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Traditional Versus Digital Note-Taking in the Knowledge Retention of Bachelor of Science in Nursing Students

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Abstract

Students' performance is always an issue when it comes to education, especially to their response with examinations and tests, because of that, students have formulated different types of methods in order to retain information, one of which is the note-taking methods that are diversely used by students of varying levels across the world.

Note-taking methods, unlike other studying techniques that had multiple variations, only have two subtypes, Traditional Note-Taking Method and Digital Note-Taking Method. This study aims to see the difference between Traditional Note-Taking Method and Digital Note-Taking Method in terms of their effect on the knowledge retention of the students.

This study used questionnaires, interviews, and pre-test and post-test in order to acquire the necessary data for the study. This study used frequency count, percentage formula, weighted mean, standard deviation, independent two tailed t-test, and paired right tailed t-test to interpret the data gathered, and to see whether there is a significant difference between the note-taking methods. The Experimental Quantitative Research was conducted at Dr. Carlos S. Lanting College which targeted 80 First Year Nursing

Students, which utilized a stratified random sampling in selecting the respondents. The researchers utilized a 75-item Multiple Choice Questionnaire divided into 3 Parts: Pre-Test, Post-Test 1 or Immediate Recall and Post-Test 2 or Delayed Recall with all having 25 items, questions were also reorganized and paraphrased among the 3 Parts, the Questionnaires was used to gather necessary data and was Analyzed using Reliability, Descriptive, and Independent T-Test Analysis.

Overall, The analysis revealed that there were no Significant Difference between Traditional Note Taking Method, Digital Note Taking Method, and with the Control Groups Preferred Note Taking Method and No Note Taking Method ($t = 0.75$, $t_{\alpha/2} = <-1.6860, >1.6860$) suggesting that regardless of the note taking method or lack thereof will still contribute to a student's Knowledge Retention but will ultimately vary on the Intrinsic and Extrinsic factors each individual students possess such as their attention, focus, individual intellect and ability to comprehend ideas and concepts.

Keywords: Traditional Note-Taking, Digital Note-Taking, Knowledge Retention

1. The Problem and its Setting

This chapter outlines and discusses the background of the study, theoretical framework, conceptual framework, statement of the problem, statement of hypothesis, scope and delimitations, significance of the study, and the operational definition of terms.

Introduction

Students' methods for absorbing and retaining information have evolved along with education. Taking notes remains a fundamental academic skill for enhancing comprehension, reinforcing memory, and boosting academic success, as widely recognized in higher education research (Kitjaroonchai *et al.*, 2025) [10]. Although taking notes by hand and other conventional ways have long been used to record lectures and organize ideas, new tools have become available by the advancement of digital technology. Students now have more options for recording and interacting with educational material thanks to devices like computers and tablets and note-taking software (Bouchrika, 2025) [4].

Digital note-taking has become increasingly popular due to its convenience, searchability, and ability to integrate multimedia resources. Programs such as Microsoft OneNote, Notion, and Evernote have become widely used in academic settings because they help students organize information and synchronize content across multiple devices, making study materials more accessible anytime and anywhere (Asyari *et al.*, 2022) ^[2]. A systematic review further highlights that digital tools provide flexible formats and efficiency for learning (Voyer *et al.*, 2022) ^[26]. Despite these useful advantages, some studies suggest that taking notes digitally rather than by hand could lead to shallower cognitive processing (Bouchrika, 2025) ^[4].

In contrast, traditional note-taking entails handwriting, which some researchers link to deeper cognitive processing and broader brain activation. Neuroscience research shows that, compared to typing, handwriting engages a broader range of brain functions, such as motor coordination, visual processing, and language comprehension, thereby boosting memory encoding and retention (Van der Weel & Van der Meer, 2024) ^[25]. Handwriting may also encourage summarization and synthesis of information, which could further support long-term memory retention (Maguire, 2024) ^[12]. However, different learning styles and academic circumstances may affect how effective each strategy is.

The note-taking technique can significantly affect learning outcomes in nursing education, since understanding, critical thinking, and information retention are all crucial (Tavener-Smith, 2021) ^[23]. For first-year Bachelor of Science in Nursing (BSN) students at Dr. Carlos S. Lanting College (DCLC), who are in the early stages of their academic development, it is important to identify which note-taking approach most effectively supports their learning outcomes.

There is not much evidence concentrating on nursing students in the Philippine setting, especially first-year students who are still figuring out their study techniques, despite the fact that international research has contrasted traditional and digital note-taking in a variety of fields. Moreover, existing studies often overlook students who do not engage in note-taking at all, despite their presence in academic settings. By including this group, a more thorough knowledge of the relationship between various note-taking behaviors—or lack thereof—and academic achievement can be obtained (Kitjaroonchai *et al.*, 2025) ^[10].

Therefore, the aim of this study is to measure the effects of traditional, digital, and non-note-taking note-taking strategies on the academic achievement of DCLC first-year Bachelor of Science in Nursing (BSN) students. Academic performance in nursing education is not only a reflection of theoretical understanding but also a key determinant of clinical readiness and success in licensure examinations, such as the Philippine Nurse Licensure Exam (PNLE). By determining which strategy produces better results, both educators and students can make well-informed decisions about integrating technology, refining study habits, and enhancing instructional practices to support long term professional competence.

Theoretical Framework

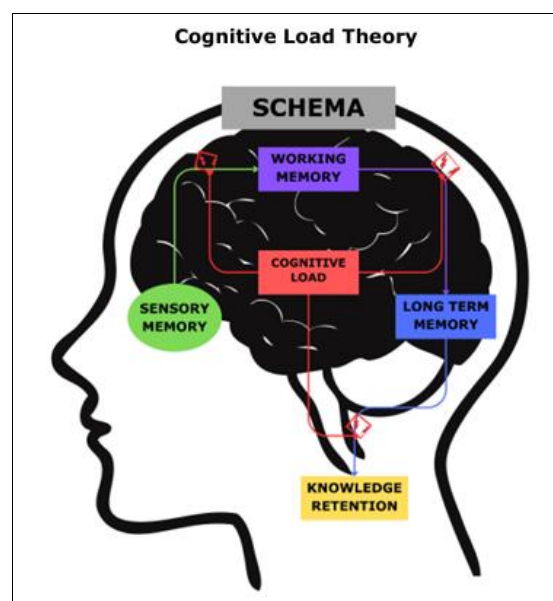


Fig 1: Cognitive Load Theory

One of the faculties that concerns a student's learning capabilities during their studies is what we call knowledge retention, "knowledge retention is the process of storing and maintaining information over time, ensuring it remains accessible for future use, enabling individuals to recall learned material and organizations to preserve critical knowledge, supporting decision-making, reducing knowledge loss, and maintaining continuity in workflows and learning processes" (Malak, 2025) ^[13]. The manipulation of this concept is tantamount to a student's expertise towards a certain subject or skill; however, to achieve a degree of control towards knowledge retention, understanding on how knowledge is formed, processed, and retained is necessary.

The Cognitive Load Theory addresses this process, according to Practical Psychology (2020), "Cognitive Load Theory explains the way that we consider working memory while teaching complex concepts or solving problems. A higher cognitive load lowers the percentage of information that is stored in long term memory because you overwhelm your working memory." Moreover, "Cognitive Load Theory (CLT) has emerged as one of the leading models in educational psychology over the last few decades. Its success is due, in part, to its generalizability across domains, including medical education. Rooted in theory, the end goal of CLT has always been to improve learning at the individual student level" (Szulewski *et al.*, 2021) ^[22]. Relatively, this theory tackles a concept called Schema, a schema is the structural process in which memory is being processed and transformed into a long-term memory, under the Schema, we have the Sensory Memory, "When you see something, hear something, or take in any type of information through the senses, it enters your sensory

memory. From here, your brain quickly filters out the information that is irrelevant. If you are intentionally devoting your focus to a video game, for example, the sound of the wind or the smell of your food cooking in the next room may be forgotten” (Practical Psychology, 2020). Afterwards, it is then moved to your Working Memory, where memory is either processed or forgotten, the processed memory is then stored in your Long-Term Memory; however, not all memory winds up in the long-term memory.

