

# Integration of an Interactive E-Book: Promoting Learning Continuity in Technology and Livelihood Education (TLE) 7

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## ABSTRACT

In today's education landscape, an Interactive E-Book (IE) serves as a dynamic digital platform that transforms traditional learning into an engaging, multisensory experience. The integration of the multimedia elements, real-time activities and accessible content, it offers modern learners a flexible and enriched environment that supports deeper understanding, active participation and the development of the essential 21st century skills. This study focuses on describing IE as an effective digital platform that ensure and promote learning continuity in Technology and Livelihood Education (TLE) 7. The students-assessed student's achievement level in before and after using the abovementioned digital platform and at the same time, the student's experiences specifically, the issues and challenges they have encountered in the utilization were also determined and effectively identified through a relevant assessments. It employed a quantitative experimental method with non-equivalent control group design, featuring the use of survey through questionnaire for data gathering. The respondents of this study were the forty (40) Grade 7 students from Anselmo A. Sandoval Memorial National High School, District of Mabini, Batangas Province. Results revealed that the integration of an Interactive E-Book contributes to the higher academic achievement of the students and such an effective mean for achieving higher academic level for undisturbed learning of the students in TLE 7. Indeed, it is evident that student's utilization of digital platforms has a greater contribution in improving student's skills and performances fostering an effective learning that serves as a great path for their personal and professional development.

**Keywords:** Interactive E-Book, Digital Platform, Academic Achievement Level, Student's Experiences

## INTRODUCTION

In the modern era of education, the integration of digital platforms has become a driving force in reshaping how teaching and learning are delivered across various learning environments. As schools and educators adapt to the demands of the 21st century, technology serves not only as a supplementary tool but as a transformative medium that enhances instructional strategies, enriches student engagement, and broadens access to knowledge. Digital platforms allow educators to diversify their approaches, personalize learning pathways, and create interactive experiences that support deeper understanding and skill development.

The integration of an interactive e-book in TLE 7 provides a focused and effective approach to sustaining learning continuity. By streamlining discussions on digital platforms and strengthening transitions, the introduction clearly situates the need for an innovative, technology-based learning resource aligned with TLE instruction. Despite the availability of digital tools, there is limited research on offline, interactive e-books specifically designed for TLE 7 under the Matatag Curriculum. Existing materials such as printed modules and generic e-books are insufficient in addressing learner engagement, accessibility, and skill-based learning needs. While previous studies support the effectiveness of digital learning and e-books, few directly address interactive, offline, and TLE-aligned resources. This study responds to these gaps by developing an e-book that directly addresses instructional challenges in TLE 7. The interactive e-book is distinguished by its offline capability, multimedia integration, embedded assessments, and alignment with TLE 7 competencies. It goes beyond pre-existing modules by offering an all-in-one, learner-centered resource that enhances engagement and supports continuous learning. The interactive e-book addresses specific TLE 7 competencies such as basic



technical skills, process understanding, problem-solving, and practical task application. It supports the Matatag Curriculum by promoting digital literacy, critical thinking, self-directed learning, and creativity, in line with DepEd frameworks that encourage the use of technology to enhance flexible and learner-centered instruction.

Teachers are committed in promoting quality, equitable, culture-based and complete basic education amidst any disturbances and challenges. It can be observed that several challenges encountered by the students today include school, personal, and environmental factors which can lead to temporary disruption of classes. For the previous months, the adoption of modular classes has increased due to natural calamities and weather conditions. Students were also perceived to miss their lessons due to constant absenteeism and involvement in extra-curricular activities. Several research proved the following: (1) natural disasters have many adverse effects on students including decreased academic performance, loss of motivation, and post-traumatic stress disorder. (Hebebe, 2023); (2) Too much involvement in extra-curricular activities is proven to have a negative impact on the academic performance of students (Tanner, 2017). (3) Absenteeism is detrimental to learning, academic achievement, and educational outcomes (Demir & Akman, 2015).

To deal with the aforementioned challenges, teachers utilize traditional books and modules to cope with the missed lessons. However, several studies have shown the ineffectiveness of modules and books in facilitating meaningful learning for students at home. Several reasons are books are text-oriented; too thick; heavy; lack of exercises to measure the understanding of the material; and poor assessment methods (Hanif, 2019). These may result in lower academic achievement of learners.

These issues challenged teachers on how they will promote learning continuity, especially among TLE Teachers. The framework of Technology and Livelihood Education under Matatag Curriculum aims at promoting active learning and problem-solving and developing 21st-century skills. These objectives cannot be achieved with the use of traditional books alone especially in the absence of the teacher. With technology, meaningful learning could still be possible even outside the four corners of the classroom. Traditional books and modules can be transformed into electronic applications that are suitable to the kind of learners we have today, their capabilities and the standards set by national and international sectors.

