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"NEW NORMAL METHOD OF INSTRUCTION IN SPECIAL SCIENCE INSTITUTIONS"

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Abstract:
Science education has already been a big challenge in the Philippine Education System even before CoViD-19 pandemic happened. Though there are Filipino students who showed exemplary performance on different Science competitions, they are still outnumbered by students who performed poorly on the subject as evident on the results from different local and international assessment bodies. Analysis on the method of instructions of Special Science Institutions and public secondary schools showed that difference in employing synchronous and asynchronous learning activities during Distance Learning. Special Science Institutions have their own institutionalized and centralized learning management system. They have smaller class size and more time for teachers' preparations. They use social media platform in reinforcing learning and communicating learners. Among all areas in TPCK model, teachers' technological knowledge appeared to need improvement. They employ variety of method of instructions, nonetheless, the use of virtual science laboratories appeared to differ in public secondary schools.

Keywords: Method of Instruction; Special Science Institution, Distance Learning, Education in New Normal, Flipped Learning

1.INTRODUCTION

One of the drivers of a country's economic development is science education. To participate globally as an advanced, knowledge-based economy, Filipinos need a solid foundational education in science which does not only bring about technological advancement but also promotes national wealth, health, and industry. However, the status of science education here in the Philippines is a significant, if not a perennial, problem in educational system. As early as 1950s, efforts have been implemented to improve the quality of science education from elementary to college levels (Pagador, 2017). These efforts include changing the curriculum from one specialization per year level to a spiral progression approach, modifying the number of students per class and time allotment for the subject, providing scholarships for teachers' postgraduate studies, and conducting training and seminars to enhance teacher's competencies. Despite all of these efforts, Filipino learners' achievement levels, as evaluated by national and international assessment bodies, still fall below average or poor performance. It is a problem that has been running for decades in the Philippine education system and is even more challenging given the impact of CoViD-19 (Corona Virus Disease) pandemic in the educational sector; and this situation brings a conundrum since science education is also vital in equipping the society with the tools that are essential in navigating this volatile, uncertain, complex, ambiguous, disruptive, and diverse (VUCAD) world.

Science Education and Its Challenges

Despite the challenges faced by the Philippine science education, several Filipino students still manage to win international science competitions. To name a few, four Filipino high school students won one gold, two silver and one bronze in the 5th International Earth Science Olympiad in Italy participated by 26 nations (Quizmundo, 2011); 340 medals were brought home for the Philippines in various international science and mathematics competitions in 2012 (DOST-SEI, 2012); three groups of students won first and second places during the Hong Kong Students Science Project Competition (HKSSPC) (DepEd, 2018); three students received international recognition at Phoenix, Arizona during the 2019 Intel International Science and Engineering Fair (ISEF) for their sound-absorption material project made from fibers abaca, bamboo and water hyacinth which they called "Hibla" (BusinessMirror, 2019); 94 students from different schools won 5 gold, 15 silver, 12 bronze medals and 5 honorable mention awards at the 1st

Vanda Science Global Finals in Malaysia which made them the top-ranked team out of 21 participating countries (August 2019); and another four high school students won gold, silver and bronze medals during the 5th International Earth Science Olympiad held at Modena, Italy (DOST-SEI, 2019), and many others. These are just some of the many achievements of Filipino students in the field of science education.

The government also continued to send student scientists representing the Philippines in international technology fairs. The most recent ones were the students from Taguig National High School, Iloilo National High School, Angeles City Science High School, Pangasinan National High School, and Quezon National High School who were sent to Phoenix, Arizona for the Intel International Science and Engineering Fair (ISEF) (Montemayor, 2019).

The intellectual capabilities of Filipino students are undeniably recognizable. In fact, according to PhilStar Global (2019), three minor planets were named after three Filipino students upon winning "second award" in the 2018 Intel International Science and Engineering Fair, Energy: Physical Science Category at the Massachusetts Institute of Technology Lincoln Laboratory. Each student received a certificate identifying the minor planets named after them and their currently located orbital plot.

Even during CoViD-19 Pandemic, there are still special science institutions who show excellent and outstanding performance in science. One of them is the Philippine Science High School Central Luzon Campus which was recognized as the overall champion among the 36 participating known schools, colleges and universities in the recently concluded Sihay National Biology Olympiad conducted by the University of the Philippines.

Though some Filipino students excel and are recognized internationally in different science areas, learners who perform poorly on the subject overshadow the number of students who excel. This is evident in the National Achievement Test results from 2004 to 2018 showing remarkably consistent low performance in Science. According to the 2017 World Economic Forum Executive Opinion Survey, the Philippines ranked 76th out of 137 participating countries in math and science education quality. It is also reported that the Philippines scored below average in East Asia Pacific on international assessments such as in Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS). The result of PISA 2018 showed significantly lower average score of 357 points among Filipino learners as compared to the Organization for Economic Co-operation and Development (OECD) average of 489 points. The mean score of learners in Region 3 is lower than the national performance with 351 points. Out of the six ASEAN countries that participated, the Philippines fared significantly lower in scientific literacy.

Contributory to this low performance in science is the lack of facilities and laboratories, quality of textbooks, shortage of classrooms, and shortage of teachers specialized in the field. Before the pandemic, many schools were already barely coping because of insufficient funding, high enrolment rates, and inadequate facilities. These problems are feared to magnify with the current education setup or the new-normal brought by the CoViD-19 Pandemic. This pandemic poses a significant challenge to the education system, here and abroad, due to the abrupt changes needed to be embraced by the teachers, learners, and other stakeholders in the academe.

Science Curriculum Implementation across Schools

Science curriculum implementation differs across educational institutions in the Philippines. Special Science Classes, like in the Philippine Science High School (PSHS), offer more advanced science topics than those in public secondary schools and other special science institutions. PSHS, a specialized public high school system in the Philippines, operates as an affiliated agency of DOST. On the other hand, regular science high schools, like Angeles City Science High School (ACSHS), are under the Department of Education (DepEd). Although Philippine Science High School and Angeles City Science High School are both specialized in Science teaching, they follow different curriculum and programs; moreover, they excel in different science competitions, here and abroad.

PSHS, unlike any other school, has a rigorous screening process for student-applicant. Only those who acquired 85% final grade in Math and Science or those students belonging to the upper 10% of the batch will be admitted to the school. However, the selection process does not stop there. Only the top 240 applicants are considered principal qualifiers for the main campus, and the top 90 or 120 for the regional campus (NCE online application website).

ACSHS also specializes in Science education, but unlike PSHS, it follows the DepEd curriculum with some modifications on elective Science subjects per grade level such as Environmental Science in Grade 7, Bio-Technology in Grade 8, Con Chem or Applied Chemistry in Grade 9, and Electronics in Grade 10 plus additional research subjects in Grades 9 and 10. Although the school is under DepEd, it is the only public school in the Division of Angeles City that offers a STEM strand. The school admits students from the upper 20% of the school's graduating class with grades not lower than 80. A qualifying examination is also being administered before admission (DM No. 288, s. 2016).

There are no such requirements for regular public secondary schools' admission as the "No Filipino Child Left Behind Act of 2010" dictates. As the policy declares, education should be accessible to all.

Science education among the schools mentioned earlier is being offered differently. The subject General Chemistry 1, for example, is being offered as an independent subject in Grade 9 level of PSHS while in public secondary school, it is being taught in spiral progression approach – one quarter per year at the Junior High School level. Furthermore, schools that offer STEM strands in Senior High School teach Biology, Chemistry, Physics, and Earth Science separately on a semestral basis as part of their academic subjects. While public secondary schools offer

General Chemistry 1 and 2 in their Senior High School programs, PSHS is offering more advanced Chemistry subjects at these levels.

One of the goals of K-12 education is to prepare all graduates of senior high school for college education, career, or entrepreneurship. However, the CoViD-19 Pandemic has drastically changed the educational landscape. It has now shifted dramatically to flexible learning, a state of being in which teaching and learning are increasingly freed from the limitations of time, place, and pace of study.

The New Normal in Teaching and Learning

CoViD-19 has not only impacted the Philippines but the entire world. Thus, education all over the world is adjusting to cope with the current situation.

In Singapore, attendance in schools is not compulsory as lessons provided will strengthen students' knowledge from the previous lessons and not for learning new concepts; schools will take the necessary precautions when students opt to return to school despite the CoViD-19 situation. At which point, students will return to school at different schedules throughout the day and week. They stay in groups but with no intermingling and following fixed-exam style seating arrangement and appropriate distancing. For home-based learning, video conferencing platforms such as Zoom and Google Meet will be used to engage students in live lessons. Other video conferencing platforms that are used for home-based learning are Facebook Live and Cisco WebEx. (Ministry of Education, 2020).

Education in Japan, however, is different. Since many schools in Japan do not integrate information and communication technology (ICT) in education, switching to online learning has become challenging. This is supported by the 2018 result of PISA on ICT utilization survey wherein Japan ranked the lowest among OECD countries regarding time spent using digital devices in the classroom. Individual computers and tablets are only available to students of well-financed private schools but not in most public schools. Therefore, only private schools offer online learning while the rest still adheres to the traditional face-to-face learning while observing precautionary measures to prevent the spread of the CoViD-19.

Education has become entirely virtual in the United States of America using online platforms like Zoom and video chats. However, not all students are fortunate to have access to the internet which may later result in a learning gap. In the South Coast, parents and guardians assist in homeschooling. The school delivers packets for children to accomplish. They also make use of the Zoom app and Google Classroom in the conduct of their virtual classes.

These are just some of the countries that experienced school closures due to the CoViD-19 Pandemic. UNICEF, WHO, and IFRC have developed plans for continuity of learning in temporary school closures. These include using online/e-learning strategies, assigning reading and exercises for home study, radio, podcast, or television broadcasts of academic content, assigning teachers to conduct remote daily or weekly follow-up with students, and review/developing accelerated education strategies.

In the Philippines, Republic Act No. 11480 or the act amending section 3 of Republic Act No. 7797, otherwise known as "an act to lengthen the school calendar from two hundred (200) days to not more than two hundred twenty (220) class days," authorized the department to postpone the start of the school year from June 1 to August 24, 2020. Furthermore, DepEd Order No. 30, s. 2020 amended the act and deferred the opening of classes to October 5, 2020. The start of classes was deferred in light of CoViD-19 Pandemic to ensure the preparedness of Philippine education system, processes, and stakeholders for teaching and learning in the new normal.

"*Pursuant to the 1987 Constitution Article XIV, Section 1 and 2, as well as Executive Order No. 292 or the Administrative Code of 1987, Republic Act No. (RA) 9155 or the Governance of Basic Education Act of 2001 and RA 10533 or the Enhanced Basic Education Act of 2013, DepEd is mandated to protect and promote the right of access to quality basic education*" (DO No. 18, s, 2020). The Department ensures that the support needed in the implementation of the basic education learning continuity plan is given to provide quality education to learners amid CoViD-19 Pandemic.

In accordance with the DepEd Order No. 12, 2020 or the Adoption of the Basic Education Learning Continuity Plan for School Year 2020-2021 in Light of the CoViD-19 Public Health Emergency, the new normal in education consists of the following flexible learning delivery options: face-to-face classes with a lesser number of students; the virtual set-up of learning where the use of technology and assistance of parents are employed; and the blended learning which is a combination of the two. Morata (2020) defines blended learning as integrating online with traditional face-to-face activities in a planned, pedagogically valuable manner. The preparations done by DepEd include adjustment on the critical features of the K-12 curriculum, alignment of learning materials, various delivery modalities, and corresponding teacher and parent/guardian training for homeschooling. The choice and contextualization of the learning delivery modality of schools depend on the local CoViD-19 situation and access to specific learning platforms. With the desire of the department officials to continue education through formal schooling despite the current CoViD-19 situation in the Philippines and the readiness of the students and teachers on the sudden shift from face-to-face to online learning, blended learning is most likely to happen. DepEd is looking into integrating a multimodal approach in learning which involves putting two or more learning styles together to achieve better output.

In the delivery of instruction with new normal setting in education, Mayol (2020) cited different challenges faced by teachers in conducting distance learning. These includes having students with different learning modalities,

developing concrete instructional material addressing the diversity of learners, having limited internet access, distraction on the background during synchronous meeting, and longer preparation time of audio-visual materials and other online tools. Providing quality education amidst CoViD-19 Pandemic and the preparedness of teachers when another crisis comes in the future are also other challenges among Filipino teachers in the new normal as revealed in the study of Tria (2020). These are just some of the many challenges faced by Filipino teachers in the new normal.

The education sector is dramatically affected by the CoViD-19 Pandemic. However, the impact is massively disproportionate, affecting mostly vulnerable institutions by exacerbating already existing inequalities. On the other hand, resilient institutions can respond to the needs of all learners, including the most vulnerable learners. Such responsiveness is anchored on skilled human resources, timely and effective personalized interventions, or a more targeted resource allocation. It is thus imperative to explore how different institutions are coping with the new normal in instruction and use these observations to take urgent action to address learning gaps and ensure a smooth and continued educational pathway for all learners, regardless of the type of institution.

2. RESEARCH QUESTIONS

1. How may the learning delivery modality used in the following respondent schools be described in terms of:
   1.1 Type of learning delivery modality employed;
   1.2 Number of learners per class;
   1.3 Class schedule;
   1.4 Time allotment per subject; and
   1.5 Teachers' preparation?
2. How may the level of knowledge of the teacher-respondents in the following learning delivery modalities be described:
   2.1. Face-to-Face;
   2.2. Blended Learning;
   2.3. Distance Learning; and
   2.4. Homeschooling?
3. How may the readiness of the teacher-respondents to flexible learning delivery modalities be described based on:
   3.1 Technological Knowledge, Pedagogical Knowledge, and Content Knowledge (TPCK) model; and
   3.2 Access to and use of information and communication technology in teaching?
4. Is there a significant difference between the following based on school types:
   4.1 readiness of the teacher-respondents on the use of flexible delivery of learning; and
   4.2 teachers' Technological Knowledge, Pedagogical Knowledge, and Content Knowledge (TPCK)?
5. How may the commonly used educational platforms and online applications be described by the teacher-respondents in terms of:
   5.1 Level of knowledge;
   5.2 Frequency of utilization; and
   5.3 Level of perceived effectiveness?
6. How may the innovative teaching methods utilized by the respondent-schools in the new normal be described by teachers in terms of:
   6.1 Level of awareness;
   6.2 Level of effectiveness; and
   6.3 Frequency of utilization?
7. Based on the result of the study,
   7.1 what method of instruction can be proposed to public secondary schools; and
   7.2 what innovative instructional material can be proposed?

3. MATERIALS AND METHODS

Research Design

This study made use of mixed method sequential explanatory research design to explain the teaching and learning practices within the subject schools. Mixed-method sequential explanatory research includes two distinct parts: collecting and analyzing of quantitative data followed by qualitative data collection. Qualitative data were collected following quantitative data to help explain or elaborate the quantitative data obtained in the first phase (Wipulanusat W., Panuwatwanich K., Stewart R.A., Sunkpho J., 2020).

In this study, quantitative data on the type of learning delivery modality employed in each school, the readiness of teachers on the use of ICT in teaching, their level of technological, pedagogical content knowledge, the commonly used educational platforms and online applications, as well as the teaching methods utilized in each school were first obtained and analyzed. The data gathered were further explained through qualitative data from virtual interview. Both quantitative and qualitative data were fused to explain the different perspectives of the study and draw conclusions.

Locale of the Study

The locale of the study consisted the two special science institutions based in Pampanga: Philippine Science High School – Central Luzon Campus; and Angeles City Science High School (ACSHS) in Angeles City, Pampanga, and one mega public secondary school in the Division of Pampanga offering STEM strand.

Philippine Science High School was known for its remarkable achievement and excellence in Science education. PSHS' best practices in teaching can be a good benchmarking point for public secondary schools to increase their level of achievement in Science; moreover, the set admission requirements in this school was too high to be compared to public secondary school. Issues as to whether the method of instruction that PSHS is employing and can be adopted to public secondary school may arise. For this reason, Angeles City Science High School was added in the study to neutralize the gap between PSHS and regular public secondary school.

ACSHS is under DepEd just like the regular public secondary school; but like PSHS, its curriculum is designed and specialized in Science teaching.

Sample and Sampling Procedure

Total enumeration of the Science teachers from Junior to Senior High of the subject schools were asked to respond to the study to better understand the method of instructions they were using during this time of CoViD-19 Pandemic.

Random sampling using Slovin's formula [$n = N/(1+Ne^2)$] was employed from the number of teachers who responded to the survey to select the informants for the interview. The interview aimed to clarify further and strengthen the result of the survey.

Research Instruments

The questionnaire for teachers is made up of the following components:

Part I: Teacher's Profile;
Part II: Learning Delivery Modalities Utilized;
Part III. Teachers' Level of Knowledge on Flexible Learning Delivery Modalities;
Part IV. Teacher's Readiness in the Use of Flexible Learning Delivery Modalities; in terms of:
A. Technological Knowledge, Pedagogical Knowledge, and Content Knowledge; and
B. Access to and Use of information and communication technologies (ICTs);
Part V. Use of Educational Platforms and Online Educational Applications; and
Part VI. Use of Innovative Teaching Methods

Part I included background information about the respondents. It aimed to identify the teachers' age, specialization, educational attainment, and number of years in teaching the subject to support the data gathered on the other parts of the questionnaire.

The second part was intended to determine the learning delivery modalities (LDM) used by different institutions. The LDMs included on this part of the questionnaire were based on the learning continuity plan of DepEd for the school year 2020-2021. The respondents identified the type of learning delivery modalities performed by their schools and provided description on how it was done. Questions like number of learners per class, class scheduling, time allotment and teacher's preparation were asked on this part.

