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The Efficacy of Interactive Digital Learning Modules In Mastering Basic Word Processing Skills

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Abstract

This study determined the efficacy of an Interactive Digital Learning Module (IDLM) in mastering basic word processing skills among Grade 8 learners at Butuan City School of Arts and Trades. It focused on the design and development of the module, expert evaluation, learners' pretest and posttest performance, significant difference between pretest and posttest scores, learners' appreciation, and possible enhancements. The study involved 37 Grade 8 learners and 5 experts. The module was developed through the ADDIE model. Data were gathered using an expert evaluation checklist, pretest and posttest, and a learners' appreciation questionnaire. The findings showed that the module was Highly Acceptable in content quality, instructional quality, and technical quality. Learners' performance improved from a pretest mean of 18.38 to a posttest mean of 25.38, with a mean difference of 7.00. The paired-samples t-test yielded a t-value of 10.23 and a p-value of < .001, indicating a significant difference between the pretest and posttest performances. Learners positively appreciated the module, with weighted means ranging from 4.26 to 4.53. Enjoyment and Engagement obtained the highest weighted mean of 4.53, interpreted as Very Effective. The module may be enhanced by improving its visual presentation, screen layout, navigation features, guided practice, and interactive activities. The study concluded that the IDLM was a highly acceptable and effective learning resource for improving learners' basic word processing skills.

Keywords: Basic Word Processing Skills, ICT Education, Interactive Digital Learning Module

Introduction

Digital learning is reshaping education by improving how students access information and how teachers deliver instruction. Research shows that well-designed digital tools, such as interactive learning modules, can increase student engagement and improve learning outcomes when effectively integrated into teaching. Studies from organizations like UNICEF (2022) and OECD (2023) highlight the importance of digital learning resources in supporting effective instruction and preparing students for a digital future. Furthermore, research by Tarigan et al. (2023) demonstrated that interactive digital modules significantly improve students' academic performance and memory retention compared to traditional learning methods.

This global shift is also reflected in the Philippine education system, where schools are gradually adopting digital resources as part of the Department of Education's MATATAG Curriculum. This curriculum emphasizes the development of foundational competencies and digital readiness, recognizing that technology-enhanced learning environments can support more effective instruction and flexible learning pathways. In line with this direction, digital tools are increasingly used to help students develop essential computer process skills, particularly in basic word processing.

These skills include creating and saving documents, editing text, applying formatting, using keyboard shortcuts, inserting elements, and organizing document layouts. Mastery of these process skills is important for students to perform academic tasks efficiently in a digital learning environment. Among the most promising innovations are interactive digital learning modules, which provide consistent, structured, and self-paced instruction. These tools can support learners in mastering fundamental word processing skills while allowing teachers to deliver more engaging and accessible lessons, particularly in diverse or large classroom settings.

However, despite the growing momentum toward digital learning, several persistent issues continue to undermine equitable access and effective skill development. Many schools, particularly in rural and underserved areas, struggle with limited internet connectivity, insufficient access to digital devices, and inadequate teacher preparedness for technology integration. These challenges restrict students' opportunities to practice and develop essential computer process skills, including basic word processing tasks such as creating, editing, formatting, and managing documents.

In the Philippine education context, research has shown that structural barriers—such as unreliable broadband, limited ICT infrastructure, and uneven professional development for teachers—hinder the effective implementation of technology-based instruction (Espinosa et al., 2025; Villaseñor, 2024). As a result, many learners experience difficulty mastering fundamental word processing skills that are necessary for academic tasks and digital literacy in modern learning environments.

At Butuan City School of Arts and Trades (BCSAT), Grade 8 ICT classes were conducted twice a week, which limits students' time for practice and reinforcement of computer skills. In learning basic word processing using Microsoft Word, students are expected to develop competencies such as identifying the elements of the Word interface, following the steps in creating a document, applying keyboard shortcuts, using different font styles, and applying text effects. However, because lessons often progress quickly and students demonstrate varying levels of digital literacy, it becomes difficult for the class to move at a uniform pace. As a result, some learners demonstrate low performance and difficulty in mastering these basic word processing skills during hands-on activities.

This gap in skill mastery indicates that several students require additional support and more opportunities for guided and independent practice. Furthermore, the limited availability of structured and self-paced digital learning materials reduces students' opportunities to revisit lessons and practice these competencies independently.

This situation highlighted the need for an instructional approach that provides structure, clarity, and flexibility in learning. Interactive digital learning modules present a practical solution by allowing students to review lessons, learn independently, and progress at their own pace. Through these modules, learners can repeatedly practice essential word processing competencies such as identifying the elements of Microsoft Word, following the steps in creating a document, applying keyboard shortcuts, using font styles, and applying text effects. These presumptions served as the rationale for conducting this research, which was driven not only by professional interest but also by the desire to help students improve their performance and confidence in ICT lessons. This study investigated the efficacy of interactive digital learning modules in helping Grade 8 students master basic word processing skills. Specifically, it sought to determine whether the use of these

modules leads to measurable improvements in students' performance by comparing their pre-test and post-test scores.

Review Studies

In this section, the researcher presents the different themes of the study. Here, the researcher effectively highlights various proponents of research who contribute to the development of the study.

The design and development of Interactive Digital Learning Modules (IDLMs) are grounded in well-established instructional design principles and cognitive learning theories. It has consistently demonstrated that the thoughtful application of these frameworks enhances both learner engagement and knowledge retention. According to Keshavarz et.al. (2022), they examined the extent to which university instructors apply Mayer's Cognitive Theory of Multimedia Learning (CTML) principles in electronic course design.

Through comparative content analysis of e-courses, the researchers found inconsistent implementation of multimedia principles, with many instructors overloading learners through redundant text, excessive visuals, and poorly organized content. The findings highlight a persistent gap between theoretical multimedia design principles and practical application in higher education. The study reinforces the importance of minimizing extraneous cognitive load and structuring instructional materials into meaningful chunks to enhance learner engagement, comprehension, and knowledge integration.

It also underscores the need for professional development programs to equip instructors with evidence-based multimedia design skills. In a more recent synthesis, Mayer (2024) revisited the Cognitive Theory of Multimedia Learning (CTML), emphasizing that learning improves when instructional design incorporates selection, organization, and integration of coordinated visual and verbal materials. Surbakti et al. (2024) extend Cognitive Load Theory to contemporary digital classrooms, arguing that poorly integrated multimedia elements significantly increase extraneous cognitive load and impair learning outcomes. Drawing on Sweller's framework, the authors emphasize that multimedia should not be added for aesthetic appeal but must be cognitively aligned to reduce split attention, redundancy, and unnecessary mental effort.

They highlight that excessive visuals, redundant text-narration combinations, and complex interface designs can overwhelm working memory, leading to cognitive fatigue and superficial processing. In contrast, well-structured visuals and interactivity optimize mental effort and comprehension. Integrating Mayer's CTML with Sweller's Cognitive Load Theory (CLT) forms a dual framework for digital learning design that maximizes efficiency and learner satisfaction. Together, these theories highlight the importance of balancing cognitive demand with multimedia richness to enhance comprehension.

Empirical studies affirm that CTML-based design strategies are essential for multimedia learning. For example, Wan Ali (2022) explores the intersection of Mayer's Cognitive Theory of Multimedia Learning (CTML) and Computational Thinking (CT) to address cognitive overload among young digital learners. The study proposes that integrating CT principles—such as decomposition, abstraction, pattern recognition, and algorithmic thinking—into multimedia instructional design can help structure information more systematically, thereby reducing extraneous cognitive load and enhancing analytical reasoning and engagement. Similarly, Mao et al. (2025) investigate how digital mathematics textbooks can be redesigned using Cognitive Load Theory (CLT) to optimize intrinsic, extraneous, and germane cognitive load.

Using a mixed-methods approach, the study identifies structural and interface-related weaknesses in existing digital textbooks and proposes a CLT-driven optimization framework. Their empirical findings demonstrate that segmenting complex mathematical concepts, improving interface coherence, and integrating adaptive interactive feedback significantly enhanced retention and conceptual mastery while reducing perceived cognitive load.

