The Effectiveness of Using a Yellow Highlighter on Memory Retention

A Thesis

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Abstract

Highlighting with highlighter pens was widely used by students as an essential aid for learning. In the study, researchers described the respondents based on the demographic variable sex. Researchers also determined memory retention in both experimental and control conditions and identified significant differences in memory retention in both groups. The participants were first-year BS Psychology students who were enrolled in a Higher Education Institution, with the purpose of contributing to past research studies on the use of yellow highlighters to retain information better. The researchers utilized a within-subjects design for quantitative-experimental research. A random sampling method was used to gather the names of 117 participants out of a total population of 166 students. The participants undergo two conditions: the controlled condition (without the use of a highlighter) and the experimental condition (with the use of a highlighter), with a two-week gap in between. Participants were given reading material and a fill-in-the-blanks testing material for the experiment. Descriptive statistics including percentage, mean, and standard deviation were employed. For inferential statistics, a paired-samples t-test with a .05 significance level was used. Results indicated a significant difference between the conditions with a p-value of .000, supporting the rejection of the null hypothesis. Effect size was determined by using Cohen's d, with a result of -.0014, which was interpreted as a little effect size. The means of the control condition (M=5.38) and the experimental condition (M=7.50) indicated that participants performed better when they used a yellow highlighter. The findings suggested that using a yellow highlighter can contribute to an individual’s memory retention.

Table of Contents

List of Tables

List of Figure

Chapter 1

Introduction

This chapter provides an overview of the effect of using a yellow highlighter on memory retention, specifically, this chapter comprises the following; (1) background of the study, (2) objectives, (3) hypothesis, (4) theoretical and conceptual framework, (5) definition of terms, (6) significance of the study, and (7) scope and limitation of the study.

Background of the Study

According to Radvansky (2017), the human brain is responsible for learning, retaining, and recalling information. It is a complex process that involves the creation and connection of millions of neurons that aid in storing and retaining any information that the human senses would detect. Human memory is defined in three aspects; memory is a storage as to where information is kept, a thing that holds experiences and may also bring changes due to the ongoing processes of information in the brain, as in a memory trace. And lastly, it is the mental processes used to learn and retrieve information.

Human memory is a dynamic, continuous process of encoding, storing, and retrieving information on the individual's experiences. It allows itself to make certain changes as it learns information over time thus, improving one's well-being and a high chance of survivability. Memory retention, according to Amin, H, U & Malik, A., (2014), is the storage of encoded information in the brain. There are two types in which human memory stores information as cited in Choudhury and Bhansali (2022), long-term memory and short-term memory. When humans take an information, it is encoded first

before it passes into these memory storages which can be retrieved when needed afterwards.

Radvansky (2017) also pointed out that learning is a crucial part of life and in forming new memories as well. From learning to walk and speak in one's home, to being able to read and write in schools, and learning society's ways as the individual gets older. For humans to be able to remember or memorize information, they must learn it first. Every human has a different way of learning things. One of the settings where individuals learn is in school.

In particular, cognitive interventions, like cognitive stimulation or rehabilitation, use learning and memory strategies as a part of a multifaceted approach to care because it is challenging to evaluate the efficacy of a technique alone. To enhance memory acquisition and retrieval, a number of compensatory and instructional techniques are used in accordance with conventional memory frameworks (i.e., visual imagery, external aids, spaced retrieval, errorless learning, etc.) (Fernández, Beron, Campos, Allegri & Pedreira 2022).

Several researchers attempt to create better ways and better tools to aid in student's academic performance and one of them is the creation of highlighters. (Nishimura & Kuwahara, 2017).

A highlighter is generally used for the purpose of promoting learning by coloring keywords or phrases that are important. It is thought that coloring and highlighting text with a highlighter pen would influence the learner's cognitive processes including learning. It was supported by the study of Nishimura and Kuwahara (2015) where results stated a significant difference between groups who used highlighter pens and findings involved an increased memorization of keywords and higher scores in arithmetic computations and in an English test. Another study by Yue et al. (2015) produced similar results when they examine students' attitudes about using highlighters as a study

strategy. Participants who belonged to the highlighting group found highlighting as beneficial in memory retention, especially in mass learning (i.e. studying continuously or with no breaks). In contrast with this study it found no difference in recall performance between non-highlighted keywords from the highlighter group and the non-highlighter group. This suggests that highlighting doesn't affect the retention of non-highlighted keywords.

According to Malaikahaider (2021), many studies show that highlighting is ineffective. It was stated that highlighting decreases students or people making inferences, it does not allow someone to connect with different ideas. What to highlight may also affect an individual's learning especially when re-reading the highlighted material because highlighting emphasizes words or phrases and separates them from their sentences which can easily be taken out of context if the individual only memorizes the highlighted texts and not understand what the highlighted words really mean (Terada, 2021).

This study investigates the effectiveness of using a yellow highlighter on memory retention. The researchers believe that there is a contradictory evidence gap and clarified that utilizing a yellow highlighter indeed enhances information retention in memory. In addition to this, there are a lot of ways on the internet that have been recommended for retaining information however, highlighting using a highlighter pen seems to not be their focus (e.g. underlining, bold letters, italicizing). Only a few researchers have conducted a study in relation to highlighting, therefore there is a need for further research about the effectiveness of using yellow highlighter on memory retention. Other beneficial aspects such as using highlighting as a study method are being observed. Therefore, this study fills in these knowledge gaps by looking at how yellow highlighters are used to improve memory retention. The researchers relate to the

study because it interests them in the practical applications of study skills and brings to mind their own experiences of using yellow highlighters to underline texts, aiding memory recall throughout their academic careers.

Research Objectives

This study aims to determine the effectiveness of yellow highlighters on the memory retention of BS Psychology students enrolled in a Higher Education Institution (HEI).

Specifically, this study aims to:

1. Describe the respondents according to the demographic variable sex.
2. To determine memory retention in both experimental and control conditions.
3. To determine if there is a significant difference in memory retention in both experimental and control groups.

Hypothesis

With the objectives, theoretical framework, and conceptual framework as the basis, the researchers tested the hypothesis:

1. There is no significant difference in memory retention in both experimental and control groups.

Theoretical and Conceptual Framework

Theoretical Framework

The theoretical framework for this study is based on Craik and Lockhart's "Processing Depth Theory". This theory explains that the depth of processing that goes into the memory is the focus of the levels of the processing model which makes the assumption that the longer a memory trace lasts, the more deeply the information is processed. The hypothesis is that the encoding scheme of information influences how

well the data is recalled. Information is easier to recall at deeper levels of processing (Mcleod, 2023).

Mcleod (2023) also proposed Baddeley's Working Memory Model as an alternative to Atkinson and Shiffrin's Multi-Store Model. Working memory includes more cognitive processes, working memory elaborates the function of STM by having different components namely, the central executive, visuospatial sketchpad, phonological loop, and episodic buffer which processes different types of information such as phonetics, or processing of words.

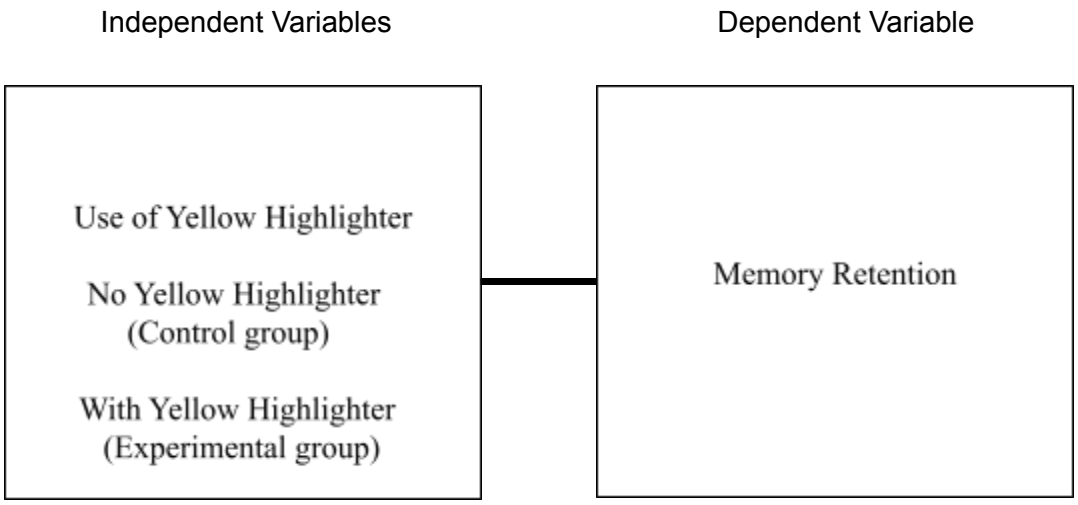
Viquepedia, as cited from Eysenck and Keane (2019) stated that Episodic Buffer is the latest component being added to Baddeley's model of working memory. It integrates information from other components or systems including long-term memory and binds them into one representation. By applying this model in the current study, researchers may observe how these components function and whether yellow highlighters effectively retain and recall information.

Craik and Lockhart's Processing Depth Theory which was discussed by (Bastianetto, 2022), explains that memorization improves when the information is processed in depth and with the intention of processing it semantically. Instead of repetition, what influences retention in memory is the processing of these experiences. Or to put it in another way, how we remember information depends on how we process it. In order to make our memories readily available, semantic processing requires us to think carefully about an occurrence.

Conceptual Framework

The current study investigates how the independent variable affects the dependent variable. Figure 1 illustrates the effect between variables. The use of yellow highlighter served as the independent variable. The memory retention of 1st year BS Psychology students served as the dependent variable in this research.

Figure 1 illustrates a diagram of the relationship between the variables.



Definition of Terms

To fully understand the study, the following terms and variables were conceptually and operationally defined.

Effectiveness. It is defined as the degree to which something is successful in producing a desired result which its outcome is success. (Gagers, 2018).

In this study, effectiveness was defined as the extent to which the use of a yellow highlighter enhanced memory retention in the experimental group, with data analysis conducted using tools such as MS Excel and SPSS version 20 programs..

Memory Retention. Refers to the ability to remember information previously encoded and stored, essentially involving the retrieval of stored information over time.(Siu, 2022).

In this study the memory retention refers to the number of words retained by filling the missing words.

Sex. Refers to a set of biological attributes in humans and animals. It is primarily associated with physical and physiological features including chromosomes, gene expression, hormone levels and function, and reproductive/sexual anatomy. Sex is usually categorized as female or male but there is variation in the biological attributes that comprise sex and how those attributes are expressed (Ainsworth, Clair., 2015).

In this study, sex is grouped according to male and female.

Use of Highlighter. According to Nishimura & Kuwahara (2017), a highlighter is generally used for the purpose of promoting learners by coloring keywords or phrases of importance, thereby improving learning efficiency. It is thought that coloring and highlighting text with a highlighter pen would influence the learner's cognitive process in learning.

In this study, the use of a highlighter refers to participants using a yellow highlighter to highlight specific words or phrases from the reading material(experimental) and not using a yellow highlighter (controlled).

Yellow. Yellow can quickly grab attention, but it can also be abrasive when overused. It can appear warm and bright, yet it can also lead to visual fatigue. Yellow characteristics are attention-grabbing, increase metabolism, and a bright color that is often described as cheery and warm (Cherry, K., 2022).

In this study yellow is the color of the highlighter that was used.

Significance of the Study

The results of the study would be beneficial to the following individuals for the reasons listed below:

Academic Administrators. The study's findings can benefit the academic community by enhancing the body of information regarding efficient learning techniques. It can also influence instructional methods and educational practices.

Teachers. The results of the study would help the teachers in understanding their students' techniques in studying and assess a student's problem in terms of poor comprehension, which might be a potential reason for their poor academic performance. This study can also offer insightful information for educators, assisting them in comprehending how yellow highlighting can be employed as a technique to improve students' memory retention and academic performance.

Guidance Counselors. The study's findings may be used as a basis for guidance counselors to provide support and guidance for students in terms of memory retention.

Parents. The results of the study would let the parents know how yellow highlighting may aid their children's study strategy in school. Moreover, with this understanding, parents are better equipped to support their children's learning in meaningful ways.

Students. This study is helpful to students in terms of studying. They can create ways to become productive individuals as this study would made them aware of the effects of yellow highlighting on their memory retention. The results of this study may also provide highlighting as an option to students who are still exploring study strategies which let students choose when and how to apply yellow highlighters and they may also

enhance their study habits, remember knowledge better, and make the most of their educational opportunities.

Future Researchers. The study's findings would be helpful and can benefit future researchers for they can use this as a basis if they would conduct the same or a study related to yellow highlighting and memory retention. Moreover, it can be added as information for their future studies and may also encourage additional research and help the field of study flourish.

Scope and Limitation of the Study

The objective of this study has been identified that the use of a yellow highlighter has an effect on the memory retention of first-year BS psychology students. Participants were chosen based on the following criteria: (1) 1st year student of A.Y. 2023-2024, (2) taking BS Psychology program, (3) enrolled in Central Philippine University A.Y. 2023-2024, (4) regular or irregular student, (5) mentally fit (based from the checklist provided by researchers) (6) any of age. The following are excluded: (1) students who are not enrolled as a 1st Year students in A.Y. 2023-2024, (2) students who are not taking BS Psychology as a program (3) who are not enrolled in Central Philippine University A.Y. 2023-2024, (4) who have memory impediments or mentally unfit to participate in the experiment proper (based from the checklist provided by researchers). Researchers used experimental-quantitative research as their research design and a simple random sampling technique was used to gather the data. The demographic questionnaire sex, and a passage from the book, Ikigai: *The Japanese Secret to a Long and Happy Life* by Hector Garcia and Francesc Miralles (2016) are the materials in this study. A paired sample t-test was used as the inferential statistical tool in the study.

