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Grade 12 Students' Perceptions of Distance Learning in General Chemistry Subject: An Evidence from the Philippines

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Abstract

The onslaught of the COVID-19 pandemic forces institution to close face-to-face classes, thereby resulting to a paradigm shift towards remote learning. Unconventional learning strategies were reinforced to continuously provide education amidst the crisis. This led to the conversion of classroom-oriented learning resources into learning resources adapted to distance learning. At present, the placement of alternative learning modalities in a new normal classroom setting has become a mainstream point of discussion in the education sector. In light of the new trend in education brought by the pandemic or other similar circumstances, this study aims to identify students' perceptions regarding the utilization of synchronous and asynchronous distance learning resources in Grade 12 level. It also highlighted students' preferences regarding the synchronous and asynchronous mode of delivering instructions. The participants were randomly selected 317 Grade 12 students enrolled in Special Health Sciences STEM track from a private medical institution situated in an urban area of Cavite in the Philippines. These Grade 12 students had immersed experience in synchronous online classes along with asynchronous learning activities. A dependent sample t-test was used to find out difference between the use of synchronous and asynchronous learning modalities. Conceptual understanding of students was measured based on their performance on summative assessments both in synchronous and asynchronous modalities. Descriptive statistics and thematic analysis were also used to present students' evaluation on the different distance learning aspects particularly on the teaching approach, learning materials and instructions, activities, and assessments. Results revealed that students have high interest on the teaching approach in asynchronous modality consistent with obtaining better performance in the asynchronous assessment. Students valued the asynchronous threaded discussions, the availability of relevant learning materials, and teacher's guidance and scaffolding on the learning process as essential components of distance learning (synchronous or asynchronous).

Keywords: *Alternative learning modalities; distance learning; synchronous learning; asynchronous learning; new normal education; perceptions*

INTRODUCTION

Online learning environments have become more prevalent especially in the time of global face-to-face class suspensions due to pandemic. Many institutions resorted to the conversion of traditional classes to full distance learning instructions as much as possible using different alternative learning modalities. This results to reconstruction of learning materials and individual roles, regulation of the required existing learning competencies into a more responsive model, and recalibration of teachers' skills and prowess to deliver the instructions through the placement of new learning modalities. Moreover, incorporating technology as direct and viable options to provide online learning materials during suspensions and other similar circumstances requires investment in terms of technological infrastructure, faculty development,

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and student technical competence (Olson, 2015). Despite the new challenges brought by the pandemic and the swift transition taking place in the educational system, the design and implementation of online or distance education should still adhere effective learning process. It should provide high-level support to students to avoid frustrations especially that the new methods of distance education are far different from the traditional face-to-face learning environment. The gap between online distance learning and traditional face-to-face learning differs in terms of the sense or feeling of human touch, interpersonal interaction, connectedness, social and cognitive presence, and immediacy of feedback (McCloskey et al., 2013; Moallem, 2015).

Nowadays, distance learning has become an increasingly important part of educational program than ever before and has been practically indispensable due to the advantages it offers. The reliance on technology as supplemental tool to traditional pedagogy has greatly influenced the way individuals learn. Smart phones, computers, learning management systems (LMS), interactive graphics, discussion boards and other interactive platforms that emulate traditional teaching tools are being used as an integral component of distance learning. Online resources are now considered as tools for the improvement of instructions, establishment of flexibility and personalized learning, and reduction of expenses of instruction (Taplin et al., 2013). Several studies found that the utilization of online or technology-based instructions, when properly integrated with teaching strategy, curriculum and assessment, promotes effective learning as it provides greater opportunity to strengthen the relationship between learning processes of collaboration, communication, participation, engagement, responsibility and in-depth learning acquisition for the realm of the subject matter (see, e.g., Rourke et al., 2001; Shi & Morrow, 2006; Pena, 2012)

The Community of Inquiry (COI) framework of Garrison (2000) serves as the backbone in the development of this study. This process model not only highlights the essential elements present in an ideal and worthwhile learning environment, but also provides an overview on the dynamic of the online communities of inquiries. The Community of Inquiry (CoI) model emphasizes the three core elements or "presences" of an online educational experience: (1) the ability of the participants to communicate and develop interpersonal relationships (social presence), (2) the extent to which learners engage with content and construct meaning critically (cognitive presence), and (3) the design, facilitation, and direction of social and cognitive presence process to achieve high-quality learning outcomes (teaching presence). Hence, CoI along with the elements of good practices in online teaching provides a heuristic approach in the creation of an online learning environment in General Chemistry.

