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PEPs IN IMPROVING ACADEMIC PERFORMANCE IN GENETIC CONCEPTS OF GRADE 11 STEM STUDENTS

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ABSTRACT

This research was purposely conducted to improve Genetic Concepts of Grade 11 STEM Students of Gonzaga National High School in their General Biology 1 subject for the School year 2020-2021 through the use of an intervention. The interventions that were utilized called PEP (Puzzles, Edmodo and Punnet Blocks) were combination of teaching and learning activities which enabled the students improved learning of students on the said concepts. Puzzles using the improvised punnet blocks will help them to easily understand the concept in Genetics specifically on Monohybrid and Dihybrid crosses. These interventions were aligned with the New Normal in the absence of the face to face learning. The intervention will be implemented through Online Distance Learning Modality where series of puzzles and activities were uploaded in Edmodo. The proponent used the descriptive-comparative approach using the paired sample t-test in determining the significant difference of their pre and post-test and the effectiveness of the PEPs intervention through Cohen's d formula. The data gathered by the researcher conveyed that the students with learning gaps in Genetic Concepts particularly in Monohybrid and Dihybrid crosses had greatly learned a lot after the intervention, through an increased percentage of their mastery in Genetic Concepts. Hence, the intervention applied had been found to be truly effective. The Intervention helped the students increased their academic performance particularly on the mastery of monohybrid and dihybrid crosses thru the guidance of their parents and siblings. These interventions with the use of the platform Edmodo, motivated them to learn more in the absence of Face to face learning because of the Pandemic. It was then recommended that coming up with other interventions will be a great help to the improvement of the academic performance not only for the coping students but for all the students in the class.

Keywords: Mastery of Genetic Concepts, Puzzles, Edmodo, Punnet Blocks, STEM

1. Introduction

Technology is widely used today by people and it must be used to enhance students' performance. Students are skillful with the use of technology and this had affected their daily routines. In classrooms, teaching and learning process are aided with support learning materials to further motivate the learners to actively participate, hence improving the performance of our learners. One of the widely used technologies today by the millennial is the use of the internet.
Tapscott and Williams (2017) in their study have shown how social network applications can significantly improve student learning and knowledge acquisition, enabling them mutual interaction, cooperation, active participation, sharing resources and critical thinking. Social

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network/media technology in this context include Edmodo, Blog, Wiki, Facebook, Youtube, Twitter, online discussion forum and others.

Deng and Tavares (2016) also concluded that "Web-based discussions can contribute to the development of students' reflective ability and critical thinking skills. Also, compared to face-to-face (F2F) interaction, students are more willing to voice their views or even disagreement and are more attuned to others' opinions in online discussion." A number of researchers have outlined a number of student benefits in relation to education as a result of social network participation.

(Blaschke, 2016), Social media technology provides educators with an opportunity to engage learners in the online classroom, as well as to support development of learner skills and competencies.

Chukwu, J. C., & Dike, J. W. (2019) in their study on the Effects of Jigsaw-puzzle and Graphic Organizer Instructional Strategies on Biology Students' Performance concluded that the use of Jigsaw Puzzle and graphic organizer instructional strategies in teaching have significant effect on the senior secondary school students' academic performance than lecture method in Growth as a concept in Biology. The study therefore provided empirical evidence on the relative efficacy of interactive and learner centered strategy in enhancing the performance of students in Biology.

The researcher noted a pressing concern that most of his Grade 11-STEM student's exhibit problems on the biology, specifically in the concept of genetics. Based on the quizzes of his students, and data gathered during LAC sessions, the researcher noticed that they got low scores in their quizzes. Based on the academic performance from the written diagnostic test on Concepts of genetics, and it was revealed, based on the said diagnostic test that 67% or 57 out of 86 Grade 11 learners have a mastery level of below 75% when it comes to concepts of genetics.

As such, the researcher wanted to ascertain online tutorials session through Puzzles, Edmodo, and Punnet Square could be an effective tools for mastering the concept of Genetics and with the use of puzzles and improvised Punnet squares/blocks thereby making the learners more adept with Genetic concepts and awareness as expected by the K to 12 curricula in Biology 1 and 2.

