Research Article

Gadgets and Connectivity - A Trend in New Normal: Saving Education System during Pandemic

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Abstract

This study aims to determine the effectiveness of technology and connectivity in teaching Science, precisely focused on local marine resources in the Visayan Seas, such as vertebrates, fishes, amphibians, reptiles, and mammals. This study used descriptive and inferential statistics, interviews, observation, and focus group discussion (FGD). This study's respondents were Junior High School students in the Philippines enrolled in Academic Year 2019-2020. Before implementing the control group activity, the mean scores were 13.14, described as "Average." In contrast, the experimental group has a mean score of 11.71, described as "Below Average." The control and experimental groups' mean score was 25.89 and 27.68, respectively, and were defined as "Excellent" during the posttest. Both groups' results showed no significant difference because competing at the top is critical to the learners. Through different websites, learners can collect resources and help them understand the local marine biodiversity's current situation. Thus, gadgets and connectivity have a significant impact on learning. These were further verified in n qualitative designs; learners exposed to websites helped them learn about marine resources in Estancia and the Visayan Sea. Technology and connectivity also increase the respondents' interest in becoming warriors to protect and preserve marine biodiversity for the next generation. No Wi-Fi or internet connection is available in NIPSC-West Campus; students must commute to the Main Library or spend personal money buying a load. This study recommends providing internet connection on all NIPSC campuses because of its effectiveness in teaching-learning. The result also calls for the national government to connect all basic education institutions in the entire archipelago because it can enhance teaching and learning.

Keywords: *Technology, Internet Connection, Science Curriculum, Marine Resources, Junior High School (JHS)*

1. Introduction

One of the 17 goals for Sustainable Development is quality education. Education can help enhance socioeconomic mobility and poverty. Many improvements have been made in education worldwide, but statistics in 2018 showed around 260 million are still out of school. Research showed many children in different countries are below the minimum proficiency standards in reading and mathematics (United Nations, 2021). Many reasons are causing deterioration in the education system in many countries; leaders have no concrete plans or solutions to the system's perennial problems. Despite the scarcity of resources, teachers' commitment to providing quality education find solutions to bridge the gap by innovating strategies to produce globally competitive graduates.

The current situation, infected by COVID-19 globally impacts around 91 percent or close to 1.6 billion children and youths who have stayed home for safety. Most vulnerable and marginalized students suffered from the global pandemic, which jeopardized comprehensive education development (De Leon, 2020). In the Philippines, the Department of Education (DepEd) immediately organized meetings to plan a structure to save the new standard education system. One of the proposed strategies is geared toward blended learning. Even the local government units (LGUs), like the City of Manila, pledged to give 11,000 laptops with pocket Wi-Fi, 136,950 tablets with Simcard, and 10GB monthly allotment bandwidth for School Year (SY) 2020-2021 (The ASEAN Post, 2021). Private individuals and organizations also promised and started giving gadgets to less fortunate Filipino students around the country.

Of the 66 countries surveyed by the International Institute for Management Development (IMD) research arm of Switzerland-based business school in the IMD World Competitiveness' World Talent Ranking 2018, the Philippines ranked 55th from 45th in 2017 (Tupas & Noderama, 2020). The new trend, Industry 4.0, or Fourth Industrial Revolution, required new skills workers needed for their future job; thus, a country like the Philippines was required to cope with the changing world. And to ensure the right skills for companies' demands, improving the quality of education is vital. Thus, the education department must appropriately integrate technological concepts into the curriculum (Acosta & Acosta, 2017). One of the challenges of the national government today is the scarcity of facilities and equipment in many schools. But as always, Filipino teachers are innovating and spending money to embed technology in the lessons. They used laptops and the internet to download lectures and updated strategies.

With the situations happening in the world, a new problem Filipino teachers encounter is how to push through with the opening of classes this coming August 24, 2020, but extended until October 5 this year. Thus, to help the Department of Biology formulate this study, Northern Iloilo Polytechnic State College (NIPSC), Main Campus, and the Teacher Education Department of NIPSC, Lemery Campus. The themes of this study were current technology, Science, and local resources. The research focused on educating the learners about the Visayan Sea's current situation. This study also answers the NIPSC administration's call to conduct investigations related to the college's flagship about fisheries.

