials. In addition, multimodal learning distributes information across visual and auditory channels, enhancing retention. For instance, when students observe a demonstration of knife skills while simultaneously listening to explanations, they are more likely to understand and remember the procedure. Digital tools also provide learners with control over their pace of learning, enabling them to pause, review, and repeat content as needed, thereby reinforcing mastery without exceeding cognitive capacity.

The study is further supported by national educational policies that promote ICT integration. DepEd Order No. 76, s. 2010 emphasizes the importance of incorporating technology into teaching to enhance student engagement and learning outcomes. DepEd Order No. 42, s. 2016 encourages the adoption of innovative and technology supported instructional strategies in lesson preparation. DepEd Order No. 24, s. 2019 advocates for personalized learning through ICT, allowing students to progress at their own pace using digital resources. Additionally, DepEd Memorandum No. 50, s. 2015 highlights the importance of teacher training in ICT integration, emphasizing that effective implementation depends on both access to technology and teacher competence.

Collectively, these theoretical and policy frameworks provide a strong foundation for the integration of digital instruction in Cookery education. Constructivist Learning Theory explains how learners actively construct understanding through interactive experiences, while Cognitive Load Theory clarifies how well designed multimedia tools enhance retention and prevent cognitive overload. National policies further reinforce the importance of ICT in fostering engaging and personalized learning environments. Through this synthesis, digital instruction is positioned as a pedagogically sound and contextually relevant approach that enhances student engagement, improves comprehension, and ultimately strengthens 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 learning outcomes among Grade 10 Cookery students at Lo ok National High School, Lapu Lapu City, during the School Year 2024 to 2025, as basis for the development of 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 subject, 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, 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, and preparing meat dishes using appropriate culinary techniques and food safety practices?
4. What are the significant differences between students exposed to traditional and digital instructional approaches in terms of pretest results, posttest results, and the comparison of pretest and posttest performance?
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

This 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, it utilized a pretest and posttest control group design in which 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 intervention and allowed for a systematic comparison of outcomes based on the instructional approaches implemented. The overall process of the study began with the formulation and finalization of research questions, followed by the development of a research instrument designed to evaluate student competencies. The input of the study focused on assessing the academic performance of Technical Vocational Livelihood Cookery students through pretest and posttest evaluations and comparing the effectiveness of traditional and digital instructional approaches. The process involved conceptualization, finalization of instruments, administration, data gathering, tabulation, processing, analysis, and interpretation of results. The output of the study was the development of a Learning Guide intended to enhance academic performance in TVL education.

The research was conducted at Lo ok National High School located at Caltex Road, Looc, Lapu Lapu City, Cebu. The school is a public institution that provides holistic education aimed at fostering academic excellence, compassion, and purpose among learners. It offers both Academic Strands including ABM, HUMSS, and AD, and Technical Vocational Livelihood Strands such as Cookery, Drafting, and SMAW. The institution promotes a

nurturing and supportive environment designed to equip students with the necessary knowledge, skills, and values to succeed in a dynamic and evolving society.

The respondents of the study were Grade 10 Cookery students enrolled at Lo ok National High School during the School Year 2024 to 2025. Two sections of students were selected to participate in the study. One section served as the control group and received traditional instruction through textbook based lessons, demonstrations, and hands on activities. The other section served as the experimental group and was exposed to digital instruction through multimedia tools such as instructional videos, interactive presentations, and gamified activities. Each group consisted of 30 students, resulting in a total of 60 participants. Stratified sampling was employed to ensure that both groups were comparable in terms of gender, prior academic performance, and skill level. This sampling technique minimized bias, ensured balanced representation, and strengthened the validity of comparisons between the two groups.

The primary research instruments used in the study were pretest and posttest questionnaires adapted from materials 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 accurately measure student performance before and after the intervention and to evaluate the impact of multimedia integration on students' understanding and mastery of Cookery competencies. In addition, a rubric adapted from Parker and Herrington (2022) was used to assess students' performance in practical tasks. This rubric emphasized technical accuracy, creativity, and adherence to proper cooking techniques.

