5AS-21ST CENTURY SKILLS DESIGNED LEARNING PACKAGE IN SCIENCE: AN INTERVENTION FOR DISTANCE LEARNING MODALITY

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ABSTRACT

Title: **"5AS- 21ST CENTURY SKILLS DESIGNED LEARNING PACKAGE IN SCIENCE: AN INTERVENTION FOR DISTANCE LEARNING MODALITY"**

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The purpose of this action research is to determine the effectiveness of 5As-21st Century Skills Designed Learning Package in Science as an intervention for distance learning modality. This intervention will increase the competency level of Grade 10 learners both in Most Essential Learning Competencies in third quarter in science and the 21st century skills in Bolo National High School.

The MELC with lowest percentage of correct responses is *"Explain how mutations may cause changes in the structure and function of a protein"* which is 24.91% with low mastery level while the MELC with highest percentage of correct responses is "Explain how protein is made using information from DNA" which is 37.08% or with low mastery level. The progression indicators with average mastery levels based on their percentage of correct responses are "*Classify information" (41.57%), "Generalizes hypothesis to the other problem" (45.51%), "Interpret questions or forms to provide appropriate information" (47.75%),*

“Differentiate between relevant and irrelevant information” (50.00%), and “Select appropriate methods to solve problems” (52.25%).

The average mean difference of pretest-posttest scores is 12.19 with 28.04% increase. Before the respondents used the developed 5As- 21st century skills designed learning package they believed that science was exciting, Important, relevant, unenjoyable, concrete, meaningful, easy, realistic, restricted, and useful based from the results. However, after using the developed 5As- 21st century skills designed learning package their attitude towards science changes from unenjoyable to enjoyable perspective. The computed t Stat is 0.43 while the tabular or t Critical with 8 degrees of freedom and 5% level of significance is 1.86. Since the t Stat < t Critical, therefore, accept H_O and reject H_A. Therefore, there is no significant difference in the average pretest and posttest scores of the respondents.

Therefore, it is highly recommended that other schools may adopt the developed 5As- 21st century skills designed learning packages. Modifications or contextualization of these learning packages are highly recommended.

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I. Context and Rationale

The K to 12 Program covers Kindergarten and 12 years of basic education (six years of primary education, four years of Junior High School, and two years of Senior High School [SHS]) to provide sufficient time for mastery of concepts and skills, develop lifelong learners, and prepare graduates for tertiary education, middle-level skills development, employment, and entrepreneurship. 21st century skills are one of the most important features of K to 12 Program in the Philippines. The term 21st century skills refer to a broad set of knowledge, skills, work habits, and character traits that are believed—by educators, school reformers, college professors, employers, and others—to be critically important to success in today's world, particularly in collegiate programs and contemporary careers and workplaces.

There are different situations wherein 21st century skills in classroom settings could be improve. Teachers may be more intentional about teaching cross-disciplinary skills in subject areas. For example, science students might be required to learn research methods that can also be applied in other disciplines; articulate technical scientific concepts in verbal, written, and graphic forms; present lab results to a panel of working scientists; or use sophisticated technologies, software programs, and multimedia applications as an extension of an assigned project.

Schools and teachers may use educational approaches that inherently encourage or facilitate the acquisition of cross-disciplinary skills. For example, educational strategies such as authentic learning, demonstrations of learning, or

project-based learning tend to be cross-disciplinary in nature, and students—in the process of completing a research project, for example—may have to use a variety of applied skills, multiple technologies, and new ways of analyzing and processing information, while also taking initiative, thinking creatively, planning out the process, and working collaboratively in teams with other students.

Filipino students ranked low in PISA for mathematics and science, with 353 points and 357 points, respectively, against the 489 OECD average for both categories. PISA is a student assessment of 15-year-old learners across 79 countries done by the Organization for Economic Co-operation and Development. PISA considered 21st century skills in crafting their assessment to measure the competencies of learners worldwide. Based on these results we can say that Filipino students are not familiar with assessments incorporating the 21st century skills. There is a looming learning gaps in our educational system. Also, the COVID- 19 pandemic hindered the conduct of face-to-face classes in our country which adds up to the learning gaps our learners are experiencing. The Coronavirus (COVID-19) pandemic has caused a dramatic disruption in the delivery of education and health services in the Philippines. With school closures and challenges in the delivery of distance learning, students learning losses are expected to be enormous. For basic education to continue, all schools were mandated to prepare their Basic Education Learning Continuity Plan (BE-LCP). This Basic Education Learning Continuity Plan (BE-LCP) responds to the directive of the Secretary and provides guidance to the department on how to deliver education in this time of crisis. The BE-LCP lays down the direction for basic

education in the coming school year. Bolo National High School as one of the secondary schools in Schools Division Office of Masbate City prepared its BE-LCP and selected distance learning using printed module as learning modality.

The purpose of this action research is to determine the effectiveness of 5As-21st Century Skills Designed Learning Package in Science as an intervention for distance learning modality. This intervention will increase the competency level of Grade 10 learners both in Most Essential Learning Competencies in third quarter in science and the 21st century skills in Bolo National High School.

I. Innovation, Intervention and Strategy

A. Innovation

To lessen the learning gaps encountered by learners and enhanced their 21st century skills while implementing the distance learning modality the researcher proposed an innovation called 5As- 21st Century Skills Designed Learning Package. This package is composed of 5As which are Assessment, Activity, Analysis, Abstraction, and Application. It is taken from the 4As of Adult Learning by Malcolm Knowles with sets of assessment before and after the intervention incorporating the 21st century skills which is one of the features of K to 12 curricula. Figure 1 shows the 5As- 21st Century Skills Designed Learning Package Model.

The assessment phase or the pre- test will be given to the respondents before the start of the third (3rd) quarter. It incorporates the 21st century skills and the most essential learning competencies (MELCs) from the preparation of table of specifications (TOS) to the crafting of the assessment. After the analysis of

results from the assessment, the least mastered 21st century skills and MELCs were identified. It will be the basis for designing suitable activities for the learning needs of respondents. The respondents will utilize the crafted activity by the researcher depending on their least mastered 21st century skills and MELCs. After finishing the activity, the respondents will answer guide questions leading to the analysis phase. Under abstraction phase, the respondents will summarize the general idea or concepts. New concepts learned by the respondents will be applied in different situations in the application phase. In order to analysis the effectivity of 5As- 21st Century Skills Designed Learning Package, a post- test will be conducted after the intervention.

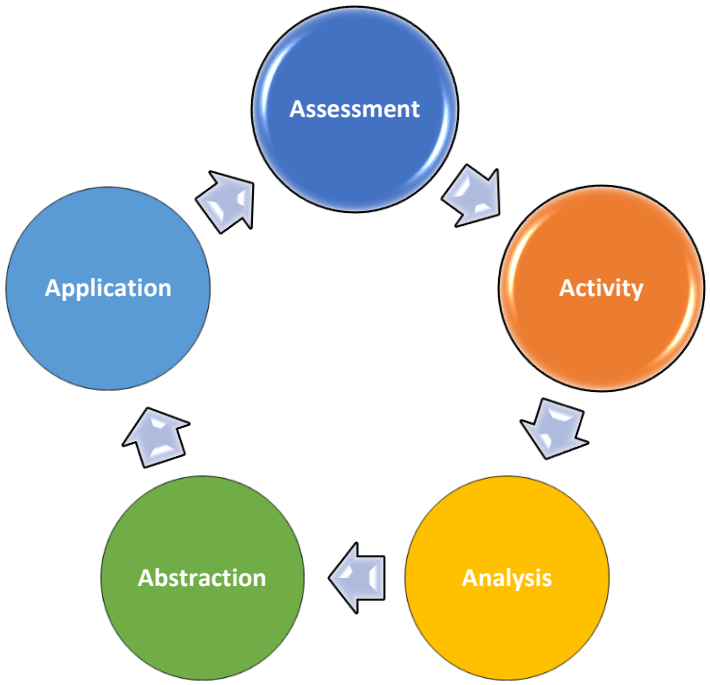

FIGURE 1

5As- 21st Century Skills Designed Learning Package Model

B. Intervention

The 5As of the proposed learning package started with the assessment but the actual intervention started in the activity part. The purpose of the assessment or the pre-test is to determine the least mastered 21st century skills and MELCs of the respondents. The designed activities were contextualized to suit to the learning needs of learners based on the results of the pre-test. The respondents will utilize the designed activities. This is the beginning of the intervention part. After they are done with the activity, the respondents will answer essential questions using their higher order thinking skills based on the identified 21st century skills and MELCs. The analysis allows the learners to process their insights or ideas gained from the activity. In the abstraction part, the learners will give the summary or general idea of all the concepts presented in the package. The new learnings of learners will be applied to new situations in the application part. Post- test will be conducted to determine if the package is effective.