This study will aim to determine the effect of gadgets and connectivity as an intervention in the performance of below-average learners in Science. Furthermore, this helps students value the importance of marine resources in the Visayan Sea, Philippines.

1.1 Basic Education System in the Philippines

In recent years, the Philippines shifted from the traditional ten years in basic education through a more innovative and grand K12 Basic Education Program. The additional two years in senior high school are the department's vision to produce globally competitive graduates (Aggabao et al., 2018). Adding two years to the curriculum will give sufficient instructional time to all subject areas (Abulencia, 2015). Education aims to nurture human beings as a social investment for families and the nation. Under the watch of former President Aquino, the Republic Act (RA) 10533, also known as

the Basic Education Act of 2013, was signed into law. The program's primary beneficiaries are the unprivileged sectors, but the new program's success is accepting positive and negative criticisms (Sergio, 2011).

SHS comprises three tracks that allow graduates to employ after Grade 12, continue higher education, or do entrepreneurial jobs. However, the department trains teachers fully equipped with the necessary tools and addresses problems and issues for sustainability (Calderon, 2014). The country's readiness to implement the new curriculum comprises *eligibility, staffing guidelines, course streamlining, workforce surplus management, and alternative programs* (Aggbao et al., 2018). All stakeholders play a vital role in the success of the K12 Basic Education Curriculum.

Improving the performance of learning is to enhance teachers' effectiveness and efficiency. "*Students don't fail; teachers do"* (Montebon, 2014). Values and attitude formation are essential three domains in the science curriculum. Also, teachers were carefully implementing the K12 curriculum, as stated by student respondents (Valdriz, 2017).

Specifically, the Science Curriculum in the new program adopts the spiral approach. The topics are simple and complex, from traditional methods to innovative techniques that improve students' critical thinking and scientific skills. The three domains in K12 Science Curriculum are *performing scientific processes and capabilities, understanding and applying scientific knowledge, and developing scientific attitudes and values*. Then, the goal of the departments are;

1. *Critical Problem Solver*
2. *Responsible Steward of Nature*
3. *Innovative Thinker*
4. *Informed Decision Maker*
5. *Effective Communicator* (Valdriz, 2017).

1.2   Contextualization and Localization: A Concept in Basic Education in the Philippines

Table 1 shows some of the initiatives in localization and contextualization in DepEd.

Table 1: projects of Deped on Contextualization and Localization (De Lara, 2018).

Years	Project	Purpose
1998-2006	Third Elementary Education Project (TEEP	Development of readers using local stories Integration of culture and artistic expression in learning areas
2005 - present	Strengthening Implementation of Visayas Education (STRIVE)	Region-wide efforts on localization and contextualization.
2011-2014	Philipines Response to Indigenous People's and Muslin Education	An initial attempt at the general contextualization process

In the Philippines, teachers are motivated to use local resources in teaching and learning. In the lesson plan, teachers are evaluated if contextualization and localization are employed in teaching the subject. In the Governance of Basic Education Act of 2001 or RA 9155, states should encourage local initiatives to improve quality education. The Enhanced Basic Education Act of 2013, or RA 10533, Sec. 5, revealed that contextualization is one of the standards and principles for developing the curriculum (De Lara, 2018).

Teaching Science should include real-life experiences aside from experimentation and inquiry-based. Since facilities, equipment, and instructional materials in most countries face the same perennial problems and issues in the Science Curriculum. Thus, his study revealed that contextualization and localization are acceptable variables in teaching grade 5 Science (Mourza & Lite, 2013). History Class using contextualizing practices improves students' performance, but teachers' lack of formal training is a problem (Krause et al., 2016). Also, contextualization can

improve motivation, learning, and persistence (Napata et al., 2020).