The time frame for the completion of this research started in March 2023 and was finished in May 2024, a total of three semesters. Participants participated in both control and experimental conditions, given with a two-week gap in between conditions. A maximum of three months is spent to gather all the needed data for the study.

There were limitations that the researchers dealt with such as the time required for this type of research design and an ample amount of participants for this study. Researchers also encountered difficulties in setting a proper time during data gathering due to conflicting schedules from the participants, sudden withdrawal of participants in the study, and other factors during experimentation such as limited color options and demographic variables, the risk of practice effects phenomenon due to the use of a within-subjects designs, and the preparations needed in order to highlight effectively. The amount of testing materials and tools also shows how financially challenging the study was, starting from the number of yellow highlighters and tokens as appreciation for their participation, to printing the consent forms, reading and testing materials. Several strategies were made in order to resolve these factors. For conflicting schedules of the participants, researchers provided a set of schedules, taking into account their availability and making advanced reservations on settings where the data would be gathered (psychology and testing laboratories, rooms in Lopez Hall and Old Valentine Buildings). Researchers contacted each block representative to ease the recruitment process as well. As for the costs of this study, reusing yellow highlighters as tokens for their participation to lessen the expenses. Researchers made sure that enough copies are prepared for participants before the experimentation as this would be the important material for this study. Inevitable factors such as the sudden withdrawal of participants and environmental changes were taken into account by keeping in contact with the participants.

Chapter 2

Review of Related Literature

This chapter focuses on the review of related literature. The following literature is based on reputable research sources, including online journals, articles, books, and research papers. This study offers theories to support the study and offers specific justifications. The literature review is divided into 5 parts tackling specific factors that could support researchers' study. (1) Discussed about memory retention in general, how memory retention works and being processed in a human's mind. (2) Tackle the use of yellow highlighting, and how it affects positively and negatively a student's academic performance. (3) memory retention and its significant connection to sex. (4) The Connection of memory retention to the age and year level of students. (5) Lastly, the synthesis and research gap are presented.

Memory Retention

"Knowledge is the collection of our experiences", says in the study of Amin, H,U & Malik, A., (2014) titled, "Memory Retention and Recall Processes". The way individual understand and interpret the world is by learning, retaining, and recalling information that is being passed daily. It is a unique skill that the brain is capable of. With this capability, humans learn how to develop and reuse this stored knowledge when deemed necessary. This is known as the human memory system. Everything we think depends on our memory, which is active all the time, continuously receiving new information, updating existing knowledge, and retrieving what has been stored.

Memory retention is the storage of encoded information in the brain. It is part of the three fundamental memory processes along with encoding and recall. It is important

to learn the fundamentals of how a memory works before an individual understands memory retention. The first stage of creating a memory is encoding. It interprets what the stimuli around the senses experience and prepare it for the next stage, which is retention. When a person meets a new friend, their senses may take this stimuli and signal the brain, which is then encoded and interpreted by the brain itself. The reason why people can remember their new friend is because of retention, the memory storage of the brain.

Generally, there are two types of memory systems; short-term memory and long-term memory. In the study of Mahdi N. & Kherbouche O. (2021), short-term memory, or STM, is relatively brief and limited whereas long-term memory, or LTM, is considered to have an unlimited capacity and can retain information for long periods of time. STM, also known as working memory, is where encoding usually takes place. It actively maintains the verbal (or auditory) and nonverbal(visual/spatial) information coming from the sensory systems, choosing what information to keep or to discard. An impairment in STM may cause people to struggle to process new and current information. Students with ADHD in Kofler et.al (2020) research for example, shows that their inattentive and hyperactive/impulsive symptoms may be the result of this impairment in the brain.

Baddeley and Hitch's Working Memory Model further explains the mechanisms of short-term memory by expanding its processes further which Norris D.(2017) study perfectly explained. He strongly opposes that STM is only a storage or an activation for LTM. It is instead, a complex mechanism that involves complex mechanisms such as manipulation of information necessary for complex tasks such(e.g. language comprehension, learning, and reasoning). Baddeley and colleagues emphasize that there is a separation between the processes of verbal (phonological loop) and

visuospatial (visuospatial sketchpad) information. Both of these can work hand-in-hand in order to retain or prevent the decay of information (e.g. rehearsal).

Long-term memory allows a person to retain information much longer than STM. They are usually categorized into two groups; explicit or declarative memory which involves conscious recollection of information (learning the names of places, presidents, etc.), and implicit memory which does not depend on conscious recollection (riding a bike, writing, etc.). One process that differs LTM from STM is called consolidation. Consolidation is the process that stabilizes the recently acquired information and is the main reason why individual are able to retain information for long periods of time. It stabilizes the information by strengthening synapse, increasing the number of signals that are sent and received between the neurons, or known as long-term potentiation.

Memory retention happens in both of these memory systems. STM can retain information ranging from seconds to a few minutes in maximum while LTM can retain information ranging in years or decades thanks to its consolidation process. The only way individual can measure memory retention is through the individual's memory recall. It is the process of taking out information from your memory, utilizing this memory for cognitive tasks. It re-accesses the retained information in your mind therefore, recalling information may also help us determine our retention processes. Thus, determining their memory performance, retained information, or the amount of encoded information would help us get an idea as to what their retention and recall processes are.

Memory is the representation of learning (Amin, Hafeez Ullah & Malik, Aamir, 2014). Without the human memory system, we would not be able to acquire the knowledge and necessary skills to adapt into the world. Memory retention plays a crucial role in learning and memory. It is also important to note other processes that contribute to prolong the retention of information such as long-term potentiation and rehearsal.

Measuring memory recall is the basis through knowing an individual's retention processes. Therefore, tasks involving the activation of the recall phase would help researchers explore the lore of memory.

Use of Yellow Highlighter and Memory Retention

The most significant visual experience for humans is considered to be color according to Sajnani & Chaturvedi (2013). It is known that highlighting important points of sentence problems with a highlighter pen improves the speed of answers and correct answer rates, especially in school subjects (Nishimura & Kuwahara, 2017). Multiple studies have shown that highlighting significantly affects memory. Studies have shown that information that has been highlighted improves memory and comprehension, whereas information that has not been highlighted has no effect on either (Choudhury and Bhansali 2022).

Highlighter is used to highlight or give an added emphasis to a text. According to Holt, P., (2023), it is a study method that entails the act of annotating significant sections within a text. The fundamental concept revolves around emphasizing crucial aspects in a text, such as essential figures, dates, names, and other pivotal details, making them readily identifiable during subsequent review of the material. Holt added that highlighting can help in terms of focus and reading comprehension. Another writer, Eva, L. (2021), mentioned that highlighting specific text does some magic perfectly. When you highlight something, the text remains but in a unique position which can be easily identified. Our attention towards that text becomes more confined and concise, making it easy to identify and recall in your mind. She mentioned that text highlighting strategy is very effective especially for handwritten notes. She added that yellow highlighting is best for

our memory which makes us remember words accurately. Yellow, for her, grabs the most excellent attention of learners like students.

Colors contribute to our memory as well. According to Chang B., Xui R.,Watt T. (2018), colors affect student's learning especially in cognition and emotion. Bringing attention to a specific text, or object, is one of the usage of color. Dzulkiflii and Muztafar, (2013) cited from this study, that attention also helps us focus and select certain information that the cognitive system wants to be processed or retained. Colors help increase these attention levels, helping that certain information to be transferred from short-term memory, to the long-term memory. Thus, increasing the individual's chance to memorize and recall the information. Warm colors such as yellow, red, or orange are assumed to be the ideal colors in increasing a learner's attention and stimulating their active participation in activities. Another study that supports this notion is from the study of Olurinola and Tayo, (2015), where they conducted the effects of colors on the retention rate of student graduates. It was concluded that color enhances the retention rate of learners, particularly adult learners.

Based on the reviewed studies, there is a foundation for linking color with enhanced memory capabilities. Essentially, color holds promise for boosting the likelihood of successful encoding, storage, and retrieval of environmental stimuli. Kuhbandner, Et., Al. (2015), added that the binding is stronger for red and yellow colors, it is also in line with previous findings on the effects of colors on attention. As often noted in applied contexts such as advertising and design, warm colors such as red and yellow seem to attract more attention.

Several studies confirm that highlighters have an effect on our memory retention. One of them is the study of Nishimura & Kuwahara (2015), where they conducted an experimental study about the use of highlighter in the story tests in the Japanese

language, arithmetic computation problems, and third-person singular present S judgment problems in English. It was established that underlining keywords or important points in questions with highlighter pen could have learning effects and contribute to the necessary memory ability, attentional capacity, and cognitive capacity of learners (elementary school students, junior high school students, and high school students). The results of their experiment demonstrate distinct differences when highlighted with a highlighter pen, namely an increase in the number of memorized Japanese tale keywords, a greater percentage of correct arithmetic computation responses, and an increase in the percentage of correct English test answers. It was concluded that it would seem that students' academic achievement could be enhanced through highlighter marking.

Highlighting text with the use of yellow highlighter pen can be predicted to offer enhanced learning benefits in sectors such as memory ability, attentional capacity, cognitive capacity, or computational ability. This can help the students achieve one of their main learning goals. In addition, another study proves that highlighting has an effect is the study of Winchell, Et. Al., (2020). He conducted a study to measure the benefits of using highlighter. Researchers use multiple representations of the highlighting patterns, they built probabilistic models to predict quiz performance and matrix factorization models to predict what content would be highlighted in one passage from highlights in other passages. The result of the study shows that using highlighting data is small in magnitude but reliable. This would be explained since highlighting choices is a proxy for the complex interpretative and memory processes a reader undergoes when exposed to reading material. Highlighting provides a peek into processes.

Hasanabadi et. al. (2016), conducted an experimental study about the effectiveness of using highlighters on memory retention. Study shows that the

experimental group have higher retention of words than those who did not use highlighters. Hasanabadi and his colleagues suggested that recognition of words retained was better for students. Highlighting can lead to better memory of text when re-reading it and better comprehension as students evaluate the importance of individual passages. These could be an indication that the effects can translate into better test performance (Yue, Et. Al., 2015).

A related study was also conducted, 104 native Hebrew-speaking people directly compared the use of highlighting in printed and digital formats. First, when there was no highlighting (control group), the researchers found comprehension was greater for those who read the printed text than the digital text. Then, when the participants were instructed to use highlighters (experiment group), comprehension improved only for the printed text group, not the digital text group (Yehuda & Alkali, 2018).

However, there are also some studies that shows using of highlighter in general is ineffective in retaining and comprehending words or sentences, one study that supported this is the study of Terada (2021), he explained that although highlighting helps students in identifying the gaps in knowledge, students tend to highlight the first line of the text that seems appealing or highlight the whole passage with different colors, in that way highlighting can be ineffective. He added that highlighting might impair long-term retention as students only focus on highlighted parts, and do not read the whole text. Moreover, highlighting is a simple strategy in which you do not read all the text. The consequences will be, you do not fully understand what you have read. But it does not mean that is not already good since according to Surma Et. Al., (2018), salient attention cues in texts are beneficial for readers.

Memory retention and Sex

Several researches have been conducted to identify whether there is a difference between a male and a female's memory. According to Asperholm, Et. Al., (2020), males have a different forte in terms of memory functioning, the same as women. The probability of genetically-based differences between the quality of male and female memory is still unknown, but the results of this study showed that females currently hold an advantage in episodic memory, a type of memory that refers to recalling past events and relating them with one another. Women outperform men in verbal tasks. Men, on the other hand, have the advantage of spatial tasks.

As cited by Med, J.(2018), there are pieces of evidence that suggest biological sex influences memory. One would be that females tend to access memories faster than males and that they tend to use more emotional terms to describe them. They also have the advantage of autobiographical memory, a memory of one's history. Males, on the other hand, have the advantage of spatial-based memory tasks and are better at remembering factual information.

In contrast to this, a recent study from Martinez (2020) suggested otherwise where a sample of 248 college students were subjected to free recall and visual-spatial tasks. The results found little to no difference in memory recall among males and females.

However, Adyalkar, (2019) conducted a study about the relationship between gender ages from 18 to 20 years old and short-term memory. This study aims to assess the relationship between gender and STM since it was found that people ages 18-20 can only store 5-9 meaningful items in their short-term memory. The result of the study shows that they accepted the hypothesis indicating that women have higher short-term memory as compared to male. This was also supported by Dr. Gabriel and Dr. Sridevi's

study in 2016, where they tested the short-term memory task and the perceptual ability of both sexes. Results in the study showed that females do better in short-term memory tasks, supporting the evidence that females excel better in verbal. Males, however, performed four times faster than females in identifying illusions, meaning that they excel more in visuospatial processing.

Memory retention and Age

Li, Et. Al., (2022) stated that memory performs better during childhood and adolescence and will decrease when one becomes old. In contrast, Mazurek et. al., (2015) conducted a study about real-world what-where-when memory tests, to measure resilience to the normal cognitive declines of aging in mentally healthy individuals. The result shows that older people perform strongly, including remembering things that younger people do. Another researcher conducted a study about age-related differences in recall and recognition: a meta-analysis.

Researchers believe that older adults tend to perform more poorly on tests of both free recall and item recognition memory. According to Rhodes, S., Et. Al., (2019), the age difference in performance is typically larger for recall tasks relative to those involving recognition. However, there have been several studies of comparable age-related differences in free recall and item recognition performance which is the reason for this study, to investigate and quantify age differences in free recall and item recognition in studies that directly compared the two, and also analyze whether single function can explain the relation between older and younger performance or if different functions are needed for recall and recognition. The result of the study shows direct comparisons of free recall and item recognition performance in the same groups of younger and older adults. Looking at the results of these articles confirms that age

differences are larger for recall than recognition, but differences are clearly larger than zero for the latter.