The teacher's level of knowledge on flexible learning delivery modalities is measured in the third part of the questionnaire using a 4-point Likert scale. Each LDM on this section was given specification that the respondents can choose to better understand the way they employed the modality in their respective schools. The level of knowledge of the respondents on these items corresponds to their level of awareness and experience on its implementation. The responses of the teachers used the following verbal descriptions:

Rating	**Verbal Description**
4	Very much knowledgeable
3	Knowledgeable
2	Less knowledgeable
1	Not knowledgeable at all

The fourth part of the questionnaire was used to determine the teachers' readiness in the use of flexible learning delivery modalities. Part IV was subdivided into two sections; the first one was to determine the level of agreement of teachers on Technological, Pedagogical, and Content Knowledge (TPCK); and the second one was to determine the readiness of the teachers on the access and use of information and communication technologies in teaching.

The TPCK questionnaire was adopted from the study of Hosseini and Kamal (2012) entitled "Developing an Instrument to Measure Perceived Technology Integration Knowledge of Teachers". The level of agreement of teachers on TPCK items were determined using a 5-point Likert scale. The questionnaire consisted of 11 items measuring technological knowledge, 7 items for pedagogical knowledge, 6 items for content knowledge, 5 items for technological content knowledge, 7 items for pedagogical content knowledge, 10 items for technological pedagogical knowledge, and 7 items for technological pedagogical content knowledge. The level of agreement of teachers on each statement

given signified their level of knowledge on that particular area; thus, indicating their level of readiness on the matter. The scale used has the following verbal description and interpretation.

Rating	Verbal Description	Interpretation
5	Strongly Agree	extremely knowledgeable/very much ready
4	Agree	moderately knowledgeable/ moderately ready
3	Undecided	knowledgeable/ready
2	Disagree	slightly knowledgeable/slightly ready
1	Strongly Disagree	not knowledgeable at all/not ready at all

The questionnaire for the second part of teachers' readiness survey was adopted from the study of Kirkland and Price (2016) with some modifications on the content to suit the purpose of the respondents. For gadgets ownership, option to buy within the next 12 months was included on the list. In terms of the devices that were used in school, questions as to whether they are provided by the school or if they were using their personal devices were included on the list. Checklist, on the other hand, was provided for items concerning internet access, knowledge on the use of ICT, social media account and frequency of utilization, as well as membership on mailing list and discussion fora. The respondents' skills on computer-related activities were assessed using a 5-point Likert Scale with the following verbal descriptions and interpretations:

Rating	Verbal Description	Interpretation
5	I can use it very well.	very much ready
4	I can use it well.	Moderately ready
3	I can use it satisfactorily.	Ready
2	I can use it to a small extent.	Slightly ready
1	I can't use it.	Not ready at all

A 25-item 6-point Likert Scale was used to assessed the respondents' level of experience on the use of technology-enabled learning environment. The scale used the following verbal descriptions:

Rating	Verbal Description
6	Excellent
5	Good
4	Neutral
3	Fair
2	Poor
1	Not Available

The fifth part of the questionnaire was intended to determine the level of knowledge, frequency of utilization and the level of perceived effectiveness of educational platforms and online educational application amidst new normal in education. It consisted of 12 major educational platforms (technological and flexible interventions), and four applications used in the new normal settings in educations. Space was provided for other platforms and applications used in different institutions that were not included on the list. The questionnaire utilizes 4-point Likert Scale with the following verbal descriptions:

Rating	Verbal Descriptions		
4	Very much knowledgeable	Always	Very effective
3	knowledgeable	Often	Effective
2	Less knowledgeable	Sometimes	Less Effective
1	Not knowledgeable at all	Never	Not effective at all

Part VI of the survey questionnaire consisted of 50-item innovative teaching methods which were based from Edsys (2018). This part was used to determine the teaching method commonly utilized in special science institutions and which can be adopted by public secondary school. The teachers' level of awareness on these innovative teaching methods, the frequency of utilization and the perceived effectiveness in teaching were determined using a 4-point Likert Scale with the following verbal descriptions:

Rating	Verbal Descriptions		
4	Very much aware	Always	Very effective
3	Aware	Often	Effective
2	Less aware	Sometimes	Less Effective
1	Not aware at all	Never	Not effective at all

The researcher also conducted interview to gather qualitative data that will support the previously gathered quantitative data of the study. Semi-structured interview guide was developed and tested to three informants outside the groups of respondents as recommended by the validator. The interview guide consisted of questions supporting and elaborating the responses under each statement of the problem. Questions on the implementation of the school chosen LDM, their educational platforms, methods of instruction employed and how they facilitate them were tackled during the interviews. The interview lasted for not less than 30 minutes for each informant.

Reliability and Validity of Instrument

The instrument was validated by experts in the field and underwent pilot testing among selected Science teachers not belonging to the group of respondents. Content validity was also performed by experts in the field of Science and Technology to know whether the items included in the instrument were relevant or not. Revisions on the survey questionnaire were made following the suggestions and comments of validators.

Permit to use the questionnaires adopted from previous researches were secured from the authors while those that were personally made based on available references were subjected to validation of experts, pilot testing, and statistical tests prior to administration.

Data Analysis Technique

To interpret the data on the learning delivery modalities among the subject schools in terms of the number of learners per class, class scheduling, time allotment per subject and teachers' preparation, frequency count and percentage distribution were used.

Mean scores were utilized in interpreting data for the level of knowledge of the teachers on the learning delivery modalities in terms of face-to-face learning, blended learning, distance learning, and homeschooling. The following verbal descriptions were used in interpreting the data using a 4-point Likert scale:

Rating	Verbal Description
3.26 – 4.00	Very much knowledgeable
2.51 – 3.25	Knowledgeable
1.76 – 2.50	Less knowledgeable
1.00 – 1.75	Not knowledgeable at all

Mean scores were also used in assessing the technological, pedagogical, and content knowledges of teachers. The following verbal descriptions were used to interpret the data:

Rating	Verbal Description	Interpretation
4.21 – 5.00	Strongly Agree	extremely knowledgeable/very much ready
3.41 – 4.20	Agree	moderately knowledgeable/ moderately ready
2.61 – 3.40	Undecided	knowledgeable/ready
1.81 – 2.60	Disagree	slightly knowledgeable/slightly ready
1.00 – 1.80	Strongly Disagree	not knowledgeable at all/not ready at all

Mean scores, frequency count and percentage distribution were used in accessing teacher's readiness on the use of flexible learning delivery modalities in terms of the access to and use of information and communication technologies in teaching. The respondents' skills on computer-related activities were assessed using a 5-point Likert Scale with the following verbal description:

Rating	Verbal Description	Interpretation
4.21 – 5.00	I can use it very well.	Very much ready
3.41 – 4.20	I can use it well.	Moderately ready
2.61 – 3.40	I can use it satisfactorily.	Ready
1.81 – 2.60	I can use it to a small extent.	Slightly ready
1.00 – 1.80	I can't use it.	Not ready at all

Also, the respondents' experiences on the use of resources/services/spaces provided by the school were also noted and were interpreted using a 6-point Likert Scale with the following verbal descriptions:

Rating	Verbal Description
5.16 – 6.00	Excellent
4.33 – 5.15	Good
3.50 – 4.32	Neutral
2.67 – 3.49	Fair
1.84 – 2.66	Poor
1.00 – 1.83	Not Available

ANOVA was utilized to check the differences on the responses of the teachers on TPCK items and their readiness in terms of access to and use of ICT in teaching.

Mean scores were used in assessing the level of knowledge, frequency of utilization and perceived effectiveness of teacher-respondents on the use of educational platforms and online educational applications. The items were presented using 4-point Likert Scale with the following verbal descriptions:

Level of Knowledge

Rating	Verbal Description
3.26 – 4.00	Very much knowledgeable
2.51 – 3.25	knowledgeable
1.76 – 2.50	Less knowledgeable
1.00 – 1.75	Not knowledgeable at all

Frequency of Utilization

Rating	Verbal Description

3.26 – 4.00	Always
2.51 – 3.25	Often
1.76 – 2.50	Sometimes
1.00 – 1.75	Never

Level of Perceived Effectiveness

Rating	**Verbal Description**
3.26 – 4.00	Very effective
2.51 – 3.25	Effective
1.76 – 2.50	Less effective
1.00 – 1.75	Not effective at all

Mean scores were also used in assessing the level of awareness, frequency of utilization and perceived effectiveness of teacher-respondents on the use of innovative teaching methods. The items were presented using 4-point Likert scale with the following verbal descriptions:

Level of Awareness

Rating	**Verbal Description**
3.26 – 4.00	Very much aware
2.51 – 3.25	Aware
1.76 – 2.50	Less aware
1.00 – 1.75	Not aware at all

Level of Effectiveness

Rating	**Verbal Description**
3.26 – 4.00	Very effective
2.51 – 3.25	Effective
1.76 – 2.50	Less effective
1.00 – 1.75	Not effective at all

Frequency of Utilization

Rating	**Verbal Description**
3.26 – 4.00	Always
2.51 – 3.25	Often
1.76 – 2.50	Sometimes
1.00 – 1.75	Never

Thematic coding, on the other hand, was used to analyze and interpret qualitative data from the interviews. The researcher read the responses of the informants several times and mark significant statements for each response. Coding of the significant statements was done thereafter, followed by the clustering of the coded responses to form a theme. The coded themes were added on the discussion to support the quantitative data and further explain the findings.

4. RESULT AND DISCUSSIONS

As education must continue, different education institutions find ways on how to ensure learning still takes place amidst CoViD-19 Pandemic. CoViD-19 causes sudden shift in the education system from the usual face-to-face learning to distance learning.

Learning Delivery Modality as Implemented in Each School

Table 1. Learning Delivery Modality Employed per School

Learning Delivery Modalities	**PSHS**	**ACSHS**	**PSS**
Face-to-Face			
BL: Face-to-face Instruction + Remote (Non-digital/Offline Instructional Materials			.6%
BL: Face-to-face Instruction + Remote (Non-digital Instructional Materials + Digitalized/Digital Offline Materials)			1.1%
BL: Face-to-face Instruction + Remote (Digitalized/Digital Offline Materials + Online Synchronous and Asynchronous Activities)	.3%	2.5%	.6%
BL: Face-to-face Instruction + Remote (Online Instructional Materials + Online Synchronous and Asynchronous Activities)		2.5%	.6%
DL: Purely Offline Instructional Materials + Print Learning Activities		2.5%	1.1%

DL: Offline (Non-digital) Instructional Materials + Online Synchronous and Asynchronous Learning Activities		2.5%	1.1%
DL: Offline (Non-digital and Digital) Instructional Materials + Online Synchronous and Asynchronous Learning Activities	1.7%	0%	0%
DL: Purely Online Instructional Materials and Online Synchronous and Asynchronous Learning Activities	0%		
Homeschooling			

**NOTE: Blank items means 0% or no response; BL=Blended Learning; DL=Distance Learning*

Table 1 shows that Philippine Science High School teachers were employing distance learning as their learning delivery modality during CoViD-19 Pandemic; 41.7% of them were doing offline (non-digital and digital) instructional materials with online synchronous and asynchronous learning activities and 50% used purely online instructional material with online synchronous and asynchronous learning activities. Synchronous learning activities, as evident during the interview, are regularly done on a weekly basis to ensure learning among students. Even prior to the CoViD-19 Pandemic, remote synchronous learning is already proven effective in higher education as shown on the study of Szeto (2014).

Angeles City Science High School was also employing distance learning with 50% of the teachers doing offline (non-digital and digital) instructional materials plus online synchronous and asynchronous learning activities. According to the informants, the school was employing blended learning but with no face-to-face interaction with the learners. They are employing synchronous and asynchronous learning delivery modality just like in distance learning. ACSHS, just like PSHS, also regularly does synchronous learning activities on a weekly basis to ensure learning takes place. In fact, based on the interview, the school allotted more time for synchronous learning activities on STEM Specialized subjects.

In Public Secondary School, 72.2% of the teachers were also using distance learning as their modality in teaching while the remaining 27.8% were employing blended learning. Fifty percent of those who utilized distance learning are giving offline (non-digital and digital) instructional materials with online synchronous and asynchronous learning activities while others gave purely offline instructional materials with print learning activities and offline (non-digital) instructional materials with online synchronous and asynchronous learning activities.

The findings show that the subject schools in this study are all employing distance learning where education is remote and/or online. It means that the school administrations follow the protocol issued by the government authorities proving that they protect the welfare of the students and the faculty members by minimizing their possibilities of meeting one another, and lessening the possible exposures to CoViD-19 which could be gotten during classes or while on their way to school. Thus, distance education is an effective alternative means to deliver knowledge and facilitate learning during periods of educational disruptions.

Distance learning is a lawful alternative to the usual face-to-face instructions amid the CoViD-19 Pandemic (Qazi, et.al., 2021). It also aids education to continue while preventing the spread of CoViD-19 (McCloskey, 2020).

Class size

In terms of class structure, PSHS follows the same class structure and program as that of during face-to-face learning, where each class has a maximum of 30 students for Grades 7-10 and 15 students for Grades 11 to 12. At Grades 11-12, students are already choosing to enroll either, Biology, Chemistry, Physics and Engineering, Technology, Agriculture, or Computer Science as their specialized subject. PSHS follows strict admission guidelines and maintains a quota for student-applicant to control the number of students in every class. Only the top 240 applicants will be considered Principal Qualifiers in the Main Campus while, top 90 or 120 for Regional Campuses (pshs.edu).

Angeles City Science High School, being under DepEd, also follows the same policies in terms of class size and other programs with few exceptions on the offerings of specialized Science subjects in all grade levels. It is the only public school in Angeles City that offers Science, Technology, Engineering, and Mathematics strand in Senior High School. Just like PSHS, ACSHS also has screening guidelines for student-applicants which only allows students from the upper 20% of the school's graduating class with grades not lower than 80 to be admitted. They also have qualifying examination prior to admission. Nonetheless, they maintain an average class size of 40 students per section.

In terms of class size, DepEd schools adhere to House Bill No. 437 otherwise known as "The Public School Class Size Law of 2016" which reiterated standard class size of 35 to 50, utmost, number of learners. Moreover, it is still noticeable that special science institutions have smaller class size than regular public schools. Special Science Institutions, having smaller class size, are able to monitor closely students' progress, provide quality education, and address the needs of individual learners. Additionally, smaller class size goes along with different teaching styles, as well as more resources and energy.

This encourages students' participation and engagement in collaborative discussion practices which were shown to have a significant impact on students' achievement levels (Schaffhauser, 2019).
Several researches cited in the study of Blatchford & Russell (2018), showed benefits of having small class size in terms of teaching quality, teachers' given attention in addressing individual differences, and level of performance in the teaching and learning process. This is also supported by the study of Han and Ryu (2017) on Class size reduction.
The level of engagement of students in the learning process were also gauged through their weekly schedule of activities, as shown in Table 2.

Table 2. Number of learners per class

SCHOOL	CLASS SIZE
Philippine Science High School	30 for Grade 7-10 (maximum) 15 for Grade 11-12 (maximum)
Angeles City Science High School	40 in all grade levels (average)
Public Secondary School	45-50 in all grade levels (average)

Class Schedule

During CoViD-19 Pandemic, PSHS schedules each subject for 50 minutes per day, five days a week. Moreover, they only spend 50 minutes of this time for synchronous learning activities and the rest are for asynchronous learning. In ACSHS, specialized STEM subject is scheduled for 2-hour synchronous learning and 2-hour asynchronous learning per week. Scheduling of the 2-hour synchronous and asynchronous learning activity is prepared by the school.
In Public Secondary School, each subject is scheduled for 1 hour a day, 4 days a week. The first hour is allotted for module distribution (online and offline) and giving instruction to learners while the rest of the hours are mostly given for asynchronous learning activities. Teachers will decide on which day of the week they would conduct synchronous learning activities as long they follow the given schedule for their subject.

The class scheduling among the subject schools still adheres to the implementation of the learning delivery modality employed in their respective schools. Special Science Institutions are noticeably paying more time and importance on the conduct of synchronous learning activities as opposed to public secondary school – one factor that may contribute to higher level of achievement in Special Science Institutions despite of CoViD-19 situation.
Class scheduling is an essential component in the success of the teaching and learning process. This affects the pace of the interaction among learner-content, learner-teacher, and teacher-content, and cannot be undermined. The presence of a schedule design ensures that the learning content and strategies are in a format that supports and promotes learning (Rettig and Canady, 2013). Scheduling and students' achievement have a significant relationship. (Sisson & Sisson, 2015)

Table 3: Class Schedule

SCHOOL	CLASS SCHEDULE
Philippine Science High School	With **scheduled synchronous** learning activities per week
Angeles City Science High School	With **scheduled synchronous** learning activities per week
Public Secondary School	**No fixed schedule for synchronous** learning activities

Time Allotment per Subject

The time allotment for each subject was also considered to see possible similarities and differences on the implementation of distance learning delivery modalities among the subject schools, as presented in Table 4.

Table 4: Time Allotment per subject

SCHOOL	CLASS SCHEDULE	SYNCHRONOUS LEARNING
Philippine Science High School	250 minutes per week	50 minutes per week
Angeles City Science High School	240 minutes per week	120 minutes per week
Public Secondary School	240 minutes per week	**Varies** depending on the teacher

In employing distance learning, each subject in PSHS is being taken for 50 minutes per day, five days per week. For synchronous classes, teachers would meet their students once a week for 50 minutes while the rest of the hours are allotted for asynchronous learning activities. Teachers can decide on what day of the week they would meet their students; moreover, the general class program is still prepared by the school.

PSHS being under Department of Science and Technology has different system, curriculum and policies. During face-to-face learning, more time is being allotted for laboratory activities. The time to discuss Science concepts are also being focused because of the year-round implementation of the curriculum.