Data gathering procedures began with the submission of a formal request letter to the school head of Lo ok National High School to secure approval for the conduct of the study. Upon approval, coordination with teachers was undertaken to facilitate the smooth implementation 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 intervention phase, the control group received traditional instruction through lectures, demonstrations, and textbook based lessons, while the experimental group received multimedia enhanced instruction using instructional videos, interactive presentations, and digital learning resources. After the instructional period, a posttest was administered to both groups to measure changes in performance. The collected data were then organized, processed, and analyzed using appropriate statistical methods, and a comprehensive report was prepared to present the findings and provide recommendations for improving instructional practices in Cookery education.

Student responses from the pretest and posttest were evaluated using a rubric designed to assess proficiency in Cookery competencies across three criteria, namely content, organization, and depth. For content, a score of 5 described a comprehensive, accurate, and well explained response with key details, 4 indicated a mostly accurate response with minor gaps, 3 reflected an adequate response with general accuracy but some lack of clarity or detail, 2 described a response that addressed the question but lacked depth and detail, and 1 indicated a limited response with unclear or underdeveloped points. For organization, a score of 5 represented a well-structured, logical, and easy to follow response, 4 indicated mostly clear organization with minor issues, 3 reflected some logical flow with occasional lapses in clarity or structure, 2 described a somewhat structured response that was repetitive or unclear, and 1 indicated a disorganized response in which key points were difficult to follow. For depth, a score of 5 represented in depth analysis with strong reasoning, 4 indicated clear reasoning with some lack of depth, 3 reflected moderate reasoning with occasional insight, 2 described basic

explanation with limited examples, and 1 indicated minimal explanation with little detail. Scores were tallied, collated, and tabulated to ensure systematic and objective assessment of student performance.

The level of confidence of respondents in their Cookery skills was measured using a Five Point Likert Scale. A score of 5 with a range of 4.21 to 5.00 was categorized as Very Confident, indicating that the student demonstrated a very high level of confidence in Cookery skills. A score of 4 with a range of 3.41 to 4.20 was categorized as Confident, indicating a high level of confidence. A score of 3 with a range of 2.61 to 3.40 was categorized as Moderately Confident, indicating an average level of confidence. A score of 2 with a range of 1.81 to 2.60 was categorized as Slightly Confident, indicating a low level of confidence. A score of 1 with a range of 1.00 to 1.80 was categorized as Not Confident, indicating a very low level of confidence.

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

The pretest and posttest consisted of 30 items including multiple choice, identification, and essay questions designed to assess knowledge in Cookery and food safety. Each correct answer in the multiple choice and identification sections was assigned one 1 point, while incorrect answers received zero 0. Essay responses were evaluated using a five point rubric based on completeness, accuracy, clarity, and organization of ideas. Total raw scores were converted into percentage scores and interpreted using proficiency levels adapted from DepEd Order No. 8, s. 2015. A score interval of 90 to 100 was categorized as Excellent, indicating outstanding mastery of concepts and skills in Cookery and food safety. A score of 85 to 89 was categorized as Very Satisfactory, indicating a high level of mastery. A score of 80 to 84 was categorized as Satisfactory, indicating adequate understanding. A score of 75 to 79 was categorized as Fairly Satisfactory, indicating basic understanding with a need for improvement. A score of 0 to 74 was categorized as Did Not Meet Expectations, indicating limited understanding and the need for further instruction.