C. Strategy

The process of implementing the 5As- 21st Century Skills Designed Learning Package started with assessment. Under assessment, the table of specifications integrating the 21st Century Skills and in the Most Essential Learning Competencies (MELC) will be crafted. The TOS will be the basis for formulating the diagnostic and summative assessments. Activities are based on the least mastered 21st Century Skills and Most Essential Learning Competencies (MELC). All Activities were designed with differentiate instructions (DI). In the analysis part, the learners will process and classify what is valid and not. The

learners will also answer questions related to the activity presented. The learners here start to feel more the importance of the lesson to them and see the necessity of it to their lives during abstraction. The learners will give the summary, or the general idea presented. The word application itself describes the stage as bringing the learners to a more practical way of using HOW are they going to use what they have learned and thinking of new ways on how it can be improve further. Figure 2 shows the important features in each stage or part.

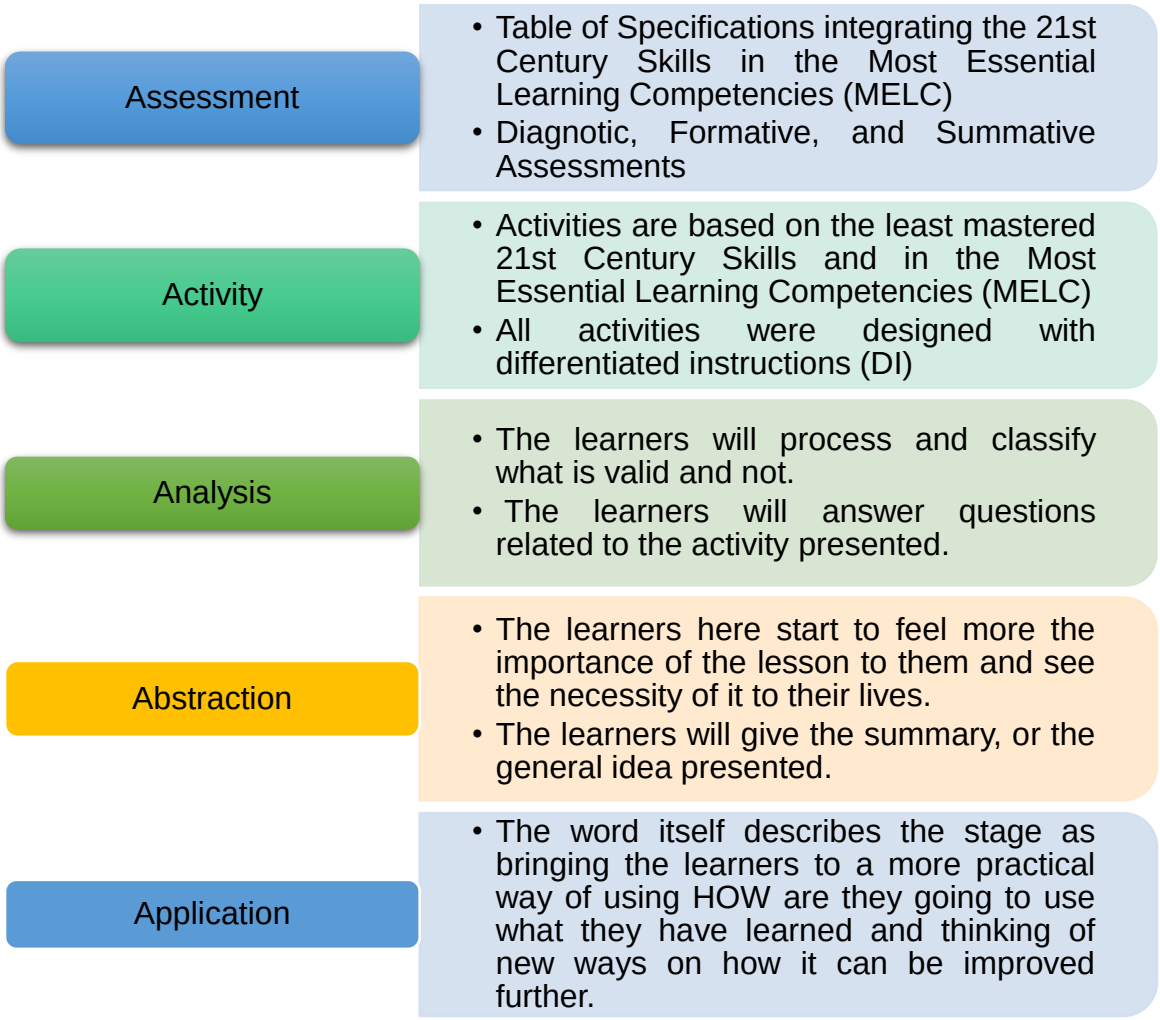

FIGURE 2

5As- 21st Century Skills Designed Learning Package Stages

II. Action Research Question

This study was conducted to determine and test the effectiveness of 5As-21st Century Skills Designed Learning Package in Science as an intervention for distance learning modality for Grade 10 learners this third quarter of School Year 2021-2022. In particular, this research attempted to answer the following sub-problems:

1. What is the initial level of competency of Grade 10 learners in science as to:

1.1 most essential learning competencies (MELCs); and

1.2 21st Century Skills?

2. What are the areas of difficulty of Grade 10 learners in science as to:

2.1 most essential learning competencies (MELCs); and

2.2 21st Century Skills?

3. What intervention may be proposed to enhance the level of competency of the Grade 10 learners?

4. What are the effects of developed 5As- 21st Century Skills Designed Learning Package in Science in terms of:

4.1 conceptual understanding; and

4.2 attitude towards science?

5. Is there a significant difference in the results of Grade- 10 science learners before and after using the 5As- 21st Century Skills Designed Learning Package in their conceptual understanding?

III. Action Research Methods

The researcher employed the pretest- posttest design. The design was the one- group design and was confined to only one group of respondents treated in the study. For the purpose of determining the effectiveness of 5As- 21st Century Skills Designed Learning Package, the design for the study did not have a control group or controlled variable.

A pretest (O_1) is conducted before the treatment or intervention (X) is introduced. After the intervention, a posttest (O_2) was administered. Results from the pretest (before survey) and posttest (after survey) are compared to determine the change.

The illustration for the design is shown as follows:

O_1 ⟶ O_2

x

pretest (before x) posttest (after x)

x is the treatment/ intervention

The interpretations and analysis made on the pretests determined the initial level of competency and the areas of difficulty of the respondents for 21st Century Skills and in the Most Essential Learning Competencies (MELC) in learning science for grade 10. The comparisons made between the pretest and posttest results through obtained mean, determined the effect of the 5As- 21st Century Skills Designed Learning Package in the conceptual understanding of the respondents. The t- test analysis of the pretest and posttest determined the significance of the mean scores of the respondents to determine the effective significance of findings to assess improvement of conceptual understanding. Also, a semantic differential checklist for the effects of 5As- 21st Century Skills Designed Learning Package in attitude towards science for grade 10 is used.

A. Participants and/or other Sources of Data Information

Table 1 shows the participants of this research. The respondents or the participants of this research came from four (4) sections of Grade 10 learners which are Tubigan, Languiton, Paros, and Bituoon of Bolo National High School for School Year 2021- 2022. The respondents are composed of sixty-seven (67) male and seventy- seven (77) female learners, for a total of one hundred forty-four (144). There are three main instruments used in the conduct of the study. These include the assessment tests (pretest, formative, and posttest), 5As- 21st Century Skills Designed Learning Package, and the semantic differential checklist for assessing the attitudes toward science for grade 10. All the instruments are made by the researchers and are subjected to quality assurance.