Healey and Kahana (2016), imply that age-related deficiencies may be specific variations in recall. They discovered four factors, most of which are relevant to both tasks that affect how recollection and recognition evolve with age. The parameters governing the stability of attention during item encoding, the use of context to direct recall efforts, and the examination of memory for intrusions had to be changed in order to simulate the data from older adults. There were additional age-related features that applied especially to recollection, even though these three components all contribute in a comparable way to age-related variances in recall and recognition. In particular, it was discovered that assuming that retrieval calculations become noisier and more vulnerable to competition as people age improves model fit. Accordingly, while this model makes the assumption that age differences in free recall and item identification are primarily the result of similar underlying processes, it also raises the possibility that the impact of age on free recall might be disproportionate.

Synthesis of Literature Review

Various studies have been conducted in understanding how memory retention works. It is crucial to learning and memory as its purpose is to keep, strengthen, and retain knowledge that was acquired through STM and LTM processes. There are ways to retain knowledge and one of them is highlighting using a highlighter pen. There are various pertaining to highlighting, however, there are only a few studies that explain the relationship between a yellow highlighter and the retention of one's memory. In this study, various gaps have been identified such as the differences between sex and the use of highlighter, research studies that measure the efficacy of using specifically using a yellow highlighter.

Outdated studies could have been a big help in obtaining an overview in order for the researcher to build a better understanding and hypothesis for the current study. This study that the researchers are currently conducting could be a piece of additional information for future researchers who are also interested in studying the benefits of highlighters in one's memory retention.

Chapter 3

Methodology

This chapter primarily focused on how this study was conducted. This includes the research design, data collection strategy, sampling method, recruitment of participants, and instrumentation procedures. Also, this chapter discusses the statistical procedure and how data were interpreted.

Research Design

The researchers conducted an experimental-quantitative research using a within-subjects design. A test-retest type of data gathering method was utilized with a two-weeks period in between experiments. The use of a yellow highlighter was the independent variable (IV), and memory retention was the dependent variable (DV).

In a true experiment, two groups are being compared– with one group being in a control group (groups that were not exposed to the condition) or in an experimental group (groups that are exposed to conditions), whether the assigned conditions are effective or not (DeCarlo M., 2018).

In this study, quantitative-experimental research is the best research design to measure the effectiveness of yellow highlighters on memory retention because the study's objectives require control and experimental data. By comparing the results of the control and experimental conditions, researchers can determine the effectiveness of yellow highlighters by observing whether there is a significant difference between the two groups.

According to Cherry (2022), a within-subjects design is a type of experimental design in which all participants are exposed to every treatment or condition.

It is also known as a repeated measures design. Researchers chose a within-subjects design because it reduces the factors or extraneous variables that may affect the results of the study, allowing researchers to have a better control of participants' individual differences, and is an efficient use of participants as well which leads to more reliable findings.

However, using a within-subjects design may also be susceptible to a phenomenon known as the practice effect, which happens when there is repeated exposure to a task and improves performance through familiarity or skill acquisition, affecting the comparative results as well. This is why there is a time frame set in between conditions in order to reduce the practice effect.

Participants of the Study

Participants were collected using a simple random sampling method. A simple random sample is a subset of a population chosen at random. Each member of the population has an exact equal probability of getting chosen using this sampling procedure. Simple random sampling method best fits the current study due to the size of the chosen population which is relatively small to medium sized therefore, this method is deemed enough (Thomas, 2023).

The population chosen by the researchers are the students from 1st year, BS psychology program. As of A.Y 2023-2024, the total population of BS Psychology 1st year students is 166. Using the formula Yamane cited from the study of Munir, S, et. al., (2021) which is $n = N / (1 + Ne^2)$, researchers solved the sample size by adding one to the multiplication of the total population (N) and the margin of error squared (e^2), which was then divided into the total population of first year BS Psychology students, $166/(1+166(.95)^2)$. Getting a total sample size of 117.31, researchers rounded it to the

nearest whole number and concluded that the sample size was 117. The researchers then used a simple random sampling method by having the names of the participants to be randomly picked through the wheel of names. Chosen participants were contacted through social networking sites and meeting in person. A maximum of three months was spent in gathering all the needed data for the study. See the data gathering and procedure for further details, and for the sampling plan and technique please see (Appendix A).

Research Instrument

In this section, the researchers needed proper materials that measured the intended variables. In gathering the data on memory retention, a passage from the book entitled Ikigai: *The Japanese Secret to a Long and Happy Life* by Hector Garcia and Francesc Miralles (2016) was used. Researchers get this passage from the soft copy of the book that is being posted on the Libtoon web page. Researchers needed 234 copies of 2 pages reading materials and another 234 copies for 1 page testing material. This is for both conditions (117 each). Reading materials including demographic profile, check box, and the passage mentioned. Testing materials include the same passage but with 10 missing words and 39 yellow highlighters for the experiment condition.

Validity of the Questionnaire

Participants were provided pens to use in answering the test material. The choice of the color of a highlighter is supported by a study from Plass et al. (2014), that using bright colors like yellow in materials rather than cool ones like gray can improve students' learning.The researchers utilized a passage as an instrument for the reason that passages offer uniform content that is simple to change and regulate.

Furthermore, in order to maintain uniformity among individuals and settings, researchers chose a particular passage with specified degrees of complexity and length of its content that are relevant for the respondents to answer. This also enables more effective variable control and makes it easier to compare results from various study settings. Materials used were subjected for validation by three content validators. For the reading and testing materials, see (Appendix B).

Reliability of the Questionnaire

The researchers conducted a pilot test on first-year BS Social Work students. In this section, the researchers notified the social work students that they are the participants in a pilot test of the research, which allowed the researchers to prepare in advance. The total population of first-year BS Social Work students is 124. Using the formula Yamane cited from the study by Munir, S, et al. (2021), which is n = N (1 + Ne2), the researchers obtained a sample size of 94.65 in total. Rounding it to the nearest whole number, the result shows that the sample size is 95. The researchers used simple random sampling as the method in the study. Out of the 124 first-year BS Social Work students, 95 were selected using a wheel of names. Prior to the actual data collection, participants were given instructions regarding the timing and location of the testing. The researchers brief them on what they have to do on the day of the pilot testing. The researcher pays close attention to areas during the pilot testing that appear to be challenging for the students. By doing this, researchers are able to fill any gaps that have been apparent during the testing.

Ethical Considerations

Ethical considerations are important to ensure that the study was conducted in a

responsible and respectful manner and that the rights and welfare of participants are protected.

Seeking approval from the RERB office and other related offices/institutions

The researchers sought approval from the ethical committee and other offices/institutions to conduct the research study. They were committed to upholding the highest ethical standards in our research and ensuring the well-being and rights of all participants involved. The researchers would adhere to all relevant regulations and guidelines to ensure the ethical conduct of this study.

Risk Assessment

The risk assessment of the research study on The Effectiveness Of Using A Yellow Highlighter On Memory retention would likely be minimal. This is because the study involves a non-invasive intervention (using a highlighter) and the statistical analysis method (paired sample t-test) is commonly used in psychological research with minimal risk to participants.

To mitigate any identified risks, the researchers take the following steps:

1. **Informed Consent:** Ensure that all participants are fully informed about the study, including the purpose, procedures, potential risks and benefits, and their rights as participants. Obtaining informed consent would help mitigate any potential ethical risks.
2. **Confidentiality:** Maintain the confidentiality of participant data to minimize any potential risks related to privacy or data security.
3. **Ethical Approval:** Obtain approval from the ethical committee and institution to conduct the study, demonstrating a commitment to upholding ethical standards and ensuring participant well-being.

4. **Debriefing:** Provide participants with a debriefing at the end of the study to address any potential concerns or questions they may have about their involvement in the research.

5. **Data Analysis:** Ensure that the statistical analysis is conducted accurately and transparently to minimize any potential risks related to data interpretation.

By implementing these mitigation strategies, the researchers can further minimize any potential risks associated with the study and uphold the highest ethical standards in their research.

Benefits Assessments

The benefit assessment of the research study includes the potential to contribute valuable insights to the field of psychology and education. The study demonstrates a significant improvement in memory retention among 1st year BS psychology students when using a yellow highlighter, it has practical implications for educators and students alike. The findings inform teaching strategies and study techniques, potentially leading to improved academic performance and learning outcomes for students. Additionally, the study may contribute to the existing body of research on memory retention and cognitive processes, furthering our understanding of these phenomena. Overall, the potential benefits of the research study include practical applications in education and the advancement of scientific knowledge in the field of psychology.

Withdrawal Criteria

Participants in the research study have the right to withdraw from the study at any time without providing a reason. The withdrawal criteria was as follows:

Voluntary Withdrawal: At any time, including before or during data collection, participants have the option to leave the study without incurring any penalties or negative consequences. They won't be asked to give a justification for leaving the program.

Informed Withdrawal: Participants were made aware that their withdrawal would not have an impact on their academic standing, or relationship with the researchers or the university, either now or in the future. They were given the assurance that their withdrawal would be handled respectfully and in confidence.

Anonymity and Confidentiality

To ensure the anonymity and confidentiality of participants in the research study, several measures were implemented.

First, all participants were assigned a unique identifier or code that was used to track their data throughout the study. Personal identifying information such as names, contact details, and other sensitive information was kept separate from the data and would only be accessible to the principal investigator and designated research personnel.

Second, all data collected from participants was stored securely in locked filing cabinets. Access to this data would be restricted to authorized research personnel only.

Third, when reporting the results of the study, aggregate data was presented to maintain the anonymity of individual participants. Any quotes or personal anecdotes shared by participants were anonymized to protect their identity.

Finally, participants were informed about the measures taken to ensure their anonymity and confidentiality, and they were asked to provide informed consent before participating in the study.

These measures would help to safeguard the privacy and confidentiality of participants in the research study while still allowing for the collection and analysis of valuable data.

Voluntary, non-coercive recruitment of participants

Voluntary and non-coercive recruitment of participants was also implemented to ensure the ethical conduct of the research study.

Recruitment materials would clearly state that participation in the study is voluntary and that participants have the right to withdraw at any time without penalty. Additionally, there would be no coercion or undue influence used to persuade individuals to participate in the study.

Furthermore, informed consent would be obtained from all participants before they are enrolled in the study. This would involve providing clear and detailed information about the purpose of the study, the procedures involved, potential risks and benefits, and the measures taken to protect their anonymity and confidentiality. Participants would have the opportunity to ask questions and fully understand what their participation entails before providing their consent.

Overall, these recruitment measures would ensure that participants are treated ethically and respectfully throughout the research process.

Disposal of research materials/data

After gathering the data necessary for the findings, the data has been analyzed and then disposed of. The researchers practice the proper ways of disposing of the data which ensure the privacy of the participants. All hard copies of the data have been disposed of by burning, while digital copies have been disposed of by deleting all files

from electronic devices. After its disposal, the researchers ensure that none of the data is restored.

Contribution to local capacity building and benefits to local communities

The research study would contribute to local capacity building and provide benefits to local communities.

Firstly, by conducting this research, the researchers would be able to contribute to the knowledge and understanding of memory retention in psychology, which can benefit the local academic community. The findings of our study can be shared with local universities and educational institutions, providing valuable insights that can be integrated into their curriculum and teaching methods. Furthermore, our research would also provide opportunities for local students and researchers to gain hands-on experience in conducting experimental studies. The researchers plan to collaborate with local universities and involve students in the research process, providing them with valuable training and mentorship in research methodologies and data analysis.

Additionally, the findings of our study can have practical applications that benefit local communities. For example, if using yellow highlighters is found to be effective in improving memory retention, this information can be shared with educators and students in local schools, potentially enhancing learning outcomes. Overall, our research would not only contribute to the academic knowledge in psychology but also provide opportunities for local capacity building and potential benefits to local communities.

Incentives or Compensation for participants

In order to encourage participation in the research study, the researchers offer incentives to the participants. These incentives include food and pens. By providing

these incentives, the researchers attract a diverse and representative sample of participants, which enhances the validity and generalizability of researchers' findings. Furthermore, offering incentives also show appreciation for the time and effort that participants contribute to the study. The researchers understand that participating in research studies requires a commitment of time and energy, and researchers acknowledge and compensate participants for their valuable contribution to our research. It is important to note that any incentives offered provide in a fair and ethical manner, and do not unduly influence participants' decision to take part in the study. The researchers ensure that the incentives are appropriate and do not create any undue pressure on individuals to participate.

Overall, offering incentives for participation in our research study is a way to attract participants, show appreciation for their contribution, and ensure the ethical conduct of our study.

Disclosure or declaration of potential conflict of interest

In the interest of transparency, the researchers disclose that the researchers conducting this study have a potential conflict of interest as they have previously published research on the topic of memory retention and the use of highlighters. However, they are committed to conducting this study with the highest level of integrity and ethical conduct. To mitigate any potential bias, they ensure that the study is designed and executed in a rigorous and unbiased manner. The researchers sought input and oversight from ethics committees to ensure the objectivity and validity of the findings. They believe that by openly acknowledging our potential conflict of interest and taking proactive measures to address it, they can maintain the credibility and trustworthiness of the research study.