2. Methodology

The Proponent used the triad interventions PEP, Puzzles, Edmodo and Punnet Blocks. Puzzles, Punnets and Edmodo were combination of teaching and learning activities which enabled the students improved learning of students. Edmodo has emerged as an innovative social networking platform in the recent years. Social media has been shown to have a positive impact towards learner hence making the process of teaching and learning more meaningful. This was because social networking tools provided opportunities for students to find information, collected their own material, communicated, and interacted towards each other. Puzzles challenged learners to use their critical thinking skills in solving problems or situations related to monohybrid and di hybrid crosses by utilizing uploaded series of puzzle activities related to the subject matter.

Using the improvised punnet square/blocks helped them determine not just merely by the graphical representation of the possible genotypes of an offspring arising from a cross or breeding event rather, this will be a manipulative

The Edmodo Application teaching-learning is an approach that utilized the World Wide Web as a medium and support material in the delivery of the lessons. It was in this light that the proponent would like to determine the effectiveness of the approach to enhance the active participation and performance of the students in learning genetics concepts.

The proponent introduced and incorporated Edmodo Application as a way to reach the interest of every student under his subject in order to improve their academic performance.

There were many studies that demonstrated and guide teachers on how to use social media especially Edmodo Application for classroom teaching and learning purposes. If educators or teachers planned appropriately as part of an educational project, it would be able to facilitate and produce effectual and meaningful learning.

The study employed the experimental design particularly one group pretest post test design where the same group received the same treatment. The grade 11 STEM students of Gonzaga National High School were the respondents of the study. The researcher administered pre-test and results and recorded, tabulated, and analyzed. The scores in the pre-test and post-test of the respondents were tested and compared for significant difference to determine whether the use of PEP's shall record an improvement or none.

2.1 Participants and/or other Sources of Data and Information

The respondents of the study were the incoming Grade 11 STEM strand students of school year 2020-2021. The primary data in this study were the students' scores in the pre-test and the post-test first session were compared and tested for significant difference to determine the effect size of the PEP's as an approach in teaching genetic concepts and skills of the incoming Grade 11 students of Gonzaga National High School, Gonzaga West District, Gonzaga, Cagayan.

The results of the SY 2019-2020 diagnostic test and summative tests of the incoming Grade 11 students were the secondary sources of data.

2.1.1 Data Gathering Methods

A 40-item researcher made pre-test and post-test which were quality assured by subject experts and who were teaching the concepts as well as the validity of the test questions and following the Revised Bloom's Taxonomy on Cognitive Domain for the 12 sessions were the sources of primary data and were compared and analyzed using the appropriate statistical treatment.

The pre-test were uploaded to Edmodo Application online and were given to the respondents before the implementation of the PEP's.

Each participant created their own Edmodo account and after they were done with the creation of their own account, they received notification for them to start the uploaded pre-test.

The result were automatically checked and recorded using google forms or was reflected in the application that was used. The process was also the same during the implementation of the post-test. Competencies on genetics were taken from the curriculum guide for General Biology of the incoming Grade 11 STEM students were administered on the scheduled teaching and learning sessions. The selected worksheets from the LDRMS portal and other teacher-related websites and teacher made activities were utilized appropriately. The use of the punnet Blocks was also discuss and the Punnet Blocks User's guide were distributed to participants.

2.1.2 Data Analysis Plan

To analyze and interpret the data that were gathered in this study, the following statistical tools were used: Mean and standard deviation were utilized in analyzing the pretest and post-test results.

Paired Sample T-Test was used to determine the significant difference of the pre-test and post-test results.

The Cohen's d formula was used to determine the effect size of the PEP's in the achievement level of the respondents.

2.1.3 Ethical Issues

After explaining to the parents about the importance of the study, those parents whose son/daughter do not have android cellphone agreed to look for remedy/provide their son/daughter with android cellphone as prerequisite in the said study.

As evidenced of their willingness in support of the study, a communication letter was made by the researcher affixing their signatures with the content that they allow their sons/daughters to use/provide android cellphones with the primary intent as a supplementary intervention of improving academic performance in the General Biology particularly on the concept of genetics.

Utilizing the cellular phones or laptops of the students, the Edmodo was installed by the proponent wherein each member of the class will be instructed to join. The teacher will post topics/questions on the desired competencies that need to be mastered by the students in the form of review or exercises. It was also a chance to reach out students who failed to attend classes for other reasons. In this way, learners freely asked their questions to the teacher or from their classmates and posted their responses. This was done between 4:00 – 5:00 pm or asynchronously depending on the pace of the students from the different competencies without affecting their regular class schedule.