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

The data collected from the study were analyzed using several statistical methods. The mean was computed to determine the average scores of students in both the pretest and posttest, providing a measure of central tendency. The standard deviation SD was calculated to determine the variability or dispersion of scores from the mean and to assess consistency 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 used to compare posttest scores between the control group and the experimental group to determine whether there was a statistically significant difference in performance. Effect size using Cohen's d was computed to measure

the magnitude of the difference between the two groups and to determine whether the effect was small, medium, or large. A significance level of  $\alpha = 0.05$  was used to determine statistical significance, and if the p value was less than 0.05, the null hypothesis was rejected. The paired sample t test formula used in the study was  $t = \bar{x} \text{ divided by } s \text{ divided by the square root of } n$ , where  $\bar{x}$  represents the mean difference between pretest and posttest scores,  $s$  represents the standard deviation of the differences, and  $n$  represents the number of paired observations. This formula was used to determine whether the difference between pretest and posttest scores within each group was statistically significant.

## RESULTS AND DISCUSSION

This section presents the results and discussion of the data collected from 60 Grade 10 Technical Vocational Livelihood Cookery students of Lo ok National High School during the School Year 2024 to 2025. The study employed a quasi-experimental pretest and posttest control group design using stratified sampling, with 30 students assigned to the traditional instructional approach and 30 students assigned to the digital instructional approach. Data were gathered through validated pretest and posttest instruments aligned with three core competencies and supplemented by survey questionnaires. Statistical analyses included the computation of mean, standard deviation SD, independent sample t test, paired sample t test, and p values evaluated at  $\alpha = 0.05$ . The discussion that follows is grounded entirely in the data gathered and is interpreted directly in relation to the objectives of the study, particularly in determining the effectiveness of traditional and digital instructional approaches in enhancing learning outcomes in cookery education.

The demographic profile of the respondents revealed patterns that are relevant to understanding instructional engagement and learning outcomes. In terms of age distribution, the traditional group consisted of 7 students aged 15 years old or 23.33%, 19 students aged 16 years old or 63.33%, 3 students aged 17 years old or 10.00%, and 1 student aged 18 years old or 3.33%, while the digital group included 14 students aged 15 years old or 46.67%, 14 students aged 16 years old or 46.67%, 2 students aged 17 years old or 6.67%, and 0 students aged 18 years old or 0.00%. This distribution indicates that both groups were predominantly composed of students aged 15 and 16 years old, which aligns with the expected developmental stage of Grade 10 learners. The more balanced distribution in the digital group, particularly the equal representation of 15 and 16 year olds at 46.67%, suggests that younger learners may be more inclined toward digital instructional environments. This observation is consistent with Korlat et al. (2021), who emphasized that adolescents are highly responsive to interactive and visually engaging digital tools, while Cao et al. (2023) highlighted the importance of scaffolding in maximizing learning outcomes across age groups.

In terms of gender, the traditional group consisted of 12 male students or 40.00% and 18 female students or 60.00%, while the digital group included 10 male students or 33.33% and 20 female students or 66.67%. The predominance of female students in both groups reflects typical enrollment patterns in cookery related programs within the Technical Vocational Livelihood track. This distribution may have implications for engagement, as Wang et al. (2021) suggested that female students tend to exhibit higher engagement in collaborative and multimedia based digital learning environments. However, UNESCO (2021) emphasized that inclusive instructional design ensures equitable learning opportunities regardless of gender, reinforcing the need for balanced pedagogical approaches.

Baseline academic performance in cookery related subjects showed that the traditional group had a minimum score of 78, a maximum of 92, a mean of 83.10, and  $SD = 4.04$ , while the digital group had a minimum of 78, a maximum of 93, a mean of 84.80, and  $SD = 4.15$ .

Both groups fell under the category of Approaching Proficiency. The similarity in mean scores and standard deviations indicates that the two groups had comparable levels of prior knowledge and skill, thereby strengthening the internal validity of the study. The minimal difference between 83.10 and 84.80 suggests that any subsequent variation in posttest performance can be attributed to the instructional intervention rather than pre-existing differences. This aligns with Cao et al. (2023), who emphasized that comparable baseline proficiency is essential in evaluating instructional effectiveness.