Further advancing these concepts, Twabu (2025) investigated the integration of Artificial Intelligence with Cognitive Load Theory (CLT) and Mayer's Cognitive Theory of Multimedia Learning (CTML) to create

dynamically personalized instructional systems. Unlike traditional static multimedia environments, the AI-enhanced platform monitored learner performance in real time and adjusted task difficulty, pacing, and feedback accordingly. By regulating intrinsic load through adaptive complexity and minimizing extraneous load via tailored scaffolding, the system reduced cognitive fatigue while maintaining optimal challenge levels. The findings suggest that AI-driven personalization sustains engagement and supports schema construction by balancing support and difficulty dynamically.

This study advances cognitive load research by demonstrating that intelligent adaptive systems can operationalize multimedia design principles in real time, offering a scalable solution to individual differences in working memory capacity and prior knowledge. Staneviciene and Žekienė (2025) examined the impact of multimedia instruction incorporating Mayer's signaling and coherence principles in higher education settings.

Their findings indicate that instructional materials designed to highlight essential information and eliminate extraneous elements significantly improved students' satisfaction and transfer of learning. By directing attention through signaling cues and minimizing unnecessary cognitive distractions, learners were able to allocate working memory resources more efficiently toward schema construction. The results demonstrated that students exposed to optimized multimedia design not only reported greater clarity and engagement but also performed better on transfer tasks requiring higher-order application of knowledge. These findings reinforce Cognitive Load Theory by confirming that reducing extraneous cognitive load enhances both affective and cognitive outcomes in university-level instruction.

The practical implications of these theories are particularly relevant in ICT education, where students must master complex procedural knowledge. Applying CTML and CLT principles in module design allows lessons to be divided into short, interactive simulations—for instance, applying fonts and text effects in MS Word —each followed by guided practice and visual feedback. This modular approach aligns with learners' cognitive capacity, minimizing overload while promoting self-paced, exploratory learning that strengthens ICT competency.

In designing IDLMs, the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) provides a systematic framework that ensures pedagogical soundness and continuous improvement. As emphasized by Rahmah and Kurniawan (2025), the importance of embedding formative evaluation within each phase of the ADDIE instructional design model is highlighted to ensure cognitively effective digital module development. Rather than treating evaluation as a final step, their study advocates iterative refinement based on learner performance data and feedback. This continuous process enables developers to adjust content sequencing, reduce extraneous cognitive load, and align multimedia elements with established design principles such as coherence, segmentation, and signaling.

By integrating formative assessment throughout analysis, design, and development stages, instructional materials become more learner-centered and theoretically grounded in Cognitive Load Theory and multimedia learning research. The iterative nature of ADDIE thus supports sustained alignment between objectives, instructional strategies, and cognitive architecture, resulting in digital modules that enhance engagement, clarity, and learning effectiveness.

Overall, the reviewed literature highlights that the effectiveness of Interactive Digital Learning Modules lies in aligning multimedia integration with cognitive learning theories. By embedding Mayer's CTML and Sweller's CLT principles—supported by the ADDIE instructional design model—educators and designers can create learning environments that are visually engaging, cognitively efficient, and pedagogically sound. These insights are crucial in developing ICT learning modules that promote learner autonomy, comprehension, and digital literacy. Guided by these theoretical and empirical perspectives, the present study applies these principles to design and evaluate interactive modules for improving Grade 8 students' performance in Microsoft Word at BCSAT.

The evaluation of the Interactive Digital Learning Module (IDLM) is vital to ensuring its pedagogical effectiveness, usability, and sustainability. A well-designed module must undergo systematic evaluation to guarantee that it meets both instructional objectives and technological standards. Modern research emphasizes that the quality of a digital learning module should be assessed across three interrelated dimensions—content quality, instructional quality, and technical quality—which together determine how effectively a module supports meaningful learning. Evaluating these aspects allows educators and developers to refine their modules iteratively, ensuring that the material is accurate, engaging, and accessible to all learners.

Content quality is a fundamental component of effective digital learning, ensuring that instructional materials are accurate, aligned with curriculum standards, and structured to facilitate understanding. Recent research supports the importance of well-designed content in digital modules. For instance, Martin, Sun, and Westine (2021) found that clearly organized and objective-aligned online instructional materials significantly improved student satisfaction and perceived learning achievement. Their study emphasized that when content is logically sequenced and directly aligned with learning goals, learners demonstrate higher engagement and better academic performance. This suggests that alignment and clarity are essential indicators of content quality.

Similarly, Mutlu-Bayraktar et. al. (2021) examined the effects of structured digital materials on cognitive processing and reported that modules designed with minimized redundancy and precise segmentation significantly reduced cognitive overload. Their findings indicate that content must not only be accurate but also cognitively manageable to enhance comprehension. This reinforces the importance of organizing digital materials to support learners' working memory capacity.

Furthermore, Al Mamun et.al. (2022) found that content validity and curriculum alignment positively influence learner trust and motivation in digital learning environments. Their study demonstrated that when instructional materials are reviewed and validated by experts, students perceive the content as more reliable and are more motivated to engage with it. This highlights the role of expert validation as a key element of content quality evaluation.

Taken together, these studies demonstrated that content quality in digital modules depends on alignment with objectives, cognitive appropriateness, and expert validation. These elements collectively enhance learner engagement, comprehension, and overall learning outcomes, thereby justifying the inclusion of content quality as a primary criterion in evaluating the effectiveness of the developed instructional module.

Instructional quality is a critical component of effective digital learning, as it determines how well instructional strategies, activities, and assessments facilitate meaningful learning. Unlike content quality, which focuses on what is taught, instructional quality emphasizes how the content is delivered to promote understanding, engagement, and skill development.

Recent research highlights the importance of structured guidance, active learning strategies, and alignment between instruction and assessment. For instance, Martin et.al. (2022) found that high-quality online instruction is characterized by clear directions, structured learning activities, timely feedback, and interactive elements that actively engage learners. Their study revealed that instructional clarity and well-designed learning activities significantly improved student performance and satisfaction in digital environments. Similarly, Hodges et al. (2021) emphasized that effective digital instruction must incorporate scaffolding strategies, guided practice, and formative assessments to support learner progression. Their findings suggested that structured instructional support enhances comprehension and reduces learner confusion, particularly in technology-based settings.

Furthermore, Kintu et.al. (2021) reported that instructional design elements such as precise task sequencing, interactive engagement, and feedback mechanisms significantly predict improved academic achievement in blended learning environments. The study concluded that well-structured instructional

strategies foster deeper cognitive processing and sustained learner motivation. Collectively, these studies indicate that instructional quality in digital modules depends on clarity of instruction, structured learning activities, interactive engagement, scaffolding, and timely feedback. These elements ensure that learners not only access accurate content but also develop the skills and understanding necessary to achieve the intended learning outcomes, thereby justifying instructional quality as a key evaluation criterion for the developed digital module.

Technical quality is a crucial component in evaluating digital learning modules, as it determines the functionality, reliability, accessibility, and overall performance of the instructional system. Technical quality refers to the smooth operation of multimedia elements, device compatibility, loading speed, navigational stability, and the absence of technical errors that may disrupt learning. When digital materials function properly, learners can focus on the instructional content without distraction or frustration.

Recent studies emphasized that technical reliability significantly influences learner engagement and satisfaction. For instance, Bond et.al. (2021) found that technical functionality and platform stability are strong predictors of student engagement in digital learning environments. Their study revealed that system crashes, slow loading times, and poor navigation negatively affect learner motivation and cognitive focus. Similarly, Martin et.al. (2021) reported that students' perception of course quality is strongly influenced by the usability and technical performance of digital platforms. They noted that technical clarity, intuitive navigation, and seamless multimedia integration enhance the overall learning experience.