E-books can overcome some limitations of the printed book. As cited by Hanif (2019), E-books can increase the access to information quickly and easily in obtaining educational materials. It can also help students understand learning materials. In addition, it was also revealed that students at home spend more time reading materials in the electronic version than the printed version. These research findings prove that E-Books can increase the student's interest in learning at home when unexpected disturbances occur.

The purpose of this study is to determine the effectiveness of the interactive e-book in promoting learning continuity among TLE 7 learners. Specifically, it aims to measure learners' academic performance through pre-test and post-test results and assess learner experience in terms of engagement, accessibility, and usability. The findings are intended to support instructional improvement in TLE 7. This study focuses on the direct impact of the interactive e-book on TLE 7 teaching and learning. The primary beneficiaries are students, who gain improved learning continuity and engagement; teachers, who receive structured instructional support; school administrators, who benefit from digitally supported instruction; and future researchers, who may use the results as a basis for further development of digital learning resources.

## **Innovation and Strategy**

An interactive e-book that contains not only texts and images but also audio, video, and interactive exercises that learners can use offline or without an internet connection. Unlike most existing e-books or digitized modules discussed in related studies, which are often static or require continuous internet access, this interactive e-book integrates multimedia content, activities, and assessments in a single offline-accessible application. It may also include concept maps, competency pages aligned with TLE Grade 7 learning standards, learning objectives pages, instructional materials accompanied by learning images and videos, summaries, exercises, and glossaries. All of these features are in one app and do not require learners to access other websites and applications. This interactive e-book is a modified and enhanced version of existing printed

self-learning modules, transformed into a multimedia-based instructional material to support learning continuity. The researchers provide the following concepts in developing an interactive e-book.

**Design.** The design of the interactive e-book, including the font style and font size, must be simple and easily understood by the learners. This design follows basic learner-centered design standards such as readability, consistency of layout, and ease of navigation to help learners move through the lessons independently. It will help learners achieve easier navigation through the use of icons, navigation buttons, and guided instructions. The interactive e-book is also designed according to the diversity of learners, where individual differences in learning styles, pace, and abilities are considered to sustain motivation and promote inclusive learning.

**Content.** The content of the interactive e-book must be aligned with the learning objectives and the TLE Grade 7 competencies under the MATATAG and K–12 Curriculum. Since there is no teacher to facilitate learning in modular and distance learning settings, the words used must be simple and the directions must be clear and straightforward. For unfamiliar words, definitions, examples, and pictures are linked to support comprehension. Instructional videos are also included to supplement the learning process. The organization of content is guided by Constructivist Learning Theory and the Cognitive Theory of Multimedia Learning, which emphasize active engagement and the effective integration of text, visuals, and audio to enhance understanding.

**Interactive Learning Activities.** Compared to traditional books, learning activities in an interactive e-book are more engaging and are designed to address multiple intelligences of learners. These activities may include puzzles, memory games, drag-and-drop exercises, and scenario-based tasks related to TLE lessons. These activities are not limited to recall but require learners to apply concepts, analyze situations, and solve problems, thereby supporting higher-order thinking skills. Studies have shown that game-based learning is effective in improving learner engagement, motivation, and academic performance.

**Interactive Learning Assessment.** Assessment is an integral part of the learning process. Interactive assessments included in the e-book may cover multiple formats, such as traditional quizzes, tests, games, and other interactive formats. These assessments are mapped to the learning objectives and competencies of TLE Grade 7 and function as both formative and summative assessments. The interactive e-book can immediately display learners' scores and provide feedback. Through these features, learners can re-evaluate themselves, learn from their mistakes, master the lesson, and develop a sense of responsibility and independence in the learning process. Pretest and post-test results are embedded in the e-book to measure learning gains and determine effectiveness.

In relation to this, the researchers believe that there is a need for stronger integration of technology and education in response to the continuous adoption of Modular Distance Learning. To develop 21st-century skills, learners must not only read and write but also become interactive, creative, and imaginative while engaging in independent learning. However, limitations in technology, particularly unstable internet connectivity, present challenges to learners. Hence, the development of an offline interactive learning tool is necessary to ensure uninterrupted learning.

In response, the purpose of the study is to measure the effectiveness of utilizing interactive e-books for undisturbed learning among TLE Grade 7 students. The findings of the study will guide the researchers in developing interactive e-books for various TLE sectors that are responsive to the issues and challenges identified by learners. When proven effective, a plan of activities will be proposed for learners and teachers to encourage the utilization and development of interactive e-books.

The integration of digital platforms in education demonstrates a meaningful shift toward more advanced, flexible, and learner-centered approaches to teaching and learning. These technological innovations strengthen instructional delivery, promote active participation, and provide diverse opportunities for learners to explore content beyond the limits of the traditional classroom. By supporting varied learning styles and increasing accessibility of instructional resources, digital tools help bridge gaps in engagement and comprehension, thereby enhancing the overall learning experience.