“Long-term memory is like a computer with unlimited data storage. Working memory, on the other hand, can process a few pieces of information at a time. If we fail to come back to the information in our working memory, it will be dropped. Cognitive Load Theory suggests that if we want to learn more effectively, we must respect this reality and only “load up” a few pieces of information into our working memory at a time. If we load up too much, we will be more likely to forget or connect information that we are trying to learn” (Practical Psychology, 2020). Similar to a computer, the Cognitive Load Theory describes different cognitive loads that can affect the ability to process and store the information, namely: Intrinsic Load, Extrinsic Load, and Germane Cognitive Load. Intrinsic Load is the level of difficulty of information being learned, Extrinsic Load on the other hand is the method in which information is being taught, and finally the Germane Cognitive Load which happens when we are trying to build a new Schema.

The Cognitive Load Theory generally suggest the influence of internal and external factors that would affect memory retention, understanding of such factors had led us to create ways in order to bypass these limitations, such as learning methods, lesson plans, and studying techniques, many of which varies from person to person, yet one of these methods is being used by learners almost uninfluenced by external factors, note-taking is a ubiquitous practice in college classrooms and students’ notes often serve as the primary record of what they learned. Numerous researchers have demonstrated that note-taking is beneficial for student learning (Witherby & Tauber, 2019) [28], this practice is done by our predecessors and is being practiced in current times. Note-taking holds immense significance in various domains, including education, business settings, and personal growth. In education, students who take notes perform better academically, as note-taking facilitates deeper understanding, critical thinking, and knowledge retention. In business, note taking enhances communication, collaboration, and decision-making. It ensures that important details are captured and can be referenced later. On a personal level, note-taking promotes self-reflection, goal-setting, and continuous learning (Scholarly, 2023). This learning method, unlike its kin, is mainly branched into only two methods, the traditional pen and paper and with the advent of technology the use of electronic devices. The simplicity partnered by ubiquity of this method had led the researchers to use it as their foundation and guidance in this study.

Statement of the Problem

This study seeks to determine the effectiveness of traditional note taking and digital note-taking with the knowledge retention of first-year Bachelor of Science in Nursing (BSN) students at Dr. Carlos S. Lanting College.

Specifically, this study aims to answer the following questions: 1. What is the level of knowledge retention of students who use traditional note-taking and digital note-taking in terms of:

- 1.1 Immediate Recall (Short-Term Retention).
- 1.2 Delayed Recall (Long-Term Retention).
2. Effect of note-taking in knowledge retention using their preferred method.
3. Effect of not taking notes in knowledge retention.
4. Is there a significant difference between the knowledge retention of students using traditional note-taking and those using digital note-taking?

Statement of Hypotheses

This part of the study states all the hypotheses that the researchers have acknowledged as the possible outcomes of the research study.

Alternative Hypotheses

H_{a1}: There is a significant difference in knowledge retention between students who used traditional note-taking and those who used digital note-taking methods.

H_{a2}: There is a significant difference in the knowledge retention of students who used any form of note-taking method compared to those who did not use any note-taking method.

H_{a3}: There is a significant difference in the knowledge retention of students who are randomly assigned to traditional or digital note taking methods compared to those who used their preferred note-taking method.

Null Hypotheses

H₀₁: There is no significant difference in knowledge retention between students who used traditional note-taking and those who used digital note-taking methods.

H₀₂: There is no significant difference in the knowledge retention of students who used any form of note-taking method compared to those who did not use any note-taking method.

H₀₃: There is no significant difference in the knowledge retention of students who are randomly assigned to traditional or digital note taking methods compared to those who used their preferred note-taking method.

Scope and Delimitations

The main objective of this study was to compare digital note-taking versus traditional note-taking in the knowledge retention of nursing students. The goal was to determine which of the two strategies worked best for the majority of first-year nursing students in practicing clinical readiness and competency.

This study was delimited to first-year Bachelor of Science in Nursing (BSN) students of Dr. Carlos S. Lanting College. The study focused mainly on the assessment of learners using the strategies mentioned above and identified the strengths and weaknesses of each strategy in relation to the capability of nursing students to retain ideas and information, especially for those who were new to the profession. The study measured the effects by implementing pre test and post-test examinations as well as questionnaires to determine the immediate knowledge retention of the sample group.

Additionally, the study material along with the questionnaire remained consistent throughout the study to assure reliability of the research.

The group of randomly selected students performed traditional note taking (Group A), while Group B used digital note-taking. These were the experimental groups, tested alongside another group of randomized students who were tasked to take notes with their personally preferred method (Group 1), and another group of randomly selected students who did not take notes at all (Group 2), which served as the control group. Following this, the researchers assessed the long-term knowledge retention of the experimental and control groups using the forgetting curve method.

The research study was conducted at Dr. Carlos S. Lanting College in S.Y. 2025–2026 during its first semester. Six (6) researchers participated in this study, and they examined the advantages and disadvantages of the strategies mentioned. The study excluded other factors in practicing clinical competency, such as stress management strategies and physiologic interventions, and was exclusively focused on note-taking strategies (either digital or traditional) to improve nursing skills and learning capacity.

Significance of the Study

This study is significant as it compared traditional note-taking (handwritten) and digital note-taking (using electronic devices) in relation to the knowledge retention of first-year nursing students at Dr. Carlos S. Lanting College. The results of this research will provide valuable insights for the following beneficiaries:

First-Year Nursing Students will gain guidance on selecting the most effective note-taking method to improve knowledge retention and academic performance, while also developing study habits suited to their individual learning preferences.

Nursing Faculty and Educators will be guided by the results in recommending appropriate note-taking strategies to their students. The findings may also encourage faculty to adapt lecture delivery methods to better support student learning.

Dr. Carlos S. Lanting College will be able to utilize the findings to design workshops and programs that promote effective learning strategies. This study also strengthens the college's contribution to evidence-based educational practices and institutional research.

Future Nursing Students will benefit as the results may serve as a reference for succeeding batches in choosing effective note-taking methods.

Researchers and Academicians will find this study a valuable reference for future research in the fields of educational technology, nursing education, and learning processes.

Practical Contributions

This study provides evidence-based insights into whether traditional or digital note-taking is more effective for retaining complex nursing concepts. Prior research has shown that note-taking interventions significantly enhance academic motivation and learning in nursing students (Hussein, Mussa, & Fenta, 2018). Similarly, recent findings suggest that paper-based and digital learning formats each have distinct benefits for medical and nursing students, particularly in improving accessibility and organization of

materials (Yamada, Sekine, & Tatsuse, 2024) ^[29]. The outcomes of this study will contribute to improving students' study habits, academic performance, and preparedness for licensure examinations such as the Philippine Nurse Licensure Examination (PNLE). Furthermore, the findings will inform institutional policies regarding the integration and regulation of digital devices in classroom settings.

Theoretical Contributions

This study will enrich the body of knowledge in educational psychology by connecting note-taking methods to Cognitive Load Theory (CLT). Cognitive load theory emphasizes that excessive information in working memory reduces the likelihood of transferring knowledge into long-term memory (Szulewski *et al.*, 2021) ^[22]. By examining how digital and handwritten note-taking strategies influence retention, this study will highlight whether certain approaches facilitate or hinder cognitive processing. Additionally, it will reinforce schema theory by showing how note-taking serves as a tool for organizing sensory input into structured knowledge that can be stored in long-term memory (Sweller, 1988).

Operational Definition of Terms

This part of the research study presents the operational definitions of the following terms that are often used in the study to serve as a guide for readers' better understanding of the research.

Traditional Note-Taking: A method of note-taking involving handwritten notes using pen or ballpen on physical medium such as paper or notebook, without the use of digitalized hardware for documentation.

Digital Note-Taking: A method of note-taking with the assistance or use of digital technology such as laptop and phones and application that eases compilation and documentation of notes.

Knowledge Retention: The estimated amount of knowledge about a certain information left or retained independently on a person's long-term memory after exposure to such information.

Immediate Recall: The amount of knowledge retained in a short amount of time after information was given or taught.

Delayed Recall: The amount of knowledge retained after a long time has lapsed respective to the time after information is given or taught.