ACSHS follows the time allotted for synchronous and asynchronous learning activities prepared by the school. For STEM specialized subjects, ACSHS allotted two hours of synchronous learning per week while for non-specialized subject, one-hour synchronous learning is being given. ACSHS considers the suggested screen time for learners in conducting synchronous classes. Since teachers can decide which day of the week they would conduct synchronous learning, students can choose to attend one specialized subject and one non-specialized subject or three non-specialized subjects in one day to limit the screen time of learners to three hours for synchronous learning activities.
In public secondary school, each subject is scheduled for an hour a day, 4 days a week. This includes both synchronous and asynchronous learning activities. Moreover, though synchronous learning is advised, it is still not mandatory to be fair to those who are less fortunate to have access to online learning.

In terms of the subject offering, PSHS offers each subject for one curricular year both in Junior and Senior High School. Unlike in DepEd schools, the subject Science is being offered on spiral progression approach in Grades 7-10 while in Senior High School, all subjects are being offered in semestral basis. PSHS curriculum contents are also far more complex than DepEd's. The subject Inorganic Chemistry, for example, is being taught in Grade 11 in public schools while in PSHS, it is taught in Grade 9 level only. Chemistry contents on the succeeding years are far more advanced in nature.

This implies that knowledge acquisition and retention can be better achieved through prolonged time allotment for each competencies and most likely thru variety of activities for enrichment exercises.
The time allotments for each subject per week among the subject schools are almost the same. Moreover, PSHS have stretched time assigned for each learning competencies since each subject is being taken for one academic year.

Teachers' Preparation

Teacher's preparation also plays vital role in teaching and learning. It makes the lessons more meaningful and ensures worthwhile time of students in classroom (Huntington Learning Center, 2019). Accordingly, well-prepared teachers matter in lifting students' achievement. Thus, this was also considered in the study.

Table 5: Teachers' Preparation

SCHOOL	TEACHING LOADS
Philippine Science High School	3-4 (for teachers with no other designation)
Angeles City Science High School	5 loads for class advisers; 6 teaching loads for non-advisers
Public Secondary School	5 loads for class advisers; 6 teaching loads for non-advisers

Typical PSHS-CLC teacher would have three to four teaching loads and teach three hours per day or 15 hours per week, maximum of 18 hours if there is no other designation or work-related task such as advisorship and the likes. These teaching hours include the time spent for both synchronous and asynchronous learning activities. Teachers in PSHS can teach multi-grade level depending on their area of specialization.

ACSHS, just like PSHS and other DepEd schools, is using Division made modules written by selected teachers from different schools; moreover, since ACSHS is the only school that offers STEM strand in Angeles City, the writers on the specialized subjects are the subject teachers from that school itself, following the approval of the Division Office.

ACSHS also gives 5 teaching loads for class advisers, and 6 loads for non-advisers. Hence, they also consider their learning action cell (LAC) sessions as one teaching load as they perform it almost on a weekly basis to aid for teachers' professional development, and provide assistance, peer coaching and mentoring.

ACSHS is considered as public school under DepEd but is also characterized as Special Science School because of its achievements and program for Science Education; hence, it fills the gap between Philippine Science High School and regular public secondary school.

An observable difference was observed in the class structure and teaching loads of PSHS and public secondary school. Based on DepEd Memorandum No. 291, s. 2008, "public school teachers shall render utmost six (6) hours of actual teaching a day and two hours of work within or outside the school premises to complete the required 8 hours of workday." Advisorship and/or other special assignments, on the other hand, are considered as one teaching load. Each subject in public secondary school is being taught one hour a day, 4 days a week.
Special Science Institution assigned lesser teaching loads to provide more time for teachers' preparation in class. Special Science Institutions conduct synchronous discussions per week to provide instruction, guide learners on difficult topics, and provide clarifications and further discussion of the lesson. According to the informants, during synchronous classes, teachers create their own PowerPoint presentation, obtain ready-made videos on the internet related to the topic, or sometimes, do their self-made videos to make it more interesting, meaningful and understandable for the learners. This also provides them opportunity to maximize their allotted time for synchronous meeting per week.

Thus, it can be inferred that the number of teaching loads and class preparation of teachers matter in the effective delivery of learning. This leads to students' higher level of achievement as well as knowledge acquisition and retention.

This is supported by the Department of Education's initiatives to take into consideration how heavy workloads might affect teachers resulting to less time and attention in the delivery of their core function. These led to a series of review of forms and processes and revisit of ancillary services to develop policies that allow a teacher to focus in teaching. (DepEd Order 4, S.2014 DepEd Order 58,S.2017, and DepEd Order 11, S.2018).

Teachers' Knowledge on the use of Learning Delivery Modality

CoViD-19 Pandemic reshaped the Philippine education system when community quarantine forced the closures of school and forbade mass gatherings. Learning suddenly became distant. The Department of Education prepared teachers for this sudden shift in the education sector by crafting the Learning Continuity Plan for School Year 2020-2021.

Teachers are not all born digital natives. Some of them belong to the group of digital immigrants as perceived on their age group (Cut, 2017 and Ch'ng 2019). By knowing their level of knowledge on the different learning delivery modalities, indicated in the LCP for SY 2020-2021, better understanding on how learning is being carried out by different institutions during this time of CoViD-19 Pandemic can be attained.

To further understand if the teachers from the subject schools know how to perform the learning delivery modality in their respective schools, their level of knowledge on these modalities were considered.

Table 6 shows that the three subject schools are equally knowledgeable on the implementation of the different learning delivery modalities during CoViD-19 Pandemic.

Table 6 ***Level of Knowledge on LDM***

Learning Delivery Modalities	PSHS		ACSHS		PSS	
	mean	**VD**	**mean**	**VD**	**mean**	**VD**
Face-to-Face	3.83	VMK	3.63	VMK	3.61	VMK
Blended Learning						
BL: Face-to-face Instruction + Remote (Non-digital/Offline Instructional Materials	3.00	K	2.63	K	2.78	K
BL: Face-to-face Instruction + Remote (Non-digital Instructional Materials + Digitalized/Digital Offline Materials)	3.00	K	2.63	K	2.89	K
BL: Face-to-face Instruction + Remote (Digitalized/Digital Offline Materials + Online Synchronous and Asynchronous Activities)	3.17	K	3.13	K	3.06	K
BL: Face-to-face Instruction + Remote (Online Instructional Materials + Online Synchronous and Asynchronous Activities)	3.00	K	3.00	K	3.06	K
Mean Score	**3.04**	**K**	**2.85**	**K**	**2.95**	**K**
Distance Learning						
DL: Purely Offline Instructional Materials + Print Learning Activities	3.00	K	3.00	K	3.06	K
DL: Offline (Non-digital) Instructional Materials + Online Synchronous and Asynchronous Learning Activities	3.08	K	3.25	K	3.28	VMK
DL: Offline (Non-digital and Digital) Instructional Materials + Online Synchronous and Asynchronous Learning Activities	3.25	K	3.25	K	3.22	K
DL: Purely Online Instructional Materials and Online Synchronous and Asynchronous Learning Activities	3.58	VMK	3.00	K	3.11	K
Mean Score	**3.23**	**K**	**3.13**	**K**	**3.17**	**K**
Homeschooling	2.33	LK	2.38	LK	2.72	K
Over-all Mean	**3.13**	**K**	**3.00**	**K**	**3.08**	**K**

Legend

Numerical Rating	**Verbal Description**
3.26 - 4.00	Very much knowledgeable (VMK)
2.51 - 3.25	Knowledgeable(K)
1.76 - 2.50	Less knowledgeable (LK)
1.00 - 1.75	Not knowledgeable at all (NK)

Face-to-Face Learning

Table 9 shows that the teachers from the subject schools were very much knowledgeable on face-to-face learning (mean scores of 3.83 in PSHS, 3.63 in ACSHS and 3.61 in PSS). For quite some time, this has been the modality employed in the delivery of learning. Moreover, despite of the teachers' high level of knowledge on this type of modality, CoViD-19 restrictions forbid its implementation in the current academic year.

Face-to-face learning posters effective learning especially to those learners who really need supervision and support network (Cooper 2018). It combines different ways of learning and allows access to more information through teacher and students' body language and voice for richer understanding (Headspace National Youth Mental Health Foundation Ltd 2021). Students do not have to study on their own and put much time on understanding certain topic since there is real-time interaction with the teachers. Learners also gained greater level of interaction with their fellow students which can develop their higher-level thinking, oral communication, leadership, and social skills (Cornell University 2021).

Blended Learning

The respondents are equally knowledgeable on this type of learning delivery modality with slight difference on the mean scores of the subject schools (PSHS = 3.04; ACSHS = 2.85; PSS = 2.95).

Blended learning, as indicated on the learning continuity plan for school year 2020-2021, is a combination of face-to-face and distance learning. The respondents have higher knowledge on employing distance learning as shown on their mean scores (PSHS 3.23, ACSHS 3.13, PSS 3.17). Moreover, since the "how" of face-to-face learning during CoViD-19 Pandemic is still unknown, the level of teachers' knowledge on blended learning is still lower than on distance learning delivery modality.

Distance Learning

Among the different learning delivery modalities during CoViD-19 Pandemic, distance learning appeared to be the modality employed in all subject schools. Although they have equal knowledge on its implementation (mean scores of 3.23 in PSHS, 3.13 in ACSHS, and 3.17 in PSS), their means of implementing this modality still reflected on the type of distance learning indicated on the table.

In PSHS, the teachers are very much knowledgeable on purely online instructional materials and online synchronous and asynchronous learning activities (mean score = 3.58). Majority of the learning activities in PSHS are being done online. They were using a more comprehensive, interactive and centralized Moodle-based platform called "Pisay Khub". All instructional materials, online and offline, as well as students' output are being sent and retrieved from this learning management system.

Synchronous learning is the means of teachers in PSHS to provide online lectures related to competencies, answer students' questions on modules, and discuss concepts about the topic. During synchronous meeting, video clips, teacher-made PowerPoint, and PSHS modules are usually being used. The meeting is being done through Google Meet or Zoom apps. Perfect attendance is usually obtained during synchronous learning; however, in cases where there were learners who failed to join the class, recordings of the virtual discussion, together with other learning materials, are being sent to the parents via email.

With this "New Normal", PSHS gives more time for asynchronous learning activities to provide learners opportunity to accomplish their modules and other tasks. Aside from the instructional materials sent through Pisay Khub, hard copy of modules can also be requested from the CID office/Supply and Property Division and be sent to learners via courier.

Public Secondary School teachers were very much knowledgeable on offline (non-digital) instructional materials plus online synchronous and asynchronous learning activities (mean score = 3.28). The result of the survey conforms with the learning continuity plan presented by the school in compliance with Division Memorandum No. 180, s. 2020 of the Division of Pampanga. The LDM employed in public secondary school also considered the readiness of students to distance learning since majority of the learners in regular public secondary school belongs to low-income households and not privileged to have good and/or stable access to internet and gadgets (Socioeconomic Status to Education, 2016; Villanueva & Nunez, 2020). Equality among learners is one reason considered why synchronous learning activity or online discussion is not made mandatory for regular public secondary school.

Instructions for asynchronous learning activities are included on the self-learning modules written by selected teachers from the Division and are reinforced through Facebook and other social media platforms. In the study of Villanueva & Nunez (2020), majority of the students agreed that the access to devices and the internet is more expensive than using offline materials. They also mentioned that they are encountering connectivity issues during their e-Learnings. Another reason why many public school students opted to have offline self-learning modules and asynchronous learning activities.

ACSHS teachers, although equally knowledgeable with PSHS' on offline (non-digital) instructional materials plus online synchronous and asynchronous learning activities, showed slight difference on the mean score (ACSHS = 3.25; PSHS = 3.08). This means that more students in public secondary school and ACSHS are getting hard copy of module than in PSHS.

In ACSHS, more time is given for synchronous learning in specialized subjects as compared to other non-specialized subjects. Students would take 2 to 3 hours of synchronous learning per day - one specialized and one non-specialized or 3 non-specialized subjects. The scheduling of synchronous classes considered the suggested maximum screen time of 4 hours per day for Grades 9-12 learners (Undersecretary Pascua as cited in the report of Yumol, 2020). Synchronous learning activity sheets are uploaded on Google Classroom while meetings are done through Google Meet or Zoom application. Though ACSHS has no personalized learning management system like PSHS, its students are provided with G Suites account that gives them free access, unlimited use, larger memory and wider scope on Google applications. Students' G Suites account are being used in all activities related to teaching and learning, especially during synchronous meeting, attendance monitoring, submission of outputs and securing students' information.

For those students under asynchronous learning, hard copy of modules were being distributed to and retrieved from parents at school on scheduled dates. Though all students have access to internet, some opt to have hard copy of modules, especially those who live in nearby area due to health concern. Module outputs for asynchronous learners are sent on the designated boxes at the school premises.

The respondents were also equally knowledgeable on the implementation of distance learning in their respective schools. Their level of knowledge on this type of modality also demonstrates their level of awareness and experience on its implementation.

Special Science Institutions are getting almost, if not, 100% attendance of learners during synchronous meeting which means students from these institutions have the device and the access to do synchronous learning. Their students are supported and well-provided with the necessary tools needed to embrace distance learning. Unlike in regular public secondary school, synchronous learning is, most of the time, getting only about 50% attendance from the total population of the class. This may mean that students from regular public school are not all privileged to have means and access to attend synchronous learning activities.

Meanwhile, what the special science institution is practicing now in conducting distance learning is supported by the study of Bao (2020) that also suggests two-phases of teacher, offline and online. The descriptions of the phases are likened to synchronous and asynchronous activities in distance learning delivery modality. Online and offline teaching are equally important to achieve better student's outcome.

Nonetheless, regardless if it is synchronous or asynchronous learning, each institution is adjusting based on the capabilities and availability of resources of their learners to continue education.

Some advantages and disadvantages on the implementation of distance learning were pointed out during the interviews. Teachers from Special Science Institutions viewed the current learning set up as eye-straining due to longer screen time; some of the Science Processes Skills and Concepts are also being underdeveloped due to limited contact time with learners and hands-on experiences especially in Chemistry, Biology and Physics. More laboratory activities are being left-out, learning is more on theoretical rather than practical, assessment is harder to facilitate, and students are getting stressed and overworked because of the activities on modules they need to accomplish with less supervision and limited time allotment. According to the informants, there are Science skills that cannot be learned even if there is simulation, videoclips and the likes, unless the student really had hands-on experience on things which conform to the theory of experiential learning.

In terms of advantages, teachers viewed the current situation as a driving force to learn technology and be at far with the digital natives they are teaching. The CoViD-19 Pandemic also developed the personality of teachers in terms of their confidence in front of the camera, their remote communication skills, and their flexibility in doing other tasks. Also, on the part of the teacher, Science is easier to teach now because of the ready-made self-learning modules.

On the part of the learners, now a days, they are being more creative since they need to improvise to perform the concept with less resources available. Also, students who fail to join virtual class can still have the chance to view the recordings and listen to the discussion first hand because of technology.

Homeschooling

Among the different flexible learning delivery modalities in times of CoViD-19 Pandemic, homeschooling appeared to be the least known modality among teachers from PSHS and ACSHS (mean scores PSHS = 2.33; ACSHS 2.38). Public secondary school teachers, on the other hand, appeared to have more knowledge on homeschooling (mean score = 2.72) than special science institutions.

Homeschooling refers to students learning at home with their parents or guardian. The lessons are partly taught by their parents and partly by the school (Korkmaz & Duman, 2014). The result of the survey is manifested on the current learning set up in public secondary school. Homeschooling is somehow already part of the distance learning environment where parents take an active role in the education process. In the new normal teaching among public secondary schools, the role of parents is magnified in the continuity of education amid CoViD-19 Pandemic (Alicamen & Abadiano, 2020). With the restrictions set by the IATF, parents are the ones who personally received modules and returned outputs at school. They are also the eyes of the teachers at home in monitoring their children's academic progress.

This implies, in special science institutions, the teachers have greater interaction with the learners and do not require heavy assistance from parents in the delivery of instruction. This can also be attributed to the scheduled synchronous learning activities per week and learning management tools that these institutions were using.

Teachers' Readiness on Flexible Learning Delivery Modalities

Effective teaching and improvement on students' outcome resulted from teacher's readiness (Lynch, et al 2017). The readiness of teacher greatly influences the teaching and learning process, so it is important to identify the areas that may help or may hinder successful learning in the midst of CoViD-19 Pandemic.

Table 7.TPCK Assessment on Teachers

Items	PSHS		ACSHS		PSS	
	mean	VD	mean	VD	mean	VD
Technological Knowledge	4.11	MK	3.82	MK	3.73	MK
Pedagogical Knowledge	4.35	VMK	4.21	VMK	4.40	VMK
Content Knowledge	4.53	VMK	4.33	VMK	4.37	VMK
Technological Content Knowledge	4.38	VMK	4.23	VMK	4.32	VMK
Pedagogical Content Knowledge	4.42	VMK	4.30	VMK	4.34	VMK
Technological Pedagogical Knowledge	4.60	VMK	4.30	VMK	4.31	VMK
Technological Pedagogical Content Knowledge	4.49	VMK	4.36	VMK	4.23	VMK

Legend

Numerical Rating	Verbal Description	Interpretation
4.21 - 5.00	Very much knowledgeable (VMK)	very much ready
3.41 - 4.20	Moderately knowledgeable (MK)	moderately ready
2.61 - 3.40	Knowledgeable (K)	ready
1.81 - 2.60	Less knowledgeable (LK)	slightly ready
1.00 - 1.80	Not knowledgeable at all (NK)	nor ready at all

Table 7 shows that teachers in Special Science Institutions and public secondary school have equal knowledge on TPCK items. It showed that the respondents are very much knowledgeable on pedagogical (mean scores PSHS = 4.35, ACSHS = 4.21, PSS = 4.40), content (mean scores PSHS = 4.53, ACSHS = 4.33, PSS = 4.37), technological content (mean scores PSHS = 4.38, ACSHS = 4.23, PSS = 4.32), pedagogical content (mean scores PSHS = 4.42, ACSHS = 4.30, PSS = 4.34), technological pedagogical (mean scores PSHS = 4.60, ACSHS = 4.30, PSS = 4.31), and technological pedagogical content (mean scores PSHS = 4.49, ACSHS = 4.36, PSS = 4.23) knowledges. They also equally have moderate technological knowledge (mean scores PSHS = 4.11, ACSHS = 3.83, PSS = 3.72) which pertains to their ability to use various technologies, technological tools, and associated resources (Kurt, 2019).