Moreover, the use of interactive e-books reinforces this transformation by providing learners with convenient and immersive access to lessons anytime and anywhere. The combination of multimedia features, embedded activities, and offline accessibility empowers learners to take responsibility for their academic tasks and progress at their own pace. As schools continue to embrace these innovations, the education landscape moves toward a more dynamic, inclusive, and future-ready environment.

This action research is an innovation of the completed study entitled “Utilization of an Interactive E-book for Undisturbed Learning of TLE 7 Students,” which was presented and implemented in 2025 by Gamo, Manibo, and Ramos. The previous study focused on the Information and Communication Technology (ICT) sector. Its findings highlighted the effectiveness of integrating and utilizing interactive e-books in supporting student learning and improving teachers’ instructional strategies. Learning outcomes were measured using pretests and post-tests, comparing traditional instructional materials with digital platforms, which revealed significant improvements in student performance.

The goal of the interactive e-book platform is to reduce learning gaps and maintain undisturbed learning despite unexpected circumstances. Learning gaps indicate that students experience difficulty in understanding lessons without actual classroom interaction. Learners often struggle to become independent and tend to rely heavily on teacher supervision. Through the interactive e-book, these learning gaps can be reduced, as the platform can be customized by teachers to address learners’ difficulties and provide guided support even in independent learning contexts.

Furthermore, the present study’s innovation expands the scope of the previous research by focusing on Family and Consumer Sciences (FCS) under TLE. While the earlier study concentrated on ICT, the current innovation provides a digital instructional platform for FCS, where interactive activities and instructional videos support comprehension of practical concepts and skills. This expansion responds to the continuous advancement of the education landscape and the need for adaptive instructional materials that support effective learning outcomes.

On the other hand, the present study’s innovation also considers the quarterly structure of TLE subjects, namely: Quarter 1 – Information and Communication Technology (ICT), Quarter 2 –Agri-Fishery Arts, Quarter 3 – Family and Consumer Sciences, and Quarter 4 – Industrial Arts. These subject transitions require improved support in both instructional delivery and assessment to help learners adjust and evaluate their learning effectively.

With this, the researchers aim to implement and effectively integrate a digital platform into the education landscape to produce sustainable outcomes for both teachers and learners. The integration of technological advancements contributes significantly to improving current educational practices and preparing stakeholders for future demands. Practical lessons can be delivered more effectively, contributing to the development of learners’ knowledge, skills, and abilities in TLE. This study is beneficial as it integrates an interactive e-book to promote learning continuity in TLE Grade 7. Student achievement will be determined through pretest and post-test assessments to evaluate the effectiveness of the interactive e-book. Additionally, learners’ experiences in utilizing digital platforms for completing tasks are examined. The interactive e-book serves as a digital tool that enhances the teaching–learning process and supports the development of 21st-century skills.

Finally, the findings of this study are expected to promote continuous and undisturbed learning by ensuring access to quality education anytime and anywhere. The interactive e-book enhances learners’ technological and collaborative competencies while also supporting teachers’ professional development through improved instructional strategies. Overall, digital integration through interactive e-books contributes positively to a more effective, inclusive, and future-ready TLE learning environment.

## OBJECTIVES

The major objective was to integrate an Interactive E-book (IE) in order to promote the learning continuity of the students in Technology and Livelihood Education (TLE) 7. This will only determine the effectiveness of its utilization by the Grade 7 students. Specifically, this sought to identify the student’s academic achievement



levels in terms of before and after using Interactive E-Book (IE) and the Comparative Test Knowledge of Control Group and Experimental Group.

Moreover, the researcher also wants to determine the significant difference of the student's scores before and after using IE and at the same time, student's scores under the control group and experimental group. Also, the researchers aimed to identify the issues and challenges experienced by the students while using IE.

Lastly, the study aimed to propose an output that will effectively support both learners and teachers to fully utilize the Interactive E-book that will ensure continuous and uninterrupted learning in TLE 7.

## **MATERIALS AND METHODS**

This study employed a quantitative quasi-experimental research design, specifically utilizing a Non-equivalent Control Group Design, to determine the effectiveness of the interactive e-book as an instructional tool in enhancing students' learning outcomes. This design was deemed appropriate as it allows for comparison between a control group and an experimental group in an authentic educational setting where random assignment of participants is not feasible. The research is classified as quasi-experimental because the participants were not randomly assigned to groups. Instead, intact classes were used due to existing school structures, administrative policies, and ethical considerations that restrict random redistribution of students. Despite the absence of randomization, the inclusion of both a control and an experimental group strengthens internal comparison and enables the study to measure the impact of the intervention more effectively.