2. Review of Related Literature and Studies

Numerous related literature and studies supporting this research are presented in this chapter following the thematic organization of literature. This study aims to gather and compile data from the related literature and studies in order to delve deeper into the effects of traditional note-taking and digital note-taking on knowledge retention.

Like any other course, the journey of the nursing study is long and strenuous, but unlike others, nursing practice plays a vital role in the everyday living and safety of the society, this in turn puts a heavy demand towards the competency of the nursing students undertaking the course, as it handles not just the daily living but the patient's life themselves. The heavy demand elevates the techniques and styles of students studying the course, different methods arise, from the old ones to new ones students choose the method they are most suited with, thus playing an overall role of individual competency; however, unlike other methods, there is one

that stands firm amongst all students, regardless of their preference or their stature, unhindered by social and cultural status, and that is the note-taking method.

From preschool, to highschool, even colleges and post-graduates, during lectures they would all make sure to take a note, either to assure good grades or to attain mastery over the subject. "Note-taking is a critical component of learning, it is also one of the best practices for exam preparation" (Bouchrika, 2025) ^[4]. The note-taking method for such a long time remained unchanged and proven significant in terms of academic performance and overall proficiency towards a certain subject/s, due to the fact that handwriting engages in fine motor skills and proprioceptive feedback, this also triggers a plethora of Neural Function Activation (Mariano *et al.*, 2025). Van Der Weel and Van Der Meer's study also support this claim, their findings revealed that handwriting activates broader brain connectivity, particularly in theta and alpha bands associated with learning and memory (Van der Weel & Van der Meer, 2023). Other research from various organizations from different timelines supports these claims, further solidifying the role of note-taking in enhancing student's academic prowess.

Additional insight from Salame *et al.* (2024) ^[16] reinforces this perspective, showing that active engagement with notes—whether handwritten or digital—enhances memory retention and academic performance. Their review emphasizes that the depth of processing, such as summarizing and organizing information, plays a critical role in learning outcomes.

Traditional note-taking method remained steadfast towards the previous years, a robust, long hand method of pen and paper; however, with the advent of proliferated technology, note-taking method took a step further, from longhand, pen and paper, to smartphones, tablets and laptops, from pens to styluses and keyboards. This sudden influx of change, specially to students from universities and colleges who now mostly rely on laptops for quicker and more efficient access of information, gives rise to the question, is there a significant change from the traditional to the digital method of note-taking. Although digital note-taking exhibited better inhibitory cognitive control, students who uses longhanded note-taking demonstrated significantly higher scores with superior information processing speed, and better visual memory. (Sharman *et al.*, 2025) ^[1]. In the meta-analysis of Voyer, Ronis, and Byers, longhand note-taking showed advantages in longer lectures and conceptual learning-contexts (Voyer *et al.*, 2025). Several studies have shown that laptop note-takers performed worse on conceptual exam questions, as they tend to simply transcribe the lecture verbatim, this hinders them from the opportunity to grasp information in such a way that they can reframe it in their own words (Bouchrika, 2025 ^[4]; Mueller & Oppenheimer, 2014). These studies suggest that despite the traditional note-taking method does indeed provide a boost in academic and cognitive performance, traditional note-taking method proves superior in these aspects, especially with the digital note-taking method having mishaps in certain factors that can contribute to its decreased performance.

Hamat *et al.* (2024) ^[8] further explored the impact of digital note-taking tools, highlighting how multimedia integration, cloud access, and customizable formats can enhance student engagement. Their review suggests that digital platforms may benefit visual and auditory learners, though they also

caution against potential distractions and shallow processing.

Despite such claims, several studies show that there was no significant difference in grade point average (GPA) based on whether a student used either method of note-taking. According to Emory *et al.* (2021) ^[7] multiple variables affect the learning in the classroom environment, and that note taking method has a little impact on the academic performance, which contradicts the earlier claim, while the meta-analysis of Voyer *et al.* (2025), the 77 effect sizes from 39 samples in 36 articles showed that the study found no significant overall difference between longhand and digital note-taking when distractions were controlled, this approach provides a neutral understanding of the note-taking methods; on the other hand, Solayo's study from LSU Honors College, showed that in a time-constrained learning situation, typing will provide a more effective method of memorizing copied texts (whether it be individual words or a passage of text) when compared to handwriting the same information, according to the research this may be due to the fact in a time constrained environment, students more skilled in typewriting are more exposed to the material than those who use the traditional method. (Solayo, 2018).

In the Philippine context, Cortez *et al.* (2023) ^[6] examined the effects of note-taking methods on critical thinking among health-allied students. Although the study focused on cognitive skills rather than academic performance, it underscores the relevance of note-taking strategies in local nursing education and supports the need for further empirical research among first-year Bachelor of Science in Nursing (BSN) students.

Nevertheless, even though research suggest that there is no significant difference between the note-taking methods even with medical students (Weichmann *et al.*, 2022), understanding of the impact of these methods is essential, whether it be in a controlled environment, local or in broader spectrum as research showed, especially on nursing students who value heavily theoretical knowledge as this is directly proportional to their practical skills in the clinical setting. Utilizing these methods will be a nurses' tool on being proficient with their profession, a mastery of their calling, and providing quality care to patients.

Beriso *et al.* (2025) ^[3] also emphasized the importance of structured note taking formats in nursing education, showing that when students adopt organized approaches like SOAP or SBAR, their academic and clinical performance improves. This highlights that the structure and clarity of notes may be just as important as the medium used.

Synthesis of the Reviewed Literature and Studies

Related literature and studies have shown that note-taking plays a critical role in academic performance and knowledge retention, particularly among nursing students. It has been found that traditional longhand note taking activates broader brain connectivity and supports deeper cognitive processing, which enhances memory and conceptual understanding. While digital note-taking offers advantages such as speed, multimedia integration, and accessibility, several studies suggest that students who take handwritten notes perform better on conceptual tasks due to the generative nature of the method. In addition, structured note-taking formats like SOAP and SBAR have a significant and positive effect on both academic and clinical performance, implying that clarity and organization in notes contribute to better learning

outcomes. According to previous studies, motivation and engagement with notes, whether handwritten or digital, also increase retention and academic success. Furthermore, some research identified that while digital tools may benefit certain learners, they can also lead to shallow processing and distractions. Moreover, studies show that there is no consistent difference in GPA between note-taking methods when external factors are controlled, suggesting that the effectiveness of note-taking depends more on how notes are used than the medium itself. Additionally, in time-constrained environments, typing may offer advantages in memorization due to increased exposure to material. Lastly, note-taking is a universal academic strategy that supports mastery, efficiency, and performance, and remains essential in nursing education where theoretical knowledge directly informs clinical practice.

3. Research Methodology

This chapter presents and discusses the research methodology that was used to conduct this study. It includes research design, research locale, population and sampling, research instrument, ethical standards and considerations, data gathering procedures, and statistical treatment.

Research Design

This study used experimental research design to compare the influence of traditional and digital note-taking on knowledge retention among first-year Bachelor of Science in Nursing (BSN) students at Dr. Carlos S. Lanting College. Pre-test and post-test assessments were employed to analyze the short-term and long-term knowledge retention of four categories of students (students who took notes traditionally, digitally, in a preferred mode, or no notes). This was in line with the study's objective of determining which note-taking technique improves memory retention among nursing students.

Research Locale

This study was conducted at Dr. Carlos S. Lanting College (DCLC), a well-established institution located along Quirino Highway, Novaliches, Quezon City, Metro Manila. DCLC is a private higher education institution known for its strong emphasis on allied health programs, particularly the Bachelor of Science in Nursing (BSN). The college provides both theoretical and practical learning experiences designed to prepare students for clinical and hospital settings, making it an ideal environment for academic research focused on student learning behaviors and outcomes.

DCLC was selected as the research locale due to its accessibility to the researchers, the availability of a sufficient number of first-year nursing students, and the institution's support for academic research that enhances teaching and learning practices. The college's learning facilities, such as classrooms equipped with multimedia tools and students' access to digital devices, also make it a suitable site for comparing digital and traditional note taking methods. The research activities took place primarily within the main campus.