Dissemination plan

The dissemination plan of the researchers involved several key steps.First, the researchers aim to publish the findings in a reputable, peer-reviewed academic journal within the field of psychology or education. This ensures that the research undergoes thorough scrutiny and validation by experts in the field. The researchers also plan to present the findings at relevant conferences and symposiums, both nationally and internationally, to share the results with a wider audience of researchers, educators, and practitioners. Furthermore, researchers would create a summary of the research findings in a format that is accessible to the general public, such as a press release or a blog post. This allows researchers to communicate the findings to a broader audience and potentially impact educational practices. In addition, the researchers sought opportunities to collaborate with educational institutions or organizations to implement our findings into practical applications, such as developing guidelines for effective study strategies for students. Finally, they would make the research data and materials available for other researchers to access and use for further analysis and replication studies, promoting transparency and reproducibility in scientific research. By implementing this comprehensive dissemination plan, the researchers aim to maximize the impact of the research findings and contribute to the advancement of knowledge in the field of memory retention and study strategies.

Data-Gathering Procedures

Procedures and data collection was discussed step-by-step in this section to better understand the flow of this study during experimentation proper.

Recruitment

Step 1. Researchers first determined the population size and gathered the names

of 1st-year students enrolled in the BS psychology program A.Y. 2023-2024. A letter was sent to the Social Science Department to get the overall population and the names of students.

Step 2. After getting the population, which is 166, and their names, the sample size was then determined through the formula Yamane which is n=n/ (1+ ne2) cited from the study of Munir, S, et. al., (2021), getting a total sampling size of 117.

Step 3. Having 117 as the sample size, researchers determined the participants using the simple-random sampling technique by selecting the students who would participate using a wheel of names. All 166 students were put in a wheel of names, the first 117 students that were picked were contacted online through social networking sites which is the messenger and email or through a face-to-face encounter. Participants that participated were given informed consent in person prior to the experimental proper. Researchers then instructed the participants that they are required to return after two weeks for the next condition.

Step 4. In order to reach the target of 117 participants, it was necessary to replace those who withdrew or did not respond among the chosen participants. Researchers used the wheel of names once more for the remaining students who hadn't been selected.

Assignment of participants

Step 1. The chosen participants for the experimentation proper, are the first-year BS Psychology students, with 117 students in total.

Step 2. Participants were subjected to both control and experimental conditions due to the study's within-subjects research design. They participated in the controlled condition first.

Step 3. Two weeks later, an experimental condition was conducted to the same

set of participants.

Experiment Proper

The experiment was conducted in the Old Valentine and Lopez Hall buildings' reserved rooms, and in the Psychology and Testing Laboratories to accommodate the number of participants, whose reservation of rooms took place prior to the day of experimentation.

Step 1. Participants were instructed where the setting for the experimentation would be beforehand, which was based on their preferred schedule. Next, in order to prepare for the experiment proper, researchers arranged each seat from one seat apart. Informed consents were given before starting and after the preparations, researchers gave them an overview of the research study. Afterwards, researchers gave them the reading materials and were instructed to fill out their sex and check the box that states whether they were fit (i.e., slept enough, not intellectually disabled etc.) enough to proceed for the experiment to ensure that there are no other variables present. If they are not fit to take the experiment, they are instructed to approach one of our researchers for withdrawal. Lastly, researchers gave further instructions on what they were expected to do during the experimentation.

Step 2. After the instruction, a timer was set for them to read the passage. After 10 minutes, they were instructed to stop reading and researchers then gathered the reading materials. One researcher gave the testing material afterwards, which is a fill-in-the-blanks type of test, requiring the participants to fill in the missing words on the passage. They were still timed and must answer the test for 5 minutes. Then, researchers gathered the test materials and participants were given a token for participation with a reminder to keep in touch with the researchers as they still have to return after two weeks.

Step 3. After 2 weeks, participants were then contacted and given instructions for the setting as to where they would be doing the next experiment. Same instructions were given, however, they were instructed to use a yellow highlighter provided by the researchers and permitted to highlight any words or sentences in the reading material as long as it would contribute to a betterment of their retention, within 10 minutes. Afterwards, they were given a testing material, the same instructions and actions during the control condition experimentation.

Debriefing and storage data

Step 1. After the experiment, participants were given another token of participation and the researchers expressed their gratitude, then disclosed the details of the study through debriefing.

Step 2. Participants were informed about the true nature of the study and that they were subjected to two conditions– control and experimental conditions, in order to determine the results.

*Step 3.*To ensure its security, the electronic copy of the data was kept in a computer that only the researchers had access to. Hard copies were stored inside an envelope that only the researchers have access to for a year.

Step 4. Data is destroyed by burning it at the end of the study while the electronic copy is disposed of by deleting or removing all the files from all of the electronic devices that it has been stored.

Data Processing Procedure

The data gathered from the testing was encoded in MS Excel and transferred to SPSS. Data gathered is expected to be exact as researchers ensured a detailed gathering method.

Data Analysis Procedure

MS Excel and SPSS version 20 programs were used in analyzing Data.

Descriptive Statistics

Researchers used mean and frequency for the average number recalled by the participants in both conditions while percentages was used for the study's demographic variable, which is the sex of the participants.

Inferential Statistics

A Paired Samples t-test is a type of statistical tool that examines the means of two matched groups of persons or cases, or the means of a single group investigated at two separate times. The t-test is known as a repeated measures t-test when the same group is tested again on the same measure (Ross & Willson, 2017).

In this study, the participants' memory retention was measured by the paired samples t-test through analyzing and comparing the means from the two conditions, the control and experiment condition. Since it is a within-subjects design, the same group from the control condition would also be tested in the experimental condition with a two-week gap in between these conditions.

If the p-value is >0.05, it means that it is not significant. Therefore, the researchers would accept the null hypothesis stating that there is no significant difference between using a yellow highlighter and memory retention. However, if the p-value is <0.05, then it is significant and they would reject the null hypothesis. Lastly, if the p-value is = 0.05, then there is no improvement or difference.

The standard significance level of 0.05 was used to determine whether to accept or reject the null hypothesis.

Cohen's d is used to both measure the practical significance of the difference between two means and express it in standard deviation units. As an exemplary

example of this type of effect size metric, Cohen presented d, classifying effect sizes as small (d = 0.2), medium (d = 0.5), or big (d ≥ 0.8) (Sullivan, G. M., & Feinn, R., 2012).

Chapter IV

Results and Discussion

Chapter IV presents the results and analysis of the data collected during the experimentation. This section discloses and addresses the research objectives and hypotheses. The findings of the study are discussed in relation to existing research and relevant literature.

Table 1

Demographic profile of participants

Demographic Profile	Frequency	Percent
A. Overall Participants	117	100
B. Sex		
Male	20	17.1
Female	97	82. 9

Table 1 presents the demographic breakdown of 117 participants categorized by gender. The data reveals a notable gender difference, with a significant majority of females, comprising 97 individuals, while the male participants were notably fewer, totaling only 20 individuals. This distribution underscores the predominance of female representation within the study sample.

Table 2

Mean scores of control condition and experimental condition on memory retention.

Variables	n	Mean	Std. Deviation
Pre-test(Controlled)	117	5.38	2.274
Post-test(Experimental)	117	7.50	1.827

Mean scores represent the performance of participants in the Control condition and experimental condition on memory retention. Higher scores indicate better performance.

Table 2 shows the descriptive statistics of the study. The sample size(n) of 117 participants undergo two separate conditions; the control condition, which does not require a yellow highlighter (M = 5.38, Std. Deviation= 2.274), and the experimental condition, which requires the use of a yellow highlighter (M = 7.50, Std. Deviation= 1.827).

The said results were supported by studies of Yue et al (2014) about the effectiveness of highlighting by conducting an experimental study. Findings include that there are beneficial aspects in highlighting, which supports the present findings. One significance from Yue et al's study points out that re-reading the material after they highlight is preferable and results in an increased performance, which may explain the present findings as well where participants were also allowed to re-read the given reading material. Another study that shows how highlighting differs from non-highlighting is the study conducted by Hasanabadi et. al. (2016), in an experimental study about the effectiveness of using highlighters on memory retention. Study shows that the experimental group have higher retention of words than those who did not use

highlighters. Hasanabadi and his colleagues suggested that recognition of words retained was better for students.

It contradicts with the study of Dunlosky and colleagues (2013), who pointed out that students tend to only focus on what was highlighted and may not remember certain words that were not highlighted. Therefore, if they miss any important keywords or phrases, and they do not know how to use the highlighter properly, it negates the potential benefits of the highlighter.

Table 3

Mean and SD differences of control and experimental conditions

Variables	pretest (controlled)		post-test (experimental)		MD	t	df	p	Cohen's d
	M	SD	M	SD					
	5.38	*2.274*	*7.50*	*1.827*	*-2.210*	*-13.884*	*116*	*.000*	*- .0014*

Note. MD = Mean Difference $p < 0.05$

Table 3 shows the results of the Paired Samples T-test Statistics. The main purpose of the Paired Samples T-test is to determine whether there is a difference between the means of two paired data. Looking at the mean difference of experimental and control conditions (mean diff = -2.210), it indicates that there is a difference when participants use a yellow highlighter. Given that the mean of the experimental condition (M = 7.50) is higher, meaning the participants scored higher and performed better when they used a yellow highlighter. It can be supported further when looking at the computed

t-value and the p-value. The computed t-value (t = -13.884) is also useful in determining the rejection of the null hypothesis. Given that it is higher than its critical value, which is 1.984, the t-value suggests that the null hypothesis should be rejected. The result of the p-value (Sig. (2-tailed) = 0.000) also proved the rejection of the null hypothesis because the result is lower than its significance level, which is .05. When determining its effect size or Cohen's d, the results showed little to no effect size (Cohen's d = -.0014). The effect being studied is very subtle or minor. While statistically significant due to a large sample size, the actual difference between the groups is minuscule.

The importance of having a Cohen's d is to know the effect size that quantifies the difference between two means in terms of standard deviation units. Cohen's d determines the effect of the study in practical applications. With little to no difference in the effect size of the current study, the researchers may assume that one of the reasons might be due to a limited demographic, and only one color option for the highlighter pens. Another factor that is worth exploring is the preparation for the exam proper. Several studies have concluded that the efficacy of the highlighters also depends whether an individual knows how to highlight as well and this was not part of the current study's experiment proper which may have influenced the effect size as well.

This result is supported by numerous literatures, whereas using highlighters improve the memory such as Nishimura and Kuwahara's (2015) research on the application of highlighters in various tests; the story test in the Japanese language, arithmetic computation problems, and third-person singular present S judgment problems in English. Results indicate notable differences when using a highlighter pen, including an increase in the memorization of Japanese tale keywords, a higher percentage of accurate arithmetic computation responses, and an improvement in correct answers in English tests.

Another supporting research from Kuhbandner C, Spitzer B, Lichtenfeld S, and Pekrun R (2015) offers a perspective where colors may contribute to the results as well. Their study is about binding objects to certain colors (red, yellow, blue, and green), and investigating its effects on memory. Results show that participants tend to remember red and yellow objects more which further supports the present findings where students use specifically a yellow highlighter to highlight words or phrases in the reading material.

In the study of Choudhury and Bhansali's (2022), highlighting different colors may be overwhelming for the brain. It is because colors can increase the attention levels on certain information. The study also pointed out the importance of knowing how to highlight. Therefore, if the demographic mostly consists of people who do not know how to use a highlighter, the results may change as well. This was also pointed out in Cheng's (2018) study, where the results show highlighting is not beneficial for memory retention. The study pointed out that the efficacy of highlighter depends on the act of choosing what to highlight.

The present findings showed a significant difference where participants performed better when they used a yellow highlighter. It is possible that the color yellow contributed to the increased performance as well, which further supports the effectiveness of the yellow highlighter in memory retention. It is also important to note the importance of knowing how to highlight, as it may impede the individual's learning, highlighting unnecessary information and wrongly retaining it.

Chapter V

Summary, Conclusion, and Recommendation

Summary

This study aims to determine the effectiveness of using a yellow highlighter on memory retention. Specifically, it sought to 1) Describe the respondents according to demographic variables such as sex. 2) To determine the participants' memory retention in both experimental and control conditions. 3) To determine if there is a significant difference in both experimental (when using a yellow highlighter and control groups (without the use of a yellow highlighter).

The researchers implemented an experimental research approach to assess the reliability of a self-designed questionnaire, presented as a passage. Following the pilot test, the researchers carried out the actual experiment proper with 117 participants, who were first-year Bachelor of Psychology students selected through simple random sampling. The test aimed to collect data and demographic information, such as the participants' sex.

Selected participants underwent exposure to two conditions: the control and experimental conditions. They were required to participate in both conditions with a two-week interval. Initially, participants were exposed to the control condition, where they read the passage for 10 minutes and subsequently answered a close test containing 10 missing words from the passage for 5 minutes. After a two-week interval, they are then required to return for experimental conditions, wherein they use a yellow highlighter while reading the same passage for 10 minutes. Following this, they were asked to

respond to a 5-minute close test, featuring the same 10 missing words from the passage.

Major Findings

1. Results show that there is an increased score in the participants' post-test, indicating that the participants retain more information when they use a yellow highlighter. In the condition where participants did not use a yellow highlighter (the control condition), the average retention score was 5.38. On the other hand, in the experimental condition where participants did use a yellow highlighter, the average retention score was notably higher at 7.50. Given that the mean score from the experimental condition was higher, it shows that yellow highlighters positively affected the participant's performance in memory retention.

2. There is a significant difference in memory retention when participants use a yellow highlighter. The mean difference between the experimental and control conditions was calculated to be -2.210. This means that, on average, participants scored 2.210 points higher in the experimental condition (where they used a yellow highlighter) compared to the control condition (where they didn't use a highlighter). A negative mean difference suggests that the experimental condition had a higher mean score than the control condition. In other words, participants remembered more words, on average, when they used the yellow highlighter. Therefore, the negative mean difference of -2.210 indicates that there is a significant difference in memory retention when participants use a yellow highlighter. Specifically, it suggests that using the highlighter leads to better memory retention compared to not using it.