1.3 Northern Iloilo: The Jewel in the Visayan Sea

Globally, the state of marine resources is drastically decreasing, and the Philippines implemented a closed-season policy to conserve and protect local marine resources (Sunstar, 2019). The closed season is three months, from November 15 to February 15, the closure of the Visayan Sea for fishing sardines, herring, and mackerel. Under Fisheries Administrative Order 167-3, it started seven years ago to allow these pelagic fishes to breed (Ferrer, 2009). The Visayan Sea is the most important because it provides income and food but threatens marine areas. The site's exploitation for so many years, the fish are suffering and no longer can offer a livelihood for the community, and sustainability becomes a problem (The Visayan Daily Star, 2021).

Corals, mangroves, seagrasses, and marine protected areas are the Visayan Sea's shared ecosystem. But it is the typical breeding ground of sardines, herring, and mackerel (Anito & Morales, 2019).

In the Visayan Sea, results revealed sardine exists despite the government's effort to protect sardine and decrease non-compliance. Thus, the study suggested that the government create livelihood programs during closed season policy to stop illegal fishing done by small fisherfolks (Sunstar, 2019).

But many locals know little about the Visayan Sea, especially the new generation. Today, they are more on gadgets than learning about local resources. Thus, the education system is essential in informing young people of their status and the importance of protecting and preserving our environment. Our students will serve as protectors and saviors of your dying biodiversity. Since innovations in Science and technology, the STEM track has been reinvented into Science, Technology, Engineering, Agri-fisheries, and Mathematics (STEAM) to cater to various ecosystems' learning. Thus, the results suggested a framework of traditional modality into architecturally focused industry requirements and current trends (Mamatha et al., 2016).

1.4 Technology in the 21st Century

Technology is a driving force, a product of human innovations, and it helps humanity nowadays (Das et al., 2014). As a subject, Science permits learners to explore and discover the world through hands-on activities and experiments (Sadar et al., 2020). The world today shifted to technology, thus, the education system. Regardless of economic status, many parts of the world planned to incorporate state-of-art technologies into the curriculum. Females in the study about internet usage in Punjab, Pakistan, revealed a common trend that serves as an inspiration and improves learning and searching for curriculum content. They also concluded that the internet is a better source than textbooks (Vlasenko et al., 2020). But an insufficient awareness of wet tools in Ukrainian Universities was one of the participants' responses. Thus, designing online courses to support Mathematics teachers and using the Personal el-Learning Environment are the suggestions that arise from the study results (Ghavifekr & Rosdy, 2015). Integrating information, communication, and technology (ICT) in various subject areas significantly influences teaching and learning. Schools with complete ICT tools always produce quality graduates (Race, 2020).

Teachers and instructional supervisors needed experience and training to implement online learning during community quarantine during the pandemic. Not all teachers and students can join the activity due to a lack of resources and facilities. But those who participated in the online classes stated that the class schedule was flexible, and they could choose strategies. There are more accessibility and efficiency in time, money, and effort, but the participants declined because of limited interaction and socialization. Thus, the researcher concluded that training and workshop must be organized to enhance teachers' strategies and techniques in online classes (Khaerudin et al., 2020).

Using social media in the assessment is flexible, easily repeated, convenient, and accessible. Also, four effective assessment methods can be made using social media. These are *self-assessment, peer assessment, language patterns, and group assessment,* and teachers can alternatively employ these to evaluate students using social media (Khaerudin et al., 2020).

2. Methods

This research employed a qualitative design and accurate action research to determine the effect of gadgets and connectivity in Science in the Laboratory High School of NIPSC – Main Campus. This action research respondents handpicked Grade 8 students composed of two sections with at least no grade below 85. Statistically and interviews, observations, and focus group discussions (FGD) were employed in the study.

The researcher constructed a 30-item problem-solving test validated by science experts that involves the four fundamental operations. The researchers certified that those test items could be solved using the block model approach. The problems will be patterned from standardized textbooks and the National Achievement Test (NAT) test questionnaire with some modifications.