Furthermore, Rasheed et.al. (2021) identified technological barriers, including system errors, poor interface design, and a lack of technical support, as major factors hindering effective online learning. Their findings suggest that technical quality directly impacts learners' ability to access content efficiently and complete instructional tasks successfully. Collectively, these studies indicate that technical quality is not merely a supportive feature but a foundational requirement for effective digital learning. A module that is technically stable, accessible, and user-friendly ensures uninterrupted instruction, reduces learner frustration, and supports optimal cognitive engagement, thereby justifying its inclusion as a key evaluation criterion for the developed digital module.

Overall, the reviewed studies underscored that the comprehensive evaluation of interactive digital learning modules must address the synergy among content, instructional, and technical quality. High-quality content ensures accuracy and curriculum alignment; instructional quality promotes cognitive engagement and active learning; and technical quality guarantees smooth, inclusive access for all users. When these three dimensions are carefully evaluated and refined through expert feedback, digital modules achieve both pedagogical soundness and technological excellence. For the present study, these evaluation principles provided the framework for assessing the interactive ICT learning module for Grade 8 students at BCSAT, ensuring that it is accurate in content, pedagogically structured, and technically accessible. By applying these globally recognized criteria, the developed module will support learners in mastering ICT skills, particularly in Microsoft Word, while fostering digital literacy and independent learning habits.

The integration of Interactive Digital Learning Modules (IDLMs) into classrooms has significantly reshaped how students acquire and apply Information and Communication Technology (ICT) skills. Studies indicate that the use of digital technologies in education can enhance students' attention, engagement, and learning performance by providing more flexible and interactive learning environments (Timotheou et al., 2022). Interactive, learner-centered digital modules also promote active participation and self-paced learning, which help students better understand concepts and develop essential digital competencies. Research further shows that interactive digital learning modules can improve students' learning outcomes, engagement, and autonomy by encouraging independent exploration and structured practice (Tarigan et.al.2021; Wijaya & Vidianti 2020). These digital modules provided structured interactivity that supports skill acquisition and fosters higher-order thinking, which are important components of ICT competence.

In an international study, Susilowati et.al. (2025) examined the impact of LMS-based interactive electronic modules on ICT literacy and problem-solving performance among Indonesian secondary students. Using a quasi-experimental design grounded in the European Dig Comp framework, the study revealed that students exposed to interactive e-modules achieved significantly higher digital literacy gains (N-gain = 0.71) compared to those using traditional materials (N-gain = 0.13). Improvements were observed across all five dimensions of digital competence, including information literacy, collaboration, digital content creation, safety, and problem-solving.

The integration of structured digital interactivity and immediate feedback mechanisms enhanced learners' cognitive engagement, motivation, and independence in completing tasks. These findings underscored the role of technology-based learning in fostering analytical thinking and strengthening ICT competence, reinforcing the importance of interactive digital modules in contemporary secondary education—similarly, et. Al. (2025) conducted a systematic literature review in Indonesia analyzing the effects of digital learning technology on educational quality, motivation, and ICT competence across 37 peer-reviewed studies. Their synthesis indicated that integrating digital learning modules consistently enhanced students' technical proficiency and problem-solving abilities, while also improving collaboration and critical thinking.

The authors noted that interactive designs—particularly those embedding simulations, guided feedback, and multimedia explanations—produced higher learning gains than passive e-learning formats. Their findings align with the Cognitive Theory of Multimedia Learning (Mayer, 2024), which posits that well-designed multimedia resources enhance comprehension by engaging active processing of both verbal and visual elements.

In the Philippine context, Natividad and Jhon (2024) examined ICT integration in the Schools Division of Batac City and its influence on student performance and digital literacy. The study revealed that the use of interactive e-learning systems significantly enhanced students' critical thinking, autonomy, and ICT proficiency. Learners who engaged with digital modules showed greater initiative in managing tasks and demonstrated improved outcomes in both theoretical and practical ICT assessments. Natividad and Jhon emphasized that student-centered digital environments, supported by structured feedback and multimedia learning activities, enable sustained improvement even in schools with limited physical resources. Their results confirmed that effective digital integration contributes not only to higher ICT performance but also to the development of essential 21st-century skills.

These three studies collectively highlight that interactive digital learning modules enhance ICT performance through active engagement, multimodal content delivery, and autonomous learning pathways. The consistent positive outcomes across contexts demonstrate that interactivity, immediate feedback, and cognitive scaffolding drive both conceptual understanding and skill mastery in ICT subjects. For the present study, these findings validate the development and implementation of an interactive digital learning module tailored to Grade 8 students at Butuan City School of Arts and Trades, aiming to improve performance in Microsoft Word through structured, interactive, and self-paced instruction.

Student motivation and appreciation are essential determinants of success in digital learning environments, particularly when Interactive Digital Learning Modules (IDLM) are used to deliver instruction. Studies consistently highlight that learner engagement, satisfaction, and motivation are strongly influenced by how digital modules are designed and implemented. Interactive, user-friendly, and adaptive modules not only enhance students' academic performance but also nurture positive attitudes toward technology-based learning. This aligns with Self-Determination Theory (Deci & Ryan, 2023), which posits that intrinsic motivation is driven by three psychological needs—autonomy, competence, and relatedness. Well-designed digital modules meet these needs by allowing learners to control their learning pace (autonomy), offering immediate feedback that reinforces mastery (competence), and facilitating collaborative activities that

promote connection (relatedness). Thus, effective digital design fosters both cognitive engagement and emotional investment in learning.

In a recent study, Staneviciene and Žekienė (2025) conducted a systematic review of multimedia integration in higher education, analyzing 48 empirical studies across multiple academic databases. Their findings indicated that multimedia environments incorporating 3D visualizations, augmented reality, and interactive features significantly enhance student motivation, satisfaction, and learning outcomes. The authors explain that such immersive environments promote sensory engagement, stimulate curiosity, and render abstract concepts more tangible, thereby increasing students' appreciation for digital learning.

However, the review emphasizes that multimedia effectiveness depends on alignment with pedagogical strategies and cognitive design principles. When interactivity is thoughtfully integrated with coherence and signaling principles, digital modules not only improve engagement but also foster higher-order thinking, digital literacy, and independent learning skills. These findings reinforce the importance of merging interactivity with sound cognitive design to maximize motivational and educational impact in higher education.

Similarly, Pham (2025) examined the motivational impact of digital learning platforms among university students, integrating emotional and technological acceptance perspectives. The study revealed that interactive e-learning modules enhance both intrinsic and extrinsic motivation by fostering autonomy, adaptability, and immediate feedback. Students expressed strong appreciation for the flexibility and self-paced structure of digital modules, which enabled independent time management while reinforcing competence through real-time performance feedback. The findings further indicated that well-structured digital environments reduce learning anxiety and strengthen self-efficacy, thereby sustaining engagement and continuance intention. Pham concluded that autonomy, interactivity, and adaptive feedback mechanisms are critical design elements that support motivational persistence in digital learning contexts.

In addition, Errabo and Ongoco (2024) examined the influence of interactive mobile learning modules on student engagement and understanding in Philippine secondary schools. Their findings revealed that multimedia-enriched modules incorporating videos, simulations, and interactive tasks significantly increased learners' interest, participation, and appreciation for technology-mediated instruction. Students demonstrated heightened engagement and improved conceptual understanding when exposed to interactive digital materials. However, the authors emphasized that sustained motivation depends not only on engaging instructional design but also on equitable access to digital devices, reliable internet connectivity, and adequate ICT literacy skills.

These results highlight the importance of addressing contextual challenges such as the digital divide to ensure consistent motivational and educational benefits across diverse learning environments. Similarly, Bacomo et.al. (2022) found a strong positive correlation between learners' motivation toward self-learning modules and academic achievement, underscoring the critical role of positive attitudes toward technology-mediated instruction in influencing learning outcomes. Their findings indicated that Filipino students demonstrated strong appreciation for interactive, visually engaging, and contextually relevant digital modules, particularly those that support self-paced learning.