Based from the interaction of the TPCK of the teachers, teachers from the three schools have a high level of readiness in all components aside from technological knowledge. Teachers from special science institutions rated as having higher level of readiness in terms of technological knowledge than from public secondary school based on their average mean scores.

The use of technology was pointed out as one of the teachers' major challenges in teaching nowadays because they need to master the use of it to connect with their students in facilitating learning (Lagua, 2020). This conforms to the identified major challenge on the part of the teachers during the interviews. Dealing with students who are more knowledgeable on the use of ICT tools posters a great challenge on their part.

Technology skills are what the teachers need to implement teaching activities with digital technologies (Claro, et al., 2018). Technology levered curriculum and pedagogical innovation. The teacher's knowledge on the use of technology results to positive students' learning outcomes (Seufert, Guggemos & Sailer, 2020). Teachers frequently used technology to access and use electronic resources for teaching, classroom preparation, facilitation of higher-order thinking skills, support and document professional growth, analyze student data, support communication and others that support students' learning processes (Ottenbreit-Leftwich, et al., 2012; Chi & Wylie, 2014).

Teacher education programs prepared pre-service teachers on the use of technology for future classroom teaching (Jia et al., 2017). However, teachers still experience difficulty in using technology due to limited experience on its use (Strycker, 2020). Technology-related teaching skills are found to be a crucial aspect of teachers' competence in digital world (Sailer, et al., 2020). Although technology has already been part of people's everyday lives (Fraillon, et. Al, 2014), the use of technology in the teaching and learning has not been prevalent in teacher education and school resulting to lesser technology-related teaching skills than their basic digital skills (Sailer, Murbock & Fischer, 2021).

In the United States, integration of Computer-based technology in teacher education program started around early 2000 for their K-12 curriculum (Toledo, 2016). In the Philippines, restructuring of basic education curriculum to integrate technology in teaching was conceived in 2002 and was planned to fully operate by the year 2009 (Bonifacio, 2013). This action is in compliance to Republic Act 8525 in 1998 that sought to upgrade and modernize public and private schools. It is also in 2002 when University of the Philippines Institute of Science and Mathematics Education (UP-NISMED) integrated ICT in Basic Education Curriculum.

Considering the age of the respondents in the study, 6 out of 12 or 50% of the teachers from PSHS, 5 out of 8 or 63% from ACHS, and 15 out of 18 or 83% from public secondary school aged 30 years old and above and are most likely graduates of Bachelor's Degree prior to the intense use and implementation of ICT in teacher education program. Computer subject included on the curriculum during the early 2000s only taught basic knowledge on the use of computers especially to those non-computer related courses. Accordingly, those who were born from 1980-1990 are so-called first-generation digital natives while those who were born from 1990s onwards are called second generation digital natives (Cut, 2017 and Ch'ng 2019). The latter was found to be more experienced and technologically advanced than the first-generation digital natives.

The findings showed that teachers from the subject schools are technologically challenged. The study of Hero (2019) showed that technology integration has significant impact on teacher's teaching performance. Study showed that the integration of technology in teaching and the technology literacy of teacher directly affect students' academic achievement (Chang, 2012). With this, teachers must have high knowledge on the use of technology especially now that learning is remote.

It means that quality education can be best delivered with teachers having higher level of technological skills/knowledge. During this time of CoViD-19 Pandemic where everything is being done remotely, teachers should still be a step ahead of their students. Learners, nowadays, are the so-called digital natives, and the best way to reach out learners, communicate, and be at far with them is by equipping the teachers with the latest trends and use of technology.

Educational technology plays vital role in the delivery of instruction in remote teaching. J-PAL (2019) classified educational technology into four groups: access to technology such as gadget ownership and access to internet; computer assisted learning like the educational software; technology-enabled behavioral interventions like gamifications, and online learning such as the massive open online courses.
These areas were also considered in this study, and obtained the following results, as shown in Figure 1:

Figure 1. Teachers' Ownership

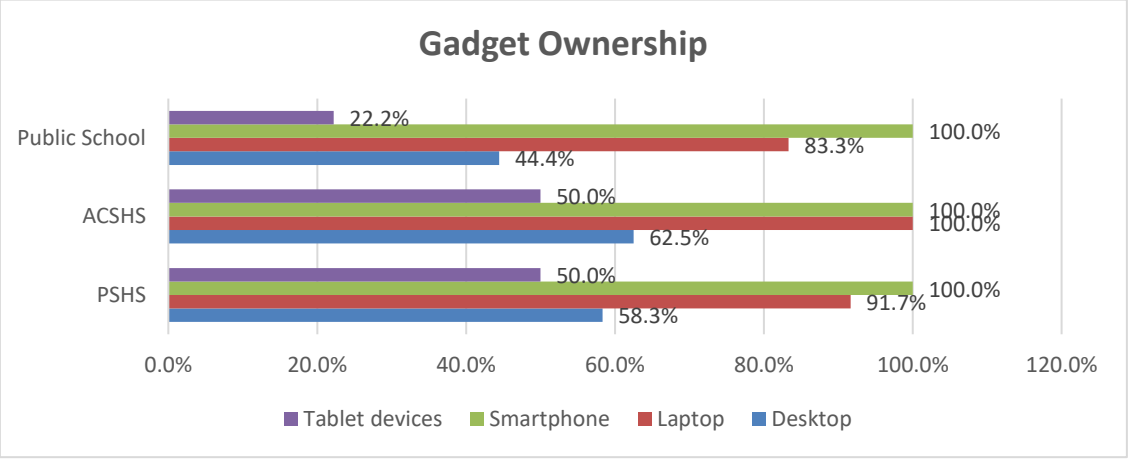


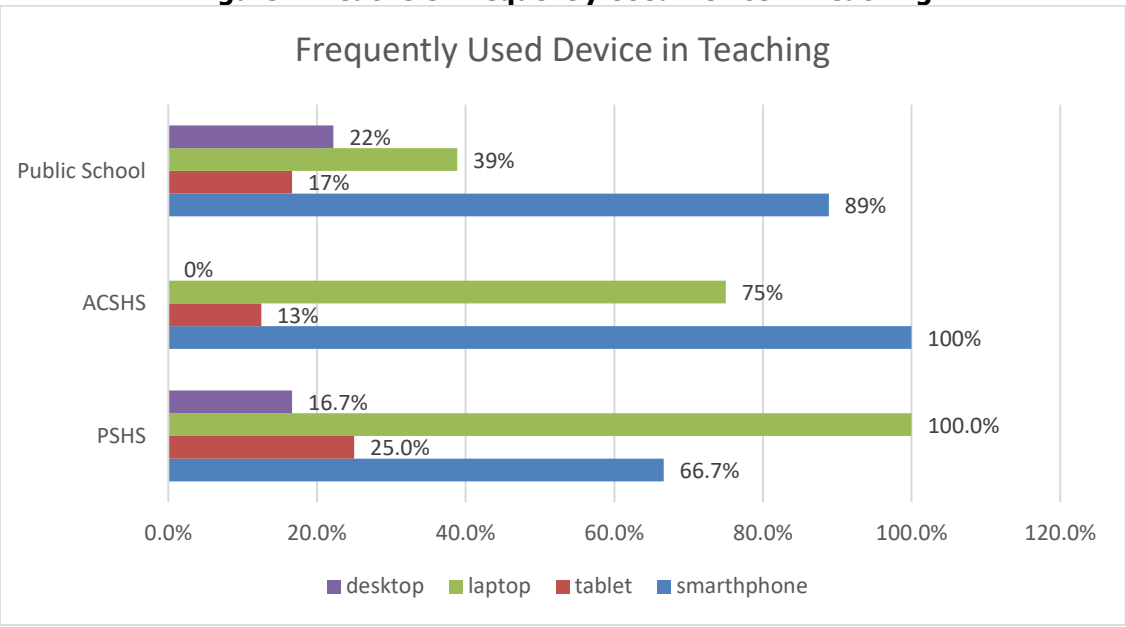
Figure 1 shows that 100% of the teachers in PSHS owned smartphones, 91.7% have laptops, and 58.3% have desktops. In ACSHS, 100% of the teachers owned smartphones and laptops and 62.5% also have desktops. In public secondary school, 100% of the respondents owned smartphones, 83.3% have laptops, and 44.4% also have desktops.

The figure shows that all teachers in Special Science Institutions and public secondary schools have their own smartphones. Majority of them also have their own laptops and only about half of the respondents have their desktops and tablet devices.

The introduction of smart devices as web 2.0 tools aids the technological age by facilitating communication and making everything easily accessible through the use of internet (Rajendran & Pagel, 2020).

One of the fastest growing segments is the smartphone industry (International Data Corporation, 2017) and with its growing demand, the phasing of the latest models of smart devices are also fast (Phantratnamongkol, Pang & Sanderson, 2018), making the older version much cheaper and affordable to majority of the consumers.
The most accessible to all teachers are smartphones.

Figure 2. Teachers' Frequently Used Device in Teaching



In terms of utilization, 100% of the respondents in PSHS were using laptops, 66.7% were using smartphones, 25% were using tablet devices, and 16.7% were using desktops in teaching and other school-related task. In ACSHS, 100% are utilizing smartphones, 75% for laptops, and 13% for tablet device in teaching. In public secondary school, 89% were using smartphones, 39% for laptops, 17% for tablet device, and 22% for desktops in performing their duties as teachers.

In can be inferred that in PSHS, the use of laptops, either personal or institutionally provided, is common and a necessity. This is the primary device used by teachers, supplemented by smartphones. The acquisition of laptops by all teachers might be attributed to either personal financial capability or provision of the institution since there are fewer teachers in PSHS, complimentary to the smaller number of students due to competitiveness of the entry requirements, as compared to a regular public high school. However, in public secondary schools, whether a special science school or a regular high school, it's smartphones which are predominantly utilized. This might be attributed to the availability of low-cost smartphones as opposed to laptops which are more expensive. Teachers have to acquire their own laptop through personal finances because the school might not have the funding to cater to all of its teachers.

It can be inferred that laptop and smartphones are common and most accessible to teachers in conducting distance learning modality, regardless of the school type. Teachers can access and bridge the gap between school and students with poor or limited internet connection or no computer at home by using phones (Holland & Kellogg, 2020). The survey of Pew Research Center (2021) showed that about 96% of household have access to mobile phone and 81% to a smartphone. This is also supported by the survey conducted by Social Weather Station (SWS) on students' used devices for distance learning. The data showed that 79% of the students used smartphones for distance learning while 13% used desktop or laptop (inquirer.net, March 2021). Dufty (2012) cited the use of smartphones, tablets, and other devices to reach social media and communicate with others. For the same purpose, social media had been used to access learners in distance learning. In the study of Cheung (2012), mobile devices were identified as the most commonly used devices in distance learning for learners. It was also found out on the same study that tablet devices are not yet widely used.

Aside from the gadget needed, internet connectivity is also important to facilitate distance learning. Data on the internet source of the subject schools are shown on Figure 5.

Figure 3: Teachers' Internet Connectivity

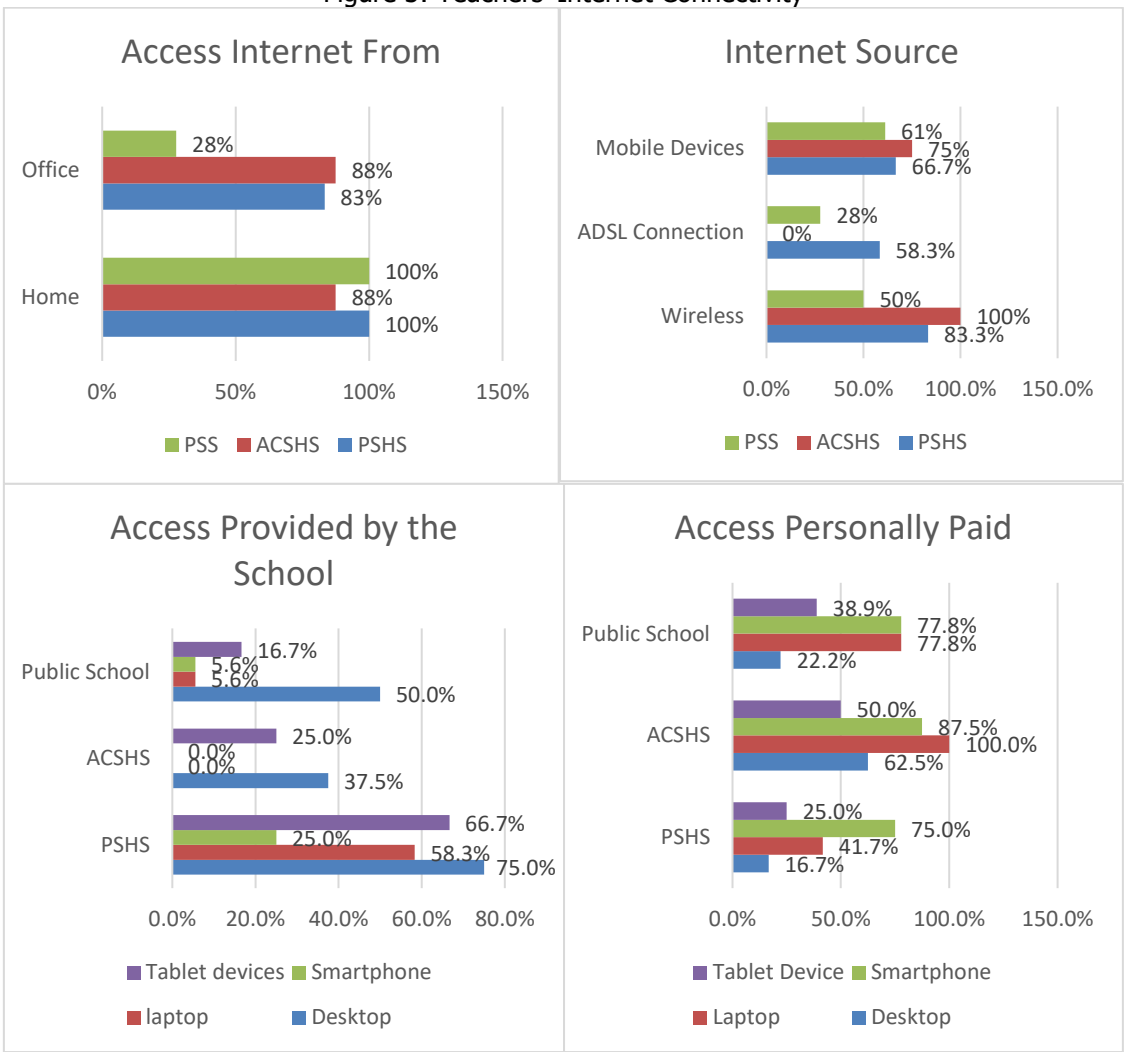


Figure 3 shows that 100% of the respondents from PSHS had internet access at home; 83.3% of them used wireless connection, 66.7% used mobile devices, and 58.3% had ADSL connection.

In school, 83% of the respondents were provided access to internet; 75% of them were provided internet on their desktops, 58.3% on their laptops, 25% on their smartphones and 66.7% on their tablet devices. The respondents who personally paid their internet access on their smartphones were 75%, 41.7% on their laptops, 25% on their tablet devices, and 16.7% on their desktops.

Majority of the sources of internet in PSHS had been through wireless and mobile device connections. Desktops with internet are mostly being used in school while access in mobile phones and laptops are mostly personally paid by teachers. The school also had wireless internet connection where tablet devices and laptops can be connected.

Based on the interviews, the informant mentioned that teachers in PSHS are not required to report to school to conduct online classes since they have full and stable internet connection at home to support synchronous learning. In Angeles City Science High School, 88% of the respondents responded of having internet access at home and 75% in the office or at school; Relatively, 100% of the respondents accessed internet through wireless connection and 75% through mobile devices.

At school, 37.5% of the teachers were provided with access to internet on their desktops, and 25% on their tablet devices. Majority of the internet access in all devices were personally paid.