Furthermore, although researchers have explored various applications and online models to deliver instructions remotely, these several studies can be deduced into two major categories-synchronous and asynchronous methods. Parlakkılıç (2015) defined synchronous delivery as real-time, teacher-led online learning in which all learners receive information simultaneously and communicate directly with the teacher and other learners in virtual spaces, however, this mode of content delivery is difficult to achieve in any online education without some prerequisite conditions such as high-speed internet connections, free access to online resources and high technological skills of students and teachers (Masic, 2008). With the asynchronous method, on the other hand, the transmission and receipt of information do not occur simultaneously. The learners are responsible for pacing their own self-instruction and learning without any specific timetable. The teacher and learners communicate using e-mail or other feedback technologies, but not in real time.

In the Philippines, only few schools especially those with advanced technological infrastructures have practiced the new instruction pedagogy through online platform. The lack of access to educational

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technologies and innovations, often termed as the digital divide, continues to be a challenge with novel educational technologies (Fairlie 2004; Jones et al. 2009). Most Filipino learners and teachers typically are not yet accustomed to this new online curriculum not until the pandemic happened that led to the adoption of distance education as the best viable solution to continuously provide academic support and services to students.

To gauge the pulse of one of the school systems in the Philippines who is also affected primarily by the emergent transition from face-to-face classes to distance learning, this study is deemed to be important as it provides a synopsis of how distance learning is going on in the most important frontier in education, which is the classroom. It is in this premise where this study was conducted to identify students' perceptions regarding the utilization and effectiveness of synchronous and asynchronous distance learning in Grade 12 level. It provides relevant understanding, views, and sentiments of the students which are considered as an important determinant of the outcome of this recent and experimental stage of distance learning in the country.

This study also covers the evaluation of the five elements of distance learning such as the (i) teaching approach, (ii) learning materials and instruction, (iii) learning activities, (iv) assessment, and (v) attendance and consultation. It also highlighted students' preferences regarding the teaching approach in synchronous and asynchronous classes. Students' conceptual understandings were also measured through formative/summative assessment in the context of general chemistry instructions. Researcher also identified students' views about the strengths and challenges of the utilization of alternative learning modalities in a new normal classroom setting. Data sources were drawn primarily from the perspective of students who are considered as the immediate recipients of this so-called new normal education in the Philippines. Furthermore, this study was conducted with all hopes to provide a snapshot of students' lived experiences with the new online learning pedagogy and share real-life context insights that would contribute to the refinement of online learning pedagogy. Effective practices or methods were determined by the researcher based on the responses and perceptions of students toward the implementation of alternative learning modalities.

Research questions

This study aims to address the following research questions:

1. Are there differences between the synchronous and asynchronous learning modalities in terms of students' interest and conceptual understanding in General Chemistry?
2. How do students perceive the use of alternative learning modalities in the context of general chemistry instructions?

RESEARCH METHOD

Research Design

This study follows a mixed method research design that utilized some elements of quantitative and qualitative approaches. The design of the research is somehow similar to the study conducted by Skylar (2009) where it investigated whether asynchronous and synchronous online instruction resulted in differences in student performance and perception. Findings were obtained based on the collection of data sources from students' scores in pre-post tests and satisfaction survey in the two learning delivery methods. In this study, quantitative data were gathered from students' responses in a students' virtual learning experience perceptions questionnaire and their scores on summative assessments. The qualitative method was used to shape the interview protocol and analysis of responses taken from

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student's interviews and feedback on the alternative learning modalities. Common themes and emerging categories were extracted and analyzed based on response transcriptions. Qualitative method is used to augment research findings obtained in quantitative analysis. Hence, both qualitative and quantitative data were cross validated to corroborate findings.