Conclusions

Derived from the study's results, conclusion is made:

1. The findings of this study highlight the effectiveness of using a yellow highlighter in improving information retention among psychology students. The increased scores in the participants' post-test compared to the non-highlighting pre-test indicate that utilizing a yellow highlighter leads to better retention of information. This result aligns with cognitive theories suggesting that highlighting can enhance memory encoding and retrieval. When students use a yellow highlighter to mark key information, they may be more likely to pay attention to, process, and remember the highlighted material. Yellow, being a bright and attention-grabbing color, may stimulate cognitive processes. In conclusion, the increased scores in the participants' post-test indicate that using a yellow highlighter is a beneficial strategy for improving information retention among psychology students. By leveraging the cognitive benefits of highlighting, students can enhance their learning outcomes and better retain key concepts and theories in psychology.

2. The results of this study indicate a significant difference in memory retention when participants use a yellow highlighter. This finding has important implications for psychology students and educators alike. One potential explanation for this phenomenon is the psychological concept of color association. Yellow is often associated with warmth quality. When individuals highlight important information with a yellow marker, it stimulates cognitive processes, making the highlighted content more memorable. This is particularly beneficial for psychology students who need to remember complex theories, concepts, and case studies. Moreover,

the act of physically highlighting information engages both visual and motor memory, which may further reinforce retention. When students actively interact with the material by selecting key points to highlight, they are more likely to encode that information into their memory. However, it's important to note that individual differences and preferences may play a role in the effectiveness of this technique. While yellow highlighting may work well for some students, others may find different colors or methods more beneficial. Additionally, the duration and intensity of the highlighting process could also impact its effectiveness. Further research could explore the long-term effects of using yellow highlighters on information retention and whether the benefits extend to different academic disciplines or cognitive tasks. Additionally, investigating the underlying mechanisms behind color-based memory enhancement could provide deeper insights into how the researchers process and retain information. Overall, this study highlights the potential of simple, yet effective, strategies for improving learning outcomes among psychology students.

Implications for Theory and Practice

The implications of our study's results, which show that yellow highlighting retained more information compared to non-highlighting, are significant in the context of existing research, such as the study by Choudhury and Bhansali (2022). Their findings demonstrated that highlighted information improves memory and comprehension, while non-highlighted information has no effect. This study adds to the growing body of evidence supporting the effectiveness of highlighting as a study strategy. Choudhury and Bhansali's study suggested that highlighting, regardless of color, enhances memory and comprehension. Our study builds upon this by specifically investigating the impact of yellow highlighting, showing that it is particularly effective in retaining information

compared to non-highlighting.The specific color choice of yellow highlights provides valuable insights into optimal highlighting practices. While previous research has shown the benefits of highlighting in general, our study suggests that not all highlighting methods are equally effective. The choice of yellow as a highlighting color appears to have a distinct advantage in information retention.

Another implication of our study's results, showing a significant difference in memory retention when students are exposed to yellow highlighting compared to pure reading, is substantial, when considering the findings from Hasanabadi et al.'s (2016) study on the effectiveness of highlighters on memory retention. Both studies underscore the importance of active learning techniques in memory retention. Highlighting engages students in an active process of selecting and emphasizing key information, which aids in memory consolidation. This aligns with educational theories that advocate for active engagement with material as opposed to passive reading. findings suggest that the use of yellow highlighting enhances word recognition, consistent with Hasanabadi et al.'s (2016) suggestion. This is particularly valuable in educational settings where students are required to recall and recognize specific terms, concepts, and theories.

The implications of our study's results hold particular significance for students pursuing a Bachelor of Science in Psychology (BS Psychology) degree. Firstly, our findings provide evidence for an effective study strategy tailored specifically to psychology majors. Psychology students are required to absorb and retain large amounts of information, ranging from theories and research methods to case studies and statistical concepts. The use of yellow highlighting can be a practical and efficient method for enhancing memory retention of these diverse materials. Secondly, the effectiveness of yellow highlighting suggests that visual aids play a crucial role in memory enhancement for psychology students. The field of psychology often deals with

abstract concepts and complex theories, and visual cues like highlighting can help students to organize and consolidate this information in their minds. Thirdly, our study highlights the importance of active engagement with course materials. Psychology courses often involve extensive reading and note-taking, and passive reading alone may not effectively encode information into memory. By actively selecting and highlighting key points, students engage in a more focused and intentional learning process, which can lead to better retention. Finally, our results contribute to the broader understanding of memory processes and learning strategies in psychology. By demonstrating the efficacy of yellow highlighting in improving memory retention, our study adds to the body of knowledge on how cognitive processes can be influenced by external cues and interventions.

Recommendations

From the study's limitation, the following recommendations are:

Teachers. A teacher’s goal is to effectively teach their students information that is necessary for their overall learning. Highlighters can be a very useful teaching tool for helping students concentrate on important details, connect ideas, and absorb the reading material better. Teachers could help encourage their students in active reading by highlighting key information as they read a text. This could help them better understand and retain the information. Highlighting utilizes visual cues by emphasizing key terms during presentations, it can enhance student attention toward specific words, thus improving teaching effectiveness.

Guidance Counselors. In order to assist students with organization, prioritization, and topic identification during counseling sessions, counselors may find that highlighters are a useful tool. Counselors could help encourage students to use

highlighters to mark some of their goals in counseling. Highlighting these goals may help students in accomplishing them by providing a visual reminder of their significance. Counselors can also encourage students to have a journal and highlight emotions or behaviors that they write. This could be beneficial to both the counselor and the student in identifying patterns and working towards underlying issues.

Parents. Parents are encouraged to actively involve themselves in meeting their children's needs, especially in their education. After learning the effects of highlighter use, parents might want to consider allowing their kids to purchase highlighters with some of their allowance. Parents can also play a role in motivating their children to regularly utilize highlighters during study sessions. By demonstrating proper highlighter usage themselves, parents can offer additional support to their children's educational endeavors.They can show how to extract the most important facts, core concepts, and pivotal elements from study materials. It could help their children become accustomed to using these tools as a way to enhance their understanding of the reading material.

Students. Findings from this study highly encourage students to incorporate yellow highlighters into their study routines, especially for those who struggle at memorizing and retaining information. By learning how to effectively highlight as well, they can fully experience the maximum benefits of highlighting. Nowadays, it is common to see many students using highlighters of various colors in libraries and study spaces. However, findings suggest students should try using a yellow highlighter specifically, as it has been found to be particularly effective. For students who prefer to scan the reviewer before diving into studying, incorporating highlighting into their approach can be highly effective. Highlighting assists in organizing and condensing complex information, facilitating easier review and study later on. By selectively highlighting key points, students can create a concise summary of the material, which proves particularly

beneficial when preparing for exams or writing papers. This method allows for a more efficient and focused study process, maximizing comprehension and retention of essential information.

Future Researchers. This study can serve as a reference for future researchers who wish to expand and reevaluate the hypothesis in their research. It is recommended that future researchers should broaden the scope of the study by exploring other highlighter colors or adding color options to uncover more insights. They may also consider employing various colors based on the preferences of the participants to investigate whether color preferences increase their memory retention. They are also recommended to employ a larger sample size and a more diverse range of participants. Moreover, it is recommended that they use online survey platforms to access a wider and more varied participant pool, thus aiding in the broader applicability of the findings.

Another recommendation pertains to the materials. Future researchers are encouraged to make authentic reading and testing material to further strengthen their study's validity and reliability. Prior to the experiment proper, future researchers are encouraged to conduct an informative discussion on highlighter usage to reduce unnecessary variables from skewing the results.

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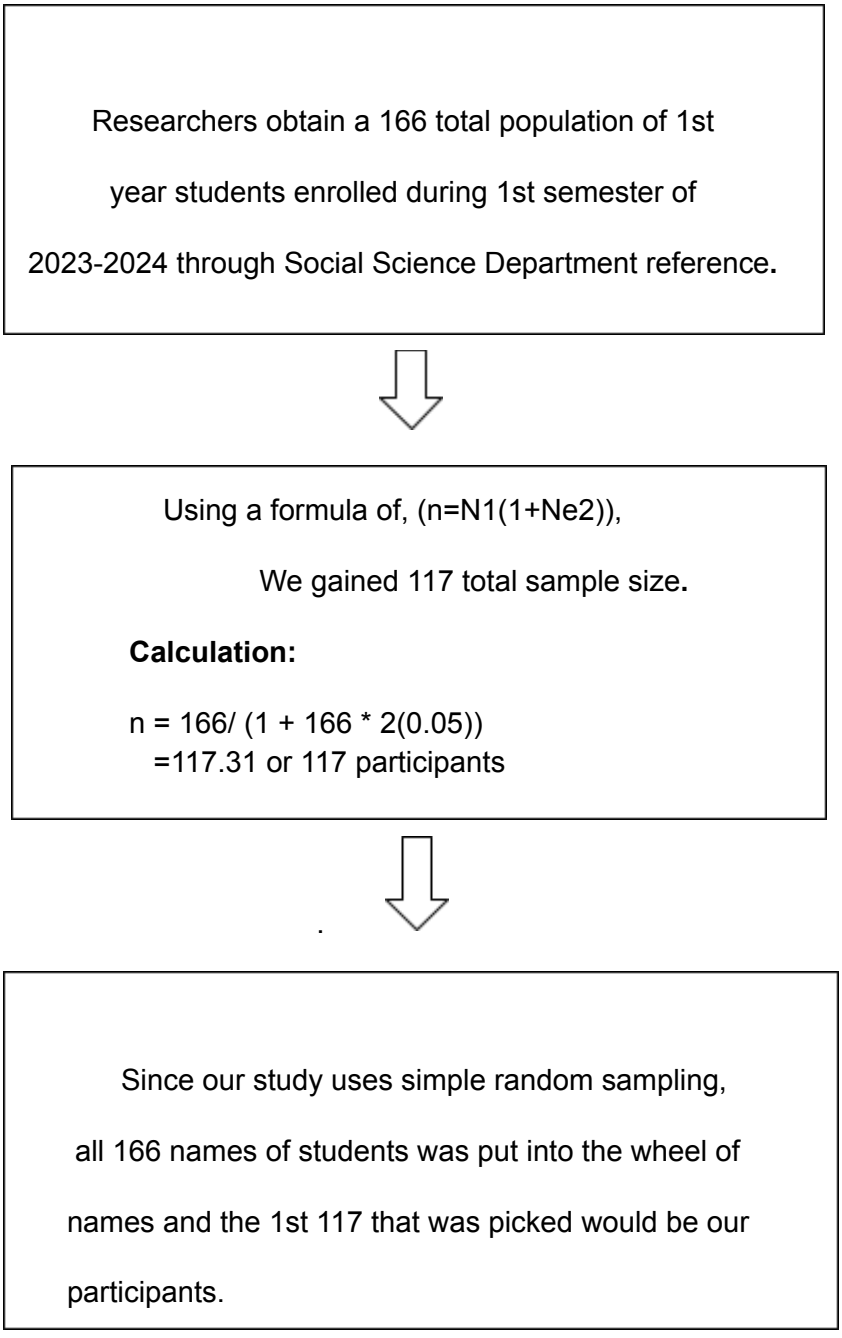
Appendices

Appendix A

Sampling plan



Appendix B

Reading and Testing material

The first reading material is for control condition while the second one is for experimental condition. Third one is the testing material for both control and experimental condition.

Missing Words:

1. Tokyo
2. Thousands
3. Purpose
4. Barcelona
5. Western
6. Logotherapy
7. Okinawa
8. Happiness
9. Longevity
10. Average

Name(optional):_____

Sex:_____

☐ Upon checking the box, you agree to participate without any disturbances that may affect the experimentation (ex. Lack of sleep, drained due to academic stresses, etc.). If experiencing any of these at the moment, kindly approach one of the researchers, if not you may proceed on reading the passage when the researcher starts the timer.

General Instruction: Read carefully and understand the passage. You have 10 minutes to read.

Ikigai: A mysterious word

THIS BOOK FIRST came into being on a rainy night in Tokyo, when its authors sat down together for the first time in one of the city's tiny bars.

We had read each other's work but had never met, thanks to the thousands of miles that separate Barcelona from the capital of Japan. Then a mutual acquaintance put us in touch, launching a friendship that led to this project and seems destined to last a lifetime.

The next time we got together, a year later, we strolled to the park in downtown Tokyo and ended up talking about trends in Western psychology, specifically logotherapy, which helps people find their purpose in life.

We remarked that Viktor Frankl's logotherapy had gone out of fashion among practicing therapists, who favored other schools psychology, though people still search for meaning in what they do and how they live. We ask ourselves things like:

What is the meaning of my life?

Is the point just to live longer, or should I seek a higher purpose?

Why do some people know what they want and have a passion for life, while others languish in confusion?

At some point in our conversation, the mysterious word ikigai came up.

This Japanese concept, which translates roughly as “the happiness of always being busy,” is like logotherapy, but it goes a step beyond. It also seems to be one way of explaining the extraordinary longevity of the Japanese, especially on the island of Okinawa, where there are 24.55 people over the age of 100 for every 100,000 inhabitants-far more than the global average.

Validated By:

“Trust yourself, you know more than you think you do”

Benjamin spock

Name(optional):_____

Sex:_____

☐ Upon checking the box, you agree to participate without any disturbances that may affect the experimentation (ex. Lack of sleep, drained due to academic stresses, etc.). If experiencing any of these at the moment, kindly approach one of the researchers, if not you may proceed on reading the passage when the researcher starts the timer.