Access to digital learning tools further revealed that in the traditional group, 26 students or 86.67% reported having access, while 4 students or 13.33% reported no access, whereas in the digital group, all 30 students or 100.00% reported access and 0 students or 0.00% reported no access. This disparity highlights an important contextual factor affecting instructional delivery. The complete access in the digital group ensured full participation in technology based instruction, whereas the 13.33% without access in the traditional group may have experienced limitations in engaging with supplementary digital resources. This finding supports Güngör et al. (2022) and UNESCO (2023), who emphasized that equitable access to digital resources is critical for effective and inclusive learning environments.

Pretest performance across the three competencies revealed uniformly low baseline proficiency. For the competency on occupational health and safety procedures, the traditional group obtained a mean of 71.67 (SD = 1.78) while the digital group obtained 63.00 (SD = 2.22), both categorized as Did Not Meet Expectations. For safety practices in the workplace, the traditional group recorded 1.67 (SD = 0.38) and the digital group 2.33 (SD = 0.43), both also categorized as Did Not Meet Expectations. For preparing meat dishes, both groups obtained 0.00 (SD = 0.00). These results indicate a lack of prior exposure and mastery in essential cookery competencies, providing a clear baseline for evaluating instructional impact. This is consistent with Cruz and Navarro (2023) and Beltran et al. (2022), who noted that students entering vocational programs often lack foundational procedural knowledge.

Statistical analysis of pretest differences showed that for occupational health and safety procedures, the mean difference was 0.519 with  $t = -1.6694$  and  $p = 0.1004$ , leading to a decision to fail to reject  $H_0$  and indicating no significant difference. For safety practices in the workplace, the mean difference was 0.105 with  $t = 0.6369$  and  $p = 0.5267$ , also resulting in a failure to reject  $H_0$  and indicating no significant difference. For preparing meat dishes, both groups recorded identical means of 0.00 with  $t = 0$  and  $p = 0$ , which is less than 0.05, leading to rejection of  $H_0$  and indicating a significant result reflecting a complete absence of prior knowledge. These findings confirm that both groups were statistically comparable prior to intervention, thereby validating the experimental conditions.

Posttest performance demonstrated notable differences between instructional approaches. For occupational health and safety procedures, the traditional group obtained 73.67 (SD = 0.62) categorized as Did Not Meet Expectations, while the digital group obtained 87.33 (SD = 1.82) categorized as Very Satisfactory. For safety practices in the workplace, the traditional group obtained 47.67 (SD = 1.36) categorized as Did Not Meet Expectations, while the digital group obtained 80.67 (SD = 1.28) categorized as Satisfactory. For preparing meat dishes, the traditional group obtained 59.67 (SD = 1.07) and the digital group obtained 57.00 (SD = 0.70), both categorized as Did Not Meet Expectations. These results indicate that digital instruction significantly enhanced knowledge based competencies, particularly in safety related areas, while both approaches showed limited effectiveness in improving practical cooking skills.

The test of significant difference in posttest performance further confirmed these findings. For occupational health and safety procedures, the mean difference was 19.66 with  $t = -7.18$  and  $p < 0.001$ , leading to rejection of  $H_0$  and indicating a significant difference favoring the digital group. For safety practices in the workplace, the mean difference was 33.00 with  $t$

= -12.94 and  $p < 0.001$ , also leading to rejection of  $H_0$  and indicating a significant difference. For preparing meat dishes, the mean difference was 2.67 with  $t = 1.84$  and  $p = 0.073$ , leading to a failure to reject  $H_0$  and indicating no significant difference. These results demonstrate that digital instructional approaches are highly effective in improving procedural and safety related competencies but have limited impact on hands on skill acquisition, consistent with findings by Santos and Reyes (2023) and Ignacio et al. (2021).

