

Development of Learning Mode- Based Supplemental Material for Enhancing Critical Thinking Abilities in Grade 10 Biology

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ABSTRACT: The purpose of this study was to create a learning mode-based supplemental material for Biology 10. This material was used to assess the critical thinking skills of student responses in the areas of argument, explanation, problem-solving, and tracking cause and effect. The development was focused on the kids' preferred learning modes, which include auditory, visual, reading/writing, and kinesthetic. Prior to the implementation of the said material, the expert and student respondents assessed its level of components in terms of format, presentation, organization, acceptability, and adaptability. Afterward, a post-test was carried out. The study discovered that the majority of respondents were extremely acceptable as judged by the two categories of respondents. The supplemental material assisted the students in improving their critical thinking skills, as evidenced by their pre and post-test scores. There were considerable disparities in the respondents' pre and post-test scores.

KEYWORDS: Critical Thinking Abilities, Grade 10 Biology, Learning Mode-based, Supplemental Material.

INTRODUCTION

Education is an important part of a country's development. In order to continue moving toward a more advanced and quality nation, it is necessary to produce cognitive resources of individuals with character (Lewin, 2019). One of the difficult debates that the government and people throughout the archipelago persistently raise is the changing environment of educational interdependence among students and teachers, as it has the potential to be a new weapon in globalization's rearing (Okabe, 2016). The government and its people resolved to advocate for the principles of independence and liberalism, requiring them to take part in the roaring outbreak of social and educational revolutions.

As a result, the government opened a new door that may transparently hold the patrimony's endurance and thinking power through the reforming of the Philippine Education System. This culminated in Republic Act 10533, often known as the K to 12 Curriculum, or the Enhanced Basic Education Curriculum. The K-12 Curriculum is a student-centered curriculum that focuses on the inner development of students through the use of four major competencies suited for communicative effectiveness, interpersonal and social respect, reasonable and efficient schema activation, and creative thought propagation.

These four fundamental qualities will surely help Filipino students competently undertake and efficiently complete all tasks and assignments. Through healthy socialization and fair competition with foreign countries, the K-12 curriculum is the government's key to improve the lives of many Filipinos. The benefits of the program will be extended throughout the firm and will address concerns in the Philippine school system.

Despite the multiple benefits provided by this curriculum, unavoidable issues have consistently confronted the various sectors of educational foundations. These are the difficulties that have inspired several curriculum experts to investigate some creative solutions. The ability to provide appropriate reasoning and ideas through meticulous review, analysis, and assessments is one of the most essential aids for these occurrences. Critical thinking skills are engaged and strengthened throughout this time. Curriculum specialists are always cultivating the developmental phases of their thinking in order to strengthen their minds' perceiving power not only to explicate the complex dispositions within the core of education, but also to rediscover the most appropriate answer to these educational difficulties.

Because education is so important for everyone, the government encourages teachers to develop, administer, and evaluate the learning process. Teachers must be innovative in building learning aids to ensure that students not only recall topics but also gain knowledge and improve their thinking skills (Ufnard and Shepherd, 2019). It is incorporated in altering instructional materials, which is one of the components that determine learning aim achievement, according to Salta and Koulouglotis (2020).

There are subjects that provide a variety of tasks that stimulate the mind's ability to analyze, evaluate, and synthesis schematic knowledge into constructive knowledge. Science is one of the courses that assists pupils in developing critical thinking abilities.

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According to the K–12 curriculum guide, the final principle of teaching Science is the development of scientific knowledge. Students will utilize this scientific information to justify and decide how they will use and apply the knowledge to achieve scientific literacy. As they develop and cultivate scientific learning, students' critical thinking skills will improve. Biology is one of the science disciplines covered in the junior high school curriculum.

Because biology students understand the demands of living things over his surroundings and the interplay of the two, biology becomes a method of insertion for students learning about environmental concerns, which may enhance students' attitudes toward the environment. The foundation for environmental knowledge will be understanding of biodiversity, ecosystems, and the problem, ensuring that students comprehend the importance of the environment.

On the one hand, knowing about curricular components should not be the sole focus of biology studies. It should, however, be capable of enabling a broad variety of thinking skills required by students Gilissen et al. al (2019). According to Ichsan (2020), learners in the twenty-first century must have four skills: teamwork, communication, creative thinking, and critical thinking. The research focuses on enhancing critical thinking abilities with supplemental content from diverse studies that boost critical thinking skills in Biology learning.

Students with good critical thinking skills are more aware of social, scientific, and practical challenges (Mahanal et al, 2019). According to Masyaddad (2019), critical thinking can also aid in making deliberate decisions and tackling day-to-day biology difficulties. Implementing critical thinking in biology education allows students to build analytic, inductive, and deductive reasoning abilities in order to answer fundamental event-related questions (Fuad, et. al, 2017). Students with good critical thinking abilities in a learning setting may gain from establishing a self-confidence attitude by perceiving oneself as a person who may profit from becoming an active contributor in the learning process. (Miharja, 2019). Cooperative learning (Bustami et al, 2016) emphasizing reading activities scientific approach-oriented activities (Bruehl, 2015), and innovative instructional or supplementary materials in teaching the subject could help students develop critical thinking skills.

According to Wartono (2018), the most fundamental difficulty in every learning process is a lack of learning resources such as instructional materials. Improving learning tools is one approach to better learning circumstances. The present administration's scientific approach was used to construct this toolbox. In addition to learning tools, teaching materials are created. The purpose of teaching materials is to teach students to study independently so that they can be more engaged in their learning, with the teacher acting as a facilitator. Teaching resources are created using a scientific approach to help students improve their critical thinking skills.

As a result, teachers can assess their pupils' critical thinking abilities. Throughout the learning process, critical thinking abilities must be employed consistently. The emphasis is on imparting skills in the next generation, who will move on to college and possibly the workforce. The goal is to produce students who can solve biology challenges in real-world circumstances. According to Fitriani (2017), one of the skills that must be fostered during the science education process is critical thinking. Critical thinking skills development entails teaching kids how to assess data, locate and organize ideas, defend beliefs, create comparisons, draw conclusions, evaluate arguments, and solve issues.

The ability to think critically is part of a critical high-level cognitive ability that pupils must develop. Critical thinking is a skill that must be developed since the purpose of critical thinking is to obtain deep understanding and to be able to address challenges encountered in daily life. Critical thinking abilities can teach pupils to make decisions from multiple perspectives thoughtfully, comprehensively, and logically, so critical thinking skills development becomes a goal that must be achieved in the learning process. A supplemental material developed by the school or teachers based on the specific needs and modes of learning of the learners is one way to improve students' critical thinking skills.

Students were observed to display negative behavior that was deemed unproductive for their improvement while taking Biology classes, such as an inability to promote questions during the learning process, less creative work, and a lack of critical thinking skills. The results of quiz distribution during meetings to determine skill acquisition in one or two basic competencies revealed that students did not achieve satisfactory results. In general, the acquisition value of the average obtained quiz score, from a maximum of 30, is only 15 to 18. It is expected that students' critical thinking skills will improve with one or two repetitions of lecture material or the use of any supplementary materials.

OBJECTIVES OF THE STUDY

This research paper focused on critical thinking abilities of Grade 10 learners. The purpose of this study is to develop a learning mode-based supplemental material that Biology teachers can use to develop critical thinking skills among learners.

The research limits itself to an assessment of the respondents' pre and post test scores. Respondents of the study were 49 junior high school students from Sta. Sta. Anastacia-San Rafael National High School. The junior high school students are now enrolled in grade 10, and Biology is one of their topics

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METHODS

The descriptive developmental research approach was utilized, which entails describing, comparing, and interpreting the data collected while focusing on the respondents' personal profiles, particularly their learning preferences.