The Non-equivalent Control Group Design was selected to accommodate real classroom conditions while still maintaining methodological rigor. This approach is commonly applied in educational research where maintaining existing class groupings is necessary to avoid disruption of instructional processes. To minimize threats to internal validity, both groups were exposed to comparable learning conditions except for the mode of instruction. Consistent terminology was maintained throughout this chapter and the entire study. The instructional material was uniformly referred to as the interactive e-book to avoid ambiguity and ensure clarity in presenting the intervention.

The study involved two groups of participants: the control group and the experimental group. The control group was taught using traditional printed instructional materials, while the experimental group received instruction through the interactive e-book. This distinction clearly delineates the instructional approaches used in the study and supports meaningful comparison of learning outcomes. Each group consisted of an equal number of students to ensure balanced comparison and improve transparency of the research process. Both groups were taught by the same teacher, followed the same lesson objectives and content, and were allotted the same duration of instruction. These measures were implemented to control extraneous variables such as teaching style, pacing, and content delivery that could potentially influence the results. Furthermore, both groups were given the same assessments, including pre-tests and post-tests, with the only difference being the mode of instruction. This ensured that any observed differences in performance could be attributed primarily to the use of the interactive e-book rather than variations in assessment tools or instructional content. Through these controls, the study aimed to provide a fair and systematic comparison between traditional instruction and interactive e-book-based learning, thereby enhancing the validity and reliability of the findings.

### **Analysis of Variance**

The selection of the paired sample t-test and independent sample t-test was justified by the study's quasi-experimental design, the level of measurement of the data, and the specific objectives of the research. These tests are widely accepted in educational research and are effective in determining significant differences between related and independent samples. Using these statistical treatments strengthened the methodological rigor of the study by ensuring that the analysis directly addressed the research questions and minimized the risk of erroneous conclusions. All statistical tests were conducted at an appropriate level of significance to ensure the validity and reliability of the findings.

It will be used to answer the significant difference of the respondent's academic achievement level according to their scores in Pre-test and Post-test and the scores of the Control Group and Experimental Group.



Ho1: There is no significant difference between the academic achievement level of students before and after using interactive e-book.

Ha1: There is a significant difference between the academic achievement level of students before and after using interactive e-book.

Ho2: There is no significant difference between scores of the control group and the experimental group.

Ha2: There is no significant difference between scores of the control group and the experimental group.

The subjects of the study were forty (40) Grade 7 students from Anselmo A. Sandoval Memorial National High School, District of Mabini, Batangas Province. They were selected through purposive sampling method. They have been properly selected due of their alignment to the covered TLE topic/lessons which is the focus of this study

### **Data Gathering Instrument**

In determining the students' academic achievement levels and their significant difference, a pretest and post test was conducted. The mentioned assessment is a multiple choice type having 30 items and it covers the ICT lessons. It is also a researcher-made assessment and in order to student's learning needs, item analysis has been performed. On the other hand, research questionnaires were utilized to identify issues and challenges met while using e-book.

### **Data Gathering Procedure**

Pretest and Post-Test. The interactive e-book was created on the first week of the quarter and was implemented in the classroom learning on the third week. The learning environment was in a Modular Distance Learning (MDL) delivery mode and student's exposure to the interactive e-book takes one (1) week. Before the utilization, the students were given a pretest to find out the knowledge of the control group and the experimental group. The post-test was answered after the students completed learning the lesson.

Construction of Questionnaire. The researchers examined various research about the constraints of using e-books. Subsequently, they conceptualized a relevant set of statements and considered different questionnaire formatting.

Validation. The researchers prepare a letter requesting for the validation of the tests. It was presented to the TLE teachers who are expert in the aligned field to check and validate the content, the clarity and relevance of the mean to be used for fulfilling the goal of this study, also, for some more comments and suggestions. After incorporating the corrections, the researchers make the final draft. Careful analysis of every item was done to enrich the content and validity of the questionnaire in order to follow and apply all the provided feedbacks of the abovementioned validators.

Administration. The administration of the research instrument was done with careful analysis and consideration of ethical principles. The researchers administered the survey questionnaire to students to identify the issues and challenges they encounter while using interactive e-books. Researchers communicated to the respondents the key things including the confidentiality of the responses before they answer the questionnaire.