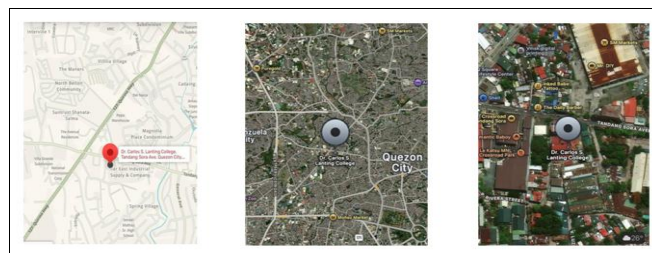


Fig 2: Research Locale

Population of the Study

The respondents of this study were first-year Bachelor of Science in Nursing (BSN) students from Dr. Carlos S. Lanting College. The total population of first-year nursing students was three hundred and forty-eight (348), distributed across four (4) sections: Faye Abdellah with eighty-four (84) students, Martha Rogers with eighty-five (85) students, Ida Jean Orlando with eighty-five (85) students, and Rozzano Locsin with ninety-four (94) students. From this population, a sample of eighty (80) students was selected to participate in the study. The researchers specifically chose first-year nursing students as respondents because they are at the beginning of their academic journey and are in the process of developing effective study habits. By exploring the comparative effectiveness of traditional and digital note-taking methods on knowledge retention, the study aims to provide insights that can guide these students in adopting strategies that will support their learning throughout their four-year nursing education and into their future professional practice.

Sampling Design

The study utilized a between-subjects design with a stratified random sampling technique to select participants from the population of first-year Bachelor of Science in Nursing students at Dr. Carlos S. Lanting College, ensuring that each section was proportionately represented in the sample. Once the sample of eighty (80) was finalized, participants were divided into four (4) groups. For the experimental groups, random assignment was applied to minimize bias and enhance validity: Group A was randomly assigned to perform traditional note-taking, while Group B was randomly assigned to use digital note-taking. These groups were tested to compare their levels of knowledge retention. Meanwhile, Group 1 and Group 2 served as control groups. Group 1 was deliberately assigned to take notes using their personally preferred method, while Group 2 was deliberately assigned as the non-note taking group, serving as the main control. Each group having twenty (20) participants.

The total population of the study consisted of three hundred and forty eight (348) first-year Bachelor of Science in Nursing students enrolled at Dr. Carlos S. Lanting College. To determine the appropriate number of respondents, the researchers used Slovin's formula, which is suitable for studies employing stratified random sampling when the total population is known. Using a margin of error of 0.10 (10%),

the computed sample was seventy-eight (78) respondents. For exact group and section equality, the sample was adjusted to eighty (80) respondents, twenty (20) per group, with five (5) participants per section per group. This margin provides an approximate 90% confidence level and ensures balanced representation while simplifying group comparisons.

Research Instrument

This study will discuss a specific nursing related subject using a self made presentation in .mp4 format, this was the basis of knowledge being tested, afterwards, the researchers used a self-made pre-test and post-test regarding the subject materials to assess first-hand the student's knowledge retention towards a nursing related subject using the two note-taking methods (Traditional and Digital Note-Taking Method). The test consists of three (3) parts with a total of seventy-five (75) items multiple choice questions, the first test (Pre-Test) consisted of twenty-five (25) items to assess the prior knowledge of the student regarding the subject which will be given before the students are subjected to the subject discussion (.mp4 presentation). The second test (Post-Test 1) consists of twenty-five (25) items to assess the immediate knowledge recall after the subject discussion. The third test (Post Test 2) consists of twenty-five (25) items to assess the delayed knowledge recall one (1) hour after the subject discussion. Each part of the test (First test "Pre-test", Second Test "Immediate Recall", and Third Test "Delayed Recall") will have their questions in a random order or paraphrased, relative to the other test parts. This is to avoid students memorizing the questions rather than applying actual knowledge retention. This method will be done with all the groups, (Experimental Group A and Group B, and Control Group 1 and Group 2).

After all the test data is gathered, they will be tabulated and sorted; afterwards, Pre-Test data will be compared to the Post-Test data of the same participant respectively to assess a student's prior knowledge regarding the subject material. Post-Test 1 data of each group will be compared with each other to assess for significant difference between each group's performance in terms of immediate recall. Data of Post-Test 1 and Post-Test 2 will also be compared to assess for significant difference of each group's performance in terms of delayed recall.

In order to gather accurate data, the test remained unchanged in the duration of the study. Students will also be given prizes to encourage their participation and their dedication in studying the material. The instruments used are also validated and modified by the researcher's instructor.

Ethical Standards and Considerations

The research will apply the ethical considerations developed by Saunders, Lewis, and Thornhill (2019), which emphasize honesty, integrity, confidentiality, transparency, and respect for participants. Guided by these principles, the study will be conducted responsibly to ensure fairness and credibility throughout all stages of the research process. Participants will be randomly selected to ensure fairness in representation, but their participation will remain voluntary, and informed consent will be obtained before the study begins. No participant will be exposed to any form of harm or discomfort, as the procedures involve only academic

tasks related to note-taking.

Confidentiality will be maintained by ensuring that all gathered information remains anonymous and used solely for academic purposes. The researchers will uphold transparency by clearly explaining the study's purpose and accurately reporting the findings without fabrication or manipulation. Lastly, respect for intellectual property will also be observed by properly acknowledging all sources and avoiding plagiarism.

Data Gathering Procedure

Phase 1: Request for Approval: The researchers will be able to convey the research survey and interview after submitting a letter to the Dean of College of Nursing and Vice President of Dr. Carlos S. Lanting College, Dr. Nora M. Gayod. The letter must then be signed and approved by the Official Heads of Nursing Department, which will serve as the major consent form and permit in order to conduct the survey. Once the permit is signed and complete, the researchers will immediately begin with the material discussion. Note before introducing ourselves to the group that the consent form will be presented and the validity of these documents must be oriented as well.

Phase 2: Distribution of Questionnaires: The initial step after introduction would be to distribute eighty (80) questionnaires among eighty (80) individuals overall, dividing each by twenty (20) students per section. The questionnaires will be formatted using Google Forms, which will then be announced before the respondents relay their answers. This step will be divided into partition of dates and times depending on the availability of the participating students.

Phase 3: Collection and Tabulation of Data: The collection of answers will be done during breaktime to avoid disturbances of other classes. After seeking permission to conduct a study among the students as well as showing the valid permit, the group will then now instruct the students on how to answer the questionnaire on Google Forms. It is worth mentioning that the researchers will also answer any questions asked by the sample group as to how the mechanic works and also discuss the prizes for participating in our study. After answering, the students are expected to submit their forms, which will then be tallied, counted, recorded, and evaluated as part of our data collection as soon as the survey is completed.

Statistical Treatment

After the researchers gathered the data, they were compiled, sorted, organized and tabulated. The data were subjected to statistical treatment in order to answer the proposed questions in the study. The data were analyzed using Frequency Count, Percentage, Mean, Standard Deviation, and T-Test.

1. Frequency: The frequency count is an arrangement of data which shows the frequency of different values or groups of variables. The frequency count is expressed as:

$$F = \text{Frequency Count}$$

2. Percentage: Percentage is used to determine the proportion of each given data relative to the sample size using the formula:

$$\% = \left(\frac{F}{N} \right) \times 100$$

% = Percentage

F = Frequency Count

N = Total Sample Size

3. Mean: The arithmetic average obtained by adding all the arithmetical scores divided by the number of cases presented by the formula:

$$x = \frac{\sum (xw)}{\sum (x)}$$

x = Weighted Mean

Σ = Summation

x = Frequency of Each Option

w = Weight of Each Option

The mean formula is used for the average scores of pre-test and post-test reflecting the performance of the students and their degree of knowledge retention.

4. Standard Deviation: To assess if the scores are less distributed, a standard deviation is used with the formula of:

$$\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$$

σ = Standard Deviation

$\bar{x}$ = Mean of Individual Scores

x = Individual Scores

n = Number of Samples

This study also uses the standard deviation in calculating the significant difference between the tests reflecting the degree of difference between the note-taking methods.