Gillaco (2014) explained how the descriptive method is used to discover actual information about a present situation. Furthermore, this technique focuses on existing data description, comparison, analysis, and interpretation. Meanwhile, Beb (n.d.) defined developmental method as a corpus of research literature that is directly tied to instructional development, meaning that an output will be developed once this study is completed. In other words, descriptive developmental technique is the systematic study of designing, developing, and carefully analyzing educational programs, procedures, and products that must meet a standard or criterion.

As mentioned, this research shall be developing a supplemental material which can help learners improve their critical thinking. This material shall be based on the IDEA (introduction, development, engagement, and assimilation) instructional process. Basically, this process is based on Regional Memorandum No. 296, s.2020. On I (idea) phase, there is a simple discussion or information relative to the background of the topic to be discussed. On one hand, the D (develop) phase consists of activities that learners need to accomplish. The E (enhance) phase includes deeper discussion of the topic while A (Assimilation) phase is for activities that are based on the discussion found in E phase.

In the study, 49 junior high school students from Sta. Anastacia-San Rafael National High School, in Sto. Tomas Batangas were the participants. The junior high school students were currently enrolled in grade 10, where one of their subjects is biology. Since all students from a section will be used as research subjects, the study used sampling with a purpose or total enumeration techniques. The experts and participants in the study included four Master Teachers and two Teacher IIIs with MAEDs in Science.

The researchers crafted a test material which includes 50 items relative to competencies in Biology that students take during the third quarter of the school year. This will be employed by the researcher as sources of the pretest and post test scores of the student-respondents. Also, the research shall be employing VARK to determine the learning modes of the learners, whether they prefer visual, auditory, reading, or kinesthetic learning. Further, the researcher developed supplementary material for enhancing the critical thinking skill of the students. This supplementary material was described based on its format, presentation/ organization, assessment tools, and usability, acceptability, and adaptability.

Required permits and documents were sought for the administration of the research survey questionnaire. First, the researcher will make a correspondence addressed to the Schools Division Superintendent. The letter will be attached with the finalized questionnaire. Once the permission is given, the researcher will send the copy of the letters to the school head of the school respondent to ask for permission for the conduct of study. She will also send a letter to the parents of the selected respondents requesting permission for their children to participate in the study. The researcher will distribute the survey questionnaire to respondents through their class advisers once it has been approved.

A pretest was performed to assess the learners' critical thinking abilities. The test items were delivered to the research adviser and assessors to be validated. Before presenting the exam to the targeted participants on a broad scale, final adjustments were made following pilot testing on grade 10 students and item analysis to assess the viability of the included questions. The participants were given a post-test to evaluate their critical thinking abilities.

To obtain answers to the given questions, grouped data were evaluated and statistically handled. To provide explanations for the collected data. The following statistical tools were used by the researcher to provide interpretations for the data collected.

Frequency Distribution method was used to determine the distribution of respondents based on their gender, age, and learning preference. Dependent T-Test was used to obtain the pretest and post-test scores of the student-respondents. Pearson r was used to evaluate whether there was a significant link between perceived acceptability of additional materials and post test scores.

RESULTS AND DISCUSSION

Table 1 present the distribution of respondents in terms of sex and age. It shows the distribution of respondents in terms of sex. It showed that out of 49 respondents, 34 or 69.39 percent were female and 30.61 percent or 15 were male. It can be gleaned that the majority of respondents is female.

Table 1. Distribution of Respondents in Terms of Sex

SEX	FREQUENCY	PERCENT
Male	15	30.61
Female	34	69.39
TOTAL	49	100.00

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Table 2 shows the age distribution of responders.. It can be gleaned from table 1 that the majority or 41 which belonged to the 83.67 percent of the respondents were from the age group 14-15 years old. Six (6) or 12.24 percent and two (2) or 4.08 percent belonged to the age groups 16-17 and 18-19 years of age respectively.

Table 2. Distribution of Respondents in Terms of Age

AGE	FREQUENCY	PERCENT
14 -15	41	83.67
16 -17	6	12.24
18 -19	2	4.08
TOTAL	49	100.00

Table 3 reveals the preferred learning modes of the respondents as to visual, auditory, reading/ writing, and kinesthetic. It can be seen in table 3 that 17 or 34.69 percent of the respondents preferred auditory, while the visual and reading/ writing learning modes were preferred by nine (9) respondents each. According to Flemming (2020) many preferred auditory learning because they find learning challenging when the data is delivered to them in a written text but have no problem understanding it in an auidial form. The remaining 14 or 28.57 percent preferred kinesthetic. . In can be gleaned that the majority of the respondents preferred auditory.

Table 3. Preferred Learning Modes of the Respondents

LEARNING MODES	FREQUENCY	PERCENT
Visual	9	18.37
Auditory	17	34.69
Reading/Writing	9	18.37
Kinesthetic	14	28.57
TOTAL	49	100.00

Description of the Components of The Developed Learning Mode-Based Supplementary Material As Assessed by the Expert-Respondents. The following tables reveal the description of the components of the developed learning mode-based supplementary materials as assessed by the expert-respondents in terms of format, presentation, organization, assessment tools, usability, acceptability, and adaptability.

Table 4 reveals the description of the components of the developed learning mode-based supplementary materials as assessed by the expert-respondents in terms of format. Individually, the indicators with the highest weighted mean of 4.00 were standard deviations of 0.00 and verbal interpretation of highly acceptable was the materials used the standard size of the text for captions and details. It implies that the development of the supplementary materials follow the standards as prescribed by the Department of education. As stipulated in DepEd Order No. 31, s. 2019 presents the guidelines set by the Bureau of Learning Resources, the ADM standards and Guidelines of the Bureau of Learning Delivery. As such, all the learning materials should follow the standard so that it would be easier for the students to see and read the content.

On one hand, the indicators which got the lowest weighted mean were acronyms and abbreviations in the materials were used sparingly and fully explained when first used, the activities in the materials were chronologically arranged according to their level of difficulty, and the materials contained the primary sources of the activities and information to recognize its sole author. All these indicators obtained a weighted mean of 3.67, verbal interpretation of 0.52 and verbal interpretation of highly acceptable.

The total mean of the format as a component of the created learning mode-based additional content was 3.79 (SD = 0.23), as shown in table 4. It means that the general format was highly acceptable. Supplementary materials needs proper format. It implies that the development of the supplementary materials for this study follows the correct format as prescribed by the Department of Education. In fact, everytime the department issues supplementary materials down to different schools, the regional offices has the obligation to validate them in terms of format, language, etc. For example, in 2021 a DepEd Memorandum was issued by the undersecretary for curriculum and instruction to regional directors to conduct an activity called supplementary materials for senior high school validation.

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Table 4. Level of Acceptability on Components of The Developed Learning Mode- Based Supplementary Material in Terms of Format

INDICATORS	Mean	Standard Deviation	Verbal Interpretation
1. The materials were significantly relevant and timely crafted.	3.83	0.41	Highly Acceptable
2. The material's figure used caption in sentence case with a period at the end.	3.83	0.41	Highly Acceptable
3. Acronyms and abbreviations in the materials were used sparingly and fully explained when first used.	3.67	0.52	Highly Acceptable
4. The activities in the materials were chronologically arranged according to their level of difficulty.	3.67	0.52	Highly Acceptable
5. The materials used colored illustration to have a visual representation of the object.	3.83	0.41	Highly Acceptable
6. The materials contained the primary sources of the activities and information to recognize its sole author.	3.67	0.52	Highly Acceptable
7. The illustrations and pictures used in the materials were significantly relevant to the activities presented.	3.83	0.41	Highly Acceptable
8. The materials used the standard size of the text for captions and details.	4.00	0.00	Highly Acceptable
OVERALL	3.79	0.23	Highly Acceptable

Legend: 1.0 – 1.49 (Not Acceptable); 1.5-2.49 (Less Acceptable); 2.5-3.49(Acceptable); 3.5-4.0 (Highly Acceptable)

Table 5 presents the description of the components of the developed learning mode-based supplementary materials in terms of presentation. The respondents' assessment on presentation as a component of mode-based learning supplementary material received a composite mean of 3.71 (SD=0.22). It means that the said material as to presentation was highly acceptable. The developed supplementary material was presentable and can easily be understood by the readers. The writer or developer should consider how these supplementary learning materials will be effective and meaningful to the instructors in performing one's job duties well, facilitating student learning, achieving academic goals and objectives, and improving the overall educational system. Also, various factors should be considered such as the grade level to which the materials shall be implemented and the academic goals. This is consistent with Kapur's (2020) assertion that teachers' presentation of learning materials in front of students enables them to use them in learning.