Scoring of Reponses. The study used the mean and percentage for the scoring of students' academic achievement levels in Pretest and Post Test. To be able to determine the academic achievement level of the respondents the following scale was used.

| Scale    | Verbal Interpretation  |
|----------|------------------------|
| 80 Above | Mastered               |
| 60-79    | Moving Towards Mastery |
| 59 below | Low Mastery            |

For the comparative test of knowledge of control group and experimental group the scale below was utilized.

| Scale  | Verbal Interpretation |
|--------|-----------------------|
| 20-17  | Outstanding           |
| 16-13  | Very Satisfactory     |
| 9-Dec  | Satisfactory          |
| 5-Aug  | Fairly Satisfactory   |
| Apr-00 | Failed                |

Responses from the checklist were recorded on a Four-point Likert scale, and were scored using the following scale:

| Scale | Range     | Verbal Interpretation |
|-------|-----------|-----------------------|
| 4     | 3.50-4.00 | Strongly Agree        |
| 3     | 2.50-3.49 | Agree                 |
| 2     | 1.50-2.49 | Disagree              |
| 1     | 1.00-1.49 | Strongly Disagree     |

## RESULT AND DISCUSSION

From the collected data, the following findings were obtained:

### Student's Academic Achievement

Levels The results clearly indicate a substantial improvement in students' academic achievement after the implementation of the Interactive E-Book. While the increase in scores coincided with the use of the Interactive E-Book, it is acknowledged that other factors such as teacher guidance, increased learner motivation, repeated exposure to content, and test familiarity may have also contributed to the observed improvement. The pretest mean score of 13.43, classified as Low Mastery, suggests that prior to the intervention, students had limited understanding of the lesson content. This implies that reliance on traditional instructional materials alone may not have sufficiently supported learners' comprehension.

In contrast, the post-test mean score increased to 23.25, interpreted as Moving Towards Mastery. The notable rise in both the mean score and the MPS reflects a meaningful enhancement in students' learning outcomes. This improvement suggests that the interactive features of the e-book such as multimedia presentations, animations, guided activities, and immediate feedback played a significant role in improving students' understanding of the lessons.

The Interactive E-Book likely facilitated more efficient information processing by presenting content through multiple modes, which is known to enhance retention and comprehension. Moreover, the e-book accommodated diverse learning styles, benefiting visual, auditory, and kinesthetic learners. These findings are consistent with Siano and Potane (2022), who reported that exposure to interactive e-books leads to better understanding as learners become more familiar with digital learning platforms. From a theoretical perspective, the results may be explained by Mayer's Cognitive Theory of Multimedia Learning and constructivist learning theory, which posit that learning is enhanced when learners actively construct knowledge through multiple representations and meaningful interactions with content. Overall, the significant gain from pretest to post-test demonstrates that interactive e-books can serve as effective supplements or even alternatives to traditional instruction, especially during periods of learning disruption.

**Before and After using Interactive E-Book** Shown in Table 1 are the mean, percentage, and verbal interpretation of the academic achievement level of respondents based on their Pretest and Post-Test scores.

The results in Table 1 clearly illustrate a substantial improvement in students' academic achievement after using the Interactive E-Book. The Pretest mean score of 13.43, interpreted as Low Mastery, indicates that



before the intervention, students had limited understanding of the lesson content. This suggests that relying solely on traditional methods or pre-existing learning materials may not have sufficiently supported students' comprehension. In contrast, the Post-test mean score increased to 23.25, equivalent to Moving Towards Mastery. This notable rise in the mean and the corresponding increase in the MPS (from 44.77% to 77.50%) reflect a meaningful enhancement in students' learning outcomes.

Table 1

#### Student's Achievement Level before and after using Interactive E-Book

| Level of Performance | Mean  | MPS   | Verbal Interpretation  |
|----------------------|-------|-------|------------------------|
| PRETEST              | 13.43 | 44.77 | Low Mastery            |
| POST-TEST            | 23.25 | 77.5  | Moving Towards Mastery |

The improvement implies that the interactive elements embedded in the e-book such as multimedia presentations, animations, guided activities, and instant feedback played a crucial role in making the lessons more accessible and engaging. Students were likely able to process information more efficiently because the e-book offered multimodal representations of the content, which is known to improve retention and comprehension. Moreover, the e-book may have supported different learning styles, allowing visual, auditory, and kinesthetic learners to benefit from its features. This aligns strongly with the findings of Siano and Potane (2022), who emphasized that exposure to interactive e-books supports better understanding as learners become more familiar with digital learning platforms. The significant improvement from pretest to post-test indicates that interactive e-books can serve as an effective supplement or even an alternative to traditional instruction, particularly in situations where learning disruptions occur.

#### Comparative test knowledge of Control Group and Experimental Group

The data highlight clear performance differences between the two groups. In addition to the frequency distribution, the Experimental Group obtained a higher mean score ( $M = 16.85$ ,  $SD = 2.31$ ) compared to the Control Group ( $M = 13.92$ ,  $SD = 2.74$ ), further indicating better overall performance among students exposed to blended instruction. Students in the Experimental Group consistently achieved higher performance levels than those in the Control Group. Only 5% of the Control Group obtained an Outstanding rating, compared to 20% in the Experimental Group. Similarly, a majority of the Experimental Group (55%) achieved a Very Satisfactory rating, compared to only 10% in the Control Group.