The Laboratory High School of NIPSC is located at the West Campus in the Municipality of Estancia. Estancia is one of the eleven municipalities in Northern Iloilo and one of the Visayan Sea coastal towns. Formerly known as Estancia High School, established in 1949, it was a component school of NIPSC. On June 10, 1983, under Batas Pambansa Blg. 500, the Western Visayas College of Fisheries and Estancia High School integrated into Polytechnic State College, and the high school is now the NIPSC Laboratory School. The curriculum junior high school (JHS) implements the K-12 program as a mandate from the government. Under the K-12 program, the core subjects science, mathematics, English, Filipino, Araling Panlipunan (Social Studies), Edukasyon sa Pagpapakatao, Musika, Sining, Edukasyong Pangkatawan, at Kalusugan or Music, Arts, Physical Education, and Health (MAPEH), and Technology and Livelihood Education (TLE) and supervised by the DepEd, Division of Iloilo (Pastrana, 2019). This JHS is supervised by the Dean of the School of Teacher Education. Furthermore, the JHS serves as practice teaching for graduating students majoring in secondary education.

The study's lesson was from grade eight's Unit VI – "Living things and their Environment," specifically on biodiversity with the following lessons; species diversity, a hierarchical taxonomic system of classification, and protection and conservation of endangered and economically important species (Department of Education, 2019). The study's main focus was to study the different fishes and other marine resources found in the Visayan Sea.

The teacher in charge of the two sections was trained in implementing the innovations for a week. They downloaded some materials from the internet and used them during the lesson. They also listed the possible websites for teaching.

Group A, Section Virgo, used the traditional approach during their science class, and Group B, Section Capricorn, used the experimental method. In Group A, the teacher employed strategies like the board and chalk approach and relied purely on textbooks and talking. While in Group B, the teacher act as the moderator of learning. She only explained the lesson and the activities and asked students to work independently with her supervision. Group B students were asked to utilize gadgets such as cellphones, tablets, computers, and connectivity to download lessons on fishes found in the ocean of Estancia, Iloilo, Philippines. Also, the researchers asked from the library and information center of NIPSC. The endeavor is to ensure that desktop and internet connections are able during the activity.

The scores were classified as Excellent (30 – 25), very good (24-19), average (18 –13), below average (12 – 7), and poor (6 – 1).

The researchers asked the College President and addressed this to the Dean of the Teacher Education Department of the Main Campus. The head's approval addressed an additional letter to the NIPSC Laboratory High School principal. Then, the principal's signal also allowed the researchers

to talk to grade 8 science teachers. The researchers explained the study's purpose and followed it with a self-introduction to create rapport among the participants. The researchers informed students about the objective of the study. The study lasted for two months.

Before implementing the program, the researchers administered the pretest to both groups on a scheduled date. Test papers will then be checked and recorded. The intervention lasted for four weeks. The researchers facilitated the observations of the respondents in both groups. Furthermore, the researchers employed the FGD with selected students per group after the intervention. After 30 days of intervention, the researchers administered the same 30-item researcher-made pretest as a posttest. Then, test papers were checked and recorded. The data were subjected to an appropriate statistical tool, specifically descriptive and inferential statistics using SPSS software, then analyzed and interpreted. The qualitative part's interviews, observations, and FGD were transcribed, analyzed, coded, themed, and triangulated.

3. Results and Discussion

3.1 Data Analysis

Table 2 shows the mean score in the two groups pretest, posttest, and the difference between Virgo and Capricorn

Table 2: Results of the pretest, posttest, and the difference between Virgo and Capricorn

Group Type		N	Mean	Std. Dev.
Pretest				
	Virgo (Control)	28	14.8571	2.8247
	Capricorn (Experimental)	28	15.4653	3.0366
Post-Test				
	Virgo (Control)	28	21.6786	2.8028
	Capricorn (Experimental)	28	26.2500	2.4589
Differences (Posttest-Pretest)				
	Virgo (Control)	28	6.8214	3.3890
	Capricorn (Experimental)	28	10.78	3.8716

Table 2 shows the result (mean and standard deviation) of the pretest and posttest and the difference when the students are categorized into Virgo (Control) and Capricorn (Experimental). Pre-test result indicates that mean score Capricorn (M = 15.4643, SD = 14.8571) is slightly higher compared to the mean score Virgo (M = 14.8571, SD = 2.8247). Posttest results further revealed that the mean score of the Capricorn Group (M = 26.2500, SD = 2.4589) is much greater than the mean score of the Virgo Group (M = 21.6786, SD = 2.8028). This is further reflected in the difference of mean scores from pre-test and post-test where Capricorn (M = 10.7857, SD = 3.8716) is much higher compared to Virgo (M = 6.8214, SD = 3.3890).