Obtaining the highest weighted mean of 4.00 (SD=0.00) was the illustrations used in the material are printed close enough to the text and directly related to the content of the topic/concept. The respondents rated this indicator as highly acceptable. Illustrations are a good resource to help readers understand and follow what they are reading. Since the supplemental resources will be used in grade 10 and the subject calls for a lot of imagery to help students visualize the texts in the materials, it follows that the illustration should be presented clearly. Its stance that it is drawn not far from the text is included in this clarity. According to Akimova (2022) illustration and texts operate together, therefore whatever is drawn is mentioned in the text. A clear image is also necessary to provide some creativity to the text.

Among the indicators of presentation, the activities/learning task's layout established comfort and motivation got the lowest weighted mean of 3.33 and standard deviation of 0.52 which implies that the respondents rated this as acceptable. Supplementary materials are developed to further students' learning, like developing their critical thinking. However, it is not possible if the learners to whom the materials are meant for are not motivated to learn and even answer the tasks because the activities themselves are not motivating. According to Filgona et al. al (2020) emphasize the importance of students' motivation to learn because students' mere presence in class is not a guarantee that they want to learn. It is simply a reflection of the fact that pupils live in a society where children are compelled to attend school. They went on to say that encouraging learners to learn is important for curriculum implementation. This is due to the fact that motivation is an important aspect in teaching-learning circumstances.

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Table 5. Level of Acceptability on Components of The Developed Learning Mode- Based Supplementary Material in Terms of Presentation

INDICATORS	Mean	Standard Deviation	Verbal Interpretation
1. The material has clear and appropriate pictures or illustrations	3.83	0.41	Highly Acceptable
2. The cover of the material is captivating and an interest-getter.	3.67	0.52	Highly Acceptable
3. The activities/learning task's layout established comfort and motivation.	3.33	0.52	Acceptable
4. The illustrations used in the material create a favorable atmosphere in learning the topic/concepts depicting realism and action	3.67	0.52	Highly Acceptable
5. The illustrations used in the material are clear, simple, and free of unnecessary details that may cause confusion.	3.67	0.52	Highly Acceptable
6. The illustrations and pictures are catchy and may sustain interest to continue learning the material.	3.83	0.41	Highly Acceptable
7. The illustrations used in the material are printed close enough to the text and directly related to the content of the topic/concept.	4.00	0.00	Highly Acceptable
8. The material provides various illustrations ranging from drawings, tables, graphs, and graphic organizers.	3.67	0.52	Highly Acceptable
TOTAL	3.71	0.22	Highly Acceptable

Legend: 1.0 – 1.49 (Not Acceptable); 1.5-2.49 (Less Acceptable); 2.5-3.49(Acceptable); 3.5-4.0 (Highly Acceptable)

Table 6 indicates the assessment of the respondents on organization as a component of the developed supplementary learning materials. It can be gleaned from table 6 that the respondents rated the organization of the supplementary materials as highly acceptable, proven by its obtained composite mean of 3.81 and standard deviation of 0.00. It implies that the supplementary material developed for Biology 10 was clearly understood by the student-users because this is how it should be. Since a supplementary material is made to further students' learning, then it should enable the learners to do so, and it is not possible if the contents are vagued. As stipulated by rapanta, et. al (2020) Content should be presented in an organized way. Well-organized content gives learners visual clues on how the course is structured and sets expectations for their own outcomes.

Taking into account all indicators, the activities were given in an ordered manner, and the content was logically grouped to provide order of understanding, activities of the material were logically connected to the previous lessons, and activities were arranged towards attaining the learning competencies all got 4.00 as their weighted mean. This implies that all these subcomponents of organization are considered in the development of the supplementary material. Learners must view all the components the course will cover such as the main topic, subtopics, what they will learn, and how mastery will be demonstrated. As the name suggests, organization entails that all of the lessons and exercises in the materials are well-written and won't result in any confusion on the part of the students. The goal of developing the learners' critical thinking would not be achieved if it were not fostered in this manner. As said by Awolaju (2016), seeing a breakdown of the course structure lets learners understand the process and flow of the course as they move from one topic to the next.

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Table 6. Level of Acceptability on Components of The Developed Learning Mode-Based Supplementary Material in Terms of Organization

INDICATORS	Mean	Standard Deviation	Verbal Interpretation
1. The activities were presented in an organized manner	4.00	0.00	Highly Acceptable
2. The material was logically arranged to supply order of understanding.	4.00	0.00	Highly Acceptable
3. The material was diversely constructed to master concepts and ideas.	3.67	0.52	Highly Acceptable
4. The instructions of the material could be easily understood and processed in the class.	3.50	0.55	Highly Acceptable
5. The characters of the material were comprehensively, visibly, and intelligibly crafted.	3.50	0.55	Highly Acceptable
6. The activities of the material were logically connected to the previous lessons	4.00	0.00	Highly Acceptable
7. The material contained appropriate use of language that considers the level of our understanding.	3.83	0.41	Highly Acceptable
8. The activities were arranged towards attaining the learning competencies.	4.00	0.00	Highly Acceptable
OVERALL	3.81	0.17	Highly Acceptable

Legend: 1.0 – 1.49 (Not Acceptable); 1.5-2.49 (Less Acceptable); 2.5-3.49(Acceptable); 3.5-4.0 (Highly Acceptable)

Table 7 indicates the assessment of the respondents on assessment tools as a component of the developed supplementary learning materials. It shows that the assessment tools got an overall mean of 3.67, standard deviation of .20 and verbal interpretation of highly acceptable. An assessment tool includes a variety of components such as the assessment context and conditions, tasks to be assigned to the student, an outline of the evidence to be acquired from the applicant, and evidence standards used to determine the level of performance. Since assessment techniques are important in determining the learning outcomes, these elements must be included in the supplemental materials. According to the respondents' evaluations, it can be concluded that the assessment tools found in the supplemental materials are effectively designed and truly serve their intended purpose of measuring the learners' performance.

Based on the results, the item the material considered the use of sets of opposite answers unless more than one pair is presented got the highest weighted mean of 4.00 and

considered as highly acceptable. It can be inferred that the assessment tools included in the supplementary materials are carefully done because it has to be effective. Wise (2020) argues that the success of multiple-choice items is dependent on the quality of the response possibilities, specifically how well the erroneous options (distractors) attract pupils with limited knowledge. It is frequently said that test authors are incapable to creating more than two credible distractors for most MC items, and that the effort required to do so is not beneficial in terms of the items' psychometric properties. However, McKeachie (2017) stated that in constructing multiple choice assessment tools, the writer must beware of using sets of opposite answers unless more than one pair is presented like to to work and not go to work. This is because this may cause confusion among the learners.

On one hand, the items that got the lowest weighted mean of 3.33 and standard deviation of 0.52 are the material used with only one clearly correct answer and the material utilized appropriate wording in the response choices consistent with the item. These findings can be confirmed by the fact that the majority of the items ask for the usage of opposing responses. The assessment's users, who are learners, may become perplexed, making it difficult for them to determine which of the possible answers is the right one. According to Barzan and Kooti (2021), in writing assessment tools, the writer must use familiar language, which means he must not introduce new terminology or use idioms that may not be recognizable to all pupils in the class. They also stated that a writer of any assessment instrument should avoid having two or more apparently valid responses, where one is more correct than the other. This is distinct from an element of truth in the distractor.