5. Independent T-Test and Paired T-Test: To determine whether there is a significant difference between the student's scores before and after using different note-taking methods, an independent sample t-test and a paired t-test is used, this tool allows the researchers to accept or reject the null hypothesis and/or alternative hypothesis and is expressed by the equations:

Step 1: Define the Hypothesis

$$H_0 = \bar{x} \text{ Method A} = \bar{x} \text{ Method B}$$

$$H_a = \bar{x} \text{ Method A} \neq \bar{x} \text{ Method B}$$

$$H_0 = \text{Null Hypothesis}$$

$$H_a = \text{Alternative Hypothesis}$$

Step 2: State the Alpha Value

$$\alpha = 0.1 \text{ (90\% Confidence Level)}$$

Step 3: Calculate Degrees of Freedom

$$df = (n_1 - 1) + (n_2 - 1)$$

df = Degrees of Freedom

n = Sample Size

Step 4: State Decision Rule

With a two tailed test, a sample size of 20 would result in a degree of freedom of 38. With alpha value of 0.1 the decision rule based on the t table would be -1.6860 and 1.6860, this means that the decision rule for the test would be: if t value is less than -1.6860 or greater than 1.6860, then the Null Hypothesis would be rejected.

Step 5: Calculate for the t value expressed in the formula:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_P^2}{n_1} + \frac{S_P^2}{n_2}}}$$

t = t value

$\bar{x}$ = Mean

n = Sample Size

$$S_P^2 = \frac{SS_1 + SS_2}{df_1 + df_2}$$

$$df_1 = n_1 - 1$$

$$df_2 = n_2 - 1$$

$$SS_1 = S_1^2(df_1)$$

$$SS_2 = S_2^2(df_1)$$

df = Degrees of Freedom

S^2 = Standard Deviation

Finally, the result would be used to state the conclusion as to either accept or reject the null hypothesis. Accepting or rejecting the hypotheses would determine if there were a significant difference between the methods used during the research.

6. Right Tail Paired Sample T-Test: To determine whether there is a significant difference between the student's scores before subjecting them to the study material to assess the student's prior knowledge and after the study course, to eliminate the possibility of the students being familiar to the subject before conducting the test, the researchers utilized a right tail paired sample t-test expressed as the equations:

Step 1: Defining the Hypotheses

$$H_0 = \mu_d \leq 0$$

$$H_a = \mu_d > 0$$

H_0 = Null Hypothesis

H_a = Alternative Hypothesis

Step 2: Calculating for the Standard Deviation

$$\sigma = \sqrt{\frac{\sum(x_d - \bar{x}_d)^2}{n - 1}}$$

σ = Standard Deviation

$\bar{x}$ = Mean of Differences

x = Difference of Paired Sample

n = Number of Samples

Step 3: Stating the Alpha Value and Degrees of Freedom

$\alpha = 0.1$ (90% Confidence Level)

α = Alpha Value

$df = (n_1 - 1) + (n_2 - 1)$

df = Degrees of Freedom

n = Sample Size

Step 4: State the Decision Rule

With a sample size of 20 (Degree of Freedom 19) and alpha value of 0.1 the research used a critical t value of 1.3277. This means that if the T Value is greater than 1.3277 the research will reject the null hypothesis in favor of the alternative hypothesis.

Step 5: Calculate for the T Value expressed in the formula:

$$t = \frac{\bar{x}_d - \mu_d}{\frac{S_d}{\sqrt{n}}}$$

t = T Value

x_d = Differences of the Paired Samples

$\bar{x}_d$ = Mean of Differences

μ_d = Mean Difference = 0

S_d = Standard Deviation

Step 6: Construct the confidence interval expressed in the formula:

$$\bar{x}_d \pm t \frac{S_d}{\sqrt{n}}$$

x_d = Mean of Differences

t = Critical T Value

S_d = Standard Deviation

n = Sample Size

By identifying the T Value and confidence interval, the researchers are able to determine whether to reject or accept the null hypothesis. This determines if there are significant differences between the pre-test and the post-test.

To ensure that the data being treated are calculated properly and thoroughly, the researchers utilized Microsoft Excel for the step-by-step calculations of the data using various treatments. The formulations and computations were then verified using online calculators such as SSS (Social Science Statistic) and Calculator.net to ensure further

validity. The researcher's instructor also examined and validated the data calculations.

4. Presentation, Analysis, and Interpretation of Data

This chapter presents the data gathered from eighty (80) first-year Bachelor of Science in Nursing students of Dr. Carlos S. Lanting College, who served as respondents in this study. The analysis and interpretation of the findings are organized in accordance with the research questions outlined in the Review of Related Literature and Studies.

Reliability Analysis

Table 1: Reliability Analysis

	α	N
Pre-Test	0.306362	25
Post-Test 1 (Immediate Recall)	0.804718	25
Post-Test 2 (Delayed Recall)	0.73172	25

The reliability analysis was conducted using Cronbach's Alpha to assess the internal consistency of the three tests: Pre Test (25 items), Post Test 1 (25 items), and Post Test 2 (25 items). The pre-test yielded a Cronbach's Alpha of (0.306362 or 0.3) indicating low level of internal consistency, this is within expectations of the researchers as the Pre-Test mostly served as a diagnostic, this part reflects the student's lack of prior knowledge of the material and high degree of guessing. Following the intervention the Post-Test 1 yielded a Cronbach's Alpha coefficient of (0.804718 or 0.8), similarly Post-Test 2 yielded a Cronbach's Alpha coefficient of (0.73172 or 0.73) this interprets as high level of internal consistency, indicating good reliability and student's grasp of the subject material across items.

Demographic Profile

Table 2: Profile of the Respondents

		F	%
Sex	Male	16	20%
	Female	64	80%
Section	Faye Abdellah (FA)	20	25%
	Ida Jean Orlando (IJO)	20	25%
	Martha Rogers (MR)	20	25%
	Rozzano Locsin (RL)	20	25%
	Traditional Note-Taking (Group A)	20	25%
Note-Taking Method	Digital Note-Taking (Group B)	20	25%
	Preferred Note-Taking (Group 1)	20	25%
	No Note-Taking (Group 2)	20	25%
Total		80	100%

Table 2 shows how the respondents are distributed demographically. It lists the frequency and percentage based on sex, section, and note-taking method. The table shows that most respondents were female with (n = 64, 80%). On the other hand, male participants were (n = 16, 20%). Moreover, random sampling was employed in this study. The age was not considered, as it does not directly influence the outcomes being measured. Thus, age was deemed unnecessary and did not affect the validity of the results. In terms of academic section, the respondents were equally distributed across four (4) groups which are Faye Abdellah (n = 20, 25%), Ida Jean Orlando (n = 20, 25%), Martha

Rogers (n = 20, 25%), and Rozzano Locsin (n = 20, 25%). Regarding note-taking methods, participants were also evenly divided among traditional note-taking (n = 20, 25%), digital note-taking (n = 20, 25%), preferred note-taking (n = 20, 25%), and no note-taking (n = 20, 25%). This equal distribution provides a solid basis for examining how different note-taking strategies might academic performance and learning outcomes.

Traditional Note-Taking Method (Group A)

Table 3: Scores of Group A Respondents

Student Number	Section	Pre-Test	Result	Post-Test I	Result	Post-Test II	Result	
1	F	FA	8	Failed	21	Passed	21	Passed
2	D	FA	10	Failed	22	Passed	24	Passed
3	M	FA	10	Failed	20	Passed	19	Passed
4	R	FA	10	Failed	17	Failed	18	Passed
5	F	FA	10	Failed	21	Passed	18	Passed
6	T	IJO	10	Failed	18	Passed	20	Passed
7	D	IJO	11	Failed	13	Failed	12	Failed
8	L	IJO	9	Failed	14	Failed	19	Passed
9	S	IJO	16	Failed	19	Passed	18	Passed
10	D	IJO	10	Failed	18	Passed	16	Failed
11	R	MR	7	Failed	9	Failed	11	Failed
12	N	MR	11	Failed	16	Failed	16	Failed
13	S	MR	8	Failed	17	Failed	16	Failed
14	M	MR	7	Failed	11	Failed	13	Failed
15	P	MR	10	Failed	12	Failed	14	Failed
16	H	RL	8	Failed	12	Failed	10	Failed
17	B	RL	12	Failed	17	Failed	17	Failed
18	L	RL	9	Failed	15	Failed	15	Failed
19	C	RL	10	Failed	12	Failed	13	Failed
20	E	RL	8	Failed	10	Failed	9	Failed