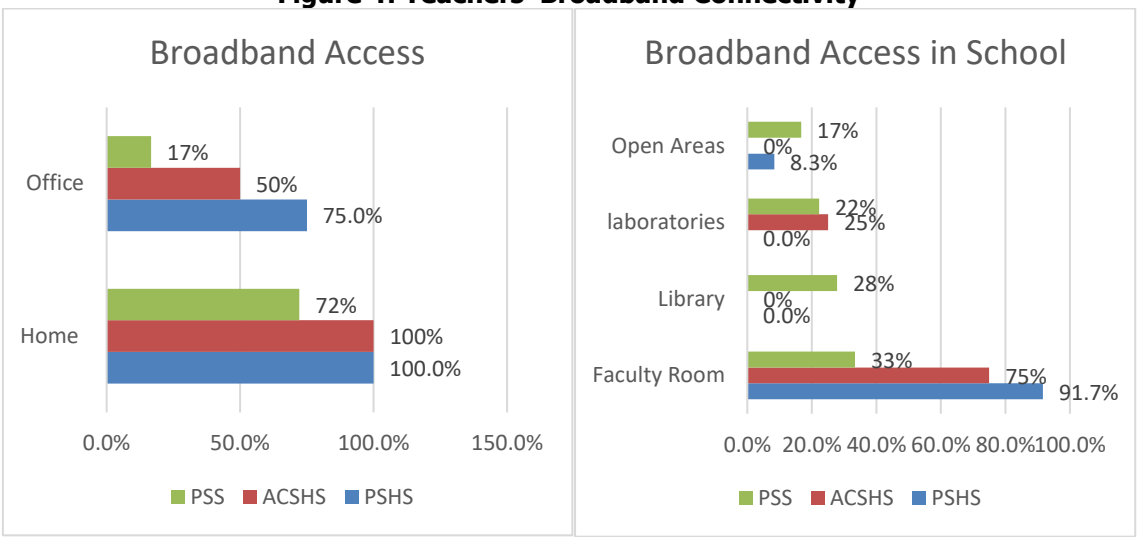
Teachers are scheduled to report to school once a week based on the subject area they are teaching. In cases where the teachers have scheduled synchronous online classes with their students, they can perform the activity while they are at school. Moreover, reporting to school, just to perform synchronous learning activity, is not mandatory. Teachers can do the teaching at home.

In public secondary school, 100% of the teachers are having internet access at home and only 28% of them have internet access in the office or at school. Another, 61% of them relied their internet access through mobile devices, 50% through wireless connection, and 28% through ADSL connectivity.

At school, 50% of those who received internet access were given connections for their desktop computer, 16.7% on tablet device, 5.6% on laptop and 5.6% on smartphones. Majority of the respondents' access to internet are also personally paid. This also justifies the reason why teachers in public school only report to school during preparation and distribution and retrieval of hard copy of modules. Synchronous and asynchronous learning activities

were being done at home. The Pew Research Center's Internet and American Life Project Online Survey of Teachers support that teachers have really good internet connection at home.
Presented on Figure 4 are the data of the respondents on broadband connectivity.

Figure 4: Teachers' Broadband Connectivity



Respondents from the two special science institutions all have broadband access at home, while only 72% of the respondents from public secondary school have broadband access. At school faculty rooms, 91.7% of the teachers from PSHS, 75% from ACSHS, and 33% from public secondary school had access to broadband connection.
The result implies that there is varying access types to internet as well as inequality in the provision of internet connectivity to public secondary teachers, as opposed to that of special science institutions. The lack of or minimal provision has prompted public secondary teachers to personally provide for their internet connectivity needs. Teachers who are respondents in this study and having attained higher education and regular income, also have broadband access at home as shown on the given graph.

Internet connection is an essential component of online distance learning and limited internet access would affect its implementation. This is particularly problematic for the Philippines, which was identified in the report of Akamai (2017) as having the lowest internet connectivity in Asia. Such challenges would cause equity gaps leading to compromised quality of learning and poor assessment results (Winthrop, 2020). In the study conducted by Purcell, Buchanan and Friedrich (2013) teachers use smartphone at higher rates specially in the teaching and learning processes. Aside from texting, they also use their mobile phones to access internet. Studies showed that those with higher incomes and educational attainments are most likely to have broadband access at home because of its affordability as compared to free wireless connection (Reddick, et. al., 2020; Srinuan & Bohlin, 2013). While wireless connection works for laptop and smartphones, broadband access works best for desktop as it is directly wired to the router which provides faster connectivity and is less susceptible to interference caused by crowded Wi-Fi signals. Broadband access at home is a necessity during CoViD-19 Pandemic for distance learning (Reddick, et.al., 2020). Additionally, broadband access is also a stable and reliable source of internet to facilitate stationary activities such as online learning and the likes (Weiner, et al., 2012).

Facilitating learning in new normal is not all about gadget ownership and access to internet. Another factor that should also be considered is the time allotted in using internet, not just to connect with students, but also, for health issues. Thus, the teachers' usage of internet is presented in Figure 5.

Figure 5: Teachers' Use of Internet

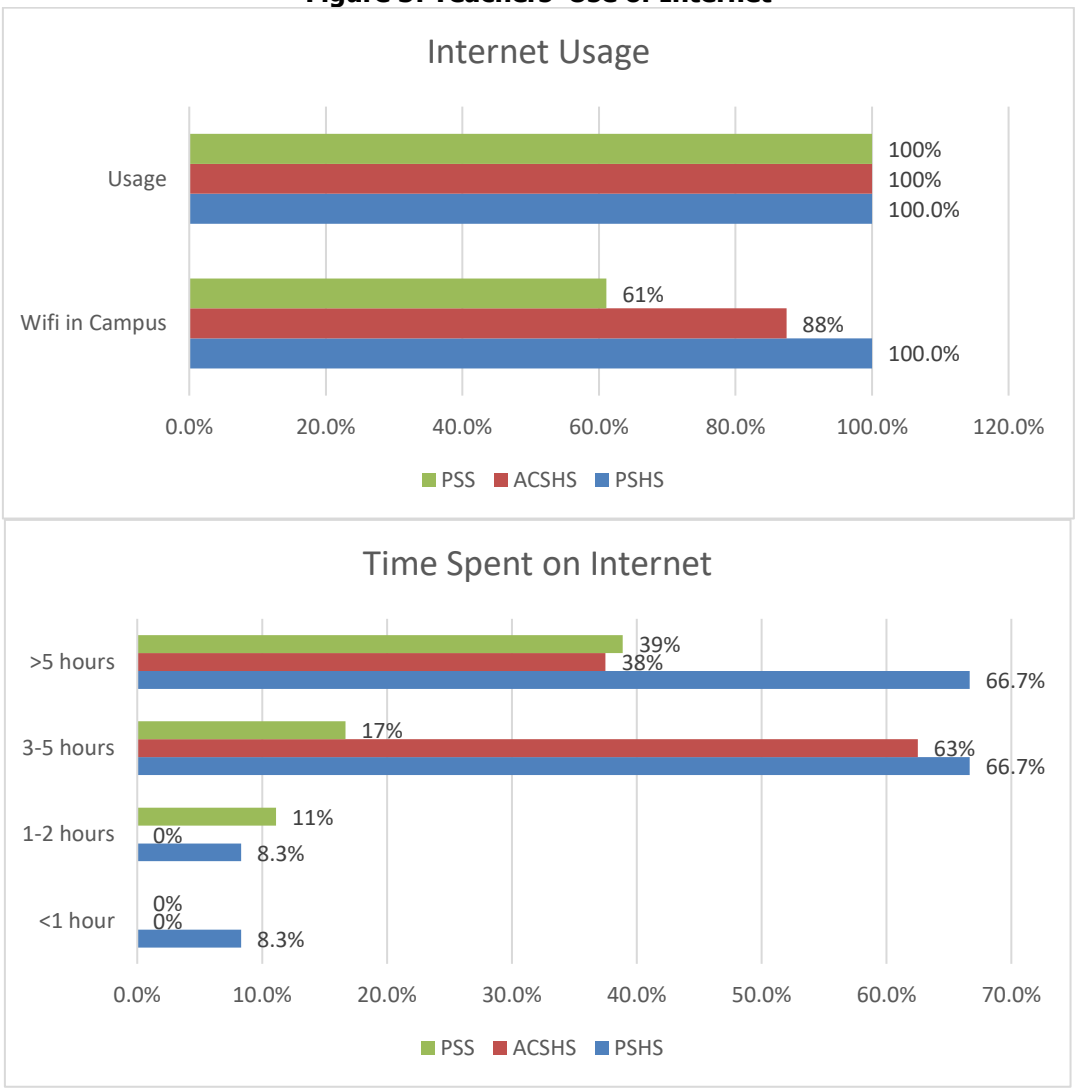


Figure 5 shows that all teachers from the subject schools were using internet daily. In PSHS, 100% of the respondents were using wireless connection, 88% in ACSHS, and 61% in public secondary school.

In PSHS 66.7% of the respondents were using internet for an average of 3 to 5 hours or more per day. In ACSHS 63% were using internet for an average of 3 to 5 hours while 38% for more than 5 hours per day. In public secondary school, only 39% were using internet for more than 5 hours or more a day, and the rest spent lesser hour on the internet daily.

The result on internet utilization is congruent with the learning activities conducted in each school. Special Science Institutions were conducting synchronous learning activities which require more hours on internet to communicate with learners while in public school, synchronous learning activities were optional. Another thing is that, Special Science Institutions used learning management system in doing not just synchronous learning but also asynchronous learning activities which include sending and retrieving learning outputs through digital means. In public secondary school, asynchronous learners were mostly given hard copy of modules at school and outputs were being sent in hard copy also. These are most likely some of the reasons why only few spend more time on internet daily.

Reid Health (2020) reported significant increase on screen time of adults since community quarantine was implemented. Teachers from the subject schools were aware of the health problem that excessive screen time may cause. They also considered the suggested screen time in performing synchronous online learning activity specially in Special Science Institutions. Moreover, screen time does not only include learning activities but also activities such as watching televisions, playing online games, browsing shops online, and the likes. Preventive medicine report showed association of screen time of more than four hours to depression (Madhav, Sherchand, SP, & Sherchan S., 2017) and other mental health issues (Schroder, 2018). Additionally, greater screen time is significantly associated with poor physical and mental health (Chassiakos, et al., 2016) as well as cardiovascular diseases (Lissak, 2018). Experts suggest to limit the screen to one to two hours outside work activities and spend more time on physical activities instead (Reid Health, 2020).

Internet connectivity is already a necessity especially now that learning is being done distantly. Digital learning requires skills on the use of online programs and offices. This is another important factor to consider in teaching distantly. It is as important as having gadgets and access to internet to facilitate learning. The teachers'

skills on the use of these technology tools in classrooms today showed their level of readiness on technological approach to learning as well as their capabilities and readiness to teach in the new normal, as presented in Table 11.

Table 8.Teachers' Skills on the Use of Online Programs and Offices

Programs and Offices	PSHS		ACSHS		PSS	
	mean	VD	mean	VD	mean	VD
Word Processor	4.92	VW	4.38	VW	4.44	VW
Spreadsheet	4.67	VW	4.13	W	3.94	W
Presentation (PowerPoint)	4.92	VW	4.38	VW	4.50	VW
Emails	4.92	VW	4.25	VW	4.22	VW
search engine	4.92	VW	4.38	VW	4.17	W
databases	3.83	W	2.88	S	3.28	S
multimedia authoring	3.33	S	2.75	S	3.17	S
graphic editing	3.33	S	2.88	S	2.72	S
digital audio	3.00	S	2.63	S	2.83	S
video editing	3.25	S	2.63	S	2.83	S
web page design	3.00	S	2.50	SE	2.22	SE
learning management system	4.17	W	3.38	S	2.78	S
Web 2.0 tools (wikis, blogs, networking and sharing tools)	3.92	W	3.38	S	3.22	S
Overall Mean	**4.01**	**W**	**3.43**	**W**	**3.41**	**W**

Legend

Numerical Rating	**Verbal Description**
4.21 - 5.00	I can use it very well (VW)
3.41 - 4.20	I can use it well (W)
2.61 - 3.40	I can use it satisfactorily (S)
1.81 - 2.60	I can use it to a small extent (SE)
1.00 - 1.80	I can't use it (U)

Table 8 shows that teachers from PSHS can use word processor (mean score = 4.92), spreadsheet (mean score = 4.67), PowerPoint presentation (mean score = 4.92), emails (mean score = 4.92) and search engine (mean score = 4.92) very well. They can also use databases (mean score = 3.83), learning management system (mean score = 4.17) and web 2.0 tools (mean score = 3.92) well; as well as to use multimedia authoring (mean score = 3.33), graphic editing (mean score = 3.33), digital audio (mean score = 3.00), video editing (mean score = 3.25), and web page design (mean score = 3.00) satisfactorily.

In ACSHS, respondents can use word processor (mean score = 3.38), PowerPoint presentation (mean score = 3.38), emails (mean score = 3.25) and search engine (mean score = 3.38) very well. They can also use spreadsheet (mean score = 3.13) well; data bases (mean score = 2.88), multimedia authoring (mean score = 2.75), graphic editing (mean score = 2.88), digital audio (mean score = 2.63), video editing (mean score = 2.63), learning management system (mean score = 2.38), and web 2.0 tools (mean score = 2.38) satisfactorily; as well as web page design (mean score = 2.50) to a small extent.

In public secondary school, respondents were capable of operating word processor (mean score = 4.44), PowerPoint presentation (mean score = 4.50) and emails (mean score = 4.22) very well; spreadsheets (mean score = 3.94) and search engine (mean score = 4.17) well; data bases (mean score = 3.28), multimedia authoring (mean score = 3.17), graphic editing (mean score = 2.72), digital audio (mean score = 2.83), video editing (mean score = 2.83), learning management system (mean score = 2.78) and web 2.0 tools (mean score = 3.22) satisfactorily; as well as web page design (mean score = 2.22) to a small extent.

The data showed that the respondents from the subject schools were equally very skilled and ready to word processor, PowerPoint presentation and emails. They also had equal skills and readiness on multimedia authoring, graphic editing, digital audio, and video editing. Respondents from Special Science Institutions can use search engine

very well while public school teachers can only use it well. PSHS is one step ahead of ACSHS and public secondary school in terms of using spread sheet, data bases, web page design, learning management system and web 2.0 tools. PSHS had slightly higher overall mean score than ACSHS and public secondary school (PSHS = 4.01; ACSHS = 3.43; PSS = 3.41). Higher mean scores correspond to higher level of readiness on the use of online programs and offices. These data mean that though the mean scores of all respondents fall under the same verbal description, it is still evident that Special Science Institution teachers are more skilled in using online programs and offices as than public secondary school teachers. This finding can be attributed on the daily learning activities the former performs while on distance learning such as synchronous meeting, use of learning management system, research activities, and the likes.

Computer skills are all the more becoming important for education especially in distance learning (Fairly, 2012). Moreover, based on the survey, teachers need more training to improve their skills and readiness on the use of online programs and offices to facilitate computer-assisted learning. This is also true on the findings of Suprabha, et. al (2017) on their study regarding readiness and utilization of computer-assisted learning among dental students and faculty. Preparing and connecting teachers and learners with the technology and resources needed will enable effective teaching (Piliouras, et al, 2015).

Social media used in instruction promote ICT integration skills and technology use in teaching and learning (Porto, et.al., 2011). The use of social media was found to be very effective in creating and disseminating collective knowledge (Na'ndez and Borrego, 2013). Furthermore, social media are beneficial to countries with poor resources and insufficient ICT-supported facilities (Attwood et al, 2013).

It can be inferred that the practices of teachers in their respective schools during distance learning is directly related to their skills on the use of online programs and offices. The more frequent they use the online programs and offices, the more skilled they become in using it.

In the conduct of distance learning where face-to-face instruction is not possible, the use of educational platforms aids the continuity of education amidst CoViD-19 pandemic. Among the most frequently used social media platforms were presented in Figure 8 as follows:

Figure 6: Teachers' Frequently Used Educational Platforms

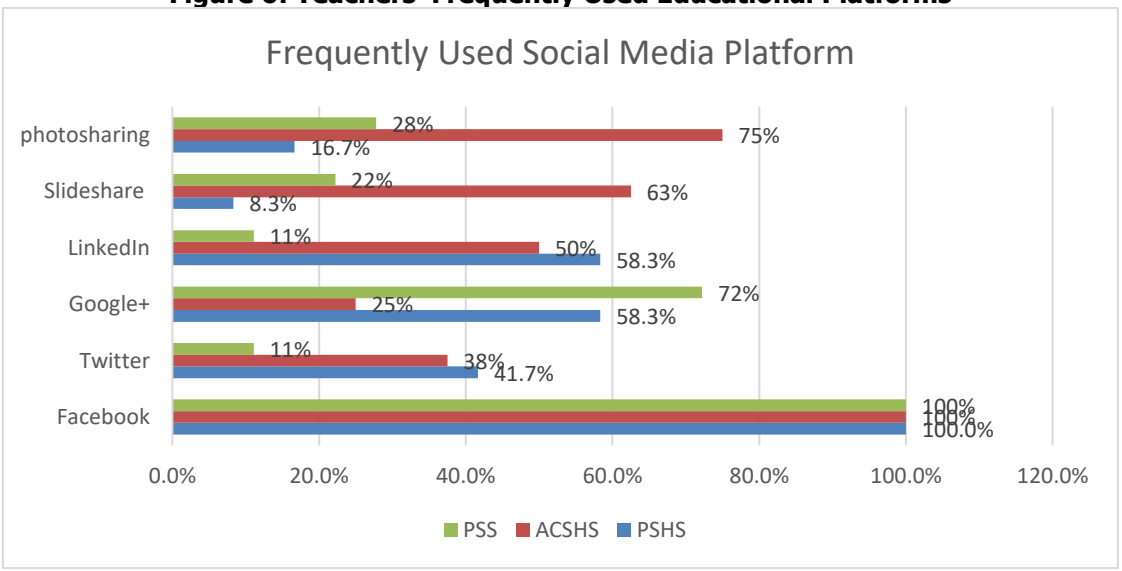


Figure 6 shows that teachers from PSHS were using Facebook, Google+, LinkedIn, and Twitter as social media educational platforms. Among these platforms, Facebook was found to be the most frequently used in education. Same is true with ACSHS and public secondary school.

ACSHS teachers also use Facebook, Photo sharing, SlideShare and LinkedIn as social media educational platforms but Facebook is the most frequently used one.

High level of percentage in public secondary school also marked the use of Facebook and Google+ as social media educational platforms. Hence, Facebook is still the most frequently used platform to aid education in the new normal.