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Table 7. Level of Acceptability on Components of The Developed Learning Mode-Based Supplementary Material in Terms of Assessment Tools

INDICATORS	Mean	Standard Deviation	Verbal Interpretation
1. The material used only one clearly correct answer.	3.33	0.52	Acceptable
2. The material utilized appropriate wording in the response choices consistent with the item.	3.33	0.52	Acceptable
3. The set of questions was presented in an organized manner.	3.83	0.41	Highly Acceptable
4. The material did not use double-negative questions or items.	3.83	0.41	Highly Acceptable
5. The material considered the use of sets of opposite answers unless more than one pair is presented.	4.00	0.00	Highly Acceptable
6. The material included timely and relevant questions.	3.67	0.52	Highly Acceptable
7. The material considered the question to process that you want to be measured.	3.83	0.41	Highly Acceptable
8. The material deemed item that defines the parameters of expected answers as clearly as possible.	3.50	0.55	Highly Acceptable
OVERALL	3.67	0.20	Highly Acceptable

Legend: 1.0 – 1.49 (Not Acceptable); 1.5-2.49 (Less Acceptable); 2.5-3.49(Acceptable); 3.5-4.0 (Highly Acceptable)

Table 8 presents the assessment of the respondents on the usability of the supplementary learning materials. The overall mean of 3.77 and standard deviation of 0.23 indicates that the usability of the supplementary learning material was highly acceptable as assessed by the respondents. It can be inferred that the developed material can be adapted and used by the school-respondent and even other schools so as to improve the critical thinking skill of the learners when it comes to Biology. According to Gomez (2017), the results of the development and validation of worktext in food service management resulted in the development of supplementary instructional materials in teaching food service management that were found to be very acceptable in terms of objectives, content, language and style, usability, learning activities, and graphics.

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Table 8. Level of Acceptability on Components of The Developed Learning Mode- Based Supplementary Material in Terms of Usability

INDICATORS	Mean	Standard Deviation	Verbal Interpretation
1. The given activities were suitable to my ability.	3.67	0.52	Highly Acceptable
2. The activities were created to stimulate my interest in learning.	3.67	0.52	Highly Acceptable
3. The material managed expectation that contains possible outcome.	3.83	0.41	Highly Acceptable
4. The material provide reality check.	3.83	0.41	Highly Acceptable
5. The material contained learning usability	3.83	0.41	Highly Acceptable
6. The material optimized images and media for quicker downloading.	4.00	0.00	Highly Acceptable
7. The material used a simple and consistent navigation scheme.	3.67	0.52	Highly Acceptable
8. The material may contain aid the students' familiarity to a given situation and acquit them to different method and solutions that can be applied to real life circumstances	3.67	0.52	Highly Acceptable
OVERALL	3.77	0.23	Highly Acceptable

Legend: 1.0 – 1.49 (Not Acceptable); 1.5-2.49 (Less Acceptable); 2.5-3.49(Acceptable); 3.5-4.0 (Highly Acceptable)

Table 9 presents the assessment of the respondents on the acceptability of the supplementary learning materials. The overall mean of 3.88 and standard deviation of 0.21 suggests that the supplementary learning materials developed by the researcher were highly acceptable. With all the components stated in the aforementioned findings, this material is undeniably acceptable. The subject matter in the learning supplementary material integrates concepts and skills with other areas and the activities/learning tasks were developed to enhance my science critical thinking abilities in learning the subject matter or lesson among the indicators that got the highest weighted mean of 4.00 which is synonymous to a highly acceptable rating. The purpose of this research was to develop a supplementary learning material which was based on the learning modes of the students. It further aims to develop the critical thinking skills of the students. Thus, it can be inferred that the researcher was able to come up with a supplementary learning material that could successfully achieve its target. Marces (2020) in his study found the same as he revealed that the developed enrichment learning materials in Physics 7 are well prepared and are acceptable to the Science teachers and department heads.

The findings are further reinforced by the findings of a study conducted by Parales (2016), in which he designed a work text in Physics that demonstrated extremely substantial effects in improving the academic performance of fourth-year students in Physics. In the same spirit, it is compatible with Selpa's (2017) findings on the development and validation of enhancement activities in mathematics for grade VI students, which attempted to determine the effectiveness of the developed enhancement activities in mathematics. According to the findings of her research, the generated enhancement materials were highly implemented in terms of aims; content was very highly sufficient; usefulness was judged to be extremely useful; and language and style were quite effective.

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Table 9. Level of Acceptability on Components of The Developed Learning Mode- Based Supplementary Material in Terms of Reliability

INDICATORS	Mean	Standard Deviation	Verbal Interpretation
1. The objectives of the learning activities/tasks followed the content standard of the subject matter.	4.00	0.00	Acceptable
2. The subject matters in the learning supplementary material are congruent with the desired competencies.	4.00	0.00	Acceptable
3. The objectives consisted of clarified and specified learning tasks.	3.83	0.41	Highly Acceptable
4. The objectives in the material were attainable and measurable.	3.83	0.41	Highly Acceptable
5. The various learning activities/task were suitable to the needs of the class	3.67	0.52	Highly Acceptable
6. The subject matter in the learning supplementary material provides for individual differences.	3.67	0.52	Highly Acceptable
7. The subject matter in the learning supplementary material integrates concepts and skills with other areas.	4.00	0.00	Highly Acceptable
8. The activities/learning tasks were developed to enhance my science critical thinking abilities in learning the subject matter or lesson	4.00	0.00	Highly Acceptable
OVERALL	3.88	0.21	Highly Acceptable

Legend: 1.0 – 1.49 (Not Acceptable); 1.5-2.49 (Less Acceptable); 2.5-3.49(Acceptable); 3.5-4.0 (Highly Acceptable)

Table 10 denotes the adaptability of the supplementary learning materials developed by the researcher. It can be seen that the adaptability of the supplementary materials was highly acceptable as indicated in its obtained overall mean of 3.92 and standard deviation of 0.13. Since the aforementioned results reveal that the developed material is usable and acceptable, it follows that it is also adaptable. Finding and selecting materials for classes might be difficult. The validity of the source, the proficiency of the target language, the age and linguistic proficiency of the learners, as well as other factors, must all be taken into consideration by teachers. Teachers must first choose materials before determining whether further adaptations are necessary to meet the needs of their students.

Individually, the indicators instructional enrichment materials help me to gain satisfaction in learning the topic/concepts, the material's illustrations such as pictures, graphs, and so on made every topic more exciting and enjoyable, the instructional material gave me self-confidence in doing scientific research activities, the instructional enrichment materials create strategies that allowed me to practice knowledge and skills at my own pace, and the material helped me to gain satisfaction in learning the topic/concepts.. The findings suggest that additional Biology 10 teachers may use the supplemental materials that the researcher has developed.

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Table 10. Level of Acceptability on Components of The Developed Learning Mode-Based Supplementary Material in Terms of Adaptability

INDICATORS	Mean	Standard Deviation	Verbal Interpretation
1. Instructional enrichment materials help me to gain satisfaction in learning the topic/concepts.	4.00	0.00	Highly Acceptable
2. The material's illustrations like pictures, graphs, etc. made every topic more exciting and enjoyable.	4.00	0.00	Highly Acceptable
3. The instructional material gave me self-confidence in doing scientific research activities.	4.00	0.00	Highly Acceptable
4. The instructional enrichment materials create strategies that allowed me to practice knowledge and skills in my own pace	4.00	0.00	Highly Acceptable
5. The activities were applied to real life situation.	3.83	0.41	Highly Acceptable
6. The material helped me to relate to the target lessons and competencies.	4.00	0.00	Highly Acceptable
7. Instructional materials as tool for learning the topics/concepts improved my study habits.	3.67	0.52	Highly Acceptable
8. With the use of reflection, I gained self-worth in dealing with lessons and activities in the topic/concept.	3.83	0.41	Highly Acceptable
OVERALL	3.92	0.13	Highly Acceptable

Legend: 1.0 – 1.49 (Not Acceptable); 1.5-2.49 (Less Acceptable); 2.5-3.49(Acceptable); 3.5-4.0 (Highly Acceptable)

Description of the Components of The Developed Learning Mode-Based Supplementary Material As Assessed by the Student-Respondents. The following tables reveal the description of the components of the developed learning mode-based supplementary materials as assessed by the student-respondents in terms of format, presentation, organization, assessment tools, usability, acceptability, and adaptability.