TABLE 1

Participants of this Research

Indicators	**Male**	**Female**	**Total**
Garde 10- Tubigan	24	13	37
Grade 10- Languiton	15	21	36
Grade 10- Paros	18	17	35
Grade 10- Bituoon	10	26	36
Total	**67**	**77**	**144**

B. Data Gathering Methods

Soon after the validation of the 5As- 21st Century Skills Designed Learning Package and semantic differential checklist for assessing the attitudes toward science for grade 10, permission to the OIC Schools Division Superintendent for the conduct of the study. The pretests are given to the respondents before they utilized the learning package. Results from the pretests are analyzed to determine the initial level of competency and the particular areas of difficulty. The 5As- 21st Century Skills Designed Learning Package were given next as the intervention. The learners were given enough time to accomplish the 5As- 21st Century Skills Designed Learning Package. When they were done with the 5As- 21st Century Skills Designed Learning Package, a posttest was given. Results from the activities and assessments from the 5As- 21st Century Skills Designed Learning Package were analyzed. The results obtained from the posttest were tabulated along with the results from the pretest to determine the effects of the 5As- 21st Century Skills Designed Learning Package in the conceptual understanding of the respondents.

A semantic differential checklist on attitude towards science for grade 10 is also used and given to the respondents before and after the administration of the 5As- 21st Century Skills Designed Learning Package. The responses are tabulated and analyzed to determine the effects of the 5As- 21st Century Skills Designed Learning Package in attitude towards science for grade 10.

IV. Discussion of Results and Reflection

1.1 Initial Level of competency of Grade 10 learners in Science for the Most Essential Learning Competencies (MELCs)

The initial level of competency of Grade 10 learners for the most essential learning competencies (MELCs) in science is presented in Table 2. Included in Table 2 are the most essential learning competencies, average number of correct answers, average number of incorrect answers, percentage of correct responses, and the mastery level of the respondents. The MELC with lowest percentage of correct responses is *"Explain how mutations may cause changes in the structure and function of a protein"* which is 24.91% with low mastery level. Followed by *"Explain how species diversity increases the probability of adaptation and survival of organisms in changing environments"* with 27.15% of correct responses or low mastery level, *"Describe the feedback mechanism involved in regulating process in the female reproductive system (e.g., menstrual cycle)"* with 27.45% of correct responses or low mastery level, *"Explain the relationship between population growth and carrying capacity"* with 28.73% of correct responses or low mastery level, *"Explain the role of hormones involved in the female and male reproductive systems"* with 29.89% of correct responses or low mastery level, "*Describe how the nervous system coordinates and regulates these feedback mechanisms to maintain homeostasis"* with 30.90% of correct responses or low mastery level, *"Explain how fossil records, comparative anatomy, and genetic information provide evidence for evolution"* with 30.90% of correct responses or low mastery level, and

"Explain the occurrence of evolution" with 34.64% of correct responses or low mastery level. Finally, the MELC with highest percentage of correct responses is *"Explain how protein is made using information from DNA"* which is 37.08% or with low mastery level.

TABLE 2

Initial Level of Competency of Grade 10 Learners for the Most Essential Learning Competencies (MELCs) in Science

Most Essential Learning Competencies	Average No. of Correct Answers	Average No. of Incorrect Answers	Total	% of Correct Responses	Mastery Level
Explain how mutations may cause changes in the structure and function of a protein	35.87	108.13	144	24.91%	Low
Explain how species diversity increases the probability of adaptation and survival of organisms in changing environments	39.10	104.90	144	27.15%	Low
Describe the feedback mechanism involved in regulating process in the female reproductive system (e.g., menstrual cycle)	39.52	104.47	144	27.45%	Low
Explain the relationship between population growth and carrying capacity	41.37	102.63	144	28.73%	Low
Explain the role of hormones involved in the female and male reproductive systems	43.04	100.96	144	29.89%	Low
Describe how the nervous system coordinates and regulates these feedback mechanisms to maintain homeostasis	44.49	99.51	144	30.90%	Low
Explain how fossil records, comparative	44.49	99.51	144	30.90%	Low

anatomy, and genetic information provide evidence for evolution					
Explain the occurrence of evolution	49.89	94.11	144	34.64%	Low
Explain how protein is made using information from DNA	53.39	90.61	144	37.08%	Low

1.2 Initial Level of competency of Grade 10 learners in Science for the 21st Century Skills

The initial level of competency of Grade 10 learners for the 21st century skills is presented in Table 3. Included in Table 3 are the 21st century skills, average number of correct answers, average number of incorrect answers, percentage of correct responses, and the mastery level of the respondents. The 21st century skills are composed of three (3) sub-skills which are problem solving, information literacy, and critical thinking. Each sub-skill is consisting of three (3) progression indicators from low to high level. The total progression indicators for the 21st century skills are twenty-seven (27). The progression indicators with very low mastery levels based on their percentage of correct responses are *"Evaluate credibility of source" (12.36%), "Identify alternative methods to solve problems" (15.73%), "Link evidence to argument" (15.73%), "Present required information when explicitly asked" (16.85%), "Develop criteria for evaluation of source" (18.54%), "Draw conclusions based on various evidence" 17.42%,* and *"Re-organize or sequence the information" (19.66%).*

The progression indicators with low and very low mastery levels were considered in crafting the learning packages. The progression indicators with low mastery levels based on their percentage of correct responses are "*Modify*

hypothesis to the other problem" (20.79%), "Identify strategy/method" (23.03%), "Predict outcome" (25.84%), "Acknowledge different types of information" (25.84%), "Identify cause and effect" (26.97%), "Sequence the information" (26.97%), "Generate hypothesis about the problem" (28.65%), "Identify that there is different information" (32.02%), "Identify association" (33.71%), Present information in another medium" (33.71%), "*Organize information in another medium" (33.71%), "State evidence" (33.71%), "Organize structure of the classification" (35.96%),* "*Identify source of information" (37.08%), and "Drawing only on relevant information" (38.20%).*

The progression indicators with average mastery levels based on their percentage of correct responses are "*Classify information" (41.57%), "Generalizes hypothesis to the other problem" (45.51%), "Interpret questions or forms to provide appropriate information" (47.75%), "Differentiate between relevant and irrelevant information" (50.00%), and "Select appropriate methods to solve problems" (52.25%).*

TABLE 3

Initial Level of Competency of Grade 10 Learners for the 21st Century Skills

Progression Indicators		Average No. of Correct Answers	Average No. of Incorrect Answers	Total	% of Correct Responses	Mastery Level
Medium	Evaluate credibility of source	17.80	126.20	144	12.36%	Very Low
High	Identify alternative methods to solve problems	22.65	121.35	144	15.73%	Very Low
Medium	Link evidence to argument	22.65	121.35	144	15.73%	Very Low

Medium	Present required information when explicitly asked	24.27	119.73	144	16.85%	Very Low
High	Develop criteria for evaluation of source	26.70	117.30	144	18.54%	Very Low
High	Draw conclusions based on various evidence	25.08	118.92	144	17.42%	Very Low
High	Re-organize or sequence the information	28.31	115.68	144	19.66%	Very Low
Medium	Modify hypothesis to the other problem	29.93	114.07	144	20.79%	Low
Low	Identify strategy/method	33.17	110.83	144	23.03%	Low
High	Predict outcome	37.21	106.79	144	25.84%	Low
Low	Acknowledge different types of information	37.21	106.79	144	25.84%	Low
Medium	Identify cause and effect	38.83	105.17	144	26.97%	Low
High	Sequence the information	38.83	105.17	144	26.97%	Low
Low	Generate hypothesis about the problem	41.26	102.74	144	28.65%	Low
Low	Identify that there is different information	46.11	97.89	144	32.02%	Low
Low	Identify association	48.54	95.46	144	33.71%	Low
Low	Present information in another medium	48.54	95.46	144	33.71%	Low
Medium	Organize information in another medium	48.54	95.46	144	33.71%	Low
Low	State evidence	48.54	95.46	144	33.71%	Low
Medium	Organize structure of the classification	51.78	92.22	144	35.96%	Low
Low	Identify source of information	53.39	90.61	144	37.08%	Low

High	Drawing only on relevant information	55.01	88.99	144	38.20%	Low
Low	Classify information	59.86	84.13	144	41.57%	Average
High	Generalizes hypothesis to the other problem	65.53	78.47	144	45.51%	Average
High	Interpret questions or forms to provide appropriate information	17.80	17.80	144	47.75%	Average
Medium	Differentiate between relevant and irrelevant information	17.80	17.80	144	50.00%	Average
Medium	Select appropriate methods to solve problems	17.80	17.80	144	52.25%	Average

2.1 Areas of Difficulty of Grade 10 Learners for the Most Essential Learning Competencies (MELCs) in Science

As shown in Table 4, all most essential learning competencies registered high level of difficulty based on the results of the pretest of the respondents. *"Explain how mutations may cause changes in the structure and function of a protein"* was the most difficult MELC for the respondents with 75.09% incorrect responses while "Explain how protein is made using information from DNA" was the least difficult MELC for the respondents even though with high level of difficulty or with 62.92% incorrect responses.