The pretest findings showed that almost all the respondents had little knowledge about local marines' resources in the area. However, Estancia is called the "Alaska of the Philippines" (Pastrana, 2019). Learning about marine resources is very important, and students within the region have enough knowledge to protect and preserve local resources for the next generation.

Most respondents live near the coastal areas and some islands, but knowledge about the fish found in Estancia is too limited. Many of them don't know the names of the fishes in the Visayan Sea.

Table 3 represents the difference in the pretest and posttest results and the contrast between Virgo and Capricorn.

Table 3: The difference in the pretest and posttest results and the contrast between Virgo and Capricorn.

	t	df	Sig. (2-tailed)	Interpretation	Decision
Pretest	-0.78	54	.442	No Significant Difference	Accept Ho
Posttest	-6.49	54	.000	Significant Difference	Reject Ho
Difference (Pretest-Posttest	-4.08	54	.000	Significant Difference	Reject Ho

Level of Significance at p < .05.

T-test shows no significant difference in the pre-test, $t(54) = -0.78$, $p = .443$, of Virgo (Control) and Capricorn (Experimental). Likewise, there is significant differences in the mean score of post-test, $t(54) = -6.49$, $p = .000$, and the difference in the mean score of pre-test and post-test, $t(54) = -4.08$, $p = .000$, of Virgo (Control) and Capricorn (Experimental).

Technology is essential today because it enhances learners' skills and cognitive characteristics. The ability of teachers to use technology is always a question; many are still not tech-savvy. Integrating technology into the curriculum is also a call for many teachers to embrace development. Teachers are encouraged to attend training and workshops to improve their skills and knowledge in using technology for the teaching-learning process (Okongo et al., 2015).

Both groups after the program improved significantly from average and below-average to excellent. The results showed that all students enrolled in NIPSC Laboratory School belong to A1 students in the municipality. They constantly study because competition is significant – they all want to be at the top. The respondents are still looking for other resources needed for learning the lessons. Good pedagogy materials can increase teaching and learning performance, thus allocating more funds. But the use of gadgets and connectivity is a little higher than the traditional methods but shows that technology could enhance teaching-learning. Therefore, integrating technology into Science is highly recommended (Sirajunissa Begum, 2013; Glava & Glava, 2013).

Traditionally, teaching methods used chalkboards, textbooks, radio, television, and films. Many institutions use information, communications, technology (ICT), and the internet as popular media or teaching instruments. The web assists learners in research and allows interactive activities (Geladze, 2015). Also, gadget users showed high emotional abilities and slightly higher reasoning skills than college students (Das et al., 2014).

Teachers' views on the WebQuest technique's effectiveness as a pedagogical frame for activity-based learning showed information from the internet is sometimes questionable. Thus, teachers must be aware of the quality of information given to students for educational purposes. Therefore, regulate and control the usage of the internet for effectiveness. Two critical points in the conclusion were important in using information technology: 1) use the resources that corresponded directly to the lessons; and 2) it changes students' attitude toward learning (Dogruer et al., 2011).

Table 4 shows the test of between-subjects effects of results of the pretest (Virgo) and posttest (Capricorn).

Table 4: The test of between-subjects effects of results of pretest (Virgo) and posttest (Capricorn).

	df	F	Sig	Partial Eta Squared	Interpretation	Decision
Group Type	1, 53	40.312	.000	0.432	Significant Difference	Reject Ho

Level of Significance at p < .05.

Table 4 revealed the analysis of variance, which showed the main effect of the treatment as Capricorn (Experimental) versus Virgo (Control), which indicates that there was a significant difference, $F(1,53) = 40.312$, $p = .000$, $\eta p2 = .432$, in the scores of each group. Further, the partial eta squared value ($\eta p2 = .432$) suggested a significant effect of the treatment.

3.2   *Qualitative Approach*

Table 4 represents the conversation summary between the selected respondents and researchers.