Table 11 reveals the description of the components of the developed learning mode-based supplementary materials as assessed by the student-respondents in terms of format. It can be seen from table 4 that the overall mean of the format as a component of the developed learning mode-based supplementary material was 3.95 and standard deviation of 0.08. It means that the general format was highly acceptable. Supplementary materials needs proper format. It implies that the development of the supplementary materials for this study follows the correct format as prescribed by the Department of Education. In fact, everytime the department issues supplementary materials down to different schools, the regional offices have the obligation to validate them in terms of format, language, etc. For example, in 2021 a DepEd Memorandum was issued by the undersecretary for curriculum and instruction to regional directors to conduct an activity called supplementary materials for senior high school validation.

Individually taken, the indicators which got the highest weighted mean of 4.00, standard deviation of 0.00 and verbal interpretation of highly acceptable materials contained the primary sources of the activities and information to recognize its sole author. It can be inferred that the researcher as the writer of the developed supplementary material followed the principle of intellectual property rights as she never forgot to write the names of the authors of each activity, and even the different concepts in the said material. According to Hussein (2021), the concept of intellectual property rights is tied to the reality that certain products of human intelligence should be accorded the same protection rights as actual goods. The basic purpose of intellectual property law is to encourage the development of a wide variety of intellectual goods. To do this, the law grants individuals and businesses property rights to the information and creative commodities they create, usually for a set period of time.

On one hand, the indicators which got the lowest weighted mean was the activities in the materials were chronologically arranged according to their level of difficulty, the materials used colored illustration to have a visual representation of the object, and he illustrations and pictures used in the materials were significantly relevant to the activities presented as evidenced in the weighted

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mean of 3.88 and 3,94 and standard deviation of 0.33 and 0.24 respectively, yet verbally interpreted as highly acceptable. This finding implies that the supplementary resources contain illustrational pictures that function as visual representations of the printed information to facilitate concept understanding.

It may be inferred from the results that the teachers are flexible in terms of subject presentation, as well as the sequencing of activities and evaluations, as assessed by the students. This is compatible with Cross's discussion, as expressed by Balderas (2016), who noted that learning modules are the result of two educational reform movements, programmed learning and mastery learning. Mastery learning plans include the major features of today's modules, such as: educational objectives were specified, instruction was organized into learning units, diagnostic progress tests were administered after each unit, and mastery of one unit was required before the learner could proceed to the next lesson or unit.

Table 11. Level of Acceptability on Components of The Developed Learning Mode-Based Supplementary Material in Terms of Format

INDICATORS	Mean	Standard Deviation	Verbal Interpretation
1. The materials were significantly relevant and timely crafted.	3.96	0.20	Highly Acceptable
2. The material's figure used caption in sentence case with a period at the end.	3.96	0.20	Highly Acceptable
3. Acronyms and abbreviations in the materials were used sparingly and fully explained when first used.	3.96	0.20	Highly Acceptable
4. The activities in the materials were chronologically arranged according to their level of difficulty.	3.88	0.33	Highly Acceptable
5. The materials used colored illustration to have a visual representation of the object.	3.94	0.24	Highly Acceptable
6. The materials contained the primary sources of the activities and information to recognize its sole author.	4.00	0.00	Highly Acceptable
7. The illustrations and pictures used in the materials were significantly relevant to the activities presented.	3.94	0.24	Highly Acceptable
8. The materials used the standard size of the text for captions and details.	3.98	0.14	Highly Acceptable
OVERALL	3.95	0.08	Highly Acceptable

Legend: 1.0 – 1.49 (Not Acceptable); 1.5-2.49 (Less Acceptable); 2.5-3.49(Acceptable); 3.5-4.0 (Highly Acceptable)

Table 12 presents the assessment of the respondents on the description of the components of the developed learning mode-based supplementary materials in terms of presentation. It presents the assessment of the respondents on the description of the components of the developed learning mode-based supplementary materials in terms of presentation.

The respondents' assessment on presentation as a component of mode-based learning supplementary material received a composite mean of 3.93 (SD=0.11). It means that the said material as to presentation was highly acceptable. The developed supplementary material was presentable and can easily be understood by the readers. The writer or developer should consider how these supplementary learning materials will be effective and meaningful to the instructors in performing one's job duties well, facilitating student learning, achieving academic goals and objectives, and improving the overall educational system. Also, various factors should be considered such as the grade level to which the materials shall be implemented and the academic goals. This is consistent with what was stated by Kapur (2020) that the presentation of learning materials made by the teachers before the students, enables them to utilize them in learning.

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Obtaining the highest weighted mean of 4.00 (SD=0.00) was the illustrations used in the material are printed close enough to the text and directly related to the content of the topic/concept. The respondents rated this indicator as highly acceptable. Illustrations are a good resource to help readers understand and follow what they are reading. Since the supplemental resources will be used in grade 10 and the subject calls for a lot of imagery to help students visualize the texts in the materials, it follows that the illustration should be presented clearly. Its stance that it is drawn not far from the text is included in this clarity. According to Akimova (2022) illustration and texts operate together, therefore whatever is drawn is mentioned in the text. A clear image is also necessary to provide some creativity to the text.

Among the indicators of presentation, the activities/learning task's layout established comfort and motivation got the lowest weighted mean of 3.33 and standard deviation of 0.52 which implies that the respondents rated this as acceptable. Supplementary materials are developed to further students' learning, like developing their critical thinking. However, it is not possible if the learners to whom the materials are meant for are not motivated to learn and even answer the tasks because the activities themselves are not motivating. According to Filgona et al. al (2020) emphasize the importance of students' motivation to learn because students' mere presence in class is not a guarantee that they want to learn. It is simply a reflection of the fact that pupils live in a society where children are compelled to attend school. They went on to say that encouraging learners to learn is important for curriculum implementation.

Table 12. Level of Acceptability on Components of The Developed Learning Mode-Based Supplementary Material in Terms of Presentation

INDICATORS	Mean	Standard Deviation	Verbal Interpretation
1. The material has clear and appropriate pictures or illustrations	3.90	0.31	Highly Acceptable
2. The cover of the material is captivating and an interest-getter.	3.86	0.35	Highly Acceptable
3. The activities/learning task's layout established comfort and motivation.	3.86	0.35	Acceptable
4. The illustrations used in the material create a favorable atmosphere in learning the topic/concepts depicting realism and action	4.00	0.00	Highly Acceptable
5. The illustrations used in the material are clear, simple, and free of unnecessary details that may cause confusion.	3.88	0.33	Highly Acceptable
6. The illustrations and pictures are catchy and may sustain interest to continue learning the material.	3.96	0.20	Highly Acceptable
7. The illustrations used in the material are printed close enough to the text and directly related to the content of the topic/concept.	3.96	0.20	Highly Acceptable
8. The material provides various illustrations ranging from drawings, tables, graphs, and graphic organizers.	4.00	0.00	Highly Acceptable
TOTAL	3.93	0.11	Highly Acceptable

Legend: 1.0 – 1.49 (Not Acceptable); 1.5-2.49 (Less Acceptable); 2.5-3.49(Acceptable); 3.5-4.0 (Highly Acceptable)

Table 13 indicates the assessment of the student-respondents on organization as a component of the developed supplementary learning materials. It can be gleaned from table 13 that the respondents rated the organization of the supplementary materials as highly acceptable, proven by its obtained composite mean of 3.93 and standard deviation of 0.08. It implies that the supplementary material developed for Biology 10 was clearly understood by the student-users because this is how it should be. Since a supplementary material is made to further students' learning, then it should enable the learners to do so, and it is not possible if the

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contents are vague. As stipulated by Rapanta, et. al (2020) Content should be presented in an organized way. Well-organized content gives learners visual clues on how the course is structured and sets expectations for their own outcomes.