However, the study also acknowledged persistent disparities in digital access and ICT readiness, which may moderate the consistency of motivational and performance outcomes. These results affirm that while Filipino learners respond positively to multimedia-enriched modular instruction, equitable access and digital preparedness remain essential for maximizing instructional effectiveness.

Collectively, these studies affirmed that interactive digital learning modules enhance both students' appreciation and motivation by addressing cognitive, emotional, and behavioral aspects of learning. The use of multimedia interactivity, gamification, and feedback mechanisms fosters intrinsic motivation and sustained engagement, while flexible learning environments support autonomy and self-regulation. The integration of

Self-Determination Theory (Deci & Ryan, 2023) with Mayer's Cognitive Theory of Multimedia Learning (CTML) and Sweller's Cognitive Load Theory (CLT) provides a holistic framework that explains how digital module design promotes deeper learning and learner satisfaction. For the present study, these insights reinforce the importance of mastering an interactive digital learning module in ICT education that not only enhances academic performance but also cultivates motivation and appreciation among Grade 8 students at Butuan City School of Arts and Trades.

Theoretical/Conceptual Framework

This study was anchored on the Cognitive Theory of Multimedia Learning (CTML) developed by Richard E. Mayer (2009). This theory explains how learners process and understand information presented through multimedia formats such as text, images, audio, and animations. According to Mayer, learning becomes more effective when instructional materials combine verbal and visual information in ways that support the learner's cognitive processes. The theory is based on three key assumptions: the dual-channel assumption, which states that learners process visual and verbal information through separate channels; the limited capacity assumption, which suggests that each channel can process only a limited amount of information at one time; and the active processing assumption, which proposes that meaningful learning occurs when learners actively select, organize, and integrate information.

Interactive digital learning modules utilize multimedia elements such as text, images, and animations to present lessons in a more engaging and understandable way. When these elements are carefully designed, they can support students in processing information more effectively while preventing cognitive overload. Mayer (2009) also emphasized several multimedia design principles that enhance learning, including the coherence principle, which recommends removing unnecessary information that may distract learners; the signaling principle, which highlights essential information to guide learners' attention; and the segmenting principle, which presents lessons in smaller, manageable sections so learners can process information at their own pace.

Applying these principles in the design of interactive digital learning modules helped students focus on essential concepts and better understand ICT lessons. In the context of this study, these modules supported the Grade 8 students in mastering basic word processing skills such as identifying the elements of Microsoft Word, creating documents, applying keyboard shortcuts, using font styles, and applying text effects. By presenting information through structured multimedia content and allowing learners to review lessons independently, the modules improved the students' comprehension and performance in basic word processing tasks.

The Cognitive Theory of Multimedia Learning provided the theoretical foundation for using interactive digital learning modules in this study. By combining visual and verbal elements following multimedia design principles, these modules can enhance students' understanding and retention of ICT concepts. In this research, the interactive digital learning modules served as the instructional intervention, while students' mastery of basic word processing skills was expected learning outcome. Guided by Mayer's theory, well-designed multimedia instruction improved the students' competencies and performance in basic Microsoft Word tasks.

This study was also supported by John Sweller's Cognitive Load Theory (CLT) (1988), which explains how the human mind processes and retains information during learning. The theory emphasizes that learning becomes more effective when instructional materials are designed in a way that does not overwhelm the learner's working memory. Working memory has a limited capacity to process information at a given time. When too much information is presented simultaneously, learners may experience cognitive overload, which can hinder comprehension and learning.

Cognitive Load Theory further explains that learning involves the interaction between working memory and long-term memory. Working memory temporarily processes new information, while long-term memory stores knowledge and skills that can be retrieved later. For learning to occur effectively, instructional materials must be organized in a way that helps learners process information gradually and meaningfully. When information is presented in a clear and structured manner, students are more likely to understand concepts and store them in long-term memory.

According to Sweller, cognitive load can be categorized into three types: intrinsic load, extraneous load, and germane load. Intrinsic load refers to the complexity of the learning material itself, extraneous load refers to the unnecessary mental effort caused by poorly designed instructional materials, and germane load refers to the mental effort that contributes to meaningful learning. Effective instructional design aims to reduce extraneous cognitive load while supporting germane cognitive load so that learners can focus on understanding essential concepts.

In the context of this study, the design of the interactive digital learning modules was guided by the principles of Cognitive Load Theory. The learning of basic word processing skills involved several procedural steps, which could create intrinsic cognitive load for learners. By presenting these skills in structured and segmented digital modules, the instructional design helped students manage the complexity of the tasks and process information more effectively. The modules presented lessons in organized and manageable steps, provided guided examples, and allowed students to learn at their own pace. By reducing unnecessary cognitive load and presenting information clearly, the modules helped Grade 8 students better understand and practice basic word processing skills such as identifying the elements of Microsoft Word, creating documents, applying keyboard shortcuts, using font styles, and applying text effects.

The ADDIE Model of Instructional Design also guides this study; it is a systematic framework widely used in the development of instructional materials and learning programs. The ADDIE model consists of five major phases: Analysis, Design, Development, Implementation, and Evaluation. It provided a structured approach to creating effective instructional resources by ensuring that learning objectives, instructional strategies, and assessment methods are carefully planned and aligned with learners' needs. The model has been widely adopted in educational settings because it promotes organized, learner-centered, and goal-oriented instructional development.

The Analysis phase focused on identifying learners' needs, learning gaps, and instructional goals. This stage involved examining the learners' current level of knowledge and determining the skills that needed to be developed. The Design phase involved planning the instructional structure, including learning objectives, lesson organization, learning activities, and assessment strategies. During this stage, educators determined how the content would be presented to facilitate effective learning.

The Development phase involved creating and assembling the instructional materials based on the design plan. Learning resources, multimedia elements, and instructional activities were produced during this stage. The Implementation phase referred to the delivery of the instructional materials to the learners, allowing them to engage with the learning resources and participate in the planned activities. Finally, the Evaluation phase focused on assessing the effectiveness of the instructional materials and determining whether the learning objectives had been achieved.

As an instructional design framework, the ADDIE model supported the systematic development of effective learning materials that were aligned with learners' needs and instructional goals. By following this structured process, educators were able to design learning resources that promoted clarity, organization, and meaningful learning experiences.

Taken together, Mayer's Cognitive Theory of Multimedia Learning, Sweller's Cognitive Load Theory, and the ADDIE instructional design model provided the theoretical foundation of this study. These perspectives explained how well-designed instructional materials could improve learning by presenting

information clearly, combining visual and verbal elements, and reducing unnecessary cognitive load. In addition, the ADDIE model provided a systematic process for developing and implementing instructional materials that addressed learners' needs. Guided by these theoretical foundations, the conceptual framework of this study illustrated that interactive digital learning modules could enhance Grade 8 students' mastery of basic word processing skills.

This study was guided by the ADDIE Instructional Design Model, which consisted of five phases: Analysis, Design, Development, Implementation, and Evaluation. The model provided a systematic process for developing and implementing the interactive digital learning modules used in this study. Evaluation served as a continuous component throughout the process to ensure that the instructional materials were effective and aligned with the learning objectives.

The process began with the Analysis phase, where the learning needs of Grade 8 students were examined. In this stage, the researcher identified students' difficulties in basic Microsoft Word competencies, including identifying elements of the graphical user interface, creating a new blank document, applying keyboard shortcuts, and applying fonts and text effects. This phase also considered students' prior knowledge and current skill levels to determine the learning gaps that the instructional modules would address.

The results of the analysis guided the Design phase, where the learning objectives, instructional strategies, module structure, multimedia components, and assessment tools were carefully planned. During this phase, the design of the interactive digital modules was guided by principles from Mayer's Cognitive Theory of Multimedia Learning and Sweller's Cognitive Load Theory to ensure that the instructional materials were clear, organized, and supportive of effective learning.