General Instruction: Read carefully and understand the passage. Use yellow highlighter to accentuate words or sentences. You have 10 minutes to read and highlight.

Ikigai: A mysterious word

THIS BOOK FIRST came into being on a rainy night in Tokyo, when its authors sat down together for the first time in one of the city's tiny bars.

We had read each other's work but had never met, thanks to the thousands of miles that separate Barcelona from the capital of Japan. Then a mutual acquaintance put us in touch, launching a friendship that led to this project and seems destined to last a lifetime.

The next time we got together, a year later, we strolled to the park in downtown Tokyo and ended up talking about trends in Western psychology, specifically logotherapy, which helps people find their purpose in life.

We remarked that Viktor Frankl's logotherapy had gone out of fashion among practicing therapists, who favored other schools psychology, though people still search for meaning in what they do and how they live. We ask ourselves things like:

What is the meaning of my life?

Is the point just to live longer, or should I seek a higher purpose?

Why do some people know what they want and have a passion for life, while others languish in confusion?

At some point in our conversation, the mysterious word ikigai came up.

This Japanese concept, which translates roughly as "the happiness of always being busy," is like logotherapy, but it goes a step beyond. It also seems to be one way of explaining the extraordinary longevity of the Japanese, especially on the island of Okinawa, where there are 24.55 people over the age of 100 for every 100,000 inhabitants-far more than the global average.

Validated By:

"Trust yourself, you know more than you think you do"

Benjamin spock

Instruction: Fill in the missing words. You have 5 minutes to answer.

Ikigai: A mysterious word

THIS BOOK FIRST came into being on a rainy night in _____, when its authors sat down together for the first time in one of the city's tiny bars.

We had read each other's work but had never met, thanks to the _____of miles that separate _____ from the capital of Japan. Then a mutual acquaintance put us in touch, launching a friendship that led to this project and seems destined to last a lifetime.

The next time we got together, a year later, we strolled to the park in downtown Tokyo and ended up talking about trends in _____ psychology, specifically logotherapy, which helps people find their purpose in life.

We remarked that Viktor Frankl's _____ had gone out of fashion among practicing therapists, who favored other schools psychology, though people still search for meaning in what they do and how they live. We ask ourselves things like:

What is the meaning of my life?

Is the point just to live longer, or should I seek a higher _____?

Why do some people know what they want and have a passion for life, while others languish in confusion?

At some point in our conversation, the mysterious word ikigai came up.

This Japanese concept, which translates roughly as "the _____ of always being busy," is like logotherapy, but it goes a step beyond. It also seems to be one way

of explaining the extraordinary _____ of the Japanese, especially on the island of _____, where there are 24.55 people over the age of 100 for every 100,000 inhabitants-far more than the global _____.

Validated By:

“Trust yourself, you know more than you think you do”

Benjamin spock

Appendix C

Research Instrument Validation Question

RESEARCH INSTRUMENT VALIDATION QUESTIONS

Instruction: Please answer the questions below to use as a guide for correction to ensure the instrument's validity.

Questions:

1. Does the instrument address the research objective of the study?

_____
_____
_____.

2. Can the instrument measure the variables that the study purports to measure?

_____
_____
_____.

3. Is the layout or format of the instrument technically sound?

_____
_____
_____.

4. Are the chosen words appropriate for the objective of the study?

_____
_____
_____.

Comments and suggestions:

_____
_____
_____.

_____
Validator

Appendix D

Turnitin Similarity Check

REVIEW, CONTINUING EDUCATION and CONSULTANCY CENTER
Central Philippine University
Jaro, Iloilo City
Tel. No. 329-1971 local 1008 email: rceccsec@cpu.edu.ph
Website: rcecc.cpu.edu.ph

September 8, 2023

CERTIFICATION

This is to certify that the paper entitled **"THE EFFECTIVENESS OF USING A YELLOW HIGHLIGHTER ON MEMORY RETENTION"** by **Orange Kaye Faldas, Emirie Gayongo, Ian Francis Morante, Jhercel Tesoro, and Jhon Mark Zante** has undergone Turnitin Similarity Checking with a passing percentage of 17% and has passed the requirements (Chapter 1-3).

Prepared by:

PINKY E. LUTERO-TONGOL
Staff -in-charged

Approved by:

LENNY ROSE P. MUCHO, EdD.
Director, RCECC

Appendix E

Research Budget

RESEARCH 1 BUDGET	
	COST OF EXPENSES IN PESO
TITLE PROPOSAL DEFENSE	
• Panelists (3)	1500 (500 each)
• Research Adviser	2000
• Bottled water (4)	48 (12 each)
• C2 (4)	128 (32 each)
• Alberto's Pizza (2)	348 (174 each)
• Money Envelope (4)	8 (2 each)
• Styrofoam box for Food (4)	12 (3 each)
RESEARCH PAPER	
• Total Hard copies (includes during checking to research adviser, final paper for title proposal defense given to panelists, informed consent given to adviser, and revised paper passed to research teacher)	300
• Clear folder (3)	32 (8 each)
• Sliding clip (3)	12 (3 each)
TOTAL	**4,388**
Individual Contribution	**878**

RESEARCH 2 BUDGET	
• Hard copies of the study checked by turnitin to be given to researcher's panelist and questionnaire validator (6)	**200**
• Payment for Research ethics Committee	**1500 (300 each)**
• Payment for printed copies of Reading Materials, Research Questionnaires and Informed Consent for participants in Pilot Testing (BS in Social Work)	**300**
• Tokens for Pilot Testing participants	**350**
• Payment for printed copies of Reading Materials, Research Questionnaires and Informed Consent for participants (Bs in Psychology; 1st years)	**370**
• Yellow highlighters and foods as tokens for participants	**300**
• Grammarian	**2300**
• Payment for Research Adviser	**2500**
• Payment for Panelist	**2100**
• Payment for printing (providing 4 hard copies for panels and research adviser before signing approval sheet)	**450**
• Hard bound	**1000**

Appendix F

Curriculum Vitae

Name & Surname	**:**	**ORANGE KAYE A. FALDAS**
Address	**:**	Poblacion Bingawan, Iloilo
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Email	**:**	orangekaye.faldas-20@cpu.edu.p

PERSONAL DATA

Nationality	**:**	Filipino
Sex	**:**	Female
Marital Status	**:**	Single
Date of Birth	**:**	January 23, 2001
Place of Birth	**:**	Poblacion Bingawan

EDUCATION

2020 - 2024	**:**	Central Philippine University Bachelor of Science in Psychology
2018 - 2020	**:**	Colegio de San Jose Senior High School- HUMSS, *With Honors*

2014 - 2018	**:**	Bingawan National High School Junior High School, *With Honors*
2008 - 2014	**:**	Bingawan Central Elementary School

SEMINARS AND TRAININGS

October 19, 2022	**:**	**“**Self- Harm Prevention: How to Help Others and Yourself”by CPU Republic
May 5, 2023	**:**	Paghaw-as kag Paghimali: CULMINATING ACTIVITY by CPU Psychological society
May 12, 2023	**:**	Feel My Rhythm: Coping Through Music Intervention: ALTERNATIVE LEARNING in Tubungan National High School by CPU Psych Society

CURRICULUM VITAE

Name & Surname	**:**	**EMIRIE J. GAYONGO**
Address	**:**	Brgy. San Roque, Jaro, Iloilo
Contact Number	**:**	09606972380
Email	**:**	emirie.gayongo-14@cpu.edu.ph

PERSONAL DATA

Nationality	**:**	Filipino
Sex	**:**	Female
Marital Status	**:**	Single
Date of Birth	**:**	March 12, 2002
Place of Birth	**:**	Dubai, UAE

EDUCATION

2020 - 2024	**:**	Central Philippine University Bachelor of Science in Psychology
2018 - 2020	**:**	Iloilo National High School Senior High School- HUMSS

2014 - 2018	**:**	Central Philippine University Junior High School
2008 - 2014	**:**	East Valencia Elementary School Jaro 1 Elementary School

SEMINARS AND TRAININGS

October 19, 2022	**:**	**“**Self- Harm Prevention: How to Help Others and Yourself” by CPU Republic

CURRICULUM VITAE

Name & Surname	**:**	**IAN FRANCIS C. MORANTE**
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Email	**:**	ianfrancis.morante-18@cpu.edu.ph

PERSONAL DATA

Nationality	**:**	Filipino
Sex	**:**	Male
Marital Status	**:**	Single
Date of Birth	**:**	February 3, 2001
Place of Birth	**:**	Ramon Tabiana Memorial District Hospital

EDUCATION

2020 - 2024	**:**	Central Philippine University Bachelor of Science in Psychology
2018 - 2020	**:**	Central Philippine University Senior High School- STEM

2014 - 2018	**:**	Santa Barbara National Comprehensive High School
.		Junior High School- Special Program in Arts
2008 - 2014	**:**	Doane Brilliant Child Learning Haven Inc

SEMINARS AND TRAININGS

October 19, 2022	**:**	**“**Self- Harm Prevention: How to Help Others and Yourself” by CPU Republic
.		

CURRICULUM VITAE

Name & Surname	**:**	**JHERCEL C. TESORO**
Address	**:**	Brgy. Sta. Monica, Oton, Iloilo
Contact Number	**:**	09462219420
Email	**:**	jhercel.tesoro-20@cpu.edu.ph

PERSONAL DATA

Nationality	**:**	Filipino
Sex	**:**	Female
Marital Status	**:**	Single
Date of Birth	**:**	February 26, 2002
Place of Birth	**:**	Aleosan District Hospital

EDUCATION

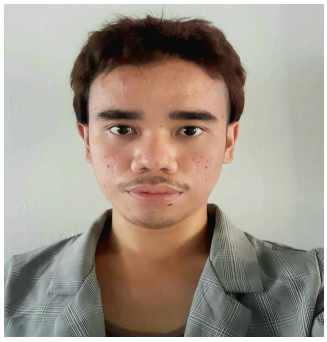
2020 - 2024	**:**	Central Philippine University Bachelor of Science in Psychology
2018 - 2020	**:**	Batuan- Cadinglian National High School Senior High School- GAS, *With Honors*

2014 - 2018	**:**	Batuan Cadinglian National High School Junior High School, *With Honors*
2008 - 2014	**:**	Sta. Monica- Rizal Elementary School, *With Honors*

SEMINARS AND TRAININGS

October 19, 2022	**:**	"Self-Harm Prevention: How to Help Others and Yourself" by CPU Republic
O**ctober 30, 2021**	**:**	" Meeting of Minds: A Series of Virtual Talk about Mental Health and Psychological Support" by Rotaract Club of Central Iloilo City

CURRICULUM VITAE



Name & Surname	**:**	**JHON MARK S. ZANTE**
Address	**:**	Brgy. Balanac, Janiuay, Iloilo
Contact Number	**:**	09387013708
Email	**:**	jhonmark.zante-20@cpu.edu.ph

PERSONAL DATA

Nationality	**:**	Filipino
Sex	**:**	Male
Marital Status	**:**	Single
Date of Birth	**:**	April 16, 2001
Place of Birth	**:**	Janiuay Public Hospital

EDUCATION

2020 - 2024	**:**	Central Philippine University Bachelor of Science in Psychology
2018 - 2020	**:**	Janiuay National Comprehensive High School Senior High School- ABM, *With Honors*
2014 - 2018	**:**	Janiuay National Comprehensive High School Junior High School, C.A.T Officer(MP)

2008 - 2014 **:** Janiuay Pilot Elementary School

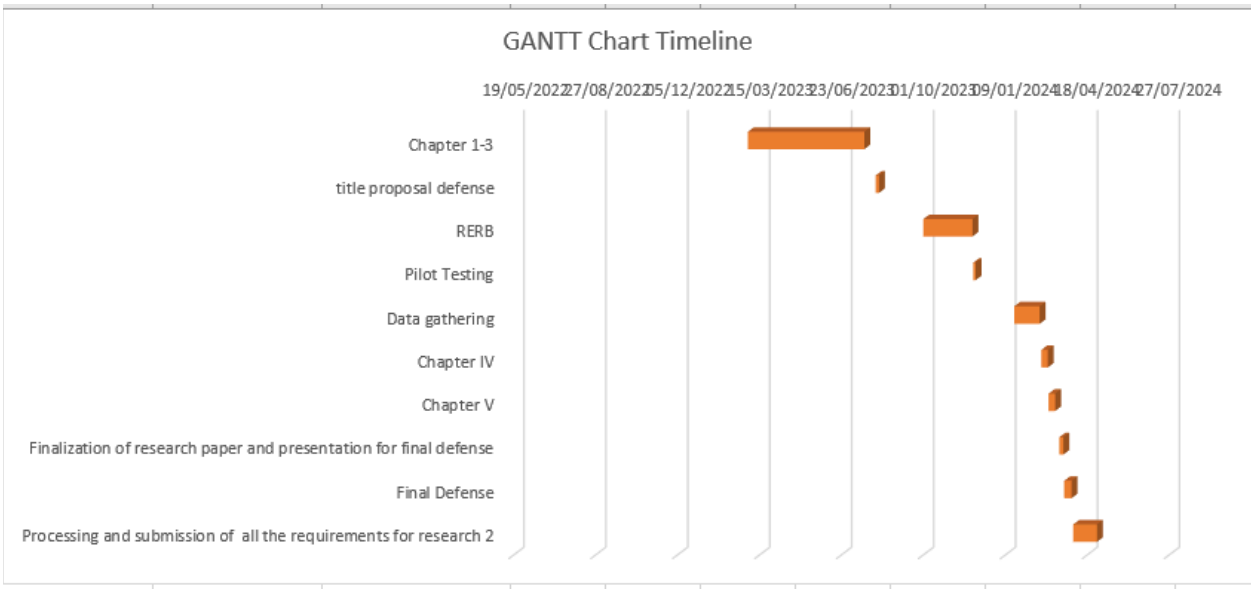
SEMINARS AND TRAININGS

May 8, 2021 **:** **AMPING-PAGHALONG:** The Reminder to take Caution, to Educate and Inform Decisions Regarding Sex Education. *By NSTP students of Central Philippine University*

Appendix G

GANTT Chart Timeline

Task	Start Date	End Date	Duration
Chapter 1-3	3/1/2023	07/21/2023	**142**
Title Proposal Defense	8/4/2023	08/08/2023	**4**
RERB	10/1/2023	11/30/2023	**60**
Pilot testing	12/1/2023	12/04/2023	**3**
Data Gathering Chapter IV	1/20/2024 2/22/2024	02/20/2024 03/25/2024	**31** **33**
Chapter V	3/26/2024	04/7/2024	**12**
Finalization of Research paper and presentation for final defense	4/9/2024	04/10/2024	**2**
Final defense	4/11/2024	04/11/2024	**1**
Processing and submission of all the requirements for Research II	4/12/2024	05/05/2024	**23**


GANTT Chart Timeline
19/05/2022
27/08/2022
05/12/2022
15/03/2023
23/06/2023
01/10/2023
09/01/2024
18/04/2024
27/07/2024
Chapter 1-3
title proposal defense
RERB
Pilot Testing
Data gathering
Chapter IV
Chapter V
Finalization of research paper and presentation for final defense
Final Defense
Processing and submission of all the requirements for research 2

Appendix H

Certificate of Validation for Research Instruments

CERTIFICATE OF VALIDATION FOR RESEARCH INSTRUMENT

This certificate serves to confirm that the research instrument used in the study titled "THE EFFECTIVENESS OF USING A YELLOW HIGHLIGHTER ON MEMORY RETENTION" of the Bachelor of Science in Psychology Students" has undergone a validation process conducted by expert validators. The instrument has been examined and deemed to meet the standards.