Pre-Test	9.7	2.00	0%
Post-Test I	15.7	3.92	35%
Post-Test II	15.95	3.87	40%

Table 3 illustrates the transition of Group A from the baseline (Pre-test) to the final assessments Post-test 2). Group A's transition from baseline assessment to final assessments yielded (Pre-test M = 9.7, SD = 2.00, 0% Passing Rate) (Post-test 1 M = 15.7 SD = 3.92, 35% Passing Rate) (Post-test 2 M = 25.95 SD = 3.87, 40% Passing Rate). Group A initially demonstrated a low level of prior knowledge with a pre test mean of 9.70 (SD=2.00), where 100% of the participants failed to meet the passing criterion of 18. During the pre-test of all group showed that there are no students passed the test, this outcome is within the expectations of the researchers as students are expected to not have an idea, more or less prior knowledge with the material. Following the intervention, a marked increase in performance was observed, with the mean score rising to 15.70 in the first post-test and peaking at 25.95 in the second post-test. While there was a marginal improvement between the two post-tests, the group average remained below the 75% passing mark. By the final assessment, the passing rate reached 40%. The significant increase in Standard Deviation from 2.00 to 3.87 suggests that while the group average

improved, the gap between high performing and low-performing students widened after the treatment, indicating that the traditional method yielded varied individual results.

Digital Note-Taking Method (Group B)

Table 4: Scores of Group B Respondents

Student Number	Section		Pre-Test	Result	Post-Test I	Result	Post-Test II	Result
1	L	FA	9	Failed	20	Passed	20	Passed
2	T	FA	13	Failed	21	Passed	24	Passed
3	O	FA	11	Failed	19	Passed	16	Failed
4	A	FA	12	Failed	18	Passed	21	Passed
5	D	FA	10	Failed	19	Passed	18	Passed
6	V	IJO	8	Failed	13	Failed	12	Failed
7	C	IJO	6	Failed	14	Failed	10	Failed
8	D	IJO	12	Failed	17	Failed	16	Failed
9	C	IJO	10	Failed	12	Failed	15	Failed
10	D	IJO	10	Failed	14	Failed	15	Failed
11	T	MR	10	Failed	13	Failed	13	Failed
12	U	MR	7	Failed	7	Failed	9	Failed
13	S	MR	10	Failed	16	Failed	16	Failed
14	T	MR	9	Failed	10	Failed	11	Failed
15	M	MR	11	Failed	14	Failed	14	Failed
16	F	RL	8	Failed	17	Failed	17	Failed
17	C	RL	10	Failed	13	Failed	16	Failed
18	D	RL	6	Failed	10	Failed	12	Failed
19	A	RL	11	Failed	14	Failed	15	Failed
20	D	RI	8	Failed	15	Failed	13	Failed

	<i>M</i>	<i>SD</i>	% Passing Rate
Pre-Test	9.55	1.93	0%
Post-Test I	4.80	3.62	25%
Post-Test II	15.15	3.71	20%

Table 4 shows the scores for Group B, detailing the progression through the digital note-taking intervention.

The progression of Group B from their initial evaluations to their final results showed: (Pre-test M = 9.55 SD = 1.93, 0% Passing Rate) (Post-test 1 M = 14.80 SD = 3.62, 25% Passing Rate) (Post-test 2 M = 15.15 SD = 3.71, 20% Passing Rate). As shown in Table 4, the initial average for Group B was 9.55 (SD = 1.9324). During the pre-test phase, 0% of the participants met the passing threshold of 18, which confirms that the respondents had insufficient prior knowledge of the subject matter before the digital intervention was introduced. Post-intervention results indicate a steady upward trend, with the mean score rising to 14.80 in the first post-test and reaching 15.15 in the final assessment. While the mean increased, the percentage of students passing remained extremely low, recorded at 25% in Post-test 1 and dipping slightly to 20% in Post-test 2. Although the digital curriculum proved masterful for a very small minority, the overall average suggests that the digital instructional delivery may require further reinforcement or a blended approach. The significant increase in Standard Deviation from the pre-test (1.93) to the final post-test (3.71) indicates that while the method raised baseline scores, it also increased the performance gap among students, leaving the majority of the group in the "Failed" bracket.

Preferred Note-Taking Method (Group 1)

Table 5: Scores of Group 1 Respondents

Student Number		Section	Pre-Test	Result	Post-Test I	Result	Post-Test II	Result
1	M	FA	10	Failed	16	Failed	17	Failed
2	B	FA	15	Failed	19	Passed	24	Passed
3	G	FA	8	Failed	15	Failed	14	Failed
4	A	FA	10	Failed	14	Failed	18	Passed
5	S	FA	11	Failed	15	Failed	14	Failed
6	R	IJO	11	Failed	9	Failed	12	Failed
7	M	IJO	11	Failed	13	Failed	15	Failed
8	A	IJO	8	Failed	21	Passed	20	Passed
9	A	IJO	9	Failed	14	Failed	10	Failed
10	A	IJO	6	Failed	18	Passed	19	Passed
11	M	MR	9	Failed	11	Failed	21	Passed
12	R	MR	9	Failed	16	Failed	13	Failed
13	P	MR	5	Failed	12	Failed	13	Failed
14	Y	MR	7	Failed	9	Failed	14	Failed
15	M	MR	8	Failed	15	Failed	21	Passed
16	B	RL	5	Failed	11	Failed	10	Failed
17	D	RL	9	Failed	15	Failed	14	Failed
18	C	RL	10	Failed	17	Failed	16	Failed
19	C	RL	10	Failed	15	Failed	15	Failed
20	D	RL	6	Failed	11	Failed	9	Failed

	<i>M</i>	<i>SD</i>	% Passing Rate
Pre-Test	8.85	2.39	0%
Post-Test I	15.95	3.87	15%
Post-Test II	15.45	4.04	30%

Table 5 presents the results for Group 1, highlighting the variance in student performance when using their preferred methods.

Group 1's shift from their starting point to the final tests showed the following: (Pre-test $M = 8.85$ $SD = 2.39$, 0% Passing Rate) (Post-test 1 $M = 15.95$ $SD = 3.87$, 15% Passing Rate) (Post-test 2 $M = 15.45$ $SD = 4.04$, 30% Passing Rate). Group 1 started with the lowest pretest mean score of 8.85. Since 0% passed the pre-test, it shows that the students had very little knowledge of the topic before the study began. By the second post-test, the group's average improved to 15.45. While the passing rate technically doubled from 15% to 30%, it remained very low. This group showed a "late-bloomer" effect, meaning they slowly got better over time as they used their preferred study methods. However, this group had the hardest time reaching the passing score of 18. There was also a very high "spread" in scores (Standard Deviation of 4.04), which means some students did very well while others stayed far behind. Even though the passing rate showed a slight increase, the fact that only 30% passed overall suggests that letting students choose their own method was not enough to help the whole group pass. These students would likely need extra help or a more structured study plan to reach the 75% passing mark. This could also mean that the students who believed on their

preferred method as the effective method was proven otherwise.

No Note-Taking Method (Group 2)

Table 6: Scores of Group 2 Respondents

Student Number	Section	Pre-Test	Result	Post-Test I	Result	Post-Test II	Result	
1	B	FA	11	Failed	13	Failed	17	Failed
2	C	FA	13	Failed	14	Failed	24	Passed
3	F	FA	9	Failed	19	Passed	14	Failed
4	B	FA	12	Failed	18	Passed	18	Passed
5	L	FA	9	Failed	18	Passed	14	Passed
6	M	IJO	9	Failed	10	Failed	12	Failed
7	P	IJO	10	Failed	17	Failed	15	Failed
8	A	IJO	15	Failed	14	Failed	20	Failed
9	B	IJO	12	Failed	20	Passed	10	Passed
10	G	IJO	12	Failed	17	Failed	19	Passed
11	O	MR	6	Failed	16	Failed	21	Failed
12	S	MR	8	Failed	10	Failed	13	Failed
13	M	MR	7	Failed	14	Failed	13	Failed
14	R	MR	9	Failed	15	Failed	14	Failed
15	R	MR	7	Failed	20	Passed	21	Passed
16	D	RL	10	Failed	16	Failed	10	Failed
17	D	RL	6	Failed	10	Failed	14	Failed
18	L	RL	3	Failed	14	Failed	16	Failed
19	A	RL	7	Failed	9	Failed	15	Failed
20	C	RL	6	Failed	13	Failed	9	Failed

	<i>M</i>	<i>SD</i>	% Passing Rate
Pre-Test	9.05	2.9	0%
Post-Test I	14.85	3.37	25%
Post-Test II	14.9	4.48	30%

Table 6 details the performance of Group 2, characterized by consistent growth and specific score clustering.