Taking into account all of the indicators, the activities were presented in an organized manner, the material was logically arranged to provide order of understanding, the material's activities were logically connected to previous lessons, and the activities were arranged towards attaining the learning competencies all received a weighted mean of 4.00. This implies that all these subcomponents of organization are considered in the development of the supplementary material. Learners must view all the components the course will cover such as the main topic, subtopics, what they will learn, and how mastery will be demonstrated. As the name suggests, organization entails that all of the lessons and exercises in the materials are well-written and won't result in any confusion on the part of the students. The goal of developing the learners' critical thinking would not be achieved if it were not fostered in this manner. As said by Awolaju (2016), seeing a breakdown of the course structure lets learners understand the process and flow of the course as they move from one topic to the next.

Table 13. Level of Acceptability on Components of The Developed Learning Mode-Based Supplementary Material in Terms of Organization

INDICATORS	Mean	Standard Deviation	Verbal Interpretation
1. The activities were presented in an organized manner	4.00	0.00	Highly Acceptable
2. The material was logically arranged to supply order of understanding.	3.98	0.14	Highly Acceptable
3. The material was diversely constructed to master concepts and ideas.	3.73	0.45	Highly Acceptable
4. The instructions of the material could be easily understood and processed in the class.	3.98	0.14	Highly Acceptable
5. The characters of the material were comprehensively, visibly, and intelligibly crafted.	3.78	0.42	Highly Acceptable
6. The activities of the material were logically connected to the previous lessons	3.98	0.14	Highly Acceptable
7. The material contained appropriate use of language that considers the level of our understanding.	3.98	0.14	Highly Acceptable
8. The activities were arranged towards attaining the learning competencies.	4.00	0.00	Highly Acceptable
OVERALL	3.93	0.08	Highly Acceptable

Legend: 1.0 – 1.49 (Not Acceptable); 1.5-2.49 (Less Acceptable); 2.5-3.49(Acceptable); 3.5-4.0 (Highly Acceptable)

Table 14 indicates the assessment of the respondents on assessment tools as a component of the developed supplementary learning materials. It shows that the assessment tools got an overall mean of 3.91, standard deviation of .11 and verbal interpretation of highly acceptable. An assessment tool includes a variety of components such as the assessment context and conditions, tasks to be assigned to the student, an outline of the evidence to be acquired from the applicant, and evidence standards used to determine the level of performance. Since assessment techniques are important in determining the learning outcomes, these elements must be included in the supplemental materials. According to the respondents' evaluations, it can be concluded that the assessment tools found in the supplemental materials are effectively designed and truly serve their intended purpose of measuring the learners' performance.

This finding is consistent with Nepomuceno's discussion, as cited by Balderas (2016), who described supplementary materials as follows: it focuses on a distinct, identifiable skill or set of skills or outcomes other than skills, it is relatively short so that learners use their study time efficiently, it is primarily self-teaching, even though group work may be encouraged, and it blends theory and practice.

Based on the results, the item the material considered the use of sets of opposite answers unless more than one pair is presented got the highest weighted mean of 4.00 and considered as highly acceptable. It can be inferred that the assessment tools included in the supplementary materials are carefully done because it has to be effective. According to Wise (2020), the success of multiple-choice items is dependent on the quality of the response possibilities, specifically how well the erroneous options (distractors) attract pupils with limited knowledge. It is frequently said that test authors are incapable of creating more than two credible distractors for most MC items, and that the effort required to do so is not beneficial in terms of the items' psychometric properties. However,

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McKeachie (2017) stated that in constructing multiple choice assessment tools, the writer must beware of using sets of opposite answers unless more than one pair is presented like to to work and not go to work. This is because this may cause confusion among the learners.

On one hand, the items that got the lowest weighted mean of 3.33 and standard deviation of 0.52 are the material used with only one clearly correct answer and the material utilized appropriate wording in the response choices consistent with the item. These findings can be confirmed by the fact that the majority of the items ask for the usage of opposing responses. The assessment's users, who are learners, may become perplexed, making it difficult for them to determine which of the possible answers is the right one. According to Barzan and Kooti (2021), in writing assessment tools, the researcher must use familiar language, which means he must not introduce new terminology or use idioms that may not be recognizable to all pupils in the class. They also stated that a writer of any assessment instrument should avoid having two or more apparently valid responses, where one is more correct than the other. This is distinct from an element of truth in the distractor.

Table 14. Level of Acceptability on Components of The Developed Learning Mode-Based Supplementary Material in Terms of Assessment Tools

INDICATORS	Mean	Standard Deviation	Verbal Interpretation
1. The material used only one clearly correct answer.	3.61	0.49	Acceptable
2. The material utilized appropriate wording in the response choices consistent with the item.	3.94	0.32	Acceptable
3. The set of questions was presented in an organized manner.	3.94	0.24	Highly Acceptable
4. The material did not use double-negative questions or items.	3.98	0.14	Highly Acceptable
5. The material considered the use of sets of opposite answers unless more than one pair is presented.	3.96	0.20	Highly Acceptable
6. The material included timely and relevant questions.	3.96	0.20	Highly Acceptable
7. The material considered the question to process that you want to be measured.	4.00	0.00	Highly Acceptable
8. The material deemed item that defines the parameters of expected answers as clearly as possible.	3.88	0.33	Highly Acceptable
OVERALL	3.91	0.11	Highly Acceptable

Legend: 1.0 – 1.49 (Not Acceptable); 1.5-2.49 (Less Acceptable); 2.5-3.49(Acceptable); 3.5-4.0 (Highly Acceptable)

Table 15 presents the assessment of the student- respondents on the usability of the supplementary learning materials. The overall mean of 3.94 and standard deviation of 0.09 indicates that the usability of the supplementary learning material was highly acceptable as assessed by the respondents. It can be inferred that the developed material can be adapted and used by the school-respondent and even other school so as to improve the critical thinking skill of the learners when ti comes to Biology. According to Gomez (2017), the results of the development and validation of work text in food service management resulted in the development of supplementary instructional materials in teaching food service management that were found to be very acceptable in terms of objectives, content, language and style, usability, learning activities, and graphics.

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Table 15. Level of Acceptability on Components of The Developed Learning Mode-Based Supplementary Material in Terms of Usability

INDICATORS	Mean	Standard Deviation	Verbal Interpretation
1. The given activities were suitable to my ability.	4.00	0.00	Highly Acceptable
2. The activities were created to stimulate my interest in learning.	3.98	0.14	Highly Acceptable
3. The material managed expectation that contains possible outcome.	3.76	0.43	Highly Acceptable
4. The material provide reality check.	3.98	0.14	Highly Acceptable
5. The material contained learning usability	4.00	0.00	Highly Acceptable
6. The material optimized images and media for quicker downloading.	3.96	0.20	Highly Acceptable
7. The material used a simple and consistent navigation scheme.	3.86	0.35	Highly Acceptable
8. The material may contain aid the students' familiarity to a given situation and acquit them to different method and solutions that can be applied to real life circumstances	3.96	0.20	Highly Acceptable
OVERALL	3.94	0.09	Highly Acceptable

Legend: 1.0 – 1.49 (Not Acceptable); 1.5-2.49 (Less Acceptable); 2.5-3.49(Acceptable); 3.5-4.0 (Highly Acceptable)

Table 16 presents the assessment of the student- respondents on the acceptability of the supplementary learning materials. The overall mean of 4.00 and standard deviation of 0.00 suggests that the supplementary learning materials developed by the researcher were highly acceptable. With all the components stated in the aforementioned findings, this material is undeniably acceptable. The subject matter in the learning supplementary material integrates concepts and skills with other areas and the activities/learning tasks were developed to enhance my science critical thinking abilities in learning the subject matter or lesson among the indicators that got the highest weighted mean of 4.00 which is synonymous to a highly acceptable rating.