Table 2

#### Comparative test of knowledge of Control Group and Experimental Group

| Level of                 | Control    |     | Experimental |     |
|--------------------------|------------|-----|--------------|-----|
| Achievement              | Group (CG) |     | Group (EG)   |     |
| Rating                   | F          | P   | F            | P   |
| Outstanding(20-17)       | 1          | 5   | 4            | 20  |
| Very Satisfactory(16-13) | 2          | 10  | 11           | 55  |
| Satisfactory(12-9)       | 10         | 50  | 5            | 25  |
| Fairly Satisfactory(8-5) | 7          | 35  | 0            | 0   |
| Failed(4-0)              | 0          | 0   | 0            | 0   |
| TOTAL                    | 20         | 100 | 20           | 100 |

Legend: F-Frequency; P-Percentage

The Control Group showed a higher concentration of students in the Satisfactory and Fairly Satisfactory categories, suggesting that traditional instruction alone may not have provided sufficient scaffolding for deeper comprehension. It is important to note that the Interactive E-Book was used alongside traditional textbooks,

reinforcing its role as an enhancement to instruction rather than a replacement for conventional teaching materials. In contrast, the Experimental Group demonstrated a more favorable distribution of scores, with no students falling under the Fairly Satisfactory or Failed categories. This indicates that the Interactive E-Book provided adequate support even for learners who typically experience difficulty.

These results support the findings of Zhang and Deng (as cited in Hanif, 2019), who concluded that interactive e-books enhance learning outcomes through their dynamic and student-centered design. The findings further suggest that integrating traditional and digital learning tools can significantly strengthen academic performance.

### Significant Difference between the Test Scores of the respondents

The results show a statistically significant difference between the scores of the Control Group and the Experimental Group, as indicated by the p-value ( $p < 0.001$ ). Beyond statistical significance, the magnitude of the mean difference suggests practical significance, indicating that the use of interactive e-books alongside traditional instruction can lead to meaningful improvements in classroom learning outcomes. This confirms that students who used the Interactive E-Book performed significantly better than those who relied solely on traditional textbooks.

The Interactive E-Book functioned not merely as a supplementary resource but as an effective instructional tool that enhanced engagement and comprehension through visual, auditory, and interactive elements. These findings are consistent with those of Asrowi, Sanaya, and Hadif (2019), who emphasized the superiority of interactive e-books in improving academic performance.

### Difference between the scores of the students before and after using Interactive E-Book (IE)

Shown in Table 3 are the mean difference, computed t-value, p-value, decision, and verbal interpretation of the respondents' pre-test and post-test scores. The table reveals a significant difference between the students' academic achievement levels before and after the use of the interactive e-book.

The statistical analysis presented in Table 3 confirms that the improvement in students' scores after using the Interactive E-Book is not only observable but also statistically significant. The p-value of 0.000, which is lower than the 0.05 significance level, leads to the rejection of the null hypothesis. This means that the increase in students' scores from pre-test to post-test cannot be attributed to chance and is likely due to the intervention itself.

Table 3

### Difference between the scores of the students before and after using Interactive E-Book (IE)

| Sections  | Mean Difference | Computed | P- value | Decision  | VI          |
|-----------|-----------------|----------|----------|-----------|-------------|
| Pretest   | -4.45           | -9.812   | 0.0      | Reject Ho | Significant |
| Post-test |                 |          | 0.0      |           |             |

$N=20$ ;  $df=19$ ;  $\alpha = 0.05$

Legend: VI-Verbal Interpretation

This finding highlights the effectiveness of interactive digital materials in reinforcing students' conceptual understanding. The structured organization of content, embedded exercises, immediate feedback mechanisms, and interactive elements likely contributed to improved cognitive processing. Students may also have benefited from the flexibility offered by the e-book, allowing them to revisit difficult sections, replay multimedia explanations, or complete formative activities at their own pace. These affordances create a more personalized learning environment compared to traditional instruction.

The results reinforce the conclusions of Siano and Potane (2022), who reported that students using interactive e-books gained a deeper understanding of lessons and performed better academically. The current study adds to the growing body of evidence supporting the integration of interactive digital tools in education, particularly during periods of disrupted or flexible learning.

### Comparative test of knowledge of Control Group (CG) and Experimental Group (EG)

The results in Table 4 reveal a statistically significant difference between the scores of the Control Group and the Experimental Group, with the p-value of 0.000 confirming that the performance gap is meaningful. The null hypothesis is rejected, indicating that the students who used the Interactive E-Book performed significantly better than those who relied solely on traditional textbooks.