Looking at Group 2's progress from the first test to the last, here is what the data showed: (Pre-test $M = 9.05$ $SD = 2.9$, 0% Passing Rate) (Post-test 1 $M = 14.85$ $SD = 3.37$, 25% Passing Rate) (Post-test 2 $M = 14.9$ $SD = 4.48$, 30% Passing Rate). As shown in Table 6, Group 2 started with an average score of 9.05. Just like the other groups, 0% passed the pre-test, which means the students did not have enough prior knowledge about the topic before the experiment started. After the intervention, the scores improved to 14.85 and then stayed steady at 14.90. While the scores went up, the passing rate ended at only 30%. A common pattern in this group was "clustering," which means many students got scores that were very close to the passing mark of 18 but didn't quite reach it. This shows that while the alternative method helped students understand the basics, it wasn't enough to help them fully master the subject. Also, this group had the highest "spread" of scores (4.48), the widest among all groups. This means that even though the group average grew consistently, the results for each student were very different—some improved a lot, while others stayed at much lower scores.

Independent T-Test

Table 7: One-Tailed Independent T-Test (Pre-Test vs. Post-Test 1)

		<i>N</i>	<i>M</i>	<i>SD</i>	<i>df</i>	<i>t</i>	<i>Interpretation</i>
Pre-Test	Group A	20	9.70	2.00	19	7.48	Significant Difference
	Group A	20	15.70	3.92			
	Group B	20	9.55	1.93	19	7.90	Significant Difference
	Group B	20	14.80	3.62			
Post-Test I	Group 1	20	8.85	2.39	19	7.34	Significant Difference
	Group 1	20	15.45	4.04			
	Group 2	20	9.05	2.91	19	6.84	Significant Difference
	Group 2	20	14.85	3.37			
Decision Rule > 1.3277							

After subjecting individual participant's scores from Pre-test and Post test 1 to Independent One-Tailed T-test, the researchers were able to determine that the participants who were subjected in the study did not have a prior understanding of the subject material; evident in Table 7, where it shows that the T-Value of Group A (Traditional Note-Taking), Group B (Digital Note Taking), Group 1 (Preferred Note-Taking) is in the range of (7) while Group 2 (No Note-Taking) being in range of (6), compared to the critical T value of (>1.3277) suggesting that there is a significant difference; the data shows that the scores of the participants during the Post-Test 1 were significantly higher compared to their initial Pre-Test. On the other hand, each group Standard Deviation remained moderately spread with only few scores reaching the extremes, this could be influenced by uncontrolled factor such as student's intellect, problem solving skills or other intrinsic factor that the study has not accounted for, nevertheless, this variable change does not affect the total outcome of the study.

Independent T-Test

Table 8: Two-Tailed Independent T-Test Differences of Note-Taking Methods

		<i>N</i>	<i>M</i>	<i>SD</i>	<i>df</i>	<i>t</i>	<i>H</i> ₀
Post-Test I	Group A	20	15.70	3.92	19	0.75	Accepted
	Group B	20	14.80	3.62			
Post-Test II	Group A	20	25.95	3.87	19	0.66	Accepted
	Group B	20	15.15	3.71			
Post-Test I	Group A	20	15.70	3.92	19	1.23	Accepted
	Group 1	20	14.30	3.18			
Post-Test II	Group A	20	25.95	3.87	19	0.39	Accepted
	Group 1	20	15.45	4.04			
Post-Test I	Group A	20	15.70	3.92	19	0.73	Accepted
	Group 2	20	14.85	3.37			
Post-Test II	Group A	20	25.95	3.87	19	0.79	Accepted
	Group 2	20	14.90	4.48			
Post-Test I	Group B	20	14.80	3.62	19	0.46	Accepted
	Group 1	20	14.30	3.18			
Post-Test II	Group B	20	15.15	3.71	19	-0.24	Accepted
	Group 1	20	15.45	4.04			
Post-Test I	Group A	20	14.80	3.62	19	-0.04	Accepted
	Group A	20	14.85	3.37			
Post-Test II	Group B	20	15.15	3.71	19	0.19	Accepted
	Group B	20	14.90	4.48			
Decision Rule < -1.6860, > 1.6860							

Being the main focus of this study is to determine whether there is a significant difference between Group A (Traditional Note-Taking Method) and Group B (Digital Note-Taking Method) as the experimental group, along with Group 1 (Preferred Note Taking Method) and Group 2 (No Note-Taking Method) acting as control groups, using the critical T-Value of (<-1.6860, >1.6860) as the "decision rule" whether to accept or reject the alternative hypothesis, the questions stated were determined.

Upon subjecting the scores of participants to T-Test Analysis (Independent Two-Tailed T-Test) yielded the T-values for Post-Test 1 of Groups A and Group B shown in Table 8, with a T-value of (0.75401) which did not align with our decision rule of critical T-Value of (<-1.6860, >1.6860), while Post-Test 2 showed a T-value of (0.66648). Both T-values of Post-Test 1&2 failed to meet the "decision rule;" hence rejecting our alternative hypothesis 1 and accepting our null hypothesis 1; there are no significant difference between Group A (Traditional Note-Taking) and Group B (Digital Note Taking) in terms of their immediate knowledge retention, and (1 hour) delayed knowledge retention despite both methods proving to increase the ability of students to retain significant information; contrary to other related studies where data suggests Traditional-Note Taking Method proved significantly better (Shi *et al.*, 2020) [19], or those that states otherwise (Sun & Li, 2019) [20], this study was able to conclude that neither of the Note-Taking Method were superior, similarly Voyer's study on the effect of note-taking method on academic performance: a systematic review and meta-analysis (Voyer *et al.*, 2022) [26] suggests that Note-Taking Approach were not significant to student's academic performance. Although the result proved contrary to the researcher's expected outcome, the data remained cohesive amongst the participants as shown by the relevant close Standard Deviation ranging from (3.6 - 3.9).

On the other hand, when comparing the difference of Group A and B with Group 1 (Preferred Note Taking Method) and Group 2 in terms of the score results for Post Test 1, the T-Test Analysis yielded a T-Value of (1.23999 and 0.46392) compared to Group 1 respectively, and a T-Value of (0.73461 and -0.04516) for group 2 respectively. In terms of Post Test 2, the T-Test resulted in a T-Value of (0.39928 and -0.2442) for Group 1 and a T-Value of (0.79268 and 0.19199) for Group 2 respectively, the T-Values yielded for both Post-Test 1 and Post-Test 2 still failed to meet the criterion for the "Decision Rule" with Critical T-Value of (<-1.6860, >1.6860), this data rejects alternative hypotheses 2 and 3 and accepts null hypotheses 2 and 3; there are no significant difference between students that were instructed to use Traditional Note-Taking and Digital-Note Taking regardless of their preferred method compared to those that used either method based on their preference, this suggest that Traditional-Note Taking and Digital-Note Taking proves effective in terms of knowledge retention, regardless if a student preferred or is new to a one method or another, this yield could be beneficial for those students that are at an impasse with using a preferred method over the other but cannot attain to use such due to intrinsic or extrinsic factors such as financial status or environmental constrictions.

Finally, this data suggest that for students that used Various Note Taking Method observed in Groups A, B, and 1 whose attention were divided with listening to the lecturer or to the subject discussion, note-taking, and "partially by

distractions from note-taking by other applications that are present only with digital devices” (Voyer *et al.*, 2022) ^[26] were able to compensate with the notes that they have, compared to students whose attention was purely dedicated to attentive listening noted with Group 2, resulting to equal amounts of knowledge retention in both immediate recall and (1 hour) delayed recall. This states that students incapable of Note-Taking may opt for Attentive Listening and will still yield the same result to those that did; the research suggests that this phenomena could possibly accounted due to the learning environment where the participants are subjected triggering adaptations in learning (Ong *et al.*, 2023) ^[15]; a fast paced learning approach where nursing students are already instructed to absorb massive information in single seating since their first day, this may have resulted to students having an enhanced learning adaptability.