In the Development phase, the planned instructional materials were produced and organized into interactive digital learning modules. The modules included multimedia presentations, guided demonstrations, and practice activities designed to help students understand and perform basic word processing tasks.

The Implementation phase involved using the developed modules with Grade 8 ICT students during classroom instruction. Students interacted with the modules while performing structured learning activities intended to improve their mastery of Microsoft Word competencies.

Finally, the Evaluation phase assessed the effectiveness of the modules. Expert validation, student feedback, and the comparison of students' pre-test and post-test results were used to determine whether the modules successfully improved students' mastery of basic word processing skills. The results of this phase also guided revisions and improvements to the instructional materials. Figure 1 illustrates the research paradigm of the study.

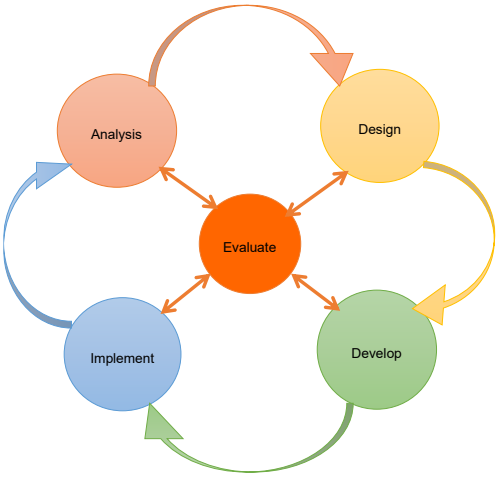

Figure 1. *Research Paradigm of the Study Showing the ADDIE Instructional Design Model*

Objectives of the Study

This study sought to determine the following objectives: (1) design and develop an interactive digital learning module for mastering the basic word processing skills of Grade 8 learners at Butuan City School of Arts and Trades; (2) evaluate the developed interactive digital learning module in terms of content quality, instructional quality, and technical quality; (3) determine whether there is a significant difference between the pre-test and post-test performance of Grade 8 learners; (4) determine whether there is a significant difference in the gain scores of the learners; (5) determine the extent to which Grade 8 learners appreciate the interactive digital learning module; and (6) enhance the developed interactive digital learning module based on the findings of the study.

Methodology

The study utilized a descriptive–evaluative research design employing a one-group pretest–posttest approach to determine the efficacy of the Interactive Digital Learning Module (IDLM) in mastering basic word processing skills among 37 Grade 8 learners at Butuan City School of Arts and Trades during School Year 2026–2027. Data were gathered using a 30-item pretest and posttest, an expert evaluation checklist assessing content, instructional, and technical quality, and a student appreciation questionnaire measuring the module's usefulness, ease of use, clarity, and enjoyment. The instruments underwent expert validation and reliability testing prior to implementation. Data were analyzed using frequency, percentage, mean, standard deviation, and paired-samples t-test to describe learner performance, expert evaluation, student appreciation, and significant improvement from pretest to posttest. The findings served as the basis for enhancing the developed IDLM.

Results and Discussion

Problem 1. How may an Interactive Digital Learning Module be designed and developed to facilitate the mastery of basic word processing skills among Grade 8 learners?

The Interactive Digital Learning Module was designed and developed to help Grade 8 learners master basic word processing skills. The development was guided by the identified learning competencies and the criteria used in evaluating the module, particularly content quality, instructional quality, and technical quality. The need for the module was also based on the learners' need for additional opportunities to practice basic word processing skills, especially when classroom time was limited. Thus, the module was designed to provide learners with accessible and structured materials that they could review and practice at their own pace.

In terms of content quality, the lessons were organized according to the identified competencies and presented basic word processing concepts and skills in a clear and logical sequence. The content included relevant examples and activities intended to help learners understand and apply the skills. In terms of instructional quality, the module included clearly stated objectives, guided activities, interactive exercises, practical tasks, and feedback to give learners opportunities to practice and reinforce what they had learned. These features were intended to make learning more active and engaging rather than relying only on teacher-led discussion.

In terms of technical quality, the module incorporated appropriate images, colors, multimedia elements, navigation buttons, and interactive features to make the lessons easier to follow and more engaging. The design also considered the learners' ability to navigate the module independently. The module was developed through a systematic process of planning, designing, developing, implementing, and evaluating the

learning material. Feedback and observations gathered during the development and use of the module were considered in refining its content, instructional activities, and technical features.

Overall, the module was developed to provide Grade 8 learners with a practical, interactive, and self-paced learning resource for mastering basic word processing skills. It was designed to support learners' understanding, practice, and independent application of essential word processing skills.

The design of the Interactive Digital Learning Module was consistent with the principles of the Cognitive Theory of Multimedia Learning (CTML), which emphasizes the appropriate integration of words and visuals to support learners' understanding. The use of guided activities, multimedia elements, and interactive features in the module provided opportunities for learners to actively engage with the learning content. Mayer (2009) also emphasized several multimedia design principles that enhance learning, including the coherence principle, which recommends removing unnecessary information that may distract learners; the signaling principle, which highlights essential information to guide learners' attention; and the segmenting principle, which presents lessons in smaller, manageable sections so learners can process information at their own pace.

These principles were reflected in the development of the module through its organized presentation of content, purposeful use of multimedia elements, guided activities, and self-paced learning features. Thus, the application of these principles supported the development of a structured and meaningful digital learning resource intended to help learners understand, practice, and master basic word processing skills (Mayer, 2009).

Problem 2. How do experts evaluate the developed Interactive Digital Learning Module in terms of content quality, instructional quality, and technical quality?

The developed Interactive Digital Learning Module was evaluated by experts in terms of content quality, instructional quality, and technical quality. These criteria were used to determine the appropriateness, instructional value, and functionality of the module for the intended Grade 8 learners. The results of the expert evaluation are presented in Tables 1, 2, and 3.

Table 1 presents the experts' evaluation of the Interactive Digital Learning Module in terms of content quality. The results showed that all six criteria obtained a weighted mean of 4.00, interpreted as Highly Acceptable. Since all criteria received the same rating, there was no highest or lowest indicator. This consistent rating indicates that the experts found the content aligned with the DepEd Learning Competencies, accurate, up-to-date, logically organized, and appropriate for the intended learners.

Table 1. *Experts' Evaluation of the digital learning module in terms of Content Quality*

Criteria	*Wtd Mean*	*Descriptive Rating*
1. Content is consistent with topics/skills found in the DEPED Learning Competencies for the subject and grade/year level it was intended for.	4.00	Highly acceptable
2. Concepts developed contribute to enrichment, reinforcement, or mastery of the identified learning objectives.	4.00	Highly acceptable
3. Content is accurate.	4.00	Highly acceptable
4. Content is up-to-date.	4.00	Highly acceptable
5. Content is logically developed and organized.	4.00	Highly acceptable

6. Content is free from cultural, gender, racial, or ethnic bias.	4.00	Highly acceptable
Overall Weighted mean	4.00	Highly acceptable

The overall weighted mean of 4.00, interpreted as Highly Acceptable, indicates that the content adequately addressed the identified learning objectives and basic word processing competencies.

This finding is consistent with Martin et al.'s statement (2021), which emphasized that clearly organized and objective-aligned digital instructional materials contribute to o positive learning experiences. They suggested that the content of the module must be relevant, accurate, appropriate, and aligned with the intended learning competencies in basic word processing. Similarly, Al Mamun et al. (2022) emphasized the importance of content validity and curriculum alignment in digital learning materials, particularly in promoting learner trust and motivation. These findings support the experts' assessment that the content of the developed Interactive Digital Learning Module was relevant, appropriately organized, and aligned with the intended competencies.