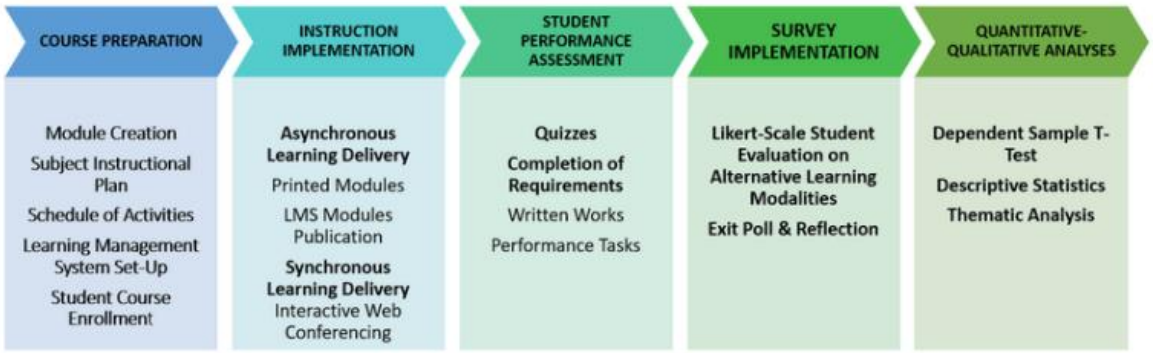

Figure 1. The Methodological Framework

Participants

The participants were randomly selected 317 Grade 12 students enrolled in Special Health Sciences STEM track from a private medical institution situated in Dasmarinas, Cavite. Sample of the study was the Grade 12 students with almost 5-month long virtual learning experience in both alternative learning modalities synchronously and asynchronously in General Chemistry course. Of the 317 Grade 12 students in this study, 98% percent of the participants (n=312) accessed online classes at home. The program required students to have at least good internet connection and learning gadget, as they are expected to have virtual simulation on their special health sciences courses in preparation of becoming future healthcare providers even at the early level of basic education. Students experienced a fair to good internet connection from where they accessed online classes. It was identified also that 73% of the student participant (n=232) has reported having a conducive learning environment and approximately 70% of the student participants was satisfied with their class schedule. See Appendix for the additional information about respondents' profile.

Setting

The course was advertised as a hybrid course, a combination of synchronous and asynchronous methods in delivering the instruction. In the study, all students received both conditions. The two setting conditions that were used are the asynchronous set-up and synchronous web conferencing via MS team. Two hours per week were allotted for each of the two set-ups, hence, students needed to meet the required 4 hours per week for this course and for the coverage of the content based on eight modules with the corresponding lesson topics. See Table 1.

Table 1. Sample of Learning Modules organized per Week on Learning Management System

Week No.	Lesson Topic (Asynch+Synch)
Week 1	**Course Orientation**
Week 2	Module 1: Matter and Its Properties
Week 3	Module 2: Atom, Molecules, and Ions

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Week 4	Module 3: Mole Concept
Week 5	**Completion of Requirements**
Week 6	
Week 7	Module 4: Reaction Stoichiometry
Week 8	Module 5: Gas Chemistry
Week 9	**Completion of Requirements**
Week 10	
Week 11	**Course Orientation**
Week 12	Module 5: Gas Chemistry
Week 13	Module 6: Atom's Electronic Structure
Week 14	Module 7: Chemical Bonding
Week 15	Module 8: Organic Compounds
Week 16	**Completion of Requirements**
Week 17	

Asynchronous Set-up Learning Delivery

The presentation of the course was asynchronous, meaning, students did not need to be present at a scheduled time of accessing the learning materials. All learning materials and contents were delivered through learning management system (LMS)-Canvas in asynchronous format and organized by weeks and by modules. Canvas is a learning management system that supports online learning and teacher. Teachers can post the learning contents including instructional materials, discussion boards, assignments, grades and class announcement online. Complete instructions for each module were stated in detail for students to be guided on what were the things they need to prepare for the course such as worksheets, formative/summative assessment, and performance tasks. Students were encouraged to download the lecture slide presentations with notes and watch the lecture videos. In this set-up, students communicated with the teacher and peers in the class through LMS and threaded discussions. The students were required to adhere to due dates for the completion of weekly requirements such as quizzes, creative outputs, and worksheets. Quizzes were available only during the set course schedule with time and limited attempt constraints.

Synchronous Set-Up Learning Delivery

In this environment, the teacher is required to conduct a real time synchronous web conferencing with students via MS Teams. Students were encouraged to read and study the learning materials before a synchronous web conferencing. Any needed intervention or clarification on the contents that was not addressed on asynchronous set-up was accommodated during the synchronous meeting. Synchronous web conferencing was structured to resemble traditional face-to-face classroom. Interactive elements of the synchronous web conferencing include breakout rooms, chat forum, sharing window application, two-way audio, polling features, whiteboard, post-session recordings, emoticons, and students' raising hand icon to be easily recognized by teachers especially those students who want to participate in an oral discussion. Another unique activity added during synchronous meetings was the student-organized mini-awarding ceremony in recognition to students who actively participated in the threaded discussions during asynchronous. The mini-awarding ceremony was conducted in a weekly basis. This follows the discussion of the lesson proper, open forum and lastly closing remarks. To assess their understanding on

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the synchronous discussion, a live post-test was conducted via Quizizz. A real-time leaderboard was displayed on the quiz platform to monitor students' responses on the prompted question. Questions in the live assessment were aligned to the discussion and objectives of the lesson. Web conferences were announced early in the week so that students have enough time to prepare and study the published learning materials in the LMS.

Instruments

The instruments used in this study included a Likert-scale student evaluation survey, summative assessments, and an open-ended exit poll on alternative learning modalities.