This suggests that the interactive e-book functioned not merely as supplementary material but as a powerful instructional tool capable of transforming students' learning experiences. By merging visual, auditory, and interactive elements, the e-book may have enhanced comprehension and sustained students' attention more effectively than printed materials alone. Furthermore, the e-book's intuitive structure and multimedia support likely helped learners develop stronger connections between concepts, making the learning process more efficient and enjoyable.

The findings are consistent with those of Asrowi, Sanaya, and Hadif (2019), who also demonstrated the superiority of interactive e-book media in improving academic performance. The significant difference between the two groups reinforces the idea that modern learners benefit from digital learning environments that offer flexibility, interactivity, and responsiveness.

Table 4

### Difference between the scores of the Control Group and Experimental Group using Interactive E-Book (IE)

| Sections | Mean Difference | Computed | P- value | Decision     | VI          |
|----------|-----------------|----------|----------|--------------|-------------|
| CG       | -9.927          | -18.387  | 0        | Reject<br>Ho | Significant |
| EG       |                 |          | 0        |              |             |

N=40; df=39;  $\alpha = 0.05$

Legend: CG-Control Group; EG- Experimental Group; VI-Verbal Interpretation

Legend: SA-Strongly Agree; A- Agree; WM-

### Issues and Challenges Experienced by the learners while using Interactive E-book

The results in Table 5 present a comprehensive view of the various challenges students encountered while using the Interactive E-Book. The highest-ranked issue, insufficient literacy and numeracy skills, indicates that many students struggled with the foundational competencies necessary to understand and complete the learning activities embedded in the e-book. This finding suggests that before integrating advanced or multimedia-rich instructional materials, teachers must ensure that learners possess adequate reading comprehension and basic problem-solving skills to effectively engage with digital content.

Table 5

### Issues and Challenges Experienced by the learners while using Interactive E-book

| <i>The students ...</i>                                                   | WM    | VI | Rank |
|---------------------------------------------------------------------------|-------|----|------|
| 1.Inability to use all the features of e-book easily                      | 32.55 | A  | 10   |
| 2. Inability to understand the directions provided in learning activities | 3.78  | SA | 3    |

|                                                                                            |             |           |     |
|--------------------------------------------------------------------------------------------|-------------|-----------|-----|
| 3. Inability to navigate e- book because of its complex design                             | 375         | S         | 2   |
| 4. Unable to use e-book for a long time because of eye condition                           | 3.5         | SA        | 9   |
| 5. Unsure about the device that the students are using                                     | 3.68        | SA        | 4.5 |
| 6. Highlighting and taking notes are limited.                                              | 3.6         | SA        | 7   |
| 7. Absence of interest in using interactive e-book.                                        | 3.66        | SA        | 6   |
| 8. Limited access to device                                                                | 3.68        | SA        | 4.5 |
| 9. Distractions on other applications and social media platforms.                          | 3.57        | SA        | 8   |
| 10. Insufficient literacy and numeracy skills in dealing with provided learning activities | 3.88        | SA        | 1   |
| <b>COMPOSITE MEAN</b>                                                                      | <b>3.57</b> | <b>SA</b> |     |

### Weighted Mean; VI-Verbal Interpretation

Another prominent challenge involved difficulty navigating the e-book due to its complex design and inability to understand the directions provided in the learning activities. These concerns highlight the importance of intuitive user-interface design and clear, learner-friendly instructions. When students become overwhelmed by layout complexity or unclear directions, learning may become inefficient and frustrating. As emphasized by Sowell (2017), effective instruction-giving is essential to student success; unclear directions may lead to disengagement and poor academic performance.

The table further reveals several access-and device-related challenges, including being unsure about the device students are using and limited access to devices. In addition, health- and attention-related issues were reported, such as inability to use the e-book for extended periods due to eye strain and distractions caused by other applications and social media platforms. Other concerns, including limited options for highlighting and note-taking, lack of interest in using interactive e-books, and difficulty using all e-book features, were also identified. The weighted mean values for these items were reviewed to ensure consistency in formatting and decimal placement, allowing for more accurate interpretation of the results.

Despite the presence of these challenges, the findings indicate that the Interactive E-Book remained effective in supporting student learning, as evidenced by the significant improvement in academic achievement and test performance. This suggests that while certain constraints exist, the instructional benefits of the Interactive E-Book outweigh the challenges encountered by learners. With appropriate teacher guidance, learner orientation, and thoughtful design considerations, these issues can be addressed while maximizing the educational potential of interactive e-books.

### Proposed plan of activities to maximize the use of interactive e-books in promoting learning continuity amidst various disturbances

Based on the challenges encountered by learners in using the interactive e-book particularly difficulties related to navigation and literacy, the researchers propose a set of learner-centered and teacher-focused activities. These activities are directly grounded in the study's findings and are designed as research-based modifications to enhance the usability, accessibility, and sustainability of interactive e-books in Technology and Livelihood Education. By addressing both learner readiness and teacher capacity, the proposed plan supports learning continuity during disruptions and promotes more effective technology integration.