Validated by:

Jane Marie D. Tamayo, MS Psych, RPm, RPsych

CERTIFICATE OF VALIDATION FOR RESEARCH INSTRUMENT

This certificate serves to confirm that the research instrument used in the study titled "THE EFFECTIVENESS OF USING A YELLOW HIGHLIGHTER ON MEMORY RETENTION" of the Bachelor of Science in Psychology Students" has undergone a validation process conducted by expert validators. The instrument has been examined and deemed to meet the standards.

Validated by:

JADE S. ERMITAÑO, MA Psych, RPsych, RPm

CERTIFICATE OF VALIDATION FOR RESEARCH INSTRUMENT

This certificate serves to confirm that the research instrument used in the study titled "THE EFFECTIVENESS OF USING A YELLOW HIGHLIGHTER ON MEMORY RETENTION" has undergone a validation process conducted by expert validators. The instrument has been examined and deemed to meet the standards.

Validated by:

ORPHA VIC S. FARAON MSGC

Appendix I

Certificate of Technical Review

CENTRAL PHILIPPINE UNIVERSITY
College of Arts and Sciences
Department of Social Sciences
1st Floor Valentine Hall, Jaro Iloilo City
Tel. No. (033) 329-1971 local 1068
www.cpu.edu.ph | socsci@cpu.edu.ph

CERTIFICATE OF TECHNICAL REVIEW

(Research Proposal)

This is to certify that the Research Proposal:

TITLE: The Effectiveness Of Using A Yellow Highlighter On Memory Retention

AUTHOR/S:
Faldas, Orange Kaye
Gayongo, Emirie
Morante, Ian Francis
Tesoro, Jhercel
Zante, Jhon Mark

has undergone technical reviews and approval.

TECHNICAL REVIEW COMMITTEE

DARILL F. PAMOCOL, Ph. D

Prof. BERNADINE T. BALIGUAT M. Ed.

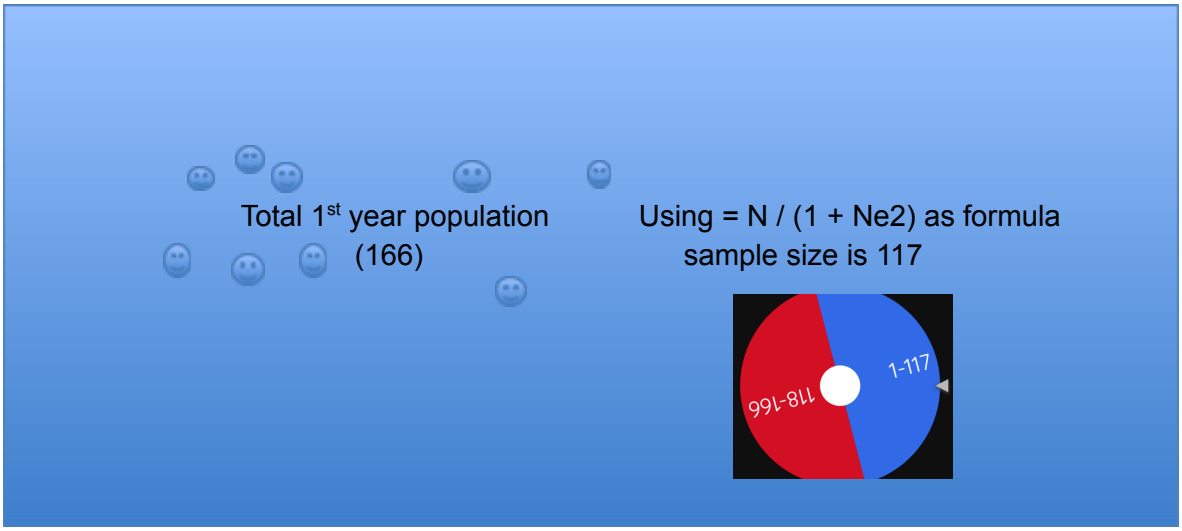
Prof. OTHONIEL O. LEGADA MPA

DARRIL F. PAMOCOL, Ph. D.
Department Chairperson

STELLA G. FERNANDEZ, Ph. D.
Dean

Appendix J

Simple Random Sampling



Using simple random sampling, all 166 names was put in a wheel of names then 1st 117 that was picked was our participants. Blue on the wheel indicates that it is the students picked from 1-117 which was our participants, Red ones are students from 118-166 which are not picked and was not our participants.

Appendix K

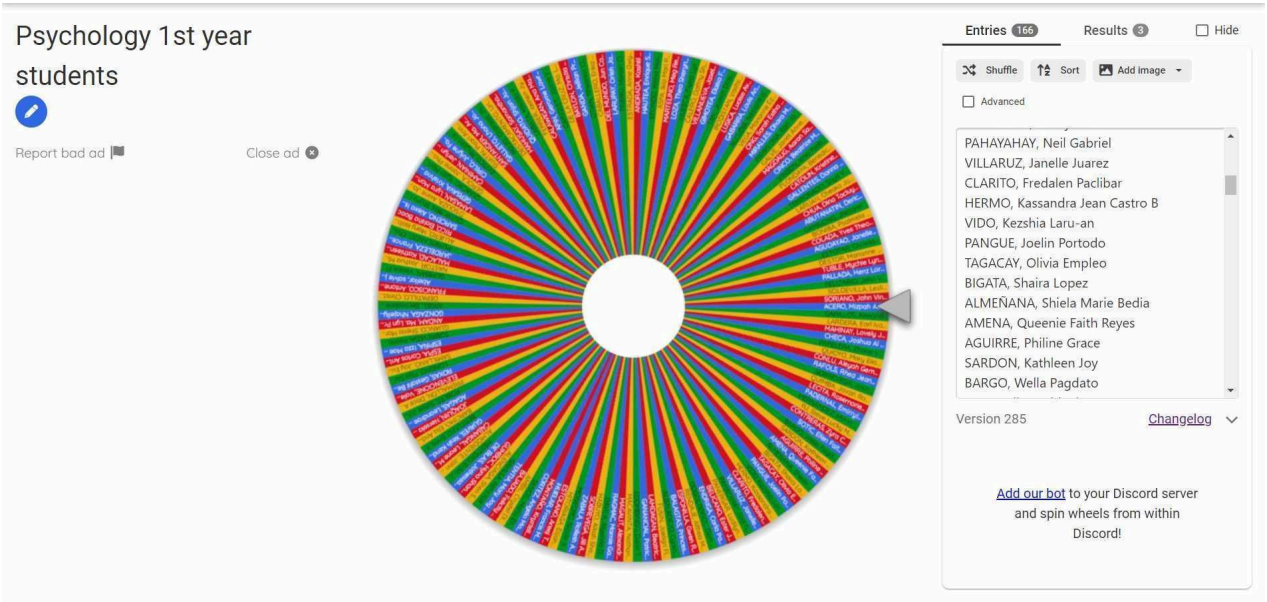
Checklist

CHECKLIST

- Have you consumed any alcohol or drugs within the past 24 hours?
- Are you currently under the influence of any substances?
- Have you been diagnosed with any substance use disorders?
- Are you experiencing any withdrawal symptoms from alcohol or drugs?
- Have you used any medications or substances that may impair your cognitive or physical abilities?
- Are you able to fully understand and comply with the instructions and requirements of the study?
- Do you feel alert and focused at the moment?
- Have you had enough sleep and rest prior to participating in the study?
- Are you experiencing any physical or mental health conditions that may affect your ability to participate in the study?
- Are you willing to abstain from alcohol or drugs for the duration of the study?

Appendix L

Wheel of Names for Participants



Appendix M

Experimentation Proper

Appendix N

SPSS Tables

```
T-TEST PAIRS=Controlled WITH Experimental (PAIRED)
  /CRITERIA=CI(.9500)
  /MISSING=ANALYSIS.
```

T-Test

[DataSet0]

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Controlled	5.38	117	2.274	.210
	Experimental	7.50	117	1.827	.169

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Controlled & Experimental	117	.696	.000

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Controlled - Experimental	-2.120	1.651	.153	-2.422	-1.817	-13.884	116	.000

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Zscore(pretest)	-.0007692	117	1.00043280	.09249004
	Zscore(posttest)	.0006838	117	1.00141342	.09258070

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Zscore(pretest) & Zscore (posttest)	117	.696	.000

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Zscore(pretest) - Zscore (posttest)	-.00145299	.78041795	.07214967	-.14435449	.14144851	-.020	116	.984

Appendix O

Decision Letter

RESEARCH ETHICS REVIEW BOARD
CENTRAL PHILIPPINE UNIVERSITY
Lopez Jaena St., Jaro, Iloilo City, Philippines
329-1971 to 79 local 3336

DECISION FORM	RERB Form No. 22-1
	Version No. 04
	Date of Effectivity: 17 May 2023

Date: October 27, 2023

NAME OF PROPONENT: Orange Kaye Faldas
Emirie Gayongo
Ian Francis Morante
Jhercel Tesoro
Jhon Mark Zante

Institution: CENTRAL PHILIPPINE UNIVERSITY

Re: *"THE EFFECTIVENESS OF USING A YELLOW HIGHLIGHTER ON MEMORY RETENTION"*

RERB code: 2023-361-UG-ZANTE et al.

Dear Mr/Ms. Zante,

This is to acknowledge receipt of your request and the following supporting documents dated **September 20, 2023**:

1. Letter of application for research ethics review addressed to CPU- RERB Chair
2. Accomplished RERB Application (Form 07-1)
3. Full protocol/Research proposal (Chapters 1, 2 and 3) with references.
4. Validated Research Instrument/Questionnaire for Quantitative Research
5. Certificate of Validation for researcher-made questionnaire preferably from (3) three experts in the field, not by the adviser and panel members
6. Informed Consent Form (CPU-RERB template)
7. Certificate of Technical Review/Approval sheet of proposal signed by (3) three members of the technical panel and the Dean
8. Turnitin Similarity Certificate from CPU-RCECC
9. Budget
10. Curriculum Vitae/Resume of the Researcher/Investigator and Co-Researchers with 2x2 photograph
11. GANTT Chart/Timelines/Table of schedule
12. Two (2) Hard Copies *(Soft Bound in Blue or Black cover)* of the above documents placed inside a long clear plastic envelope
13. Soft Copy of the above documents emailed to researchethics@cpu.edu.ph

The above documents underwent **Expedited Review** which generated the following list of recommendations:

1. Suggest to use General Objective instead of statement of the problem
2. Statement of the problem is for Qualitative research
3. Memory retention: How will this be measured? Show the process and also explain the scale (high? Average, low: what kind of retention?

- *This form contains the CPU-RERB recommendations. Please comply within (15) days and wait for the Ethical Clearance before the conduct of the study.*

4. Provide scale and how will the variables be operationally used in the study?
5. Please indicate the sampling technique and show the formula.
6. Provide stable of stratification and show computation for each batch.
7. Provide clear inclusion and exclusion criteria
8. Include duration of the study in the Scope and Limitation
9. Revise the Ethical consideration section. It should be written after Research Instrument. The following is the content of Ethical Consideration, discuss as a sub-paragraph.

Seeking approval from the RERB office and other related offices/institutions
- prior to the conduct of the study

Risk Assessment
- identify research related –risk based on the following categories: negligible, low, minimal, more than minimal, and high risk) and discuss how to mitigate the identified risk.

Benefits assessment
- should be summarized to make it more comprehensive to your respondents.