Student Evaluation Survey

Students' virtual learning experience questionnaire was used to collect students' responses and feedback on the alternative learning modalities. Each of these Student Evaluation on Alternative Learning Modalities questions requires students to respond on the statement about their online learning experience. Students indicated whether the following attributes of each distance learning elements were not observed, needed improvement, failed to meet expectation, met expectation, and exceeded expectations. The instrument is divided into two sections: one for the students' situated learning environment, and the second section pertains to the different aspects of alternative learning modalities and distance learning resources including the (i) teaching approach both in synchronous and asynchronous classes, (ii) learning materials and instructions, (iii) learning activities, (iv) assessment, and (v) consultation. Statements related to synchronous and asynchronous learning activities include whether the teaching approach in synchronous and asynchronous classes stimulates students' interest, effectiveness of question-and-answer sessions, availability of teachers during consultation, online lectures and video conferences. Statements related to learning materials and instructional activities were about the variety and appropriateness of learning materials (handouts, modules lecture slide presentation, video/weblinks, and other resources) and the learning tasks in relevance with the learning objectives of the course. The instrument also includes statements related to the effectiveness of using the different features of learning management system in the delivery of instructions. Other learning resources involved in the whole implementation of the study are Learning Management Systems (LMS), researcher-made modules, worksheets, self-produced lecture videos, video conference platform, formative/summative assessment, slide presentations, and relevant online websites.

Student Performance on Summative Assessment

Two parallel 20-item tests were administered separately at the end of the session: one each for asynchronous and synchronous sessions. The multiple-choice and true/false tests were taken from the test bank that corresponds to the course contents. In asynchronous set-up, the test was published in the LMS and students accessed it anytime whenever the test is already opened for access on the scheduled availability. It was set with limited time constraint of 1 hour. In a synchronous environment, the test was held via live quiz application such as Kahoot and Quizizz. This is done after the teacher discussed the lessons and clarified specific topics with the students. Teacher provided the code and monitored closely the real-time response of students on the test items. The live assessment was also set with time constraints similar with the asynchronous condition.

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Open-Ended Exit Poll

At the end of the semester, students were asked to write a reflection of what they liked and disliked about the two set-ups of the alternative learning modality: asynchronous and synchronous. They were encouraged to include relevant suggestions and opinions on how they want their online learning experience to be more meaningful and worthwhile.

Data Analysis

Statistical Package for Social Sciences version 25 (SPSS), also known as IBM SPSS Statistics 25, was used for analyzing the data. Specifically, this study sought to answer the following research questions:

1. Is there a significant difference between the students' interest in synchronous and asynchronous learning modalities?
2. Is there a significant difference between the means of the scores in a synchronous and asynchronous conceptual understanding assessment?
3. What are the general evaluations on the five elements employed in alternative learning modalities?
4. How do students perceive the use of alternative learning modalities in the context of general chemistry instructions?

Mean difference in the students' interests between the synchronous and asynchronous learning activities was identified through dependent sample t-test. Descriptive statistics was used to present students' responses and feedback on the implementation of alternative learning modalities with respect to the following aspects such as teaching approach, learning materials and instruction, learning activities, assessment, and consultation. Using Principal Component Analysis (PCA), the student evaluation questionnaire was comprised of 14 items reported on a 5-point Likert scale that explained 89% of the variance with factor loadings from .896 to .966. Internal reliability of the 14-item student evaluation survey on alternative modalities was investigated using Cronbach's alpha. Results indicated that the survey questionnaire was found to be highly reliable (α=.989).

A dependent sample t-test was also used to know the difference between the means of the scores of students in synchronous and asynchronous assessments. Distribution of the student scores obtained from synchronous and asynchronous assessments was analyzed to provide quick comparison between students' performances in the two alternative learning modalities. Lastly, students' responses on the open-ended exit poll were qualitatively analyzed using thematic analysis to produce common themes and emerging categories in relative to the different aspects of alternative learning modalities.

FINDINGS AND DISCUSSION

This section presents the analysis and interpretation of the data. The general purpose of this study is to point out students' perception regarding the utilization of synchronous and asynchronous distance learning as alternative learning modalities in the new normal General Chemistry classroom setting. Eventually, the study also identifies students' preferences regarding the most convenient learning delivery method for them. The following data outcomes present a valid evidence to consolidate answers to the research questions presented in this study.

Research Question: Is there a significant difference between the students' interest in synchronous and asynchronous learning modalities?

Students' Interest in Synchronous and Asynchronous Learning Modalities

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Interest as defined in the study of Hidi and Renniger (2006) refers to individuals' predisposition and momentary experience of being captivated towards a particular object or topic over time. In this study, the concept of interest is used to determine students' preference regarding the teaching approach employed to steer their attention and engagement towards the lesson., both in synchronous and asynchronous modalities. Student responses on the five-point scale survey evoked what students most likely preferred for the delivery of instruction. Table 2 presents the five-rating scale on the student learning experience perceptions questionnaire. Both modalities obtained a positive result as shown on the trend of the data distribution, where most of the responses falls along the higher side of the scale. However, findings statistically revealed that students have a high interest in the teaching approach in asynchronous modality (M=3.95, SD= 0.82) compared to synchronous set-up (M=3.87, SD=0.75).