TABLE 4

Areas of Difficulty of Grade 10 Learners for the Most Essential Learning Competencies (MELCs) in Science

Most Essential Learning Competencies	Average No. of Correct Answers	Average No. of Incorrect Answers	Total	% of Incorrect Responses	Difficulty Level
Explain how mutations may cause changes in the structure and function of a protein	35.87	108.13	144	75.09%	High
Explain how species diversity increases the probability of adaptation and survival of organisms in changing environments	39.10	104.90	144	72.85%	High
Describe the feedback mechanism involved in regulating process in the female reproductive system (e.g., menstrual cycle)	39.52	104.47	144	72.55%	High
Explain the relationship between population growth and carrying capacity	41.37	102.63	144	71.27%	High
Explain the role of hormones involved in the female and male reproductive systems	43.04	100.96	144	70.11%	High
Describe how the nervous system coordinates and regulates these feedback mechanisms to maintain homeostasis	44.49	99.51	144	69.10%	High
Explain how fossil records, comparative anatomy, and genetic information provide evidence for evolution	44.49	99.51	144	69.10%	High
Explain the occurrence of evolution	49.89	94.11	144	65.36%	High
Explain how protein is made using information from DNA	53.39	90.61	144	62.92%	High

2.2 Areas of Difficulty of Grade 10 Learners for the 21st Century Skills

There were seven (7) progression indicators with very level of difficulty based on the pretest results of the respondents as shown in Table 5. Fifteen (15) progression indicators with high level of difficulty and five (5) progression indicators with average level of difficulty. *"Evaluate credibility of source"* with the highest percentage of incorrect responses which is 87.64% and *"Interpret questions or forms to provide"* with lowest percentage of incorrect responses which is 47.75%.

TABLE 5

Areas of Difficulty of Competency of Grade 10 Learners for the 21st Century Skills

Progression Indicators		Average No. of Correct Answers	Average No. of Incorrect Answers	Total	% of Incorrect Responses	Difficulty Level
Medium	Evaluate credibility of source	17.80	126.20	144	87.64%	Very High
High	Identify alternative methods to solve problems	22.65	121.35	144	84.27%	Very High
Medium	Link evidence to argument	22.65	121.35	144	84.27%	Very High
Medium	Present required information when explicitly asked	24.27	119.73	144	83.15%	Very High
High	Develop criteria for evaluation of source	26.70	117.30	144	81.46%	Very High
High	Draw conclusions based on various evidence	25.08	118.92	144	82.58%	Very High

High	Re-organize or sequence the information	28.31	115.68	144	80.34%	Very High
Medium	Modify hypothesis to the other problem	29.93	114.07	144	79.21%	High
Low	Identify strategy/method	33.17	110.83	144	76.97%	High
High	Predict outcome	37.21	106.79	144	74.16%	High
Low	Acknowledge different types of information	37.21	106.79	144	74.16%	High
Medium	Identify cause and effect	38.83	105.17	144	73.03%	High
High	Sequence the information	38.83	105.17	144	73.03%	High
Low	Generate hypothesis about the problem	41.26	102.74	144	71.35%	High
Low	Identify that there is different information	46.11	97.89	144	67.98%	High
Low	Identify association	48.54	95.46	144	66.29%	High
Low	Present information in another medium	48.54	95.46	144	66.29%	High
Medium	Organize information in another medium	48.54	95.46	144	66.29%	High
Low	State evidence	48.54	95.46	144	66.29%	High
Medium	Organize structure of the classification	51.78	92.22	144	64.04%	High
Low	Identify source of information	53.39	90.61	144	62.92%	High
High	Drawing only on relevant information	55.01	88.99	144	61.80%	High
Low	Classify information	59.86	84.13	144	58.43%	Average
High	Generalizes hypothesis to the other problem	65.53	78.47	144	54.49%	Average

High	Interpret questions or forms to provide appropriate information	17.80	17.80	144	52.25%	Average
Medium	Differentiate between relevant and irrelevant information	17.80	17.80	144	50.00%	Average
Medium	Select appropriate methods to solve problems	17.80	17.80	144	47.75%	Average

3. 5As- 21st Century Skills Designed Learning Package in Science

The proposed intervention in this research is the developed 5As- 21st Century Skills Designed Learning Package in Science. The parts of the developed learning package in Science are title page, overview, pre-assessment, activity, analysis, abstraction, application, and post-assessment. The overview presented the MELC and the 21st century skills, sub-skills, and progression indicator. The questions in the pre-assessment were based on the MELC and the 21st century skills. The results of pre-assessment were the basis in formulating the activity. The respondents processed the results of the activity in the analysis part by answering the questions. The topics, concepts, and generalization of the lesson were presented in the abstraction part. New knowledge and skills were applied in a new situation in the application part. Finally, the post-assessment measured the learnings of the respondents. Figure 3 gave the overview of the developed 5As-21st century skills designed learning package. The nine (9) learning packages is part of the annexes.

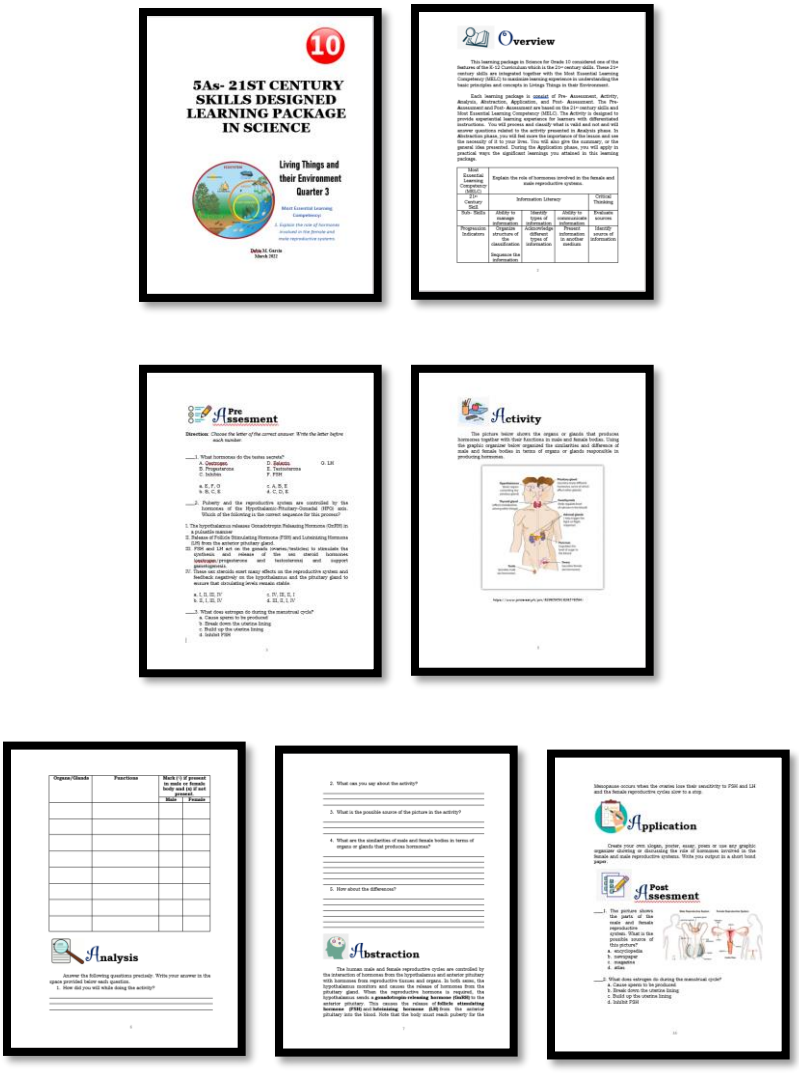

FIGURE 3

Developed 5As- 21st Century Skills Designed Learning Package

4.1 Effects of Developed 5As- 21st Century Skills Designed Learning Package in Science on Conceptual Understanding

Table 6 presented the effects of developed 5As- 21st century skills designed learning package in science on conceptual understanding using the mean difference of pretest-posttest scores. For *"Describe how the nervous system*