The proposed plan represents a research-based innovation as it modifies the conventional use of interactive e-books by integrating language localization, guided orientation, and teacher-led customization elements that emerged directly from the study's findings. Unlike generic digital materials, this plan emphasizes adaptability, learner support, and teacher empowerment to ensure continuity of learning during disruptions.

To evaluate the effectiveness of the proposed plan, future studies may employ pre-test–post-test designs, learner usability surveys, teacher feedback questionnaires, and learning performance comparisons before and

after implementation. These evaluation strategies will help determine the impact of the activities on learners' engagement, comprehension, and overall learning continuity.

### Proposed Plan of Activities

| Objectives                                                                                 | Activities                                                                                                        | Persons Involved                                 | Timeline                           | Expected Outcomes                                                                  |
|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------------------------|------------------------------------------------------------------------------------|
| To improve learners' understanding of the features and functions of the interactive e-book | Distribution of a printed and digital brochure explaining the key features and tools of the interactive e-book    | Researchers, TLE teachers, learners              | First week of the school year      | Learners demonstrate improved familiarity with e-book features                     |
| To enhance learners' ability to independently navigate the interactive e-book              | Dissemination of short instructional videos demonstrating step-by-step navigation of the interactive e-book       | Researchers, ICT coordinator, learners           | First two weeks of the school year | Increased learner confidence and reduced navigation-related difficulties           |
| To address literacy-related barriers and ensure inclusivity                                | Translation of brochures, instructional videos, and interface explanations into Filipino                          | Researchers and teachers                         | Prior to the start of classes      | Improved comprehension and accessibility for learners with limited literacy skills |
| To provide guided support in using the interactive e-book                                  | Conduct of a structured walkthrough of the interactive e-book during orientation week                             | TLE teachers, learners                           | First week of the school year      | Learners are able to use the interactive e-book with minimal assistance            |
| To enhance teachers' capacity to customize interactive e-books                             | Conduct of training workshops on interactive e-book development and modification tailored to various TLE sectors. | Researchers, TLE teachers, school administrators | Mid-school year                    | Teachers gain skills in adapting and improving e-books based on learner needs      |
| To ensure sustainability and continuous improvement of the e-book                          | Collaborative revision and enhancement of the interactive e-book based on classroom experiences                   | TLE teachers, researchers                        | End of the school year             | Contextualized and improved interactive e-books aligned with learner skill levels  |

### CONCLUSION

Based on the findings presented in the study, the following conclusions were made.

1. The use of an Interactive E-Book in Grade 7 Technology and Livelihood Education (TLE) has a positive and meaningful influence on students' academic achievement. Rather than merely improving test scores, the findings suggest that interactive digital learning materials can enhance how students engage with and process TLE content. The integration of multimedia elements, guided tasks, and immediate feedback appears to support deeper understanding by making abstract or procedural concepts more concrete and accessible.
2. Blended instruction using an interactive e-book enhances learning in Technology and Livelihood Education (TLE) by promoting deeper understanding and more consistent student performance. The integration of digital and traditional instructional materials provides effective
3. learning support, particularly for students who struggle with conventional teaching methods. Overall, interactive e-books function as valuable instructional tools that contribute to improved comprehension, engagement, and inclusive learning outcomes in TLE.
4. Integrating interactive e-books into TLE instruction enhances student engagement and understanding, leading to better learning outcomes. The results highlight the value of combining digital tools with

traditional teaching to support active, learner-centered instruction and improve classroom practice in TLE.

5. Interactive e-books in TLE are most effective when learners have adequate foundational skills and receive proper teacher guidance. Challenges related to literacy, navigation, device access, and distractions highlight the need for clear instructions, simple design, and thoughtful integration of technology in teaching. Despite these issues, improved academic performance suggests that interactive e-books can enhance TLE learning when supported by responsive teaching practices and learner-centered design.
6. The proposed outputs and activities of this research aim to support both learners and teachers in fully utilizing the Interactive E-book to ensure continuous and uninterrupted learning in TLE 7.

## RECOMMENDATIONS

From the conclusions derived from the findings, the following recommendations are suggested:

1. The learners should actively engage with the interactive e-book and complete all guided tasks to enhance understanding of TLE concepts.
2. The teachers must provide clear guidance and support when using the interactive e-book to ensure all students can navigate and learn effectively.
3. To the school, the proposed plan may be used to ensure students have reliable access to devices and technology to fully benefit from interactive e-books in TLE.
4. To the future researchers, investigate strategies to overcome challenges in digital learning, such as literacy gaps and device access, to optimize interactive e-book effectiveness.

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