The goal of this study was to provide extra learning materials depending on the students' learning styles. It also tries to improve pupils' critical thinking abilities. As a result, it may be concluded that the researcher was effective in developing extra learning material that met its objectives. Marces (2020) discovered the same thing in his study, revealing that the generated enrichment learning materials in Physics 7 are well prepared and acceptable to Science teachers and department heads.

The findings are further reinforced by the findings of a study conducted by Parales (2016), in which he designed a work text in Physics that demonstrated extremely substantial effects in improving the academic performance of fourth-year students in Physics. In the same spirit, it is compatible with Selpa's (2017) findings on the development and validation of enhancement activities in mathematics for grade VI students, which attempted to determine the effectiveness of the developed enhancement activities in mathematics. According to the findings of her research, the generated enhancement materials were highly implemented in terms of aims; content was very highly sufficient; usefulness was judged to be extremely useful; and language and style were quite effective.

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Table 16. Level of Acceptability on Components of The Developed Learning Mode-Based Supplementary Material in Terms of Reliability

INDICATORS	Mean	Standard Deviation	Verbal Interpretation
1. The objectives of the learning activities/tasks followed the content standard of the subject matter.	4	0	Acceptable
2. The subject matters in the learning supplementary material are congruent with the desired competencies.	4	0	Acceptable
3. The objectives consisted of clarified and specified learning tasks.	4	0	Highly Acceptable
4. The objectives in the material were attainable and measurable.	4	0	Highly Acceptable
5. The various learning activities/task were suitable to the needs of the class	4	0	Highly Acceptable
6. The subject matter in the learning supplementary material provides for individual differences.	4	0	Highly Acceptable
7. The subject matter in the learning supplementary material integrates concepts and skills with other areas.	4.00	0.00	Highly Acceptable
8. The activities/learning tasks were developed to enhance my science critical thinking abilities in learning the subject matter or lesson	4.00	0.00	Highly Acceptable
OVERALL	4.00	0.00	Highly Acceptable

Legend: 1.0 – 1.49 (Not Acceptable); 1.5-2.49 (Less Acceptable); 2.5-3.49(Acceptable); 3.5-4.0 (Highly Acceptable)

Table 17 shows the applicability of the researcher's supplemental learning resources. As can be observed from the acquired overall mean of 3.95 and standard deviation of 0.08, the adaptability of the additional materials was highly satisfactory. Because the aforementioned results show that the generated material is functional and acceptable, it is also adaptable. Individually, the indicators instructional enrichment materials help me to gain satisfaction in learning the topic/concepts, the material's illustrations such as pictures, graphs, etc. made every topic more exciting and enjoyable, the instructional material gave me self-confidence in doing scientific research activities, the instructional enrichment materials create strategies that allowed me to practice knowledge and skills at my own pace, and the instructional enrichment materials create strategies that allowed me to practice knowledge and skills at my own pace, and the material helped me to relate to the target lessons and competencies were all highly acceptable subcomponents of adaptability as shown in its attained composite mean of 4.00. The findings suggest that additional Biology 10 teachers may use the supplemental materials that the researcher has developed..

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Table 17. Level of Acceptability on Components of The Developed Learning Mode-Based Supplementary Material in Terms of Adaptability

INDICATORS	Mean	Standard Deviation	Verbal Interpretation
1. Instructional enrichment materials help me to gain satisfaction in learning the topic/concepts.	4.00	0.00	Highly Acceptable
2. The material’s illustrations like pictures, graphs, etc. made every topic more exciting and enjoyable.	3.98	0.14	Highly Acceptable
3. The instructional material gave me self-confidence in doing scientific research activities.	3.71	0.46	Highly Acceptable
4. The instructional enrichment materials create strategies that allowed me to practice knowledge and skills in my own pace	3.98	0.14	Highly Acceptable
5. The activities were applied to real life situation.	3.98	0.14	Highly Acceptable
6. The material helped me to relate to the target lessons and competencies.	3.98	0.14	Highly Acceptable
7. Instructional materials as tool for learning the topics/concepts improved my study habits.	3.98	0.14	Highly Acceptable
8. With the use of reflection, I gained self-worth in dealing with lessons and activities in the topic/concept.	3.96	0.20	Highly Acceptable
OVERALL	3.95	0.08	Highly Acceptable

Legend: 1.0 – 1.49 (Not Acceptable); 1.5-2.49 (Less Acceptable); 2.5-3.49(Acceptable); 3.5-4.0 (Highly Acceptable)

Level of Critical Thinking Abilities Of The Respondents Based on The Pre-Test and Post Test. The following tables show the level of critical thinking of the student-respondents based on the results of the administered pre-test and post-test in terms of arguing, explaining, problem solving, and tracking cause and effect.

Table 18 shows the respondents' critical thinking skills in terms of argumentation based on their before and post-test scores. Argumentation is an important part of science education that enhances topic learning. It can provide a solid foundation for fully and correctly grasping an idea. It is shown in table 18 that 30 or 61.22 percent falls within the legend of 5 to 8 (as stated in the rubrics for pre and post-test) and is verbally interpreted as nearly standard during the pre-test administered by the research to the student-respondents. This means that prior to the implementation of the supplementary learning material, the learners' critical thinking through argumentation still needed improvement. On one hand, no one among the respondents scored 5 to 8 or nearly standard during the post-test. In addition, one(1), four (4), and 14 student-respondents scored 9 to 12, 13 to 16, and 17 to 20 and verbally interpreted as approaching standards, meet standards, and exceeds standards during the pre-test, respectively. It can also be observed from the table that the arguing critical thinking of the learners improved after being exposed to supplementary learning material as evident in the results where two (2) or 4.08 percent fall on the scoring legend of 13 to 16 and 47 or 95.92 percent and verbally interpreted as meet and exceeds standards, separately. These results denote that the mean scores of the respondents from the pretest are quite far from the mean scores during the post-test, aside from the legend 13-16. This is consistent with the findings of the Amielia et al. investigation. al (2018) indicated that including an argument-driven inquiry-based module into the learning process is useful in improving students' argumentation skills.

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Table 18. Level of Critical Thinking Skills of the Student-Respondents in Terms of Arguing

Legend	Pre-Test		Post-test		Verbal Interpretation
	F	%	F	%	
1 to 4		0.00		0.00	Not at Standard
5 to 8	30	61.22		0.00	Nearly Standard
9 to 12	1	2.04		0.00	Approaching Standards
13 to 16	4	8.16	2	4.08	Meet Standards
17 to 20	14	28.57	47	95.92	Exceeds Standard
TOTAL	49	100.00	49	100.00	

Table 19 presents the level of critical thinking skills of the respondents in terms of explaining. It can be seen from table 7 that 30 or 61.22 percent scored 5 to 8 or nearly standard during the pretest and three (3) or 6.12 percent scored within the legend of 9 to 12 and verbally interpreted as nearly and approaching standards respectively. Meanwhile, seven (7) or 14.29 and nine (9) or 18.37 scored within the legend of 13 to 16 and 17 to 20 and received a verbal interpretation of meet standards and exceeds standards correspondingly during the pre-test. The enhancement of the explaining skill of the respondents was evident as shown in the scores during the post test where there were five (5) or 10.20 percent and 44 or 89.80 percent got the same scores within the legends of 13 to 16 and 17 to 20 individually. The results imply that same with arguing, the respondents' explaining skill improved after using the supplementary material

Table 19. Level of Critical Thinking Skills of the Student-Respondents in Terms of Explaining

Legend	Pre-Test		Post-test		Verbal Interpretation
	F	%	F	%	
1 to 4		0.00		0.00	Not at Standard
5 to 8	30	61.22		0.00	Nearly Standard
9 to 12	3	6.12		0.00	Approaching Standards
13 to 16	7	14.29	5	10.20	Meet Standards
17 to 20	9	18.37	44	89.80	Exceeds Standard
TOTAL	49	100.00	49	100.00	

The application of modules in learning can assist students in solving difficulties on their own as shown in Table 20 the level of problem solving skill of the respondents as indicated in their pre and post-test scores. As revealed in table 20, 13.0 or 26.5 percent of the respondents got scores within the range of 5 to 8 and verbally interpreted as nearly standard during the pretest. Twelve (12) or 4.08 percent scored approaching standard as they fall within the legend of 9 to 12 during the pretest. No one among the respondents got the same scores during the posttest. Meanwhile, there were 22 or 44.90 and 24.49 percent fall within the range of 13 to 16 and 17 to 20 and verbal interpretations meet and exceed standards respectively. Just the same with the two aforementioned critical thinking skills, the arguing and explaining, the learners' pretest and post test scores enhance after the use of supplementary learning material.