Table 4: Summary of the conversation between the selected respondents and researchers.

Questions (Themes)	Responses	
	Control Group	*Experimental Group*
1. Knowledge about Local Marine Biodiversity	"The resources we have like textbooks, activity sheets, no topics about marine resources in the Visayan Sea."	"We have options to focus on the Visayan Sea because of many resources."
2. Knowledge acquired after the program	"After the lesson, we never encountered topics about the Visayan Sea." "But we know that all the examples, such as fishes, are also found in the Visayan Sea. These resources are common in our fish market." "Some of those fishes serve as food. And I have tasted some of them."	"Northern Iloilo is blessed with these bountiful resources." "But upon reading news on the internet, many fishes and other marine organisms are vanishing." "Aside from natural calamities, human interventions and activities cause deterioration of these organisms.
3. Use of gadgets and connectivity	"I hope it can allow all students to use the internet in learning science and local resources."	"Effective in teaching-learning process, specifically in Science. "I hope the school will provide free internet on the campus."

But above all, students' knowledge about the current marine biodiversity situation in the Visayan Sea increases. They identified the names of local, English, and Scientific marine resources found in the coastal resources of the Municipality of Estancia, Iloilo, Philippines. Furthermore, they also found out three decades ago; that they were around seven species of sardines on the coastline of northern Iloilo, but currently, fishers caught around two to three species. The experimental group becomes vigilant about what happens to the Visayan Sea resources – most human activities destroy many marine habitats, such as over and illegal fishing.

The internet is for entertainment, academic and scientific information, and vital sources such as news, health, hobbies, etc. In this case, the internet is a tool to provide information to a bigger audience regardless of time and space. Thus, students are encouraged to use the internet for academic studies because of its benefits (Geladze, 2015).

Furthermore, teachers trained to use ICT play a crucial role in helping students' quality education (Khaerudin et al., 2020). Thus, primary and tertiary educations offer various training to equip teachers with the latest technologies.

The study about the STEM track in SHS in NIPSC revealed unavailability of facilities was a common problem in the college; thus, the administration should acquire more facilities like gadgets and connectivity to improve the science curriculum (Tupas & Matsuura, 2019). Therefore, the college must concentrate on developing the availability of technology and connectivity.

4.   Limitations

There were limitations to this study; internet connections or Wi-Fi were only available on the main campus. The students commute from West Campus to Main Campus every day, taking almost 30 minutes of their time. Also, virtually all the respondents from the control and experimental groups have a desktop or laptop and Wi-Fi at home. Students from the control group also used technology to study the lessons with limited resources in textbooks and other instructional materials. Since competition is dominant in the two sections, and almost all of them belong to above-average learners; thus, they find ways to learn the lessons ahead of time. This program should be

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implemented for below-average learners to measure gadgets and connectivity in learning Science effectively. Also, there were days the subject teacher could not supervise students on the Main Campus. The safety of students was the primary concern of this study. They also spend their allowance to have an internet connection.

5. Conclusions

Currently, technology is a trend in the education system around the world. In countries like the Philippines, schools in the entire archipelago encourage teachers to integrate these facilities into the curriculum. Many teachers used websites to collect teaching materials in subjects with limited instructional materials. Teachers in Science want to integrate gadgets and connectivity to enhance learning and teaching. Results showed that both groups have little knowledge of the selected topics in Science; thus, the mean scores are average and below average. But after the intervention, both groups are excellent; the experimental group is slightly higher than the control group. Hence, the innovations of using gadgets and internet connections were effective methods of teaching the subject. Allowing students to surf the internet as instructional materials improved teaching-learning. But teachers' prior knowledge about technology and internet connections is essential to implement the innovations effectively. The availability of gadgets and Wi-Fi data is also critical to learners. The government should prioritize these facilities to help the education system provide technology and connectivity in all public schools. After the K12 implemented the same problems and issues for the past ten years, DepEd faced a lack of instructional materials and references. If the government cannot promise accessible facilities to all public schools in the nation, providing internet connections to all campuses is the answer. But proper training for all teachers is recommended because not all of them are tech-savvy.

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