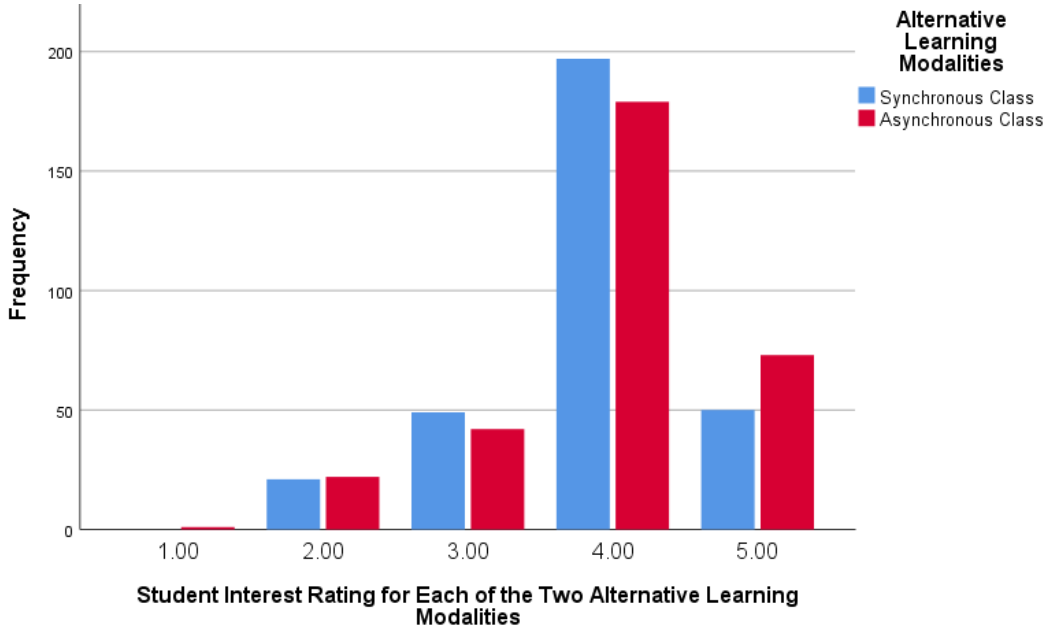

Table 2. Mean Rating Attributes for the Student Learning Experience Perceptions Questionnaire

Numerical Equivalence	Class Boundaries	Abbreviations	Attributes
1	1-1.50	NO	Not Observed
2	1.51-2.50	NI	Needs Improvement
3	2.51-3.50	FME	Fails to Meet Expectation
4	3.51-4.50	ME	Meets Expectation
5	4.51-5.00	EE	Exceeds Expectation

Figure 2. Frequency of Students' Interest Rating on the Teaching Approach for Each of the Two Alternative Learning Modalities, N=317

A dependent or paired-samples t-test was conducted to evaluate whether there is a statistically difference between the means of the students' interest rating on the teaching approach in synchronous and asynchronous classes. On an average, the students' perceived interest rating in asynchronous classes was 0.079 higher than the perceived interest rating in synchronous classes. The students' perceived interests in synchronous and asynchronous classes were strongly and positively correlated (r=0.929,

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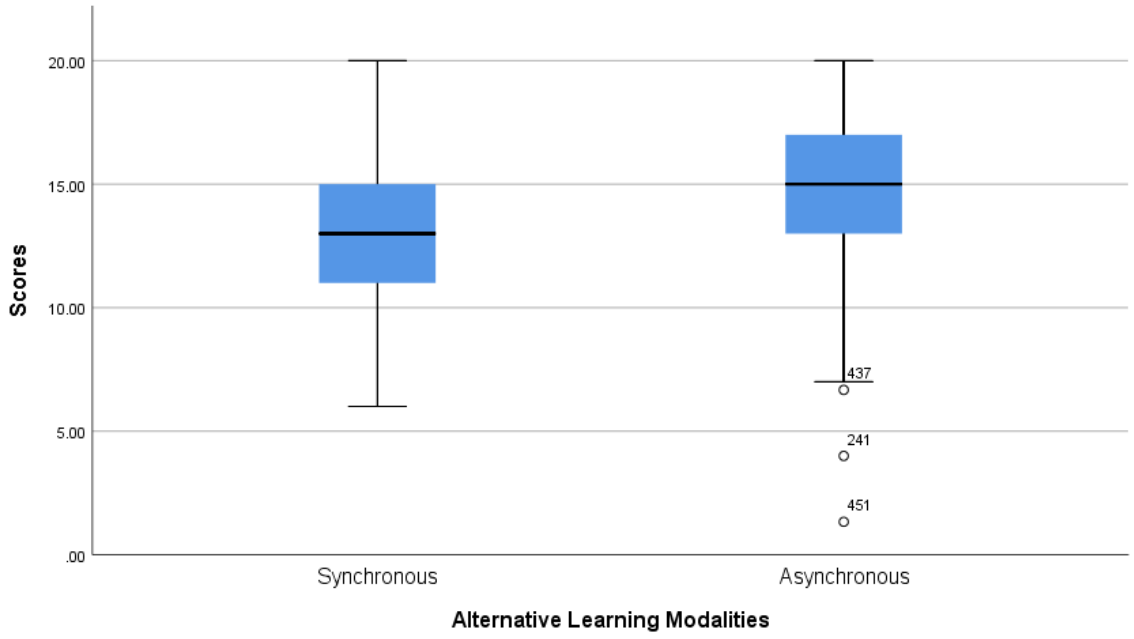
p<0.05). The effect size d of -0.26 indicates a small effect. With alpha set at 0.05, the paired-samples test showed that there was a significant difference of students' perceived interest on the teaching approach in synchronous classes (M=3.87, SD=0.75) and asynchronous classes (M=3.95, SD= 0.82), t(316) = -4.633, p<0.05.