It can be inferred from Figure 8 that all of the respondents use Facebook as educational platform regardless of the school type. To support this findings, MDR Teachers and Social Media Survey I (2018) identified teachers as heavy user of Facebook. Statistics from the third quarter of 2020 showed that 96% of the internet users in the Philippines have Facebook access (Sanchez, 2021). Thus, teachers use Facebook to access easily learners (Purcell, Buchanan and Friedrich, 2013). Parents and students are grouped in Facebook messenger to disseminate easily general information and instructions related to the teaching and learning process.

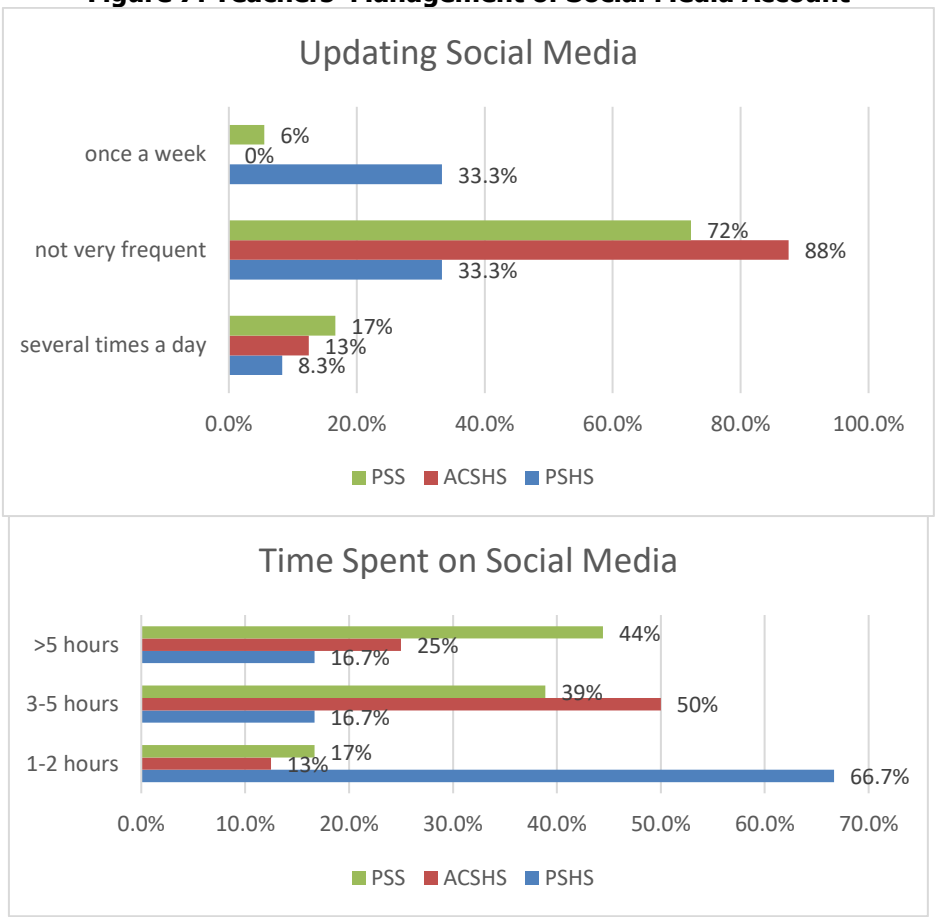
This usage means that Facebook is very popular and convenient to use since it could be accessed even with small amount of load and average internet signal. That the faculty are very well familiar in using Facebook, and it really helps attain the teaching and learning process and activities.

Teachers' knowledge on the use of social media in instruction was deemed very essential (Buus, 2012). Based on Figure 8, teachers from the subject schools were all frequently using Facebook as social media educational platform. During the interviews, it was mentioned that Facebook messenger is being used to communicate and reach out students who failed to attend synchronous online classes as well as in giving instruction to students with connectivity issues. Moreover, the use of Facebook is highly observed in public secondary schools due to the absence of specific and mandated learning management tools as that in special science institutions. It is also, at times being used in, sending and retrieving outputs especially to those students with limited access to internet. Facebook chat box can be used in answering queries of learners, setting learning goals, and monitoring learning progress (Smutny, P. & Schreiberova, P., 2020) as well as in creating course materials, conversing with others within short time, interacting with the lecturer's post and the likes (Alsaif, et. al., 2019).

Several researches cited in the study of Moorthy, et al (2018) showed high acceptability of Facebook around the world as one of the social networking services. In Malaysia, college and university students and lecturers are not just using Facebook to communicate with others but also in their teaching and learning process (Hamid, et al 2011; Statista.com, 2016). In Saudi Arabia, students effectively used Facebook tools like chat box, voice and videocalls to interact with other learners and lecturers during synchronous and asynchronous learning (Alsaif, et.al., 2019). It was also found on the same study that students' attitude towards learning was enhanced positively using Facebook and web 2.0 tools.

The frequency and the time spent by teachers in using social media account in teaching was also considered to further understand how they manage students' activities and monitoring without compromising their health which is presented in Figure 7.

Figure 7: Teachers' Management of Social Media Account



Although teachers in all subject schools used internet daily for about three or more hours, they still do not update their social media account frequently. In fact, 66.7% of the teachers from PSHS only spent 1-2 hours on social media while only 2 out of 12 respondents or 16.7% used it for 3-5 hours and another 16.7% for five hours or more. ACSHS and public secondary school spend more time on social media than PSHS because, PSHS usually uses Pisay Khub for sending and retrieving learning materials and students' output.

Based on MDR Teachers and Social Media Survey (2018), teachers of all ages are very active in social media, not just for personal use, but also in preparation of the class resources as well as personal and professional development such as enhancement of skills and interaction with other educations, and sometimes use social media as platform for teaching and learning.

Also indicated on the same report, teachers who have been in the profession for more than 11 years spend more hours on social media than those new to the profession. On this study, 33% of the respondents from PSHS,

25% from ACSHS and 50% from public secondary school are teaching for more than 11 years; hence, higher percentage of the teachers in public school were using social media for more than 5 hours a day.

It can be inferred that teachers seldom update their social media account and the time they spent on the use of it are mostly for educational purposes to safeguard their health as they perform their duties online.

In distance learning, students are being monitored and taught through the use of technology-enabled learning environment. The way students learn depends on how they were taught. The experience of teachers in using these technology-enabled learning environments plays important role in today's teaching and learning process.

Table 9. *Experience on Technology-enabled Learning Environment*

Technological Learning Environment	PSHS		ACSHS		PSS	
	mean	VD	mean	VD	mean	VD
e-classroom facilities	5.33	E	4.25	G	3.72	N
computer laboratories	5.25	E	4.00	N	4.00	N
email services	5.92	E	4.50	G	4.00	N
Learning management system	5.25	E	4.63	G	4.11	N
e-portfolio	4.58	G	4.00	N	4.00	N
network bandwidth/speed of internet	4.75	G	4.13	N	3.33	F
Wi-Fi access	4.42	G	4.00	N	3.72	N
online or virtual technologies	5.00	G	3.88	N	3.83	N
access to software	5.25	E	3.88	N	3.61	N
Download and use of free and open-source software for teaching and learning	4.75	G	3.50	N	3.39	F
support for maintenance and repair of ICTs	4.92	G	4.13	N	3.17	F
Access to data storage	5.25	E	4.25	N	3.33	F
Data Visualization software	4.75	G	3.63	N	3.22	F
Citation/reference management software	4.67	G	3.88	N	3.39	F
plagiarism detection software	5.42	E	3.88	N	3.06	F
Institutional repository for sharing of research	4.83	G	3.63	N	3.11	F
e-journals	4.92	G	3.63	N	3.28	F
e-books	5.08	G	3.63	N	3.33	F
citation databases	5.00	G	3.63	N	3.17	F
e-newspapers	4.33	G	3.63	N	3.11	F
e-thesis and dissertations	4.25	N	3.38	F	3.17	F
Patent database	4.33	G	3.38	F	3.00	F
e-proceedings of conferences	4.08	N	3.63	N	3.33	F
Statistical databases	4.00	N	3.63	N	3.22	F
Overall Mean	**4.65**	**G**	**3.86**	N	**3.30**	**F**

Legend

Numerical Rating	**Verbal Description**
5.16 - 6:00	Excellent (E)
4.33 - 5.15	Good (G)
3.50 - 4.32	neutral (N)
2.67 - 3.49	fair (F)
1.84 - 2.66	poor (P)
1.00 - 1.83	not available (NA)

Table 9 shows that PSHS teachers had excellent experience on e-classroom facilities (mean score = 5.33), computer laboratories (mean score = 5.25), email services (mean score = 5.92), learning management system (mean score = 5.25), access to software (mean score = 5.25), access to data storage (mean score = 5.25), and plagiarism detection software (mean score = 5.42). ACSHS teachers had good experience in e-classroom facility (mean score = 4.25), email services (mean score = 4.50), and learning management system (mean score = 4.63). Teachers from public secondary schools had neutral experience on the e-classroom facilities (mean score = 3.72), computer laboratories (mean score = 4.00), email services (mean score = 4.00), learning management system (mean score =

4.11), e-portfolio (mean score = 4.00), wi-fi access (mean score = 3.72), online or virtual technologies (mean score = 3.83), and access to software (mean score = 3.61).

These results showed that the level of experience of teachers on technology-enabled learning environment varies among the subject schools. PSHS teachers are more experienced in terms of technology-enabled learning environment than ACSHS' (overall mean of 4.65 PSHS and 3.86 ACSHS). On the other hand, ACSHS teachers' level of experience in technology-enabled learning environment is still higher than those from regular public school (overall mean of 3.86 ACSHS and 3.30 Public School).

Teachers' level of experience on technology-enabled learning environment also corresponds to their level of readiness in implementing flexible learning delivery modalities. The level of exposure of teachers on the use of these different technology-enabled learning environments determines their readiness and confidence on using these modalities in class to communicate with learners and deliver quality education amidst CoViD-19 Pandemic.

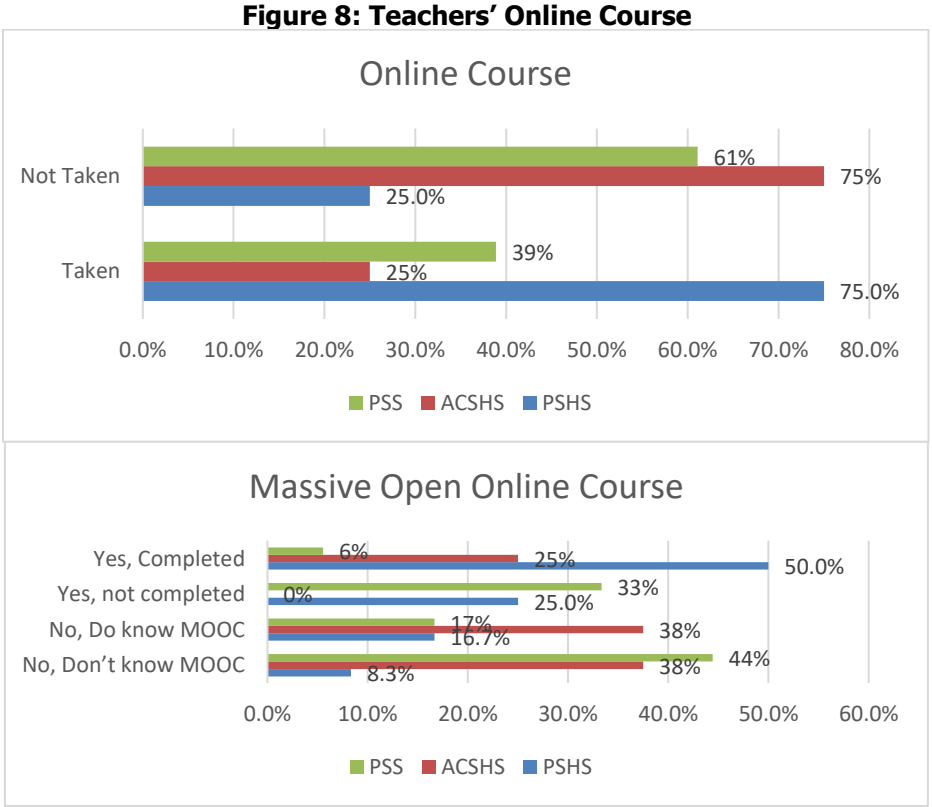
The findings of the survey can be explained by the structure of teaching and learning in Special Science Institution where the use of enhanced and more interactive learning management system is being enforced. Special science institution teachers are conducting synchronous classes and using learning management system in teaching distantly, making them more exposed on the use of these technology-enabled learning environment.

The data on the table also showed a lot of areas needed to be improved on the part of the teacher to aid in teaching amidst new normal. Accordingly, this technology-enabled learning environment posters challenge to teachers to become more proficient in the use of ever-changing technology to aid distance learning (Manzoor, 2016).

With the new set-up in education due to CoViD-19 pandemic, a lot of online courses were initiated to capacitate teachers on their needed assistance to employ effectively distance learning. Online courses provide opportunity for professional growth among teachers. It helps them gain more skill and equip themselves with additional knowledge on certain topic at the comfort of their own home.

When CoViD-19 Pandemic forced the closure of schools and learning suddenly became distant, online courses also became a trend, as shown in Figure 8. A lot of online courses were initiated to help the teachers prepare for the what we call "new normal" in education. Moreover, this is not made mandatory but elective in nature.

Figure 8: Teachers' Online Course



In PSHS, 75% of the respondents took online courses; 50% of these takers completed the course. In ACSHS, 25% of the respondents took and completed the online course. In public school, 39% took online courses and only 6% finished the course.

Majority of the respondents from PSHS took and completed massive open online course while those from ACSHS and from public school, many have not taken online course and indicated no knowledge about what massive open online course is.

Massive Open Online Course (MOOC) is rapidly growing as it is empowered by modern technology which is very vital nowadays (Karnouskos, 2017). Furthermore, the success of MOOC can be measured by the number of completers in the course (Sablina, 2018). Statistics on online platform and research findings recorded 90% dropout rate and completion rate of about 5 to 12% only (Stich & Reeves, 2017).

The study of Sablina, S., Kapliy, N., Trusevich, A., & Kostikova, S. (2018) regarding the learning success of MOOC takers showed that MOOC completers were committed on doing something which can benefit their daily life and work behaviors. They perceived completion of MOOC as commitment for life-long learning and self-esteem. The acquired knowledge and practical skills are what completers considered very important benefit in taking MOOC.

Based on the result of this study, teachers from PSHS are equipping and upskilling themselves with the latest trend in education to provide the needs of their learners who can be said highly intellectuals. They have the initiative, commitment and dedication to their job as facilitator of learning to provide quality education in the new normal.

It can be inferred that continuous professional development among teachers, upskilling and equipping with the new trends in education, may it be online or offline, is essential to provide quality education and develop quality learners.

Teachers' Readiness based on School Types

The teachers' access to and use of information and communication technology in teaching as well as their knowledge on Technology, Pedagogy and Content are important components needed to be assessed in distance learning. Their knowledge on these areas indicates their level of readiness in remote teaching.

The study sought to learn from the methods of instructions employed in special science institutions. Hence, if teachers from the subject schools do not differ on their level of readiness, it can indicate effective adaptation of the practices to public school setting.

ANOVA was also used to determine the significant difference among the three schools in terms of their TPCK, online application skills, and experience in technology-enabled learning environment. All comparisons were significant at 0.05 level of significance.

Table 10. Teacher's Readiness on the use of ICT in Teaching

		df	F	Sig
Online Application Skills	Between Groups	1	<0.001	0.995
	Within Groups	24		
Experience on Technology-enabled Learning Environment	Between Groups	1	<1.020	0.322
	Within Groups	24		

*significant at 5% level of significance

Table 10 showed no significant difference on the online application skills and experience on technology-enabled learning environment of teachers from both Special Science Institutions and Public Secondary Schools with F value of (1, 24) <0.001, p = 0.995 for the online application skills and F value of (1,24) <1.020, p=0.322 for technology-enabled learning environment.

Table 11. Teacher's Readiness on TPCK

		df	F	Sig
Technological Knowledge	Between Groups	2	1.729	0.192
	Within Groups	35		
Pedagogical Knowledge	Between Groups	2	0.619	0.544
	Within Groups	35		
Content Knowledge	Between Groups	2	0.635	0.536
	Within Groups	35		
Technological Content Knowledge	Between Groups	2	0.389	0.680
	Within Groups	35		
Pedagogical Content Knowledge	Between Groups	2	0.215	0.808
	Within Groups	35		
Technological Pedagogical Knowledge	Between Groups	2	2.980	0.064
	Within Groups	35		
Technological, Pedagogical, Content Knowledge	Between Groups	2	0.982	0.385
	Within Groups	35		

*significant at 5% level of significance

As shown on Table 14, all of the three schools do not significantly differ in terms of their technological knowledge, F (2, 35) = 1.729, p = 0.192; Pedagogical Knowledge, F (2, 35) = 0.619, p = 0.544; Content Knowledge,

F (2, 35) = 0.635, p = 0.536; Technological Content Knowledge, F (2, 35) = 0.389, p = 0.680; Pedagogical Content Knowledge, F (2, 35) = 0.215, p = 0.808; Technological Pedagogical Knowledge, F (2, 35) = 2.980, p = 0.064; and Technological Pedagogical Content Knowledge, F (2, 35) = 0.982, p = 0.385.

This means that they are all the same in terms of their level of technological, pedagogical, and content knowledges. This also implies that type of school has no effect in their level of Technological, Pedagogical, and Content Knowledge (TPCK).

Educational Platforms and Online Educational Application

Education platform is a virtual program intended for teachers and students who create virtual space to share information. The knowledge, utilization, and perceived effectiveness of these educational platform can give clearer understanding on how learning takes place on the subject schools during CoViD-19 Pandemic.