Table 2. *Experts' Evaluation of the digital learning module in terms of Instructional Quality*

Criteria	*Wtd Mean*	*Descriptive Rating*
1. The purpose of the material is well defined	4.00	Highly acceptable
2. Material achieves its defined purpose	4.00	Highly acceptable
3. Learning objectives are clearly stated and measurable.	4.00	Highly acceptable
4. The level of difficulty is appropriate for the intended target user	4.00	Highly acceptable
5. Graphics/ colors/ sounds are used for appropriate instructional reasons.	4.00	Highly acceptable
6. Material is enjoyable, stimulating, challenging, and engaging.	4.00	Highly acceptable
7. Material effectively stimulates the creativity of the target user.	4.00	Highly acceptable
8. Feedback on the target user's responses is effectively employed.	4.00	Highly acceptable
9. The target user can control the rate and sequence of presentation and review.	4.00	Highly acceptable
10. Instruction is integrated with the target user's previous experience.	4.00	Highly acceptable
Overall Weighted mean	4.00	Highly acceptable

Table 2 presents the experts' evaluation of the Interactive Digital Learning Module in terms of instructional quality. All ten criteria obtained a weighted mean of 4.00, interpreted as Highly Acceptable. Since the criteria received equal ratings, no indicator obtained a higher or lower mean than the others. The result indicates that the module had clearly defined objectives, appropriate difficulty, engaging activities, suitable multimedia elements, effective feedback, and opportunities for learners to control the pace and sequence of their learning.

The overall weighted mean of 4.00, interpreted as Highly Acceptable, indicates that the instructional features of the module were considered appropriate for supporting learners' understanding and skill development.

During the implementation of the module, the researcher observed that the learners were generally able to follow the instructions and complete the activities with less assistance from the teacher. The interactive exercises and immediate feedback helped them identify and correct their mistakes as they worked on the tasks. Learners who needed more time were able to review the instructions or repeat an activity, while those who finished earlier could proceed to the next task. These classroom observations showed that the module encouraged learners to participate actively, practice the skills independently, and take greater responsibility for their own learning.

This finding supports Martin et al. (2022), who found that high-quality online instruction is characterized by clear directions, structured learning activities, timely feedback, and interactive elements. Their findings showed that instructional clarity and well-designed learning activities can improve students' performance and satisfaction in digital learning environments. This supports the present finding that the module's instructional features were appropriately designed to guide learners and provide meaningful opportunities for practice.

Table 3 shows the experts' evaluation of the Interactive Digital Learning module in terms of technical quality. The highest weighted mean of 4.00, interpreted as Highly Acceptable, was obtained by most of the criteria, particularly those related to audio, narration, synchronization, multimedia elements, navigation, independent use, system requirements, and freedom from technical problems. These high ratings may be attributed to the careful integration of multimedia and navigation features during the development of the module.

The lowest weighted mean of 3.80 was obtained by screen displays being uncluttered, easy to read, and aesthetically pleasing and visual presentations being clear and easy to interpret. Although both were still rated Highly Acceptable, the results suggest that the visual layout and presentation could still be improved.

The overall weighted mean of 3.97, interpreted as Highly Acceptable, indicates that the module was generally considered functional, user-friendly, and technically appropriate. This finding is consistent with Bond et al. (2021) and Rasheed et al. (2021), who emphasized the importance of technical functionality, usability, navigation, and system reliability in supporting effective digital learning.

During the implementation, the researcher observed that the learners were able to navigate through the module and use the buttons, visuals, and interactive features with minimal assistance.

Table 3 *Experts' Evaluation of the digital learning module in terms of Technical Quality*

Criteria	*Wtd Mean*	*Descriptive Rating*
1. Audio enhances understanding of the concept.	4.00	Highly acceptable
2. Speech and narration (correct pacing, intonation, and pronunciation) are clear and can be easily understood.	4.00	Highly acceptable
3. There is complete synchronization of audio with the visuals, if any.	4.00	Highly acceptable
4. Music and sound effects are appropriate and effective for instructional purposes.	4.00	Highly acceptable

5. Screen displays are uncluttered, easy to read, and aesthetically pleasing.	3.8	Highly acceptable
6. Visual presentations (non-text) are clear and easy to interpret.	3.8	Highly acceptable
7. Visual sustain interest and do not distract the user's attention.	4.00	Highly acceptable
8. Visuals provide an accurate representation of the concept discussed.	4.00	Highly acceptable
9. The user support materials (if any) are effective.	4.00	Highly acceptable
10. The design allows the target user to navigate freely through the material.	4.00	Highly acceptable
11. The material can easily and independently be used.	4.00	Highly acceptable
12. The material will run using the minimum system requirements.	4.00	Highly acceptable
13. The program is free from technical problems	4.00	Highly acceptable
Overall Weighted mean	3.97	Highly acceptable

The learners were generally able to move from one activity to another and access the learning materials without experiencing major technical difficulties. However, some learners occasionally needed additional guidance when navigating certain parts of the module, which is consistent with the relatively lower ratings for screen displays and visual presentation. These observations suggest that the module was generally user-friendly and functional, while its visual layout and presentation could still be improved to make navigation and viewing more convenient for all learners.

This finding supports Bond et al. (2021), who emphasized that technical functionality and platform stability are important factors in maintaining learner engagement in digital learning environments. Similarly, Martin et al. (2021) highlighted the importance of usability, intuitive navigation, and effective multimedia integration in shaping learners' perceptions of digital learning quality. Rasheed et al. (2021) also identified poor interface design, system errors, and inadequate technical support as barriers to effective digital learning. These studies support the present finding that a functional, accessible, and user-friendly technical design is important in providing learners with a smooth and engaging learning experience.

Problem 3. Is there a significant difference between the pretest and posttest performance of Grade 8 learners after the implementation of the Interactive Digital Learning Module?

Table 4 presents the level of pretest and posttest performance of the 37 learners based on their score ranges and corresponding descriptive ratings. The results show a noticeable shift in the learners' performance from the pretest to the posttest.

Table 4. *Level of pretest and posttest performances of the learners*

Score Ranges	Pretest		Posttest		Descriptive
	f	%	f	%	Rating
26 – 30	1	2.7	20	52.6	Outstanding
23 – 25	4	10.8	9	23.7	Very Satisfactory
21 – 22	8	21.6	3	7.9	Satisfactory
18 – 20	11	29.7	4	10.5	Fairly Satisfactory
0 – 17	13	35.1	1	2.6	Did not meet expectations
Total	37	100.0	37	100.0	

In the pretest, the highest frequency was recorded in the Did Not Meet Expectations level, with 13 learners (35.1%) obtaining scores from 0–17. In contrast, in the posttest, the highest frequency was recorded in the Outstanding category, with 20 learners (52.6%) obtaining scores from 26–30. The increase in the number of learners achieving the Outstanding level may be attributed to the opportunity provided by the Interactive Digital Learning Module to review the lessons, practice the skills, and work through the learning activities at their own pace.

The lowest frequency in the pretest was recorded in the Outstanding category, with only 1 learner (2.7%), while in the posttest, the lowest frequency was in the Did Not Meet Expectations category, with only 1 learner (2.6%). This substantial decrease suggests that most learners moved from the lower performance levels toward higher levels after using the module.

Overall, the results demonstrate a clear improvement in the learners' performance from pretest to posttest. The distribution shifted from having the largest proportion of learners in the Did Not Meet Expectations category before the intervention to having the largest proportion in the Outstanding category after the intervention.

This finding is consistent with the findings of Susilowati et al. (2025), who reported that students exposed to interactive electronic modules achieved higher digital literacy gains and that structured interactivity and immediate feedback enhanced learners' cognitive engagement and independence. Similarly, Tarigan et al. (2021) and Wijaya and Vidianti (2020) reported that interactive digital or electronic modules can improve learners' learning outcomes, engagement, and autonomy by providing structured and interactive learning experiences. These findings support the improvement observed in the present study, where learners demonstrated higher performance after using the Interactive Digital Learning Module. Natividad and Jhon (2024) likewise found that interactive e-learning environments enhanced learners' ICT proficiency, critical thinking, and autonomy, particularly when digital learning activities were supported by structured feedback and multimedia resources.

Taken together, these studies support the present finding that interactive and self-paced digital learning materials can provide learners with additional opportunities to practice skills and improve their performance.