coordinates and regulates these feedback mechanisms to maintain homeostasis" the mean difference is 12.51 or 28.12% increase in the pretest-posttest scores while for *"Describe the feedback mechanism involved in regulating process in the female reproductive system (e.g., menstrual cycle)"* the mean difference is 9.48 or 23.99% increase in the pretest-posttest scores. The mean difference for *"Explain how fossil records, comparative anatomy, and genetic information provide evidence for evolution"* is 8.51 with 19.13% increase in the pretest-posttest scores. For *"Explain how mutations may cause changes in the structure and function of a protein"* the mean difference is 14.30 or 39.86% increase in the pretest-posttest scores while for *"Explain how protein is made using information from DNA"* the mean difference is 8.41 or 15.75% increase in the pretest-posttest scores. The mean difference for "Explain how species diversity increases the probability of adaptation and survival of organisms in changing environments" is 11.07 with 28.30% increase in the pretest-posttest scores. For *"Explain the occurrence of evolution"* the mean difference is 7.78 or 15.59% increase in the pretest-posttest scores. *"Explain the occurrence of evolution"* is the MELC with lowest mean difference for pretest-posttest scores. On the other hand*, "Explain the relationship between population growth and carrying capacity"* with 12.49 mean difference or 30.18% increase in the pretest-posttest scores. Lastly, for *"Explain the role of hormones involved in the female and male reproductive systems"* the mean difference is 25.16 with 58.46% increase in the pretest-posttest scores. The average mean difference is 12.19 with 28.04% increase in the pretest-posttest scores.

TABLE 6

Effects of Developed 5As- 21st Century Skills Designed Learning Package in Science on Conceptual Understanding

Most Essential Learning Competencies	Average Posttest Scores	Average Pretest Scores	Mean Difference	Percentage of Increase/ Decrease in the Pretest-Posttest Scores
Describe how the nervous system coordinates and regulates these feedback mechanisms to maintain homeostasis	57.00	44.49	12.51	28.12%
Describe the feedback mechanism involved in regulating process in the female reproductive system (e.g., menstrual cycle)	49.00	39.52	9.48	23.99%
Explain how fossil records, comparative anatomy, and genetic information provide evidence for evolution	53.00	44.49	8.51	19.13%
Explain how mutations may cause changes in the structure and function of a protein.	50.17	35.87	14.30	39.86%
Explain how protein is made using information from DNA	61.80	53.39	8.41	15.75%
Explain how species diversity increases the probability of adaptation and survival of organisms in changing environments	50.17	39.10	11.07	28.30%
Explain the occurrence of evolution	57.67	49.89	7.78	15.59%
Explain the relationship between population growth and carrying capacity	53.86	41.37	12.49	30.18%
Explain the role of hormones involved in the female and male reproductive systems	68.20	43.04	25.16	58.46%
Average	55.65	43.46	12.19	28.04%
Percentage	38.65%	30.18%	8.46%	28.04%
Mastery Level	Low	Low		

4.1 Effects of Developed 5As- 21st Century Skills Designed Learning Package in Science on Attitude towards Science

Before the respondents used the developed 5As- 21st century skills designed learning package they believed that science was exciting, Important, relevant, unenjoyable, concrete, meaningful, easy, realistic, restricted, and useful based from the results shown in Table 7. After they used the developed 5As- 21st century skills designed learning package they believed that science was exciting, Important, relevant, enjoyable, concrete, meaningful, easy, realistic, restricted, and useful. Therefore, after using the developed 5As- 21st century skills designed learning package their attitude towards science changes from unenjoyable to enjoyable perspective.

TABLE 7

Effects of Developed 5As- 21st Century Skills Designed Learning Package in Attitude towards Science

Before the Intervention After the Intervention

Positive Attitude	2	1	0	-1	-2	Negative Attitude	Mean	Attitude Towards Science
Exciting	31	43	49	12	9	Boring	0.52	Exciting
	60	41	29	9	5		0.99	Exciting
Important	51	23	20	24	26	Unimportant	0.34	Important
	106	20	10	4	4		1.53	Important
Relevant	24	56	40	12	12	Irrelevant	0.47	Relevant
	45	47	36	7	9		0.78	Relevant
Enjoyable	20	15	20	50	39	Unenjoyable	-0.51	Unejoyable
	75	38	20	6	5		1.19	Enjoyable
Concrete	30	39	50	20	4	Abstract	0.49	Concrete
	35	44	41	18	6		0.58	Concrete
Meaningful	62	23	40	5	14	Meaningless	0.79	Meaningful
	74	30	26	8	6		1.10	Meaningful
Easy	12	34	45	23	30	Difficult	-0.17	Difficult
	29	42	52	10	11		0.47	Easy
Realistic	47	24	40	21	12	Unrealistic	0.51	Realistic
	64	38	25	10	7		0.99	Realistic
Restricted	18	46	65	10	5	Extensive	0.43	Restricted
	22	47	55	12	8		0.44	Restricted
Useful	39	41	21	19	24	Useless	0.36	Useful
	62	50	18	10	4		1.08	Useful

5. Significant Difference in the Results of Grade- 10 Science Learners Before and After using the 5As- 21st Century Skills Designed Learning Package in their Conceptual Understanding

The t-test analysis of the average pretest and posttest scores of the respondents are shown in Table 8. The computed t Stat is 0.43 while the tabular or t Critical with 8 degrees of freedom and 5% level of significance is 1.86. Since

the t Stat < t Critical, therefore, accept H_O and reject H_A. Therefore, there is no significant difference in the average pretest and posttest scores of the respondents.

TABLE 8

t-Test Analysis of the Average Pretest and Posttest Scores of the Respondents

t Stat	t Critical (one-tailed)	n	df	**α**	Decision Rule	Comparison	Decision
0.43	1.86	9	8	0.05	Reject H_O and Accept H_A if t Stat ≥ t Critical, Accept H_O and Reject H_A if t Stat < t Critical	t Stat < t Critical	Accept H_O and Reject H_A

H_O: There is no significant difference in the average pretest and posttest scores of the respondents.

H_A: There is a significant difference in the average pretest and posttest scores of the respondents.

Reflection

During the pandemic we shifted from face-to-face classes to modular or blended modality. There were a lot of challenges in delivering the quality basic education amidst this pandemic. To deliver the quality basic education, I decided to craft learning packages in science for grade 10 incorporating the 21st century

skills. There were 9 learning packages for 9 MELCs to cover the whole third quarter. Contextualizing learning resources changes the behavior of my learners in terms of their attitude towards science. Also, their academic performance was enhanced as shown in the pretest and posttest results.

As a classroom teacher, we should consider the needs of our learners. We should not rely on the ready-made learning resources in delivering the expected curriculum for my learners. I strongly believe that contextualization and location of learning resources enhanced the behavioral and conceptual understanding of learners in science. Even though science viewed as one of the difficult subjects, these learning packages helped my learners overcame their difficulties.

V. Advocacy, Utilization, and Dissemination

Following the completion of this action research, the proponent used the Learning Action Cell (LAC) Sessions to share the findings to fellow teachers in Bolo National High School. As stated in the training design, the proponent conducted a 3- day training- workshop on 5As- 21st Century Skills Designed Learning Package. The training design and work and financial plan are presented in Table 9 and 10 respectively. Aside from the training- workshop the proponent will continue to utilize the 5As- 21st Century Skills Designed Learning Package.

The proponent shall participate in or organize other measures of dissemination and utilization as directed by the Schools Division Office of Masbate City. The proponent's main goal is for the results of this action research to be used

as a foundation for planning and policy making in the field of teaching and learning process during this pandemic.