Within group analysis further revealed the effects of each instructional approach. For the traditional group, occupational health and safety procedures showed a mean difference of 1.9547 with  $t = 0.5604$  and  $p = 0.5795$ , indicating no significant improvement. Safety practices showed a mean difference of 1.5222 with  $t = 16.5513$  and  $p = < 0.001$ , indicating a significant improvement. Preparing meat dishes showed a mean difference of 1.0662 with  $t = 30.6517$  and  $p = < 0.001$ , also indicating a significant improvement despite remaining within the Did Not Meet Expectations category. For the digital group, occupational health and safety procedures showed a mean difference of 24.33 with  $t = 1.1602$  and  $p = 0.2554$ , indicating no significant improvement. Safety practices showed a mean difference of 78.34 with  $t = 18.7781$  and  $p = < 0.001$ , indicating a significant improvement. Preparing meat dishes showed a mean difference of 57.00 with  $t = 44.4597$  and  $p = < 0.001$ , indicating a significant improvement. These results highlight that both instructional approaches contributed to learning gains, but digital instruction produced stronger improvements in safety related competencies.

Perceived effectiveness of digital instructional approaches was further supported by survey data, which yielded an overall mean of 3.55 categorized as Strongly Agree. Individual items recorded high mean values, including 3.27, 3.53, 3.43, 3.60, 3.47, 3.63, 3.60, 3.63, 3.53, and 3.83 for engagement indicators, as well as 3.60, 3.57, 3.77, 3.67, 3.33, 3.50, 3.77, 3.33, and 3.80 for critical thinking and retention indicators. These values indicate that students strongly perceived digital tools as enhancing engagement, promoting critical thinking, and improving retention of knowledge. This is consistent with Güngör et al. (2022), Cao et al. (2023), and Wang et al. (2021), who emphasized the role of multimedia and interactive technologies in fostering deeper learning experiences.

Overall, the findings demonstrate that digital instructional approaches significantly enhance students' performance in knowledge based competencies, particularly in occupational health and safety and workplace practices, while both traditional and digital approaches show limitations in developing practical cooking skills without sufficient hands on experience. The statistical results confirm that the integration of digital tools leads to meaningful improvements in specific domains, thereby addressing the research objectives of comparing instructional effectiveness. These findings contribute to the growing body of knowledge on educational technology in vocational education and underscore the importance of adopting a blended instructional approach that integrates digital resources with traditional hands on learning. This synthesis of results provides a strong empirical basis for the development of the proposed Learning Guide and sets the stage for the subsequent chapter, which will present conclusions and recommendations derived from the study.

## CONCLUSION

This study was conducted to assess the effect of integrating digital tools into the teaching of Cookery among Grade 10 students at Lo ok National High School during the School Year 2024 to 2025. Using a quasi-experimental design with a control group exposed to traditional instruction and an experimental group exposed to digital instruction, the study examined differences in academic performance, engagement, and retention across key competencies related to kitchen safety, workplace practices, and meat dish preparation. Pretest

and posttest measures, along with survey responses, provided the basis for determining the effectiveness of each instructional approach through statistical analyses such as t tests and evaluation at  $\alpha = 0.05$ .

The findings revealed that both groups of students began the study with comparable academic performance, as indicated by similar baseline mean scores of 83.10 (SD = 4.04) for the traditional group and 84.80 (SD = 4.15) for the digital group, both categorized as Approaching Proficiency. The demographic profile showed that the majority of participants were aged 15 to 17 years old, with a higher proportion of female students in both groups, specifically 60.00% in the traditional group and 66.67% in the digital group. Additionally, most students had access to digital tools, with 86.67% in the traditional group and 100.00% in the digital group reporting access, indicating that the learning environment was generally favorable for the implementation of digital instruction.

The results demonstrated that students exposed to digital instruction significantly outperformed those in the traditional group in posttest assessments for competencies related to occupational health and safety procedures and workplace safety practices. The digital group achieved mean scores of 87.33 (SD = 1.82) categorized as Very Satisfactory and 80.67 (SD = 1.28) categorized as Satisfactory in these competencies, compared to the traditional group's scores of 73.67 (SD = 0.62) and 47.67 (SD = 1.36), both categorized as Did Not Meet Expectations. These differences were statistically significant, with  $p < 0.001$  in both cases, leading to the rejection of the null hypothesis. These findings indicate that digital instructional approaches are highly effective in improving procedural knowledge and safety awareness, particularly when supported by multimedia tools, simulations, and interactive resources.