Withdrawal criteria of participants
- state withdrawal criteria

Anonymity and confidentiality of participants/respondents
- discuss how to anonymize & keep the confidentiality of your respondents

Voluntary, non-coercive recruitment of participants/respondents
- provide statement on voluntary & non-coercive recruitment

Disposal of research materials/data
- discuss how to dispose research materials

Contribution to local capacity building and benefits to local communities
- discuss possible contribution of your study

Incentives or compensation for participants
- provide statement on giving of incentives

Disclosure or declaration of potential conflict of interest
- provide statement on declaration of potential conflict of interest

Note: Content in the Ethical consideration should be aligned with ICF

10. Provide section for Dissemination Plan
11. On ICF:
    a. Remove instructions to researcher
    b. # 4 describe your questionnaire, how many parts? and give a brief description of each part.
    b. # 8 please be guided with the statement on the ICF template duration of the study and duration in answering your questionnaire
    c. # 18 delete name /date and signature

DECISION: [☐] Approved [☒] Minor revision
[☐] Disapproved [☐] Major revision

Very truly yours,

Joy G. Raso, PhD
Chair, CPU-RERB

Date: 10/27/23

- *This form contains the CPU-RERB recommendations. Please comply within (15) days and wait for the Ethical Clearance before the conduct of the study.*

Appendix P

Resubmission Form

	RESEARCH ETHICS REVIEW BOARD CENTRAL PHILIPPINE UNIVERSITY Lopez Jaena St., Jaro, Iloilo City, Philippines 329-1971 to 79 local 3336	
RESUBMISSION FORM		RERB Form No. 08-1
		Version No. 03
		Date of Effectivity: 17 May 2023

***INSTRUCTION TO THE RESEARCHER/s**: This form shall be filled-out by the researcher upon receipt of the Decision form. Obtain an electronic copy of this form and provide the information required in the space provided. This form shall be signed by the researcher and adviser before submission to rec-resubmission@cpu.edu.ph*

GENERAL INFORMATION			
Title of the Study	THE EFFECTIVENESS OF USING A YELLOW HIGHLIGHTER ON MEMORY RETENTION		
Version number/Date	N/A		
RERB Code	2023-361-UG-ZANTE et al.	Study Site:	N/A
Name of Researcher	Jhon Mark Zante	Contact Information	Tel No. N/A
			Mobile No. 09387013708
			Fax No. N/A
Co-researcher (if any)	Orange Kaye Faldas Emirie Gayongo Ian Francis Morante Jhercel Tesoro		Email: johnmarkzante@gmail.com
Institution of researcher/s	Central Philippine University		
Address of Institution	Lopez Jaena St., Jaro, Iloilo City		

RERB Recommendations	Response of Researcher	Section and page number of revisions
Use General Objective instead of statement of the problem	Suggestion is applied, Researchers changed the statement of the problem into General objectives.	-General Objectives -Page 6
Process on how to measure retention	We already deleted the scale (low, average, high) since it is not necessary. To measure memory retention, a 0.05 alpha level will be our indicator if there is an improvement in memory retention when using a yellow highlighter. Below 0.05 means there is a significant difference in memory retention when using a yellow highlighter, above 0.05 means there is no significant difference.	-Inferential statistics and instrumentation -Page 43 -Page 32
Provide scale and how will the variables be operationally used in the study.	Provided how variables are operationally used. If the p-value is >0.05, it means that it is not significant. Therefore, we will accept the null hypothesis stating that there is no	-Inferential Statistics -Page 43

	significant difference between using a yellow highlighter and memory retention. However, if the p-value is <0.05, then it is significant and we reject the null hypothesis. Lastly, if the p -value is =0.05, then there is no improvement or difference.	
Indicate sampling technique and show formula	suggestions were applied, already indicated providing formulation to get a sample size	-Appendix A -Page 50
Clear inclusion and exclusion criteria	Already provided clear inclusion and exclusion	-Scope and limitation -Page 13 -ICF, Inclusion and exclusion -page 2
Table of stratification	We deleted the statement that we will divide the participants into three batches, instead, we will cater all the participants within 3 days. A table for simple random sampling(how we will get our participants) is provided.	-Appendix K -page 97
Include duration of study	Duration provided	-Scope and limitation -Page 13
Revise ethical consideration	Ethical consideration was revised, content aligned with ICF, discussed as a sub-paragraph -Seeking approval from RERB office and others -Risk assessment -Benefits assessment -Withdrawal criteria -Anonymity and confidentiality -Voluntary, non-coercive recruitment -Disposal of data -Contribution and benefits to local communities -Incentives -Disclosure	-Ethical consideration -Page 34
Provide dissemination plan	Dissemination plan is provided	-Page 40
On ICF, remove instruction	Instruction is removed	-Page 1
On ICF, #4, Describe questionnaire	Questionnaire has been described, stating pages, type of questionnaire etc.	-Page 2
On ICF, #8, Duration of study and duration in answering your questionnaire	Duration of study provided, as well as the duration of answering the questionnaire which 5 minutes after reading 10 minutes of the passage	-Page 4
On ICF, #18, delete names/date and signature	Suggestions applied	-Page 7

Researcher/s:

Orange Kaye A. Faldas
Signature over Printed Name

Emilde J. Gavonoo
Signature over Printed Name

Ian Francis C. Macacio
Signature over Printed Name

Jherrel C. Tesoro
Signature over Printed Name

[illegible] Mae C. Dane
Signature over Printed Name

Adviser:

Eda Grace L. [illegible], MA Psych, RPm
Signature over Printed Name

Date: November 20, 2023

Appendix Q

Ethical Clearance

RESEARCH ETHICS REVIEW BOARD
CENTRAL PHILIPPINE UNIVERSITY
Lopez Jaena St., Jaro, Iloilo City, Philippines
329-1971 to 79 local 3336

ETHICAL CLEARANCE

RERB Form No.22-2
Version No.: 04
Date of Effectivity: 17 May 2023

Date of Approval: December 4, 2023

RERB Code: 2023-361-UG-ZANTE et al.

Protocol Title: *"THE EFFECTIVENESS OF USING A YELLOW HIGHLIGHTER ON MEMORY RETENTION"*

Version No. 02

Researcher/s: **ORANGE KAYE FALDAS**
EMIRIE GAYONGO
IAN FRANCIS MORANTE
JHERCEL TESORO
JHON MARK ZANTE

Upon resubmission of the following documents, Research Proposal Chapters 1, 2, and 3 with references and Informed Consent Form, the above protocol is hereby **APPROVED** by the CPU-RERB. This ethical clearance is valid from **December 4, 2023** to **December 4, 2024.**

The researcher/s are hereby required to submit the following:

√ Progress Report on or before **January 4, 2023** to researchethics@cpu.edu.ph
√ Final Report Form and one (1) copy of the completed protocol **within one (1) month** after completion of the study.

For any amendment or alteration in the protocol that will change the nature, or the level of risk involved after approval, the Research Ethics Review Board must be notified through writing and accomplishing the following forms as needed: Protocol Deviation Form, Serious Adverse Events, Amendment Form, and/or Early Termination Report.

Very truly yours,

JOY G. RASO, PhD
Chair, CPU-RERB

Date: 12/4/23

Appendix R

Progress Report

RESEARCH ETHICS REVIEW BOARD
CENTRAL PHILIPPINE UNIVERSITY
Lopez Jaena St., Jaro, Iloilo City, Philippines
329-1971 to 79 local 3336

PROTOCOL REVIEW OF PROGRESS REPORT	RERB Form No. 09-1
	Version No. 01
	Date of Effectivity: 17 May 2023

INSTRUCTIONS TO THE RESEARCHER/s:
This form is required thirty (30) days after your Data Collection. Obtain an electronic copy of this form and supply All information required in the space provided. This form shall be signed by the researcher and adviser before submission to researchethics@cpu.edu.ph

GENERAL INFORMATION

Title of Study	THE EFFECTIVENESS OF USING A YELLOW HIGHLIGHTER ON MEMORY RETENTION		
RERB Protocol No.	2023-361-UG-ZANTE Et al.	Study Site	Central Philippine University
Name of Researcher	JHON MARK ZANTE		
Contact No.	09387013708	Email Address	Johnmarkzante@gmail.com
Co-researcher (if any)	ORANGE KAYE FALDAS, EMIRIE GAYONGO, IAN FRANCIS MORANTE, JHERCEL TESORO		
Institution	CENTRAL PHILIPPINE UNIVERSITY		
Address of Institution	Lopez Jaena Street, Jaro Iloilo City 5000 Philippines		
Ethical clearance effectivity period:	December 04, 2023 to December 04, 2024		

PROGRESS REPORT

1. Start of study: March 01, 2023
2. Expected end of study: March 01, 2024
3. Number of enrolled participants: 166
4. Number of required participants:117
5. Number of participants who withdrew: gathering data is on progress
6. Deviations from the approved protocol: While conducting the pilot test, the researchers encountered deviations from the approved protocol. The originally two-week gap period of conducting experimental and controlled conditions was adjusted to a week due to time constraints and participant's availability. However, when it comes to the actual testing, we will adhere to the authorized plan, which includes a two-week interval.
7. New information (literature or in the conduct of the study) that may significantly changethe risk-benefit ratio: None

8. Issues/problems encountered: None

Recommendations (For RERB use only)	
DECISION: (For RERB use only)	[☐] Ask for further information [☐] Noted and Accept report
Comments of Primary Reviewer (For RERB use only)	

RERB Primary Reviewer: (For RERB use only)

_____

Signature over Printed Name

Date:

Researcher/s: Jhon Mark S. Zante

Jhon Mark S. Zante

Signature Over Printed Name

Date: January 05, 2024

Adviser: Erla Grace L. Agutaya, MA Psych, RPm

Erla Grace L. Agutaya

Signature Over Printed Name

Date: January 05, 2024

Appendix S

Final Report

RESEARCH ETHICS REVIEW BOARD
CENTRAL PHILIPPINE UNIVERSITY
Lopez Jaena St., Jaro, Iloilo City, Philippines
329-1971 to 79 local 3336

FINAL REPORT FORM	RERB Form No. 13-1 Version No. 01 Date of Effectivity: 17 May 2023

INSTRUCTIONS TO THE RESEARCHER/s:
This form is required upon completion of the study. Obtain an electronic copy of this form and supply all information required in the space provided. This form shall be signed by the researcher and adviser before submission to researchethics@cpu.edu.ph

GENERAL INFORMATION

RERB Protocol Number	2023-361-UG-ZANTE Et al.	Date (DD/MM/YYYY)	MAY 20, 2024
Protocol Title	The Effectiveness of Using a Yellow Highlighter on Memory Retention		
Principal Investigator/s	Jhon Mark S. Zante		
Department/College	Arts and Sciences		
Contact No.	09387013708	*Email Address	johnmarkzante@gmail.com
Co-investigator/s (if any)	Orange Kaye Faldas Emirie Gayongo Ian Francis Morante Jhercel Tesoro		
Contact No.	09388219119	Email Address	jhercel.tesoro-20@cpu.edu.ph
Institution of Researcher/s	Central Philippine University		
Address of Institution	Lopez Jaena St., Jaro, Iloilo City		
Effective period of Ethical Clearance	From: December 11, 2023	To: December 11, 2024	
*(*for RERB)* Primary Reviewer/s			
Type of Study	☐ Clinical ☐ Epidemiology ☐ Observational study		
	☐ Document Review ☐ Individual based ☐ Genetic		
	☐ Social Survey ☐ Others, specify _____		
Review Status	☐ Full Board ☐ Expedited		

FINAL REPORT

1. Start/end of the Study: March 2023 – May 2024
2. Number of enrolled participants: 166
3. Number of required participants: 117
4. Number of participants who withdraw: 0

Deviations from the approved protocol: Following are the recommendation of the panelists to change/include, these are:
-In the Abstract, edit and put the objectives, little intro, how many participants, method used and result. Make it very complete but concise.
-Change Slovins to Yamane
- After the result, there is an Implication for Theory and Practice.
-Other recommendation is minor like for example we need to delete certain words or phrases because it is redundant. All recommendation was applied.

5. Issues/problems encountered: No major problem encountered.

6. Summary of findings: Results show that there is an increased score in the participants' post-test, indicating that the participants retain more information when they use a yellow highlighter. In the condition where participants did not use a yellow highlighter (the control condition), the average retention score was 5.38. On the other hand, in the experimental condition where participants did use a yellow highlighter, the average retention score was notably higher at 7.50. There is a significant difference in memory retention when participants use a yellow highlighter. The mean difference between the experimental and control conditions was calculated to be -2.210. This means that, on average, participants scored 2.210 points higher in the experimental condition (where they used a yellow highlighter) compared to the control condition (where they didn't use a highlighter).

7. Conclusions/Recommendations: The findings of the study highlight the effectiveness of using a yellow highlighter in improving information retention among psychology students. The increased scores in the participants' post-test compared to the non-highlighting pre-test indicate that utilizing a yellow highlighter leads to better retention of information. And so, this study indicate a significant difference in memory retention when participants use a yellow highlighter. Researchers recommend this study to various individuals, such as teachers, guidance counselors, parents, students, and future researchers, highlighting the effectiveness of using a yellow highlighter on memory retention. The study's results indicate that this practice can be beneficial for enhancing memory retention, making it a valuable tool for educational and personal development.

8. Actions for dissemination of study results: No actions have been taken yet, but the researchers plan to officially publish the study in a journal after it has been defended and rigorously reviewed by the RERB. Hard copies will be available in the University's Library, Social Science Department, and RERB. Additionally, the digital version may be published online in official research publications, making it accessible to those interested in the study.

Researcher/s: Jhon Mark S. Zante

Jhon Mark S. Zante
Signature Over Printed Name

Date: May 20, 2024

Adviser: Erla Grace L. Agutaya, MA Psych, RPm

Erla Grace L. Agutaya
Signature Over Printed Name

Date: May 20, 2024