These findings are similar to the findings of Mulhayatiah et al. According to et al. (2019), a problem-based digital learning module integrated with religious beliefs can affect students' problem-solving skills more effectively than the PowerPoint learning medium utilized in the control class. Furthermore, the outcome supports the argument of Christoyadi et al, 2016; Purnamawati, Ertikanto, and Suyatna, 2017 that the use of modules can drill the students' ways of thinking about the fact and tie them to other facts while providing a logical justification.

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Table 20. Level of Critical Thinking Skills of the Student-Respondents in Terms of Problem Solving

Legend	Pre-Test		Post-test		Verbal Interpretation
	F	%	F	%	
1 to 4		0.00		0.00	Not at Standard
5 to 8	13.0	26.53		0.00	Nearly Standard
9 to 12	2.0	4.08		0.00	Approaching Standards
13 to 16	22.0	44.90	8	16.33	Meet Standards
17 to 20	12.0	24.49	41	83.67	Exceeds Standard
TOTAL	49	100.00	49	100.00	

The activities that the researcher added to the supplemental materials are very beneficial for the students' ability to understand cause and effect relationships. This ability is crucial in biology as well as other scientific fields as seen in Table 21 the level of critical thinking skills of the respondents as to tracking cause and effect during their pretest and post test. It can be gleaned from table 21 that there were 13 or 26.53 percent respondents who scored near to approaching as shown in the score legend of 9 to 12 during their pretest. The number of learners who were able to meet standards (13 to 16) and exceed standards (17 to 20) during the same test were 17 or 34.69 and 19 or 38.78 respectively. Meanwhile, it can be observed that 33 or 67.35 percent exceed standards during the post-test while the number of those students who meet standards was 16 or 32.65 percent.

Table 21. Level of Critical Thinking Skills of the Student-Respondents in Terms of Tracking Cause and Effect

Legend	Pre-Test		Post-test		Verbal Interpretation
	F	%	F	%	
1 to 4		0.00		0.00	Not at Standard
5 to 8		0.00		0.00	Nearly Standard
9 to 12	13.0	26.53		0.00	Approaching Standards
13 to 16	17.0	34.69	16	32.65	Meet Standards
17 to 20	19.0	38.78	33	67.35	Exceeds Standard
TOTAL	49	100.00	49	100.00	

These findings show that the generated supplementary based material was effective in improving the student-respondents' ability to track cause and effect as perceived in Table 22 the significant difference between the pretest and posttest scores of the respondents on their critical thinking skill test. It can be gleaned in table 22 that there is a significant difference between the scores of the students on their pre-test and post-test on their critical thinking test. The result led to the rejection of the research' null hypothesis. It can be inferred that the developed supplementary material was helpful to the students critical thinking skill in the subject Biology. It is a good indication that the developed material was helpful for the learners. It is undeniable that there are competencies which cannot be met by many of the students. As such, the use of supplementary material is advisable.

The findings are consistent with the findings of Villonez's (2018) study, which found a significant difference in the pre-test and post-test mean of the students who received the additional materials. It was discovered that the experimental group outperformed the control group in terms of mean gain score. This demonstrated that the inclusion of supplemental modular learning materials in the experimental group significantly enhanced student performance. Furthermore, the current study's findings are consistent with Paras's (2019) discovery of a significant increase from pretest to post-test results. According to the mean post test scores of the experimental and control groups, the redesigned supplementary modular learning materials were effective in mastering the competency-based-skills in Science.

Similarly, the current study's findings can be corroborated by Paspetari's (2020) study, which demonstrated that the use of Supplementary learning materials could assist students enhance their academic performance. It also indicates that pupils can concentrate better on course materials and topic matter or courses. They will remember the lesson since it is based on real-life events that the students can connect to. Finally, Aranda's (2020) finding was consistent because the pre-test results of the two groups were

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equal in terms of their academic performance in Science in the quasi experimental pretest-posttest design that he used. The supplementary modular learning materials group's post-test result was greater than the non supplementary modular learning materials group's post-test result.

Table 22. Significant Difference Between the Pre-Test and Post-Test Scores of the Respondents on Their Critical Thinking Skill Test

	PRE-TEST		POST-TEST		t	Df	sig.(two-tailed)
	mean	Sd	mean	Sd			
Arguing	5.96	.16	17.61	.19	-50.527	48	.000
Explaining	6.20	.20	18.67	.20	-46.628	48	.000
Problem solving	5.18	.20	17.92	.19	-45.097	48	.000
Tracking cause and effect	5.02	.14	17.18	.22	-48.375	48	.000

Table 23 presents the significant relationship between students' perceived acceptability of the supplementary material and their post test scores. It can be gleaned from the table that there is a positive correlation between the supplementary material' format and the post test scores of the respondent as to arguing, explaining, and tracking cause and effect as evident by the values obtained, .107, .098, and .170, respectively. However, a negative correlation was established between the format and problem solving as indicated in the value of -.087. As to presentation, positive correlation was determined based on the obtained values of .103, .225, and .063, individually. On one hand, a negative correlation was revealed between presentation and problem solving as it obtained the value of -.152. Moreover, positive correlation was established between organization and assessment tools and the indicated components of supplementary material as evidenced by the obtained values of .002, .317, .145, and .049, as well as .136, .216, .074, and .135 respectively. Lastly, no significant relationship was formed between the usability and the critical thinking skill of the respondents in terms of explaining as shown in the value of .445**.

Table 23. Significant Relationship Between the Students' Perceived Acceptability of The Supplementary Material and Their Post Test Scores.

	Arguing	Explaining	Problem solving	Tracking cause and effect
Format	.107	.098	-.087	.170
Presentation	.103	.225	-.152	.063
Organization	.002	.317*	.145	.049
Assessment tools	.136	.216	.074	.135
Usability	.128	.445**	.071	.135
Acceptability	-.087	-.152	.145	.074
Adaptability	-.008	.359*	-.151	.071

** . Correlation is significant at the 0.01 level (2-tailed).

CONCLUSION

The study revealed significant differences between the student respondents' pretest and post-test scores, and a positive correlation between the supplementary material and the respondent's post-test scores in terms of arguing, explaining, and tracking cause and effect. The result led to the rejection of the research' null hypothesis. It can be inferred that the developed supplementary material was helpful to the student's critical thinking skills in the subject of Biology. It is a good indication that the developed material was helpful for the learners. It is undeniable that there are competencies that cannot be met by many of the students. As such, the use of supplementary material is advisable..

RECOMMENDATION

In light of the findings, the following is recommended.

1. Biology teachers may use the learning mode-based developed supplementary enrichment learning materials in teaching the selected least mastered topics.

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2. The developed learning mode-based supplementary learning materials should be further evaluated by other researchers for improvement.
3. Biology teachers may develop supplementary enrichment learning materials for other least mastered topics.
4. Similar studies could be done in the future utilizing different competences as a guide for the development of supplemental learning materials.

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