Research Question: Is there a significant difference between the means of the scores in a synchronous and asynchronous conceptual understanding assessment?

Conceptual Understanding of the Students

From the results presented previously, it is identified that students have high interest in the teaching approach conducted through asynchronous modality than in synchronous set-up. These results are consistent with the students' performance on the 20-item assessments as reflected in the collected scores both in asynchronous modality (M=14.81, SD=2.89) and synchronous modality (M=13.00, SD = 3.00). Administration of summative assessments was done synchronously and asynchronously. Figure 2 shows the boxplot of the students' scores on summative assessments conducted separately through different modalities. On an average, the score in asynchronous format is higher compared to the score in synchronous set-up. Scores in synchronous are more dispersed than the scores in asynchronous set-up as shown in the length of the whiskers. In general, most of the scores falls on the higher side of the scales. Results also revealed that students performed better on conceptual assessment in asynchronous modality.



The results of this analysis also suggest that learning is evident both in synchronous and asynchronous modalities, though minimal outliers exist.

Figure 3. Comparative Boxplots of Students' Scores in Synchronous (n=223) and Asynchronous Assessments (n=315)

A dependent or paired-samples t-test was conducted to evaluate whether a significant difference exists between the performance of students (N=223) in summative assessments held in synchronous and asynchronous modalities. On an average, the scores obtained in asynchronous mode is 1.81 higher than the scores obtained by the students in a synchronous modality. The effect size d of 0.46 indicates a small

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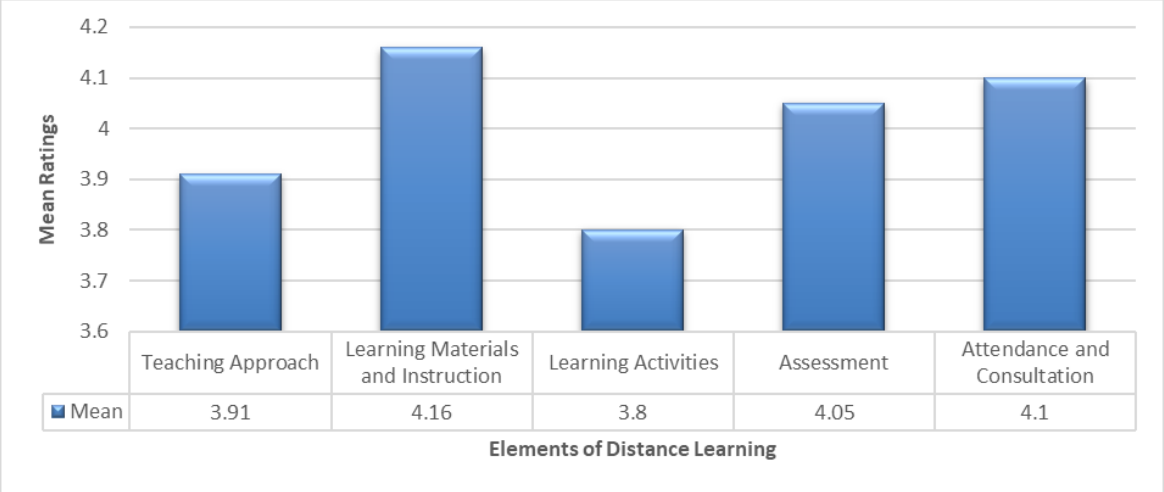
effect. With alpha set at 0.05, the paired-samples test showed that there was a significant difference between students' performance on the summative assessment in synchronous modality M=13.00, SD=3.00) and asynchronous classes (M=14.81, SD=2.86) , t(222) = -6.84, p<0.05. Hence, students performed better in a summative test in asynchronous modality wherein the assessment was just published on the learning management system with allotted time limit and accessible within the specified period of availability. This finding contrasts with the results obtained in the study of Skyler (2009) where she found that students performed better on online courses using synchronous web conferencing lectures due to the interactivity of the course. In this study, it can be suggested that stimulating learning interest towards the course is essential to students' academic performance. The importance of teacher preparation, flexibility, and availability of learning materials contribute to an engaged and motivated learning experience. (Harackiewics, et al, 2016)

Research Question: What are the general evaluations on the five elements employed in alternative learning modalities?