Table 12.Knowledge on Commonly Used Educational Platforms and Online Educational Application

Items	PSHS	VD	ACSHS	VD	PSS	VD
Learning Management System	3.58	VMK	3.38	VMK	3.00	K
Social Media Platforms	3.58	VMK	3.50	VMK	3.44	VMK
Communication Technologies	3.75	VMK	3.50	VMK	3.28	VMK
Video Conferencing Tools	3.58	VMK	3.00	K	2.67	K
Online Learning Software	3.50	VMK	3.00	K	2.44	LK

Legend

Numerical Rating	**Verbal Description**
3.26 - 4.00	Very much knowledgeable (VMK)
2.51 - 3.25	Knowledgeable (K)
1.76 - 2.50	Less knowledgeable (LK)
1.00 - 1.75	Not knowledgeable at all (NK)

Table 12 shows that teachers in Philippine Science High School were very much knowledgeable on the use of learning management system (mean score = 3.58), social media platforms (mean score = 3.58), communication technology (mean score = 3.75), video conferencing tool (mean score = 3.58) and online learning software (mean score = 3.50). ACSHS teachers are also very much knowledgeable on the use of learning management system (mean score = 3.38), social media platforms (mean score = 3.50), and communication technologies (mean score = 3.50) while teachers from regular public secondary school are very much knowledgeable on the use of social media platforms (mean score = 3.44) and communication technologies (mean score = 3.28).

PSHS is using learning management system exclusively for them which they call "Pisay Khub". This Pisay Khub, as described by the informants, is a Moodle-based platform that is very comprehensive, more interactive, secured and personalized in nature as compared to Google classroom. All learning materials and outputs of students are being sent on this learning management tool. Asynchronous learning activities are also uploaded on this learning management system. Moreover, all instructions and activities sent to this Khub are being reinforced through synchronous meet and additional communication through emails, chat, and the likes.

ACSHS does not have school-owned learning management tool like Pisay Khub. Nevertheless, students and teachers were provided with a more secured and more comprehensive access to G Suite as their learning management system. Students use G Suite account in all learning activities, such as sending and retrieving of modules and outputs, synchronous discussion, sending emails, delivery of instructions, and many others.

Public schools use distance learning with online and offline instructional materials and online synchronous and asynchronous learning activities. Offline materials are being distributed at school according to the given scheduled date and time per grade level to follow health protocols. Online materials are being sent to the learners through Google drive or Facebook messenger. Since, all students have access to Facebook and are members of the class group chat even with limited internet connection, instructions are most often being sent through Facebook messenger.

Special Science Institutions are equally knowledgeable on the use of learning management system, social media platforms and communication technologies in distance learning. Their constant use on these educational platforms on their everyday teaching makes them very knowledgeable on its use. It is also noticeable that public secondary school teachers are less knowledgeable on the use of learning management system as compared to the two special science institutions. This situation can be attributed to their daily teaching activities which most of the time, are focusing on the use of social media platforms such as Facebook and communication technologies like chat box, emails, Zoom, Google Meet and the likes.

This means that special science institutions are more familiar on the use of learning management system as it is an integral part of their learning modality in the midst of CoViD-19 pandemic. It can also be inferred that the use of learning management system is directly related to the teachers' level of knowledge on its usage.

Table 13.Utilization of Commonly Used Educational Platforms and Online Educational Application

Items	PSHS	VD	ACSHS	VD	PSS	VD
Learning Management System	3.92	A	3.88	A	2.61	O
Social Media Platforms	2.17	S	3.75	A	3.50	A
Communication Technologies	3.83	A	3.25	O	3.44	A
Video Conferencing Tools	3.58	A	3.63	A	2.22	S
Online Learning Software	3.42	A	3.13	O	2.06	S

Legend

Numerical Rating	**Verbal Description**
3.26 - 4.00	Always (A)
2.51 - 3.25	Often (O)
1.76 - 2.50	Sometimes (S)
1.00 - 1.75	Never (N)

Table 13 shows that PSHS always employs the use of learning management system (mean score = 3.92), communication technologies (mean score = 3.83), video conferencing tools (mean score = 3.58) and online learning software (mean score = 3.42). Majority of the PSHS learning activities are centralized on their learning management system exclusively for PSHS. The teachers here also employ the use of communication technology like internet, computers, cellphones, email services and the likes as well as video conferencing tool such as Zoom application and Google Meet to facilitate learning during this CoViD-19 Pandemic. Hand-on learnings are also being monitored through video call while providing feedback is being done through emails. The informants also mentioned using online learning software such as Phet Simulation, Kahoot and others.

Like PSHS, ACSHS teachers always utilize learning management system (mean score = 3.88), social media platforms (mean score = 3.75) and videoconferencing tools (mean score = 3.63) in teaching distantly. Teachers and students are provided with G Suites account to manage the teaching and learning activities. This G Suites account provides the school with comprehensive and wide range of access to Google Classroom, Drive, Meet and other Google applications that can be used in distance learning. In most Latin American countries, learning management system is used by teachers and students to access curriculum material (Burns, 2020).

Special Science Institutions are also using other social media platforms such as Facebook, SlideShare, and others to reinforce learning and provide instructions as well as video conferencing tools in conducting synchronous discussion.

Public Secondary school teachers always utilize social media platforms (mean score = 3.50) and communication technology (mean score = 3.44). Since access to internet is one of the major challenges faced in public schools, synchronous learning is not always possible; thus, teachers make use of social media platforms like Facebook to access easily and provide instruction to learners. There are some who were using Google Classroom as their learning management system but for those teachers who have students having no access to internet, asynchronous learning is being done. Facebook can be accessed with limited data. Furthermore, communication technologies which are very essential in distance learning are also always being used in public school.

According to the informants, though synchronous online teaching is advised, not all teachers are doing synchronous online discussion. Some reasons cited were: majority of their students do not have strong and reliable internet connection; students' study and sleeping habit; no gadget to use at the scheduled time; and other personal matters. For these concerns, the teacher prepares offline discussion using PowerPoint presentation with voice over or recorded video lesson using Zoom apps.

This means that the use of learning management system helps in the teaching and learning process and have significant impact on the students' level of achievement amidst distance learning. This is the aligned with the purpose of LMS which is delivering, tracking and managing learning and instruction.

Table 14.*Perceived Effectiveness of Commonly Used Educational Platforms and Online Educational Application*

Items	PSHS	VD	ACSHS	VD	PSS	VD
Learning Management System	3.67	VME	3.50	VME	3.22	E
Social Media Platforms	3.00	E	3.50	VME	3.39	VME
Communication Technologies	3.58	VME	3.75	VME	3.33	VME
Video Conferencing Tools	3.33	VME	2.75	E	3.11	E
Online Learning Software	3.17	E	3.00	E	3.00	E

Legend

Numerical Rating	**Verbal Description**

3.26 - 4.00	Very much effective (VME)
2.51 - 3.25	Effective (E)
1.76 - 2.50	Less effective (LE)
1.00 - 1.75	Not effective (NE)

Table 14 shows that PSHS perceived learning management system, communication technologies, and video conferencing tools as very much effective in teaching in new normal. ACSHS also perceived learning management system, social media platforms, and communication technologies as very much effective. Public secondary school, on the other hand, viewed social media platforms and communication technologies as very much effective in teaching distantly.

Among the given educational platforms, it showed that special science institutions have the same perceived effectiveness on the use of learning management system in remote teaching (mean score PSHS =3.67, ACSHS = 3.50). The use of learning management system makes collaboration and sharing of resources easier among students and teacher within the group (Lexia Learning 2020). Additionally, it makes learning much more comprehensive, interactive, experiential, personalized and of high quality (Rosell, 2021).

The goals of this study are to learn from the experiences of special science institutions in the delivery of learning in new normal, identify the common factors employed in special science institutions that differ from that in public secondary school, and to identify methods that can be adopted in public school setting. From the list of educational platforms and online educational application given to the respondents, the use of learning management system appeared to be the platform that the special science institutions are more knowledgeable, always utilized, and perceived to be very effective in distance learning.

In can be inferred that the use of learning management system among teachers is directly related to their level of perceived effectiveness on it usage. The higher they perceived its usefulness in teaching, the more likely they will use it.

Method of Instruction

Method of instructions plays vital role in the teaching and learning processes. It reinforces and influence motivational variables of students towards learning (Lestari, Maridi & Ashadi 2017). Method of instruction can be considered as either student-centered or teacher-centered, low-technology or high-technology. Moreover, as the saying no one-size-fits-all, teaching method still varies depending on the abilities and capabilities of students to learn. Being hi-tech does not always mean better, likewise, being low-tech does not always mean bad at all. There are students who learn better by writing rather than merely watching it, but there are also those who learn better by watching even without writing it.

The 2U, a group of universities, defined method of instruction as "*the general principles, pedagogy and management strategies used for classroom instruction*". They categorized teaching methods into four types - the high-tech teacher-centered, high-tech student-centered, low-tech teacher-centered, and low-tech student-centered. Teacher-centered are usually in the form of direct instruction where the teacher is the main authority figure that feeds all information to learners. It can be further categorized to high-tech or low-tech defending on the resources used to aid students' learning. High-tech approach utilizes different technology, such as gadgets, internet, and online programs and offices. Low-tech technology, on the other hand, is more of the traditional method of teaching which includes hand-written notes, moving around while learning, first hand or hands-on learning, and vocational and/or practical training that cannot be done virtually.

Student-centered approach, on the other hand, is more of facilitating learning. Student plays an active role in the teaching process while the teacher only acts as facilitator of learning, personal model, and delegator.

Among the 50 methods of instruction given to the respondents, 5 were identified as possible method that can be adopted for public secondary school use. The criteria that were used in identifying these methods of instruction were based on the respondents' level of awareness, frequency of utilization, and perceived effectiveness. Data from the subject schools were cross-analyzed to identify the method of instruction common to both special science institutions but different to public secondary school.

Table 15.Level of Awareness of Teachers on Methods of Instruction

Method of Instruction	Teaching Method	PSHS	DR	ACSHS	DR	PSS	DR
Flipped Classroom	multimedia approach	3.33	VMA	3.5	VMA	3.44	VMA
	video clips	3.5	VMA	3.5	VMA	3.5	VMA
	PowerPoint	3.75	VMA	3.5	VMA	3.61	VMA
Kinesthetic Learning	Virtual Science Lab	3.42	VMA	3.5	VMA	2.94	A
	Hand-on Learning	3.58	VMA	3.5	VMA	3.61	VMA

Legend

Numerical Rating	Verbal Description
3.26 - 4.00	Very much aware (VMA)
2.51 - 3.25	Aware (A)
1.76 - 2.50	Less aware (LA)
1.00 - 1.75	not aware (NA)

Table 15 shows that teachers from PSHS were very much aware on flipped learning specifically on the use of multimedia approach, video clips, PowerPoint and virtual science lab as well as on hands-on learning which is considered as kinesthetic-type method of instruction. ACSHS teachers were also very much aware on the implementation of multimedia approach, video clips, PowerPoint presentation, virtual science lab and hands-on learning. Public secondary school teachers, on the other hand, were very much aware on multimedia approach, video clips, PowerPoint presentation, and hands-on learning.

The findings showed that special science institutions are very much aware on the use of flipped learning which requires the use of high technology. Though it is said to be more on teacher-centered approach because of the nature of providing instruction and ideas to learners, this type of learning still provides opportunity for learners to work at their own pace. Teachers on this type of learning use pre-recorded videos available in online sources or choose to record their own video on how the activity should be conducted to guide learners. This method of instruction requires the use of different technology to aid students' learning; hence, it also requires good internet connection and device to access it (Teach.com, 2020).

The respondents in all subject schools have the same level of awareness on the use of multimedia approach, video clips, PowerPoint presentation, and hands-on learning. Special Science Institutions (PSHS and ACSHS) are also equally aware on the implementation of virtual science lab in class.

In PSHS, the devices, program and instructions for multimedia approach are provided on the students' learning groups together with the links for instructional videos. The links for videoclips are also provided to learners; short videoclips are being included and presented during synchronous discussion. For PowerPoint presentation, teachers upload them in Pisay Khub following synchronous discussion. According to the informants, PSHS system prepared pre-made videos but not in all subject areas and topics.

Although, ACSHS does not have their own version of learning management system, they still use Google Classroom using their G Suites account which provides them wide and more comprehensive access to the office as compared to using regular e-mail account.

For hands-on learning, the informants described the process as giving module to the learners with step-by-step instructions on how they would accomplish the hands-on activities. Assistance was also provided through video calls and/or pictures for clearer instruction.

It is noticeable that even though special science institutions and public secondary school teachers were equally aware on flipped learning method of instruction, public secondary school teachers were still considered less aware on virtual science lab (mean scores PSHS = 3.42, ACSHS = 3.50, PSS = 2.94) as compared with the other schools.

In Special Science Institutions, teachers implement the use of virtual science lab in class by making their own video/teacher-made videos anchored to the content of their modules. They also share links of online available videos to students as optional supplemental learning materials. Instructions for flipped learning are provided through the modules and emails, and are being reiterated during synchronous classes.

Table 16.Frequency of Utilization of Teachers on Methods of Instruction

Method of Instruction	Teaching Method	PSS	DR	ACSHS	DR	PSS	DR
Flipped Classroom	multimedia approach	3.17	O	2.88	O	3.06	O
	video clips	3.00	O	3.38	O	3.17	O
	PowerPoint	3.25	O	3.75	A	3.22	O
	Virtual Science Lab	2.75	O	2.88	O	2.11	S
Kinesthetic Learning	Hand-on Learning	3.33	A	2.88	O	3.17	O

Legend

Numerical Rating	Verbal Description
3.26 - 4.00	Always (A)
2.51 - 3.25	Often (O)
1.76 - 2.50	Sometimes (S)
1.00 - 1.75	Never (N)

The level of awareness of the respondents does not always indicate their level of utilization on the given method of instructions. Even though, respondents from different schools showed high level of awareness on the implementation of flipped learning, less frequency on its utilization is still observed.

Table 16 showed that the most frequently used method of instruction in PSHS is hands-on learning, and PowerPoint presentation in ACSHS. The rest of the methods of instruction are often utilized in all subject schools except for virtual science lab which showed much less frequency of utilization in public secondary school (mean score PSHS =2.75, ACSHS = 2.88, PSS = 2.11).

Other than those mentioned above, PSHS also pointed out the use of Design Thinking and Inquiry-based learning through independent study and mini-investigation. Its teachers also require learners to perform simple experiment at home and submit a copy of the video recordings of the activity as their output. Accordingly, doing research such as independent study and mini-investigation provides nourishment and exercise for the mind as well as to improve skills such as reading, writing, analyzing, and communicating (Zarah, 2021). It also allows students to explore new thoughts through study and testing, and have practical application on the concept they have learned in school (Cleaveland University, 2016).

Table 17.Perceived Effectiveness of Teachers on Methods of Instruction

Method of Instruction	Teaching Method	PSHS	DR	ACSHS	DR	PSS	DR
Flipped Classroom	multimedia approach	3.33	VE	3.38	VE	3.28	VE
	video clips	3.42	VE	3.38	VE	3.39	VE
	PowerPoint	3.33	VE	3.38	VE	3.39	VE
	Virtual Science Lab	3.50	VE	3.38	VE	3.17	E
Kinesthetic Learning	Hand-on Learning	3.75	VE	3.63	VE	3.5	VE

Legend

Numerical Rating	**Verbal Description**
3.26 - 4.00	Very much effective (VME)
2.51 - 3.25	Effective (E)
1.76 - 2.50	Less effective (LE)
1.00 - 1.75	Not effective (NE)

The level of utilization may also depend on how the respondents perceived the level of effectiveness of the given methods. Moreover, in this study, even though the respondents had equally high level of perceived effectiveness on the given method of instruction, the level of utilization is still not that much employed.

Table 17 shows that the subject schools in this study had the same level of perceived effectiveness on the given method of instruction except for virtual science lab (mean scores PSHS = 3.50, ACSHS = 3.38, PSS = 3.17) which is marked with lesser effectiveness from public secondary school teachers' view-point. This might be attributed to the minimal access and familiarity of public school teachers virtual laboratories.

The perceived effectiveness of Virtual Science Lab among special science institutions is supported by its importance in enhancing the learning process as shown on the study of Liu, et al, (2015). Furthermore, frequent integration of virtual science lab in teaching was associated to higher achievement level of student and inquiry-based learning (Van Der Graff, 2020).

The method of instruction that the special science institutions are very much aware of, always utilized, and perceived to be very effective in teaching distantly during CoViD-19 Pandemic is the use of virtual Science laboratory.

Innovative Teaching Method that Can Be Adopted to Public Secondary Schools

The objective of this study is to identify the method of instruction used by special science institutions that can be adopted to public secondary schools. These innovative teaching methods will aid in the execution of the method of instruction as practiced by special science institutions.

Based on the results of the study, the two special science institutions were equally aware on the performance of flipped classroom which includes virtual science lab, multimedia approach, video clips, and PowerPoint presentation. They both often utilized these teaching methods and found these very effective. Likewise, public secondary school also shows the same awareness, frequency of utilization, and perceived effectiveness of these methods except for virtual science laboratories.

Virtual science laboratory, as described by the informants from special science institutions, is the performance of laboratory activities by doing pre-recorded video and sending it to learners. Actual laboratory can be done during synchronous discussion but for public secondary school with numbers of students having no access to internet, it is recommended that the activity be recorded and be sent to learners for offline use.

The use of learning management system such as Google classroom and Schoology is highly recommended. Moreover, since majority of the learners in public school have limited access to internet and are mostly using cellphone to access learning materials, the proposed virtual science laboratory must have the specification that still can be sent through Facebook messenger and can be viewed using smartphones.