Independent T-Test Post-Test I

Table 9: Two-Tailed Independent T-test (Post-test 1 Vs. Post Test 2)

		<i>N</i>	<i>M</i>	<i>SD</i>	<i>df</i>	<i>t</i>	<i>H</i> ₀
Post-Test I	Group A	20	15.70	3.92	19	-0.20	Accepted
	Group A	20	15.95	3.87			
	Group B	20	14.80	3.62	19	-0.30	Accepted
	Group B	20	15.15	3.71			
Post-Test II	Group 1	20	15.95	3.87	19	-0.99	Accepted
	Group 1	20	15.45	4.04			
	Group 2	20	14.85	3.37	19	-0.03	Accepted
	Group 2	20	14.90	4.48			
Decision Rule $\leq -1.6860, \geq 1.6860$							

Afterwards, score results of all the groups in Post-Test 1 were also compared to their own Post-Test 2, this is to understand whether the scores of each method would significantly change over time (Delayed Recall). The T Test Analysis showed a T-Value ranging between (-0.03985 and -0.9994) an almost identical results, compared to its critical T-Value of (<-1.6860, >1.6860) where it still failed to meet the criterion, this results to an interpretation that there are no significant difference between Post-Test 1 and Post-Test 2 of the methods used, this could be explained by the delimited amount of time of 1 hour allotted for delayed recall which could have been insufficient amount of time to significantly effect knowledge retention; however, when comparing the passing rate, only Group A, 1, and 2 increased overtime with an increase in passing rate of 5%, meaning the in the span of 1 hr, said Group's Knowledge retention became more solidified, whilst Group B decreased overtime, with a decrease of 5%; however when examined using the Standard Deviation, it showed that the data had a moderate distribution, which means that this extreme was not significant throughout the participants of Group B, and can be accounted for intrinsic factor toward that individual participant.

5. Summary of Findings, Conclusions, and Recommendations

This section presents the summary of findings, conclusions, and outcomes of the study following the rigorous analysis of data gathered.

Summary of Findings

This study determines the difference between traditional and digital note-taking methods and what method is the most efficient in retaining short term and long-term knowledge of First-Year Nursing Students in Dr. Carlos S. Lanting College. The study was conducted on 4 different sections, with each having 20 participants that were divided into 4 subgroups. Group A stands for Traditional, Group B stands for Digital, Group 1 stands for preferred, and Group 2 stands for No methods of note-taking used.

After the collection of data and certain computations were made, the result showed that there was no significant study method that exemplified itself as the best. The study shows that the total number of examinations rejects the alternative hypothesis, which signifies that all methods provide equal knowledge retention. If there are any, they were not significant enough to be better than other methods.

The results of the pre-test examination showed a 0% passing rate among all students. Regardless of the methods used, all lacked the sufficient knowledge to answer the exam questions. This is completely expected as students did not have a prior idea of the topic as this part of examination was meant to serve as a diagnostic evaluation.

Moving onto post-test 1, this examination tells the difference between each technique used by each group. Even then, the results showed that regardless of the note taking method implemented, many students still share the same scores. In total, only 25% of the entire batch (80) passed the post test 1. Some students show a stronger grasp on the topic, excluding the choice of method used by each group. While the majority failed to show significant changes after using their note-taking method.

Lastly, the post-test 2 was taken to examine the long-term knowledge of each subgroup after an hour of break. The results showed that the total passing rate among all students (80) only increased to 30%. Again, this is considering the fact that there was no group that exemplified over one another just by using a different method. The majority of the results showed no difference between the methods taken by each group which signifies that in one way or another, a student will have the ability to retain an idea with no regards to the type or kind of technique they will use in order to understand a subject.

To put it simply, students who use traditional note-taking methods have no significant difference in knowledge retention in comparison to students who prefer digital note-taking methods in their examination. Additionally, the study revealed that a student that chooses to learn using a specific note-taking method while listening carefully to the subject matter, is not so different from a student that listens with only their visual and auditory stimulus. The results tell us that no matter what a student chooses to use in order to learn, they will have the potential to pass the examination, or likewise, fail.

However, the study still suggests that the use of note-taking methods will inherently decrease cognitive noise and increase cognitive awareness. This boils down to the idea that a student's ability to learn and retain information is not solely bound to rule of thumb or established standard, but rather on how they personally engage in specific lessons or how interested they are in the process of learning.

Conclusion

With the proven analysis results and data findings, this research concludes that, with the First-Year Nursing Students of Dr. Carlos S. Lanting College, students have adapted a learning style that allowed them to absorb knowledge regardless of the method of note-taking they use or lack thereof, this can be insinuated with the fast-paced learning environment they were subjected where significant information is obtained and comprehended in a short amount of time such as nursing procedures, and clinical skills; furthermore, qualities such as adaptability, creativity, and ingenuity regardless of the environment or the situation, are qualities observed not only to the students of Dr. Carlos S. Lanting College, but mainly to nursing students, serving as part of their arsenal of skills to be used to prepare them in the actual clinical field, such qualities gave nursing students an edge in these faculties.

The analysis of Hypothesis 1 suggest that, there are no significant difference between Traditional Note-Taking Method and Digital Note-Taking Method along with the analysis of Hypothesis 3 where there are also no significant difference whether a student used a Note-Taking Method they preferred or one they aren't usually used to, this suggests that students may use a either Note-Taking Method and it would still yield the same result in terms of knowledge retention, this influences decisions of students who are struggling with what method to choose during their study.

Finally, Students could also opt for attentive listening rather than using any note-taking method, as this would also result in the same amount of knowledge retention as both note-taking method and attentive listening enhances the schema and reduces cognitive load when studying. Overall, the method of note-taking or lack thereof will still allow students to retain knowledge the data showed that students despite tipping in the minority passed the test questionnaire given, while the majority are not so far either, as they are borderline from the passing scores; however, the degree of knowledge retained or the potency of note taking method are still not defined by any standard, students who used traditional note-taking method showed ingenuity and adaptability at the same degree that they have struggled, this is also evident with other methods and those that did not use such, rather knowledge retention would still solely depend on the student's capability of comprehending information and their willingness to engage with studying specific lessons, or otherwise a student's intrinsic and extrinsic factors affecting their studying experience.

Recommendations

Data from three respondent groups using different approaches— traditional/handwritten, digital/gadget-based, and no note-taking at all— shows equal percentage of results among the groups.

For the traditional method, students showed confusion when trying to write and listen simultaneously; on the other hand, with the digital method, students often diverted their attention from the lecture to other activities on their devices. For those who took no notes, performance varied based on individual differences in learning ability and focus.

For Students and Future Nursing Students, the researchers therefore recommend that students prioritize active listening during lessons. Gadgets and digital tools should be used supplementally, such as for searching

unfamiliar terms or clarifying concepts that are not well understood, students may also refrain from being anxious with their method as either note taking methods or the lack of one would still result with the same effect, and that it would ultimately vary on the student themselves.

For Teachers and the Faculty, the researchers recommend encouraging students to use the school library and to provide pointers to read ahead or review lectures and take notes, preparing them for class discussions, ultimately avoiding the use of any supplementary devices and focusing greatly with attentive listening; additionally, teachers should promote attentiveness and focus during lessons, and require students to ask questions or to be asked to enhance understanding.

For Future Researchers, the researchers suggest in improving various aspects of the research that was delimited resulting to insufficient data, such as the amount of time used for the delayed recall, an increase in hours or days could prove beneficial in yielding positive results. Moreover, the researchers also encourage increasing the population of participants to increase the variables and decrease possibilities of errors or extremes in the variable. Finally, a different approach such as Sequential Exploratory Design may also be used to further understand different factors that may affect the data such qualitative factors including but not limited to, student's study experience, financial status, and the overall accessibility of a method.

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