Problem 4. Is there a significant difference in the gain scores of the Grade 8 learners following the implementation of the Interactive Digital Learning Module?

Table 5 presents the results of the paired-samples t-test conducted to determine whether there was a significant difference between the pretest and posttest performances of the Grade 8 learners. The pretest obtained a mean score of 18.38 with a standard deviation of 4.24, while the posttest obtained a higher mean score of 25.38 with a standard deviation of 3.54.

Table 5. *Paired t-test between pretest and posttest performances*

Test	Mean	SD	Mean difference	t-value	p-value	Decision on H_o	Interpretation/Remarks
Pretest	18.38	4.24	7.00	10.23**	<.001	Reject H_o	Significant
Posttest	25.38	3.54					

**significant @ p<.001

The result of the paired samples t-test between the pretest and posttest performance of the learners is shown in Table 5. It can be gleaned from the result that in the pretest, the scores are more diverse (SD = 4.24) than the posttest scores (Sd=3.54). This means that, in the pretest, the competency level of the learners is scattered along the continuum, with the majority of them located below the Satisfactory level. In the posttest, after exposure to the digital module, the majority of these scores have been moved upward in the scale, indicating that many learners have raised their level of competency.

The mean difference between the pretest and posttest performance was 7.00 points and was found to be statistically significant ($t = 10.23$; $p < .001$), resulting in the rejection of the null hypothesis. This indicates that there was a significant difference between the pretest and posttest performances of the learners. The higher posttest mean suggests that the learners' performance in basic word processing skills significantly improved after using the Interactive Digital Learning Module, indicating its efficacy as a learning resource.

The finding supports the related studies reviewed in Susilawati et al. (2025), who reported that students exposed to interactive electronic modules achieved significantly higher digital literacy gains than those who used traditional learning materials. Their study further attributed the improvement to structured digital interactivity and immediate feedback, which enhanced learners' cognitive engagement and independence.

Similarly, Natividad and Jhon (2024) found that the use of interactive e-learning systems significantly enhanced students' ICT proficiency and performance, particularly through structured feedback and multimedia learning activities. These findings are consistent with the present study, in which learners demonstrated significantly higher posttest performance after exposure to the interactive digital learning module.

The result is also consistent with the findings of Tarigan et al. (2021) and Wijaya and Vidianti (2020), which highlighted that interactive digital learning modules can improve learning outcomes, engagement, autonomy, and skill acquisition through structured interactivity and self-paced learning. Thus, the significant improvement observed in the present study provides empirical support for the use of an interactive digital learning module as a learning intervention for developing and mastering basic word processing skills among Grade 8 learners.

Problem 5. To what extent do Grade 8 learners appreciate the Interactive Digital Learning Module in supporting their learning of basic word processing skills?

Table 6 presents the extent of learners' appreciation of the Interactive Digital Learning Module across five dimensions: understanding and skill development, ease of use and navigation, clarity and organization of lessons, enjoyment and engagement, and self-paced learning and recommendation. The weighted means obtained across the five dimensions indicate that the learners generally had a positive appreciation of the module.

The highest weighted mean of 4.53 was obtained for Enjoyment and Engagement, interpreted as Strongly Agree and Very Effective. This suggests that the interactive features and multimedia elements of the module made the learning experience enjoyable and helped sustain the learners' interest.

In contrast, Ease of Use and Navigation obtained the lowest weighted mean of 4.26, although it was still interpreted as Agree and Effective. This indicates that the learners generally found the module easy to use and navigate, although some learners may have experienced minor difficulty in independently using certain features.

The overall weighted mean of 4.41, interpreted as Agree and Effective, indicates that the learners generally appreciated the Interactive Digital Learning Module and considered it an effective learning resource.

This finding is consistent with Errabo and Ongoco (2024) and Bacomo et al. (2022), whose studies emphasized that interactive, multimedia-enriched, and self-paced digital learning materials can enhance learners' engagement, interest, and positive attitudes toward technology-mediated learning.

Table 6. *Extent of learners' appreciation of the digital learning module*

Particulars	Wtd mean	Verbal Description	Interpretation
1. The IDLMs helped me better understand the lesson ….	4.42	Agree	Effective
2. The activities in the module improved my Microsoft Word...	4.44	Agree	Effective
3. The module helped me use Microsoft Word's formatting …	4.33	Agree	Effective
4. The IDLMs made it easier for me to complete tasks….	4.25	Agree	Effective
5. The module increased my confidence in using Microsoft..	4.42	Agree	Effective
Overall Weighted Mean	4.37	Agree	Effective
1. The module was easy to use and navigate.	4.42	Agree	Effective
2. The instructions in the module were easy to follow.	4.33	Agree	Effective
3. I was able to use the module without much help from….	3.94	Agree	Effective
4. The buttons, menus, and icons in the module were clear…	4.50	Strongly agree	Very effective
5. I was able to move from one section of the module to..	4.11	Agree	Effective
Overall Weighted Mean	4.26	Agree	Effective
1. The explanations in the module were clear and easy….	4.61	Strongly agree	Very effective
2. The examples in the module helped me understand the...	4.44	Agree	Effective
3. The activities were appropriate for my level …	4.44	Agree	Effective
4. The lessons in the module were presented in a well-…	4.58	Strongly agree	Very effective
5. The terms and instructions used in the module were…	4.33	Agree	Effective
Overall Weighted Mean	4.48	Agree	Effective
1. I enjoyed using the Interactive Digital Learning Modules.	4.47	Agree	Effective
2. The module made the lesson more interesting.	4.47	Agree	Effective
3. The multimedia elements (pictures, colors, layout) made learning an enjoyable experience.	4.69	Strongly agree	Very effective
4. The activities in the module kept me interested …	4.50	Strongly agree	Very effective
5. The module's interactive features encouraged me to…	4.53	Strongly agree	Very effective
Overall Weighted Mean	4.53	Strongly agree	Very effective
1. The module helped me learn at my own pace.	4.22	Agree	Effective
2. I want to use similar digital modules in other lessons.	4.28	Agree	Effective
3. The module helped me become more confident…	4.53	Strongly agree	Very effective
4. The module made learning more effective compared...	4.31	Agree	Effective
5. I would recommend this module to other students.	4.61	Strongly agree	Very effective
Overall Weighted Mean	4.39	Agree	Effective

Legend: 1.00-1.49-Strongly Disagree/Very Ineffective; 1.50-2.49-Disagree/Ineffective; 2.50-3.49-Uncertain/Moderately Effective; 3.50-4.49-Agree/Effective; 4.50-5.00-Strongly Agree/Very effective

Problem 6. Based on the findings of the study, how can the developed Interactive Digital Learning Module be enhanced to improve its content, instructional, and technical quality?

Based on the findings of the study, the developed Interactive Digital Learning Module may be further enhanced by improving its visual presentation, screen layout, and navigation features, particularly those that received relatively lower ratings in the technical quality evaluation. The module may also be improved by adding more guided practice, interactive activities, and practical exercises to provide learners with additional opportunities to reinforce their basic word processing skills. Clear instructions, feedback, multimedia elements, and self-paced learning features should be maintained since these contributed to the learners' positive appreciation of the module. These enhancements may further improve the module's usability, instructional quality, and effectiveness in supporting learners' mastery of basic word processing skills.

Conclusions

The conclusions provide insights into the implications of the findings:

1. The systematic design and development of the Interactive Digital Learning Module resulted in a learning resource that was appropriately structured to address the basic word processing competencies of Grade 8 learners. Its integration of content, instructional strategies, and interactive features provided a suitable foundation for supporting learners' skill development.

2. The favorable expert evaluation indicates that the developed module possessed the necessary qualities of a highly acceptable instructional material, making it suitable for use as a supplementary resource in teaching basic word processing skills.

3. The substantial shift in learners' performance from the lower achievement levels in the pretest toward higher achievement levels in the posttest demonstrates that the learners were able to develop greater competence in basic word processing skills after using the module.