The importance of science laboratory in the teaching and learning process has already been established even before the CoViD-19 Pandemic. Several studies already proved the significance of laboratories in Science education. It provides hands-on experiences to learning that develop their critical-thinking and problem-solving skills. Even in distance learning, the importance of virtual science lab was also being pointed out. In the study of Holmberg and Bakshi (2015), they cited several benefits of having virtual science laboratory or e-laboratory such as: it provides students an opportunity to conduct experiment flexibly at their convenience; and repeat or extend observation as needed. It also gives opportunity to learners who cannot attend classes to still perform the laboratory activity such as those in remote areas, with health concerns and the likes.

Proposed Utilization of Facebook Social Learning Group as Alternative LMS and Open Educational Resources (OERs) for Virtual Laboratory

The proposed instructional material is based on the result of the study under each statement of the problem. The design of the material is summed-up on the illustration below:

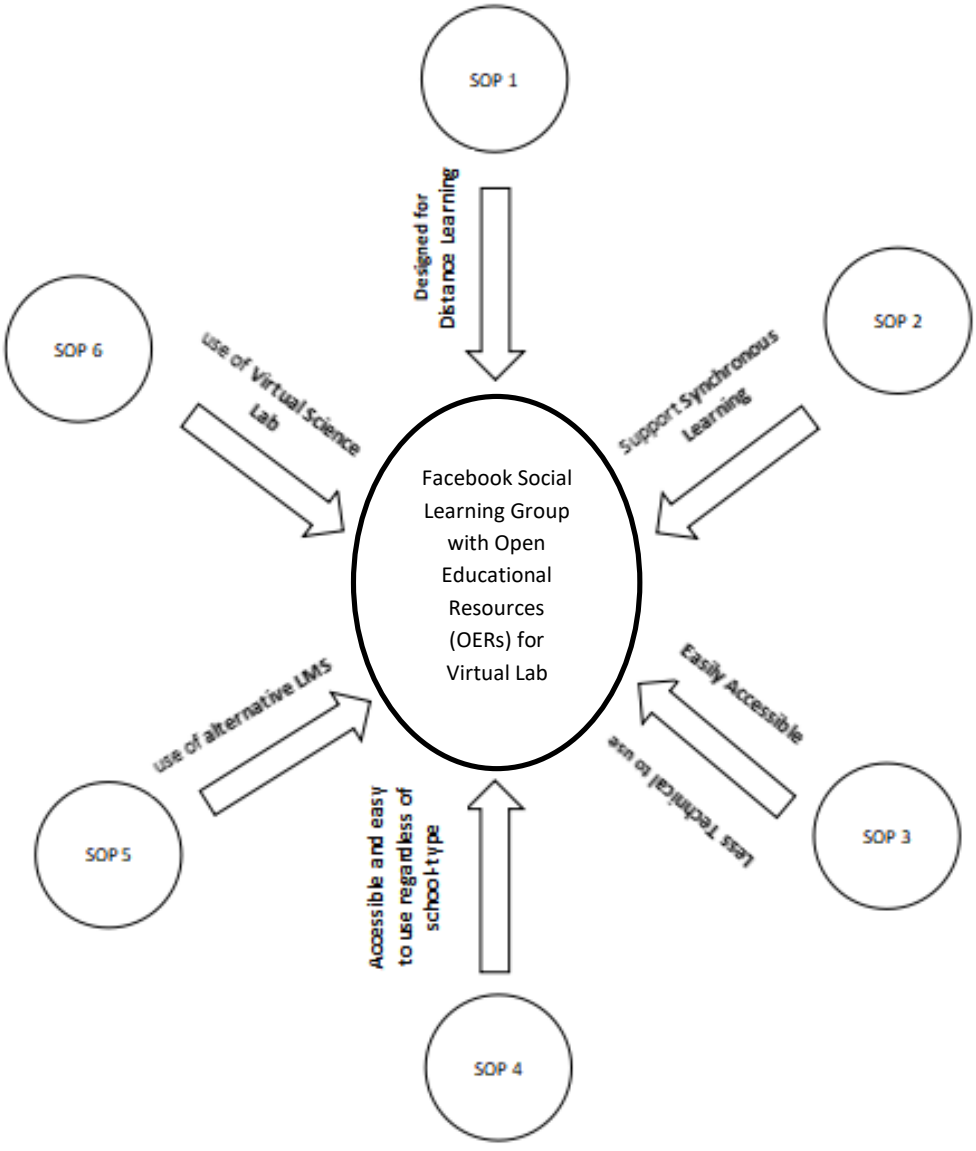


Figure 9: Proposed Learning Material and Platform Model

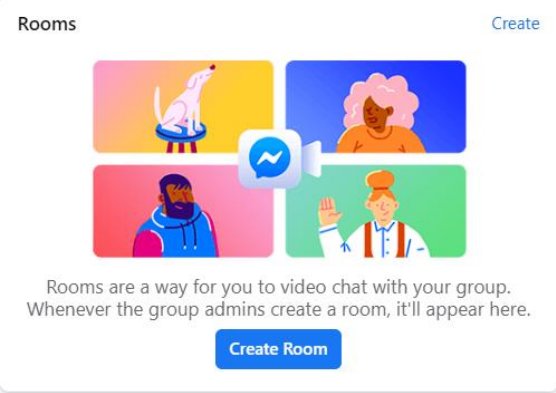
Designed for Distance Learning

The instructional material is intended for distance learning as it is the learning delivery modality used both in special science institutions and public secondary school during CoViD-19 Pandemic. It will utilize technology to facilitate remote learning.

However, aside from its use for distance learning, this proposed method can also be utilized during the normal face-to-face classes as a resource to augment the classroom discussions particularly during periods of disruption. It can also be used in providing enrichment activities to learners that can be done after school hours.

Support Synchronous Learning

One of the common practices of special science institutions in employing distance learning is the conduct of synchronous learning activities. The proposed material using Facebook as Social Media learning platform has the feature that can aid the conduct of online synchronous learning among public secondary schools even with limited access to internet. It has room where you can instantly create a video chat among the members of the group. Aside from limiting the use of different platforms in facilitating distance learning, it can also avoid confusion on the part of the students by centralizing all activities in one platform that can easily remind and update them on the scheduled activities.



Easily Accessible

One primary reason for public school not conducting synchronous learning is because of the limited access of students to internet. Based on the result of the study, students on public secondary school are not all privileged to have good and reliable internet access. Majority of them have limited data connection which they can only use in browsing social media account like Facebook. Hence, the proposed instructional material will use Facebook as platform to access easily the material even with less access to internet. Additionally, Facebook was found to be the most frequently use social media platform in education during CoViD-19 Pandemic. Data show that 100% of the respondents have Facebook accounts which is also supported by statistics data from survey worldwide.

In times of CoViD-19 Pandemic where even the economy is suffering, the most accessible gadget to teachers and learners to conduct distance learning specially in public secondary school, is smartphone; thus, this was also considered in crafting the proposed material.

The virtual laboratory application is powered by HyperText Markup Language 5 (HTML5), and run in most devices including smartphones.

Less Technical to Use

Issue on the readiness of the teachers on technological knowledge was considered making the proposed material less technical to use. There are several video tutorials available online for setting up Facebook Social Learning Group. This will guide the teachers and the students on the different features of this flexible learning management tool for a more efficient use.

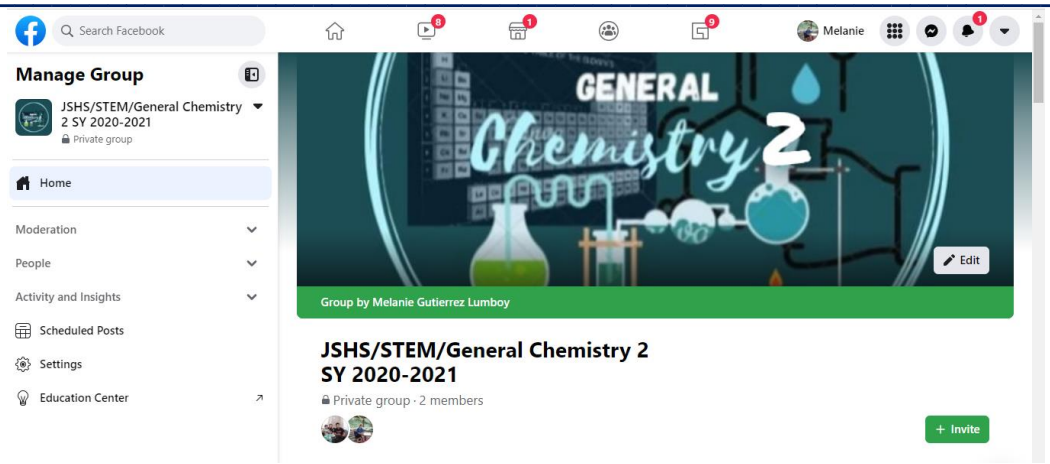
Additionally, the use of virtual science laboratory from open education resources also has the walkthrough on how to use the application to guide the students in conducting virtual experiments.

Accessible and Easy to Use Regardless of School Type

Based on the result of the study, the teachers from the subject schools had equal readiness on the access to and use of ICT in teaching as well as on their level of knowledge on TPCK items. The respondents were all using Facebook as social media educational platform and were also mostly utilizing smartphones and laptops in conducting classes. They were also equally less ready on the technological knowledge aspect as compared to other TPCK areas. Thus, the proposed alternative learning management system and virtual laboratory are less technical to use and can be utilized by the subject schools regardless of the school type.

Use of Alternative Learning Management System

With the absence of learning management system in public secondary school, the method of instruction practiced by special science institution that can be adopted to public secondary school by utilizing an alternative learning management system in the form of Facebook Social Learning Group for its dissemination and implementation.



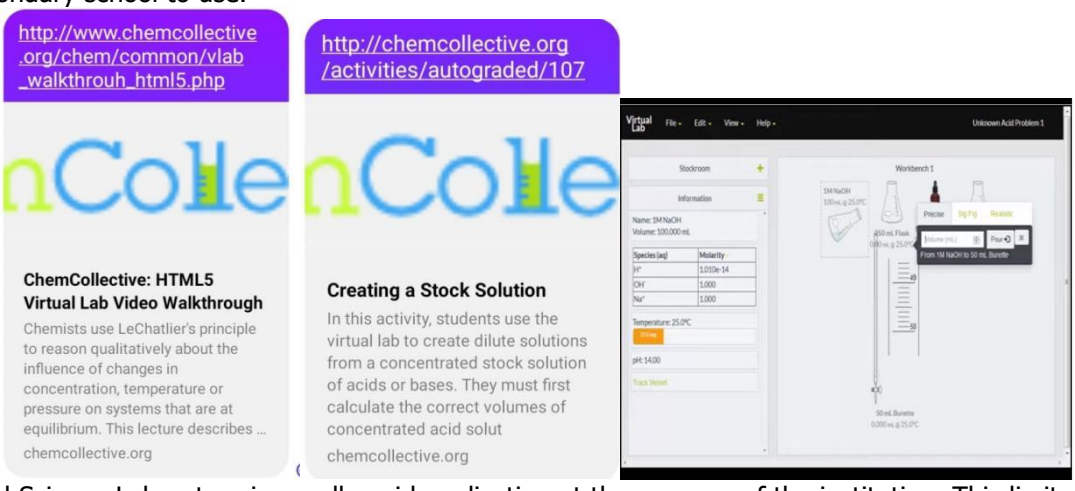
This Facebook Social Learning Group can be likened to other learning management systems used by special science institutions in terms of facilitating learning activities. Moreover, it also has advantages and disadvantages on its use.

Some advantages include the familiarity of students and teachers on the navigation of Facebook application which makes it easier for them to recognize the use of the different features found in the app; students can easily see new updates or notification from their social learning group since it is linked to their Facebook account and they spend more hours in using it daily; the application can be accessed for free; and it has a feature that can be used to perform formative assessment. Access to other platforms from the Facebook app or browser is also seamless, using links to Google, YouTube, and other apps. It also has a mentorship feature which allows learners to either serve as a peer mentor or avail of the services of a mentor. This can strengthen the effectiveness of the learning environment as studies have shown that learners learn best not only from their interaction with the teacher but also with that the other learners.

The disadvantages are: this application does not have a comprehensive grading system feature, hence, the use of third-party applications like Google Form is still needed to conduct summative assessment. Also, assessment available on this application can be taken by students repeatedly. Students also cannot submit their output privately using this group; thus, the use of Google Drive or Google Classroom for data consolidation is still advised.

Use of Open Education Resources (OERs) for Virtual Science Lab

The content of the alternative learning management system includes method of instruction practiced by special science institution that is not observed in public school. Based on the respondents' level of awareness on its implementation, frequency of utilization, and perceived effectiveness in teaching distantly, the use of virtual science laboratory appeared to be the method of instruction common to both special science institutions that can be adapted for public secondary school to use.



Virtual Science Laboratory is usually paid application at the expense of the institution. This limits the access of secondary public schools. However, there are Open Educational Resources (OERs) that can provide use of virtual laboratory for free.

Open Educational Resources are teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions (UNESCO/COL Paris OER Declaration, 2012). OERs utilize the practice of Open licensing which is built within the existing framework of intellectual property rights as defined by relevant international conventions and respects the authorship of the work. In OERs, the author

or copyright owner grants others the license or permission to reuse, and potentially, for adaptation. There is a broad range of legal framework that may govern the use of OER, one of which is the use of Creative Commons Licensing. Open licensing ensures that authors of materials can retain acknowledgment for their work while allowing it to be shared, can seek to restrict commercial activity if they wish, and can aim to prevent people from adapting it if appropriate (Butcher, 2011) A CC license is used when author wants to give other people the right to share, use, and build upon a work that they (the author) have created and enable the free distribution of an otherwise copyrighted "work". Open educational resources are also easy to find through the use of specialized OER search engines, OER repositories, and OER directory sites.

These reduce the costs, enhances access to, and allows enhancement of quality of educational materials.

The alternative learning management system contains virtual science laboratory for Chemistry subject. Among the four areas in Science education at secondary level, Chemistry, most of the time, requires the use of laboratory for experiments. As preparation for the activity using the virtual science laboratory, a three-and-a-half-minute walkthrough on its use will be provided to enable them perform the activities in the virtual lab. The virtual lab application provides scenarios and guide questions on what to do in the laboratory. It gives different quantities, compound and materials every time the refresh button is being ticked. The virtual laboratory provides opportunity for learners to explore and have hands-on experience on the use of certain chemicals by measuring, transferring and mixing them virtually. The application provides immediate feedback to learners after submitting the answer. If the students fail to get the correct answer in three attempts, the correct answer will be revealed.

5. CONCLUSIONS

1. Educational institutions are all employing distance learning delivery modality during CoViD-19 Pandemic. Special Science Institutions manage smaller class size, conduct scheduled synchronous learning activities to provide instruction and assist learners, allot more time for each competency, and give more time for teachers' preparation in teaching amid distance learning;
2. The teachers from the subject schools are very much knowledgeable and are used to face-to-face learning. Moreover, during CoViD-19 Pandemic, they are more knowledgeable on employing remote learning than during face-to-face. The teachers are very much knowledgeable on the type of distance learning modalities they are employing in their respective schools. Teachers from public secondary school are more knowledgeable on homeschooling than those from special science institutions since the latter require more parental support due to the absence of weekly scheduled synchronous learning activities;
3. The teachers from the different institutions have less readiness on technological knowledge than those from other TPCK areas. Moreover, they are equally ready in terms of gadget ownership and internet access to facilitate distance learning. Facebook application is also useful in distance learning as it is the most accessible to all;
4. The teachers from special science institutions are a bit more ready on the access to and use of ICT in teaching than those from public secondary schools. The latter are more skilled on online programs and offices and more experienced on technology-enabled learning environment. The teachers in all subject schools require improvement on the use of technology in teaching;
5. Teachers from both Special Science Institutions have higher level of knowledge on the use of learning management system than those from public secondary schools. The latter utilize learning management system and perceived it to be highly effective in employing distance learning. ACSHS and public secondary schools, on the other hand, equally perceived the use of social media platform as highly effective because of its accessibility to all; thus, public secondary school uses social media platforms like Facebook in employing distance learning;
6. Teachers from Special Science Institutions have higher level of awareness, frequency of utilization, and perceived effectiveness on the use of virtual science laboratory in teaching distantly than those from public secondary school; and
7. The use of virtual science lab and learning management system in employing distance learning is common to both special science institutions and can be proposed to public secondary schools.

6. RECOMMENDATIONS

Considering the aforementioned findings and conclusions, the following recommendations are hereby suggested:

1. Integration of distance learning to other learning delivery modality, smaller class size to public secondary schools, synchronous discussion per week to provide learners assistance, more time allotted for each learning competency, and more time for teachers' preparation to teach distantly are recommended;
2. Activities which may still target the skills developed in face-to-face learning to distance learning, and innovations on how to integrate face-to-face with remote learning may be provided. Sharing of best practices in the distance learning delivery modality among the subject schools and scheduling of synchronous learning activity may be considered to aid in the teaching and learning processes during this CoViD-19 Pandemic;

3. Conducting seminar-workshops, trainings, and learning action cells on technological skills development among teachers may be considered. Facebook may be promoted as alternative learning management system for public secondary schools;
4. Capability building for public school teachers in using online programs and offices, and technology-enabled learning environment may be organized. Conducting seminar workshops and training in using technology in teaching is recommended;
5. Teachers in public schools may be oriented on the significance of learning management system in distance learning. Social media platforms like Facebook may be utilized as learning management system. User guide on the effective use of learning management system using Facebook social learning group may be provided;
6. Public school teachers may be oriented and capacitated on the use of virtual science laboratory in distance learning. Consequently, public secondary schools are recommended to use this laboratory set-up; and
7. The use of Virtual Science lab in teaching during CoViD-19 Pandemic may be recommended along with the alternative learning management system such as Facebook Social Learning Group.

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