Evaluation on the Distance Learning Elements

Online teaching and learning environment are far different from face-to-face classroom setting. The sudden conversion of learning materials adaptive to distance learning pose a great challenge to every educator. The placement of alternative learning modalities underwent different phases: preparation, implementation, and evaluation on the effectiveness of the online learning materials and activities that drive the overall learning process and meaningful experience of the students. The evaluation on the distance learning elements provides a snapshot of how students perceived the new online pedagogy. Results of this analysis will shape the refinement of the future online pedagogy. With this, a survey was conducted to evaluate whether the elements of distance learning were effective and appropriate as tools used in the implementation of alternative learning modalities online and offline. Elements of distance learning include the teaching approach, learning materials and instructions, learning materials, assessment, and consultation. The participants (N=317) responded from a scale of 1-not observed (NO) to 5-exceeds expectation (EE) for each of the observed aspects in the online distance learning. Figure 3



shows the mean rating of each of the five different elements of the distance learning. Note that this result is already the synopsis of the overall evaluation on the several aspects of alternative learning modalities.

Figure 4. Mean Rating of Each of the Five Different Elements of Distance Learning

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On an average, learning materials and instruction (M=4.16, SD=0.761) got the highest rating, while the learning activities got the lowest (M=3.80, SD=0.89) among the five independent variables. It is highly perceived that the teaching approach stimulated students' interest both in synchronous and asynchronous classes. Synchronous and asynchronous classes were well prepared, organized, and used class time efficiently. The learning materials provided to the students were varied and appropriate giving students enough resources to rely on in synchronous and asynchronous learning. Efficient utilization of the Learning Management Systems (LMS) was also observed. All pertinent materials were posted and contained clear instructions. Appropriate assessments were provided and were aligned to learning objectives and lessons with a reasonable and manageable time on submission deadlines. Teacher also showed punctuality on the set synchronous and asynchronous class schedule and answered students' concerns and queries efficiently. Learning activities and tasks were relevant, worthwhile and time manageable. Most of the students responded positively to every attribute listed on each of the different distance learning aspects. Their expectations towards distance learning in terms of the preparation, appropriateness of materials, efficiency of teaching approach on both modalities, teacher availability and ability to cater students' needs were highly met. On the contrary, learning activities perceived the least because students usually felt burn out of the number of worksheets or performance tasks being assigned by their teachers. It may be suggested to review the curriculum and craft interdisciplinary assessments/activities that would provide a comprehensive yet meaningful assessment. This is to possibly decongest students learning tasks/activities, yet it would still uphold the essential competency across the courses. With this interdisciplinary approach, teachers in different areas or discipline should collaborate in the creation of a rich summative assessment task. With this, students learning tasks would be decongested and students would be given opportunities to synthesize and demonstrate skills and knowledge they have acquired across several disciplines. This interdisciplinary approach in the creation of assessment is left untapped for discussion and beyond the scope of this study. However, there are several studies exploring the impact of interdisciplinary approach in the enhanced students' in-depth understanding and engagement towards a course (Mackinnon, 2013).

Overall, positive and satisfactory feedback are obtained from the conducted survey where most of the students' response shows a negatively skewed distribution for each distance learning element. The result of this analysis is a good indicator that these alternative learning modalities work well in dispensing continuous academic support to students remotely despite the global crisis.

Research Question: How do students perceive the use of alternative learning modalities in the context of general chemistry instruction?

Students Lived Experiences with the Alternative Learning Modalities

A short exit poll was conducted to get a quick sense of students' experience on the virtual education in line with the utilization of alternative learning modalities, in synchronous mode and asynchronous mode. The students discussed the advantages and disadvantages of synchronous and asynchronous classes/activities, and how virtual learning should be structured to improve learning in the context of General Chemistry instructions. Through thematic analysis, positive features, and drawbacks of each of the two learning modalities were carefully extracted and deduced into these following phrases and keywords below which were found to be repetitive in almost of the students' responses.

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A. Synchronous Learning Modality

Positive Features of Synchronous Learning Modality. As regards to the utilization of synchronous distance learning, students perceived that the use of different interactive features of synchronous web conferencing like polling, interactive quiz, and chat forums have helped them to become more engaged individuals during synchronous meetings.