4. The significant difference between the learners' pretest and posttest performances provides evidence that the Interactive Digital Learning Module contributed to the improvement of learners' mastery of basic word processing skills. The rejection of the null hypothesis further supports its efficacy as a learning intervention.

5. The learners' positive appreciation of the module indicates that its interactive, multimedia, self-paced, and user-friendly features created a favorable learning experience and supported learners' engagement and confidence in learning basic word processing skills.

6. The identified areas for enhancement indicate that the module is already functional and acceptable, but can still be refined to further improve its visual presentation, navigation, and opportunities for practice. Continuous refinement based on expert feedback and learner experience can strengthen the module's usefulness and instructional value.

Recommendations

Guided by the significance of the study, the recommendations are aligned with the beneficiaries:

ICT Teachers. They may utilize the Interactive Digital Learning Module as a supplementary learning resource in teaching basic word processing skills. They may also provide additional guided practice and practical activities for learners who need further reinforcement.

Module Developers. The module may be further refined by maintaining its acceptable content and instructional features while improving its visual presentation, screen layout, and navigation based on the areas identified during expert evaluation.

ICT teachers and learners. The additional interactive activities, guided exercises, and practical tasks may be incorporated and implemented to provide learners with more opportunities to practice and strengthen their basic word processing skills.

School Administrators. They may support the use and development of interactive digital learning materials by providing adequate ICT facilities, technical assistance, and opportunities for teachers to develop digital instructional resources.

Teachers. The interactive and multimedia features that contributed to learners' positive appreciation may be maintained and appropriately integrated into other digital learning materials to promote learner engagement, confidence, and self-paced learning.

Future Researchers. They must conduct similar studies using a larger number of respondents, longer implementation periods, or other ICT competencies to further examine the effectiveness of interactive digital learning modules.

References

Al Mamun, M. A., Lawrie, G., & Wright, T. (2022). Instructional design quality and student engagement in online learning environments: The role of content validity and alignment. *Education and Information Technologies, 27*(5), 6231–6250.

Bacomo, J. L., Santos, P. A., & Ramos, A. V. (2022). Learners' attitudes and motivation toward self-learning modules during modular distance learning. *Philippine Journal of Education and Pedagogy, 8*(2), 115–129.*

Bond, M., Bedenlier, S., Marín, V. I., & Händel, M. (2021). Emergency remote teaching in higher education: Mapping the first global online semester. *International Journal of Educational Technology in Higher Education, 18*(1), 50.

Deci, E. L., & Ryan, R. M. (2023). *Self-determination theory: Basic psychological needs in motivation, development, and wellness* (2nd ed.). The Guilford Press.

Department of Education. (n.d.). *Evaluation rating sheet for non-print materials (LRMDS Template 6.6).*

Department of Education. (2023). *MATATAG Curriculum*.

Espinosa et al. (2025). *Bridging a digital divide: A critical analysis of contextual factors affecting ICT integration in Philippine schools. Issues in Educational Research, 35*(2), 526–551.

Errabo, J. P., & Ongoco, M. P. (2024). The effectiveness of interactive mobile learning modules on learner engagement in secondary education. *Asia Pacific Journal of Educational Technology, 12*(1), 45–61.

Fitriani, N. P., & Nugroho, A. E. J. K. (2025). The impact of digital learning technology on the quality of education in Indonesia: A systematic literature review. *Sosioedukasi Journal, 14*(4), 6386.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2021). The difference between emergency remote teaching and online learning. *Educause Review, 56*(1), 12–15.

Keshavarz, H., Fallahnia, S., & Hamdi, F. (2022). How university instructors apply the design principles for electronic courses: A comparative study based on Richard Mayer's model on multimedia learning. *International Journal of Information and Learning Technology, 39*(4), 421–437.

Kintu, M. J., Zhu, C., & Kagambe, E. (2021). Blended learning effectiveness: The relationship between student characteristics, design features, and outcomes. *International Journal of Educational Technology in Higher Education, 18*(1), 46.

Mao, X., Dai, Y., Liu, Y., & Jiang, Y. (2025). Optimizing cognitive load in digital mathematics textbooks: A mixed-methods study on content organization and application models. *Smart Learning Research Journal, 19*(3), 67–85.*

Martin, F., Sun, T., & Westine, C. D. (2021). A systematic review of research on online teaching and learning from 2009 to 2018. *Computers & Education, 159*, 104009.

Martin, F., Wang, C., & Sadaf, A. (2022). Student perception of helpfulness of facilitation strategies in online courses. *Online Learning Journal*, *26*(1), 68–89.

Mayer, R. E. (2001). *Multimedia learning.* Cambridge University Press.

Mayer, R. E. (2024). The past, present, and future of the cognitive theory of multimedia learning. *Educational Psychology Review, 36*(2), 501–522.

Mutlu-Bayraktar, D., Cosgun, V., & Altan, T. (2021). Cognitive load in multimedia learning environments: The effects of instructional design on learner performance. *Educational Technology Research and Development, 69*(2), 1101–1123.

Natividad, A. R., & Jhon, L. P. (2024). Integrating ICT in public schools: Implications for learner performance and critical thinking. *Philippine Journal of Educational Innovation, 9*(3), 220–235.

Organization for Economic Co-operation and Development. (2023). *OECD Digital Education Outlook 2023: Towards an effective digital education ecosystem*. OECD Publishing.

Pham, T. (2025). Evaluating the effectiveness of digital learning platforms in enhancing intrinsic and extrinsic motivation among undergraduate students: A literature review. *WorksheetZone Research Blog.*

Rahmah, M. M., & Kurniawan, E. (2025). Digital material development for secondary education. *International Journal of Educational Research Open, 10*(3), 100310.*

Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2021). Challenges in the online component of blended learning: A systematic review. *Computers & Education, 144*, 103701.

Staneviciene, E., & Zekiene, G. (2025). The use of multimedia in the teaching and learning process of higher education: A systematic review. *Sustainability, 17*(19), 8859.*

Surbakti, R., Umboh, S. E., & Pong, M. (2024). Cognitive load theory: Implications for instructional design in digital classrooms. *ResearchGate Preprint.*

Susilawati, S., Indria, F., & Farhan, A. (2025). Interactive electronic modules as a tool to foster students' digital literacy. *Journal of Physics: Conference Series, 3139*(1), 012100.*

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257–285.*

Tarigan, W. P. L., Sipahutar, H., & Harahap, F. (2021). The effect of interactive digital learning modules on students' learning activity and autonomy. *Journal of Physics: Conference Series, 1819*(1), 012072.

Tarigan, W. P. L., Sipahutar, H., & Harahap, F. (2023). The impact of an interactive digital learning module on students' academic performance and memory retention. *Computers and Children, 2*(2), em004.

Timotheou, S., Miliou, O., Dimitriadis, Y., Sobrino, S. V., Giannoutsou, N., Cachia, R., … & Ioannou, A. (2022). Impacts of digital technologies on education and factors influencing schools' digital capacity and transformation: A literature review. *Education and Information Technologies, 27*, 6695–6726.

Twabu, K. (2025). Enhancing the cognitive load theory and multimedia learning framework with AI insight. *Smart Learning Environments, 12*(1), 45–63.*

UNICEF. (2021). *Effectiveness of digital learning solutions to improve educational outcomes: A review of the evidence*. United Nations Children's Fund.

Villaseñor, R. A. M. (2024). *Challenges and dilemmas of digitalization in Philippine education: A grassroots perspective. Journal of Public Administration and Governance, 14*(2), 232–250.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* Harvard University Press.

Wan Ali, W. N. A. (2022). Integrating Mayer's cognitive theory of multimedia learning with computational thinking in tackling cognitive load issues among young learners. *Malaysian Journal of Learning Design, 8*(1), 33–47.

Wijaya, J. E., & Vidianti, A. (2020). The effectiveness of using interactive electronic modules on student learning outcomes in an education innovation course. *Journal of Physics: Conference Series, 1446*, 012039.

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