Both instructional approaches led to improvements from pretest to posttest across competencies, but the digital group demonstrated greater gains overall. Within group analyses showed that the traditional approach significantly improved students' performance in safety practices with  $p = < 0.001$  and in preparing meat dishes with  $p = < 0.001$ , although performance in occupational health and safety procedures did not show significant improvement with  $p = 0.5795$ . Similarly, the digital approach significantly improved safety practices with  $p = < 0.001$  and meat preparation with  $p = < 0.001$ , but did not yield a statistically significant improvement in occupational health and safety procedures with  $p = 0.2554$ . Despite these improvements, both groups remained within the Did Not Meet Expectations category in the competency related to preparing meat dishes, with mean scores of 59.67 (SD = 1.07) for the traditional group and 57.00 (SD = 0.70) for the digital group. This indicates that while digital tools can support the development of technical knowledge and partially enhance practical skills, mastery of hands on culinary tasks still requires direct physical practice and experiential learning.

The study further established that students exposed to digital instruction reported higher levels of engagement, motivation, and retention of knowledge. The overall mean score of 3.55, categorized as Strongly Agree, reflects strong positive perceptions of digital tools in enhancing the learning experience. Students indicated that digital resources such as instructional videos, simulations, and multimedia presentations increased their participation, improved focus, and facilitated better understanding of cookery concepts. They also demonstrated improved collaboration during performance tasks, suggesting that digital instruction fosters interactive and learner centered environments that support both cognitive and social aspects of learning.

Based on these findings, the study concludes that digital instructional approaches significantly improve the academic performance of Grade 10 Cookery students, particularly in competencies involving procedural understanding and safety practices. Digital tools enhance engagement, comprehension, and retention, making them a valuable component of modern instructional strategies. However, traditional instruction remains essential, especially for developing hands on culinary skills that require physical manipulation and real world practice. The results support the adoption of a blended instructional approach that integrates digital and

traditional methods to maximize learning outcomes, ensuring that both theoretical understanding and practical competencies are effectively developed.

In response to these findings, the study proposes the implementation of a comprehensive Learning Guide that integrates digital tools into the Cookery curriculum. This guide incorporates video based instruction, simulations, concept reinforcement activities, practical tasks, and reflective exercises aligned with core competencies. It also includes low technology alternatives to ensure accessibility in resource constrained environments. The structured five week implementation plan combines digital and traditional strategies to enhance student engagement, improve academic performance, and support skill development. Furthermore, it is recommended that digital instruction be consistently integrated across the Technical Vocational Livelihood curriculum and extended to other subject areas to promote a more dynamic and future ready educational system.

To support effective implementation, continuous professional development for teachers is essential. Training programs should focus on the design and delivery of multimedia rich lessons, the use of simulation tools, and the application of learner centered strategies that enhance engagement, critical thinking, and practical skill development. Expanding the use of digital instruction across different Technical Vocational Livelihood specializations can further align educational practices with industry demands and support inclusive and innovative teaching models. Future research is also recommended to explore the long term effects of digital instruction on employability skills, creativity, and real world application of culinary techniques, as well as its effectiveness in contexts with limited digital access. Additionally, encouraging students to create digital content such as cooking tutorials and safety demonstrations can foster creativity, deepen learning, and develop essential communication, collaboration, and digital literacy skills.

Overall, the study provides strong empirical evidence supporting the integration of digital tools in vocational education while recognizing the continued importance of traditional hands on instruction. The findings contribute to the advancement of instructional practices in cookery education and provide a foundation for curriculum innovation that responds to the evolving demands of education and industry. This integrated perspective ensures that learners are equipped with both the technical competencies and digital skills necessary for success in contemporary and future work environments.

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