TABLE 9

3- DAY TRAINING- WORKSHOP ON THE 5AS- 21ST CENTURY SKILLS DESIGNED LEARNING PACKAGE
Training Design

May 25-27, 2022 **Bolo National High School, Bolo, Masbate City**

Time/Date	Day 1 May 25, 2022		Day 2 May 26, 2022		Day 3 May 27 2022	
			MORNING			
7:30- 8:00	Arrival/Registration	Facilitator				
8:00 – 8:30	Opening Program	Facilitator	MOL	Participants	MOL	Participants
8:30- 9:00			Topic 3: Crafting of TOS using the 21st Century Skills	Proponent	Topic 5: Crafting of 5AS- 21st Century Skills Designed Learning Package	Proponent
9:00 – 9:30	Levelling of Expectations					
9:30- 9:45	HEALTH BREAK					
9:45 – 10:15	Topic 1: Presentation of MELC per Learning Area	Subject Teachers	Topic 3: Crafting of TOS using the 21st Century Skills and MELCs	Proponent	Topic 5: Crafting of 5AS- 21st Century Skills Designed Learning Package	Proponent
10:15- 10:45			Workshop 3		Workshop 5	
10:45 – 11:30						
11:30- 12:00						
12:00- 1:00	LUNCH BREAK					
	AFTERNOON					
1:00 – 2:30	Topic 1: Presentation of MELC per Learning Area	Subject Teachers	Topic 4: Crafting of Pretest/Posttest using the 21st Century Skills and MELCs	Proponent	Workshop 5	Proponent
2:30- 3:00	Workshop 1					
3:00 – 3:15	HEALTH BREAK					
3:15- 4:15	Topic 2: 21st Century Skills	Proponent	Workshop 4	Marvin M. Garcia SEPS, Planning and Research	Next Steps	Proponent
4:15 – 5:00					Closing Program	All Facilitators/Participants
Homework	Workshop 2					Home Sweet Home

TABLE 10

Work and Financial Plan
3- DAY TRAINING- WORKSHOP ON THE 5AS- 21ST CENTURY SKILLS DESIGNED LEARNING PACKAGE

General Objective: To train the teachers in crafting the 5AS- 21st Century Skills Designed Learning Package.

OBJECTIVES	PROGRAMS	ACTIVITIES	PARTICIPANTS	PERFORMANCE INDICATORS	MOVs	DATE OF IMPLEMENTATION	BUDGET	SOURCE OF FUND
Capacitate the in crafting the 5AS- 21st Century Skills Designed Learning Package.	School-based Training-Workshop	3- day Live-out Training-Workshop on the 5AS- 21st Century Skills Designed Learning Package	31 teachers & 4 staffs/speakers	No. of Teachers who attended the training- workshop	-training proposal -memos, attendance, pictorial, online M&E tool	May 25-27, 2022	42,000.00	MOOE/ Other Funds

VI. References

Ariola, Mariano M., Principles and Methods of Research, 1st ed, (Quezon City: Rex Book Store, Inc. 2006)

Garcia, Marvin M. and Valladolid, Mark A., "Validation of Learning Modules in Electromagnetism for College Physics Students", an Undergraduate Thesis, Bicol University College of Education

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VII. Financial Report

TABLE 11

Cost Estimates Format

ACTIVITY	DESCRIPTION	QUANTITY	UNIT PRICE	AMOUNT
A.Conceptualization of the Research Proposal	Short Bond Paper (Rem)	1	Php 215	Php 215
1. Supply and Materials	EPSON 003 Blank Ink	1	Php 300	Php 300
B. Implementation of Research Proposal				
1.Supply and Materials	EPSON Printer 3210	1	Php 10,700	Php 10,700
	Short Bond Paper (Rem)	10	Php 215	Php 2150
2.Data Gathering	Mobile Data Expenses	1	Php 500	Php 500
3.Transportation Cost	Fare of teacher going to the learners' houses from the school	Round Trip	Php 620	Php 620
C. Completion and Dissemination of Action Research				
1.Reproduction of Final Copy of the Research Paper	Short Bond Paper (Rem)	1	Php 215	Php 215
	1 EPSON 003 Blank Ink	1	Php 300	Php 300
Total				Php 15,000

TABLE 12

BERF Financial Report

ACTIVITY	CASH OUT	BALANCE
BASIC EDUCATION RESEARCH FUND (BERF) FACILITY GRANT		Php 15, 000
1. Crafting and preparation of research proposal	Php 640	Php 14, 360
2. Production, printing and conduct of pretest and posttest	Php 390	Php 13, 970
3. Reproduction of Learning Packages	Php 13, 130	Php 840
4. Communication expenses	Php 450	Php 390
5. Completion of Action Research	Php 390	Php 0

Statistical Analysis

Most Essential Learning Competencies	Average Posttest Scores	Average Pretest Scores	Mean Difference
Describe how the nervous system coordinates and regulates these feedback mechanisms to maintain homeostasis	57.00	44.49	12.51
Describe the feedback mechanism involved in regulating process in the female reproductive system (e.g., menstrual cycle)	49.00	39.52	9.48
Explain how fossil records, comparative anatomy, and genetic information provide evidence for evolution	53.00	44.49	8.51
Explain how mutations may cause changes in the structure and function of a protein.	50.17	35.87	14.30
Explain how protein is made using information from DNA	61.80	53.39	8.41
Explain how species diversity increases the probability of adaptation and survival of organisms in changing environments	50.17	39.10	11.07
Explain the occurrence of evolution	57.67	49.89	7.78
Explain the relationship between population growth and carrying capacity	53.86	41.37	12.49
Explain the role of hormones involved in the female and male reproductive systems	68.20	43.04	25.16

$$t = \frac{\sum D}{\sqrt{\frac{N\sum D^2 - \left(\sum D\right)^2}{N-1}}}$$

$$t = \frac{109.71}{\sqrt{((9)(1566.11) - (109.71)^2)/(9-1)}}$$

$$t = \frac{109.71}{\sqrt{(14094.99-12036.28)/9)}}$$

$$t = \frac{109.71}{\sqrt{(2058.71/8)}}$$

$$t = \frac{109.71}{257.34}$$

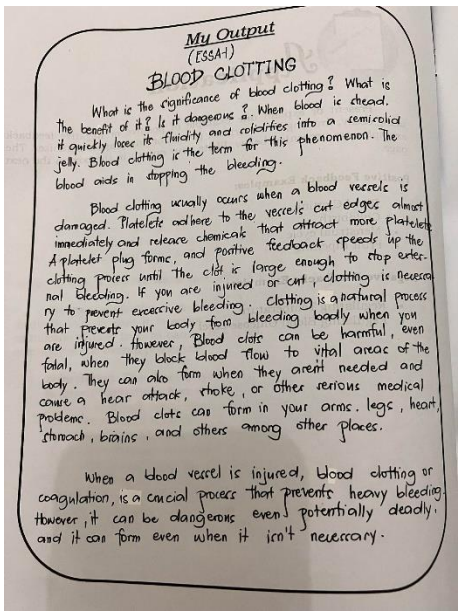
$$t = 0.43$$

t Stat	t Critical (one-tailed)	n	df	α	Decision Rule	Comparison	Decision
0.4263	1.86	9	8	0.05	Reject HO and Accept HA if t Stat ≥ t Critical, Accept HO and Reject HA if t Stat < t Critical	t Stat < t Critical	Accept HO and Reject HA

H_O: There is no significant difference in the average pretest and posttest scores of the respondents.

H_A: There is a significant difference in the average pretest and posttest scores of the respondents.

Sample Answers of the Respondents

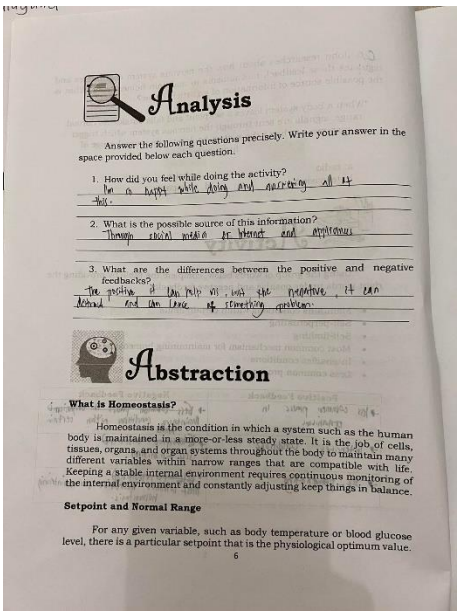


My Output
(ESSAY)
BLOOD CLOTTING

What is the significance of blood clotting? What is the benefit of it? Is it dangerous? When blood is thead. it quickly loses its fluidity and solidifies into a semisolid jelly. Blood clotting is the term for this phenomenon. The blood aids in stopping the bleeding.