For ethical issues, the conduct of this action research was acknowledged and approved by DepEd officials. After the approval, the proponent obtained consent of the parents and/or assent of the students' participants. Authors of books, journals, publications as well as websites and from the internet which were used as references in the conduct of the study were be properly acknowledged and cited. Further, confidentiality of the data/documents that were generated from the respondents' tests were highly ensured. All the data that were collected were solely used for the purpose of the study.

3. Discussion of Results and Reflection

Table 1. The mean scores of the Pre - Test and Post- test result of the respondents

	Mean Scores	**SD**
PRETEST	22.44	7.312504856
POST TEST	27.62	6.447769954

Table 1 shows the result of the Pre-test and Post-test scores of the Grade 11 STEM students. It shows that the mean scores of the pretest scores of students is 22.44 and the mean post-test scores is 27.62 with a mean difference of 3.66.

Van Horn (2015), students who participated in hands-on science would score significantly higher science content post-test scores than they would score on science content pretests. Another, he stated that students who participated in hands-on science would score significantly higher science content posttest scores than students participating in the textbook-oriented instructional approach.

Table 2. Test of difference between Pre-Test and Post Test results of the respondents.

	Mean	**T computed**	**Critical value**	**p value at 0.05**	**REMARKS**
Pre-test	22.44	-20.05	2.004	.0001076	SIGNIFICANT
Post-Test	27.62				

This presents the significant difference between the Pre-test and Post-test of the students after the utilization of the intervention PEP.

Data on the table indicated that at 0.05 level of significance, the p-value computed which is truly higher than the critical/tabular value which is 1.077E-26. These data clearly mean that the Pre-test as compared to their Post-test found to be significantly different from each other.

This further means that from having an average cognitive level on the topic presented in the study that was concertize by the students' pre-test result, the students gained a very favorable academic performance after they were exposed to the use of the PEP (Puzzles, Edmodo, Punnet Blocks) interventions.

(Heddens, 2017) states that manipulative materials are concrete models that involve science and mathematical concepts, appealing to several senses that can be touched and moved around by the student. Manipulative materials must be selected for the activity and appropriate for the concept being taught and appropriate for the developmental level 8 of the students'.

Table 3. Test on Significant Difference of the Pre-test and Post-Test scores of Grade 11 STEM Learners after the utilization of PEP

	T value	Effect Size (Cohen's d)	Verbal description
Effect of PEP to the Mastery in Genetic Concepts of Grade 11 STEM Students	-20.05	1.414	Large effect

The effect size of the interventions used in the research which are the PEP (Puzzles, Edmodo, Punnet Blocks) to the struggling learners of grade 11 students. It shows that the Intervention Material has a large effect in the Mastery of genetic concepts of the grade 11 students a midst this pandemic.

Therefore, the intervention used in uplifting the mastery of genetic concepts of the grade 11 students was very significant since it was favorably increased the post test results conducted by the researcher.

According to Heddens (2017), using manipulative materials in teaching can help students learn how to relate real world situations to science and mathematics symbolism and work together cooperatively in solving problems. He further states that manipulative allow students' to discuss science and mathematical ideas, concepts, and verbalize their scientific and mathematical thinking. Students who use manipulative in their science and mathematics courses usually outperform those who do not, although the benefits may be slight.

Also, (Clements, 2019). Manipulative usage can also improve students' attitude toward science and mathematics, and give instruction that uses concrete materials to help students retain information and increase scores on test.

4. Conclusion

The result of this research demonstrated that the use of Puzzles, Edmodo and Punnet Blocks were an effective interventions amidst this pandemic to improve Genetic Concepts particularly in mastery of monohybrid and dyhibrid cross who were identified to be the respondents. The respondents performed well in activities using the triad interventions (PEP) Puzzles, Edmodo, Punnet Blocks as evidently shown in their increased scores in their post-test as compared to their pre-test.

For teachers who are teaching General Biology 1 and concepts related to genetics, this serves as their basis in intervening students who are coping on the said concept to master the competency on monohybrid and dihybrid cross and they should also make innovations to reach out and help the students at risk because of concepts struggles so that they may be able to overcome their gaps in concepts in genetics . The PEP that were utilized will help them to master solving the monohybrid and dihybrid crosses puzzles using the manipulative punnet blocks by easily listing the ratio and describe the offspring of a certain allele.

Therefore it is imperative to reach the struggling learners even in the absence of face to face learning using productive measures to ensure the students to improve their mastery in the concepts of genetics on monohybrid and dyhibrid cross.

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