Blood clotting usually occurs when a blood vessels is damaged. Platelets adhere to the vessels cut edges almost immediately and release chemicals that attract more platelets. A platelet plug forms, and positive feedback speeds up the clotting process until the clot is large enough to stop external bleeding. If you are injured or cut, clotting is necessary to prevent excessive bleeding. Clotting is a natural process that prevents your body from bleeding badly when you are injured. However, Blood clots can be harmful, even fatal, when they block blood flow to vital areas of the body. They can also form when they aren't needed and cause a hear attack, stroke, or other serious medical problems. Blood clots can form in your arms, legs, heart, stomach, brains, and others among other places.

When a blood vessel is injured, blood clotting or coagulation, is a crucial process that prevents heavy bleeding. however, it can be dangerous even potentially deadly. and it can form even when it isn't necessary.



Analysis

Answer the following questions precisely. Write your answer in the space provided below each question.

1. How did you feel while doing the activity?
I'm a happy while doing and learning all it this.

2. What is the possible source of this information?
Through social media or internet and experiences

3. What are the differences between the positive and negative feedbacks?
The positive if can help us, but the negative, it can demand and can cause of something problem.

Abstraction

What is Homeostasis?

Homeostasis is the condition in which a system such as the human body is maintained in a more-or-less steady state. It is the job of cells, tissues, organs, and organ systems throughout the body to maintain many different variables within narrow ranges that are compatible with life. Keeping a stable internal environment requires continuous monitoring of the internal environment and constantly adjusting keep things in balance.

Setpoint and Normal Range

For any given variable, such as body temperature or blood glucose level, there is a particular setpoint that is the physiological optimum value.

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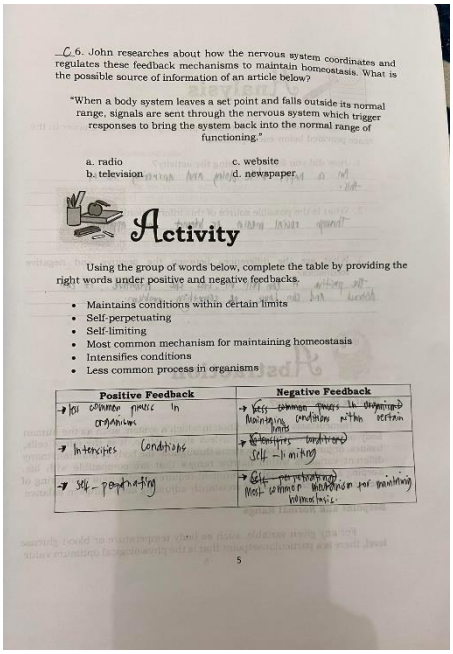


C 6. John researches about how the nervous system coordinates and regulates these feedback mechanisms to maintain homeostasis. What is the possible source of information of an article below?

"When a body system leaves a set point and falls outside its normal range, signals are sent through the nervous system which trigger responses to bring the system back into the normal range of functioning."

a. radio
b. television
c. website
d. newspaper

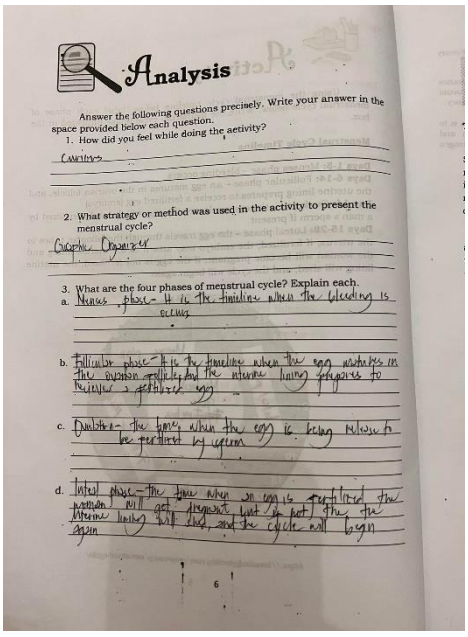
Activity

Using the group of words below, complete the table by providing the right words under positive and negative feedbacks.

- Maintains conditions within certain limits
- Self-perpetuating
- Self-limiting
- Most common mechanism for maintaining homeostasis
- Intensifies conditions
- Less common process in organisms

Positive Feedback	Negative Feedback
→ less common process in organisms	→ Most common mechanism for maintaining conditions within certain limits
→ Intensifies conditions	→ Maintains conditions Self-limiting
→ Self-perpetuating	→ Self-perpetuating Most common mechanism for maintaining homeostasis.

5



Analysis

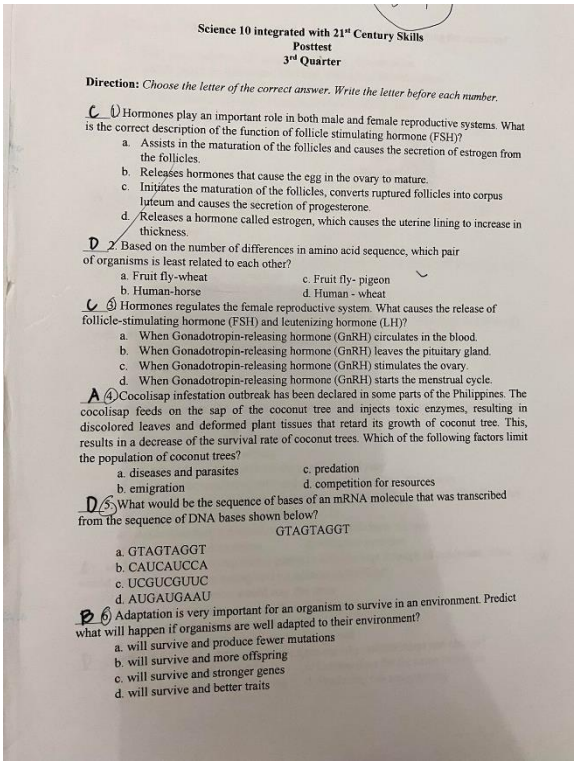
Answer the following questions precisely. Write your answer in the space provided below each question.

1. How did you feel while doing the activity?
curious

2. What strategy or method was used in the activity to present the menstrual cycle?
Graphic Organizer

3. What are the four phases of menstrual cycle? Explain each.
a. Menses phase- It is the timeline when the bleeding is occurs
b. Follicular phase- It is the timeline when the egg matures in the ovarian follicles and the uterine lining prepares to receive a fertilized egg
c. Ovulation- The time, when the egg is being release to be fertilized by sperm
d. Luteal phase- The time when an egg is fertilized the woman will get pregnant, but if not, the uterine lining will shed, and the cycle will begin again

6



Science 10 integrated with 21st Century Skills
Posttest
3rd Quarter

Direction: *Choose the letter of the correct answer. Write the letter before each number.*

C 1) Hormones play an important role in both male and female reproductive systems. What is the correct description of the function of follicle stimulating hormone (FSH)?
a. Assists in the maturation of the follicles and causes the secretion of estrogen from the follicles.
b. Releases hormones that cause the egg in the ovary to mature.
c. Initiates the maturation of the follicles, converts ruptured follicles into corpus luteum and causes the secretion of progesterone.
d. Releases a hormone called estrogen, which causes the uterine lining to increase in thickness.

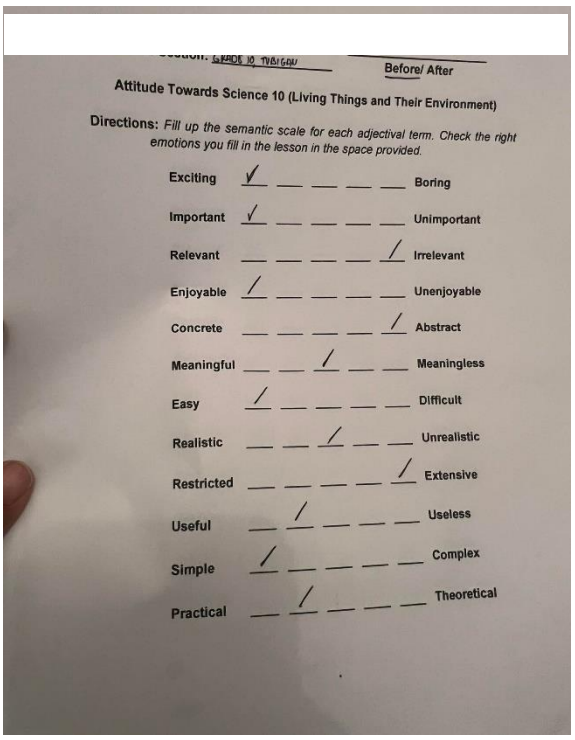
D 2. Based on the number of differences in amino acid sequence, which pair of organisms is least related to each other?
a. Fruit fly-wheat
b. Human-horse
c. Fruit fly- pigeon
d. Human - wheat

C 3) Hormones regulates the female reproductive system. What causes the release of follicle-stimulating hormone (FSH) and leutenizing hormone (LH)?
a. When Gonadotropin-releasing hormone (GnRH) circulates in the blood.
b. When Gonadotropin-releasing hormone (GnRH) leaves the pituitary gland.
c. When Gonadotropin-releasing hormone (GnRH) stimulates the ovary.
d. When Gonadotropin-releasing hormone (GnRH) starts the menstrual cycle.

A 4) Cocolisap infestation outbreak has been declared in some parts of the Philippines. The cocolisap feeds on the sap of the coconut tree and injects toxic enzymes, resulting in discolored leaves and deformed plant tissues that retard its growth of coconut tree. This, results in a decrease of the survival rate of coconut trees. Which of the following factors limit the population of coconut trees?
a. diseases and parasites
b. emigration
c. predation
d. competition for resources

D 5) What would be the sequence of bases of an mRNA molecule that was transcribed from the sequence of DNA bases shown below?
GTAGTAGGT
a. GTAGTAGGT
b. CAUCAUCCA
c. UCGUCGUUC
d. AUGAUGAAU

B 6) Adaptation is very important for an organism to survive in an environment. Predict what will happen if organisms are well adapted to their environment?
a. will survive and produce fewer mutations
b. will survive and more offspring
c. will survive and stronger genes
d. will survive and better traits

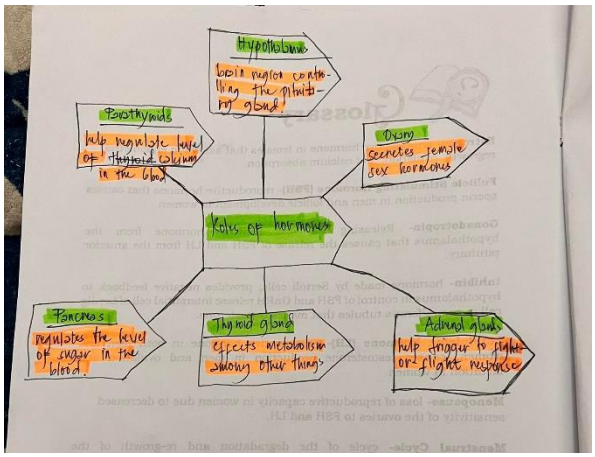


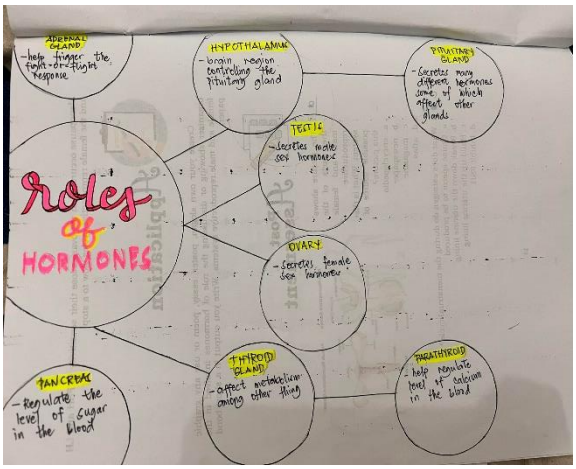
Before/ After

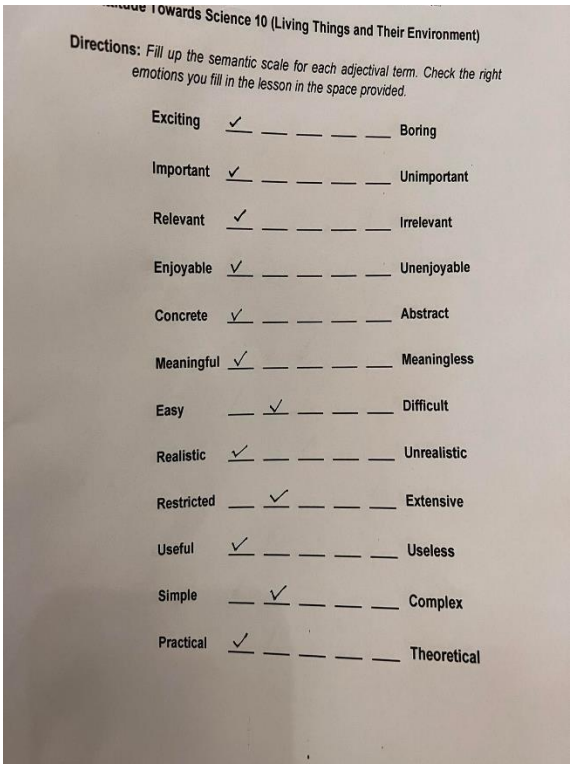
Attitude Towards Science 10 (Living Things and Their Environment)

Directions: *Fill up the semantic scale for each adjectival term. Check the right emotions you fill in the lesson in the space provided.*

Exciting	✓					Boring
Important	✓					Unimportant
Relevant					✓	Irrelevant
Enjoyable	✓					Unenjoyable
Concrete					✓	Abstract
Meaningful			✓			Meaningless
Easy	✓					Difficult
Realistic			✓			Unrealistic
Restricted					✓	Extensive
Useful		✓				Useless
Simple	✓					Complex
Practical		✓				Theoretical



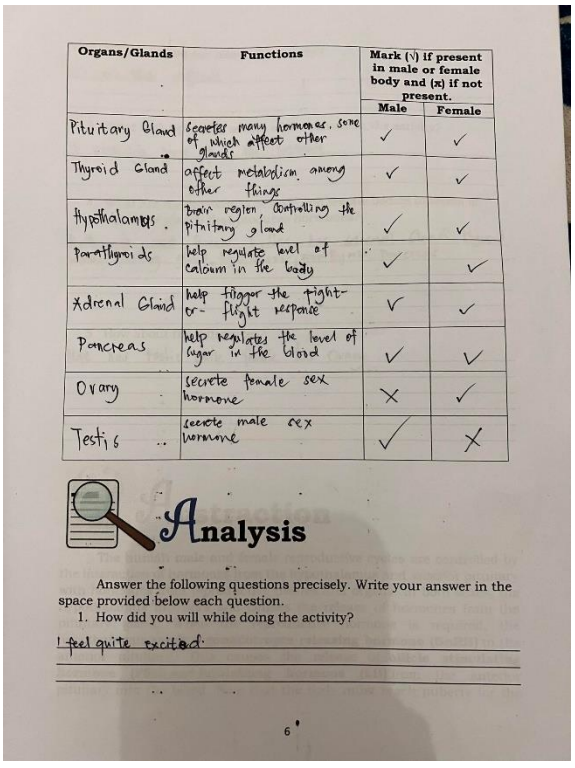




...ude Towards Science 10 (Living Things and Their Environment)

Directions: *Fill up the semantic scale for each adjectival term. Check the right emotions you fill in the lesson in the space provided.*

Exciting	✓					Boring
Important	✓					Unimportant
Relevant	✓					Irrelevant
Enjoyable	✓					Unenjoyable
Concrete	✓					Abstract
Meaningful	✓					Meaningless
Easy		✓				Difficult
Realistic	✓					Unrealistic
Restricted		✓				Extensive
Useful	✓					Useless
Simple		✓				Complex
Practical	✓					Theoretical



Organs/Glands	Functions	Mark (✓) if present in male or female body and (x) if not present.	
		Male	Female
Pituitary Gland	Secretes many hormones, some of which affect other glands	✓	✓
Thyroid Gland	affect metabolism among other things	✓	✓
Hypothalamus	Brain region, controlling the pituitary gland	✓	✓
Parathyroids	help regulate level of calcium in the body	✓	✓
Adrenal Gland	help trigger the fight-or-flight response	✓	✓
Pancreas	help regulates the level of sugar in the blood	✓	✓
Ovary	secrete female sex hormone	X	✓
Testis	secrete male sex hormone	✓	X

Analysis

Answer the following questions precisely. Write your answer in the space provided below each question.

1. How did you will while doing the activity?

I feel quite excited.

6