Collaboration, Engagement, and Interactivity. Most of the students enjoyed the administration of exit or formative assessment through interactive application and games such as Kahoot and Quizizz. They were able to have fun and interact with their classmates, recall important concepts, and reassess their understanding thoroughly with the synthesis of solutions and final answers. Students reported that they tend to be more attentive and interactive towards the lessons. They had the chance to participate through presentation, explanation and discussion of possible answers to the prompt. Students had the voice to share their ideas, thoughts, and opinions during synchronous classes. Excerpts from students' responses to open-ended exit poll questions are presented below:

"I like the most in our synchronous class/activities are: (1) The interaction between the teacher and the students because it helps to clarify and understand more about the discussion, especially when we have a particular question and when we are answering in some activities such as the games, and we are able to recite. (2) The Quizziz which is done before proceeding to the proper discussion, in order to recall the past discussion that also helps us to retain the knowledge and information. (3) Lastly, the thing that I like when it is synchronous classes is because we are able to feel that we are in the school and there is a lot of information and trivia that we are able to learn. Synchronous classes were definitely effective for me and it was a great strategy for teaching." -Student A

Reinforcement. A mini-activity or ceremony was conducted before the class commenced formally. Active students who shared relevant ideas and concepts in the discussion section in LMS were being awarded during the synchronous meeting. Students were grouped and assigned to monitor students' participation. Each group was assigned in a specific week to announce awardees or active participants. Students take ownership of their own learning as they voluntarily participated in the activity. Their involvement was astonishingly remarkable as the monitoring group of students prepared a short virtual ceremony to recognize the effort and dedication of their fellow learners. This kind of activity taps students' interest and motivation towards the subject since their understanding, dedication and hard work were being acknowledged in the class. This statement is evident in one of the students' sample responses presented below:

"My InstaChem Story Awarding. This encourages me more to strive harder and better in General Chemistry as we are being awarded for our dedication in understanding, and hard work to the said subject." – Student B

It is clearly stated above students liked the teachers' innovative and positive motivation approach of recognizing students' performance and active participation in the course. Several studies reported that motivation plays a vital role and has a great impact on the learning process. Self-determination theory of Deci and Ryan (2002) proposes that any course of action that supports students' experience of autonomy, competence, and relatedness are found to foster the most volitional and high-quality forms of motivation and engagement for activities, including enhanced performance, persistence, and creativity. According to the study of Reeve (2002), students benefit when teachers support their autonomy, listen more, encourage conversations, and held workload less.

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Communication. Teacher provided immediate feedback to students' concern or queries regarding the concepts. Learning became easier for students since the teacher effectively conveyed the instructions in an organized, clear, and concise manner. The utilization of video conferencing impacts the students' feeling of association with their instructor and promotes mutual social existence or involvement in distance education. Communication between the teacher and students helped improve the learning experience and create a positive environment in the virtual classroom. Students discussed that the support they received from their instructor positively influenced and motivated them to like the subject even more. In support of this claims, excerpts from the open-ended exit poll were presented as follows:

"One aspect that I liked is that we can communicate immediately as some of the questions need to be addressed immediately. I also like how the class was engaging as I think it is helpful especially on this subject. Lastly, even though it is online, I also like how I learned a lot on this subject" -Student C

"1) I liked that I can interact with my teacher. (2) I liked that the teacher can explain the lesson more efficiently. (3) I liked that the student can ask questions in the lesson. Why? That is because having online class, we don't have time to communicate to teacher's face to face classes, so having synchronous, it helps us student to have a chance to ask some question and to learn the lesson easily because someone is teaching us in our own paced. I also really like that our teacher would ask us a number if we can hear her because not all students are confident to talk in a meeting so being able to chat that way was less nerve-wracking and less effort."- Student D

In general, the use of synchronous modality has helped the students to become more motivated and engaged learners towards the subject. Most of the students expressed the belief that the importance of stimulating students' interest, encouraging positive reinforcement, and teacher presence makes the learning process in synchronous set-up more meaningful and worthwhile. With the aid of these synchronous learning aspects, it promotes collaboration, communication, and stronger student-teacher relationship within an online environment.

Drawbacks of Synchronous Learning Modality.

Though this section already indicated the advantages of conducting synchronous online classes, however, there are also some areas that need to be refined and improved. The following statements present the drawbacks of synchronous learning modality.

Unstable Internet Connectivity. Synchronous classes were not favorable to some students who have slow internet connection and limited bandwidth. Students felt frustrated because sometimes they cannot understand anything what the teacher was discussing during synchronous lessons. They tend to become demotivated on the lessons when there's interruption on the internet connectivity. Studies revealed that anxiety interferes academic achievement and performance of students (Rosenfeld, 1978; Spielberger, 1970). These recurrences have been established as one of the teaching problems in the new normal education. With this regard, it can be suggested that teachers should be responsive to take consideration to this uncontrolled condition of internet interruption. It would be of great help to students when teachers record their synchronous session, of course, with consideration to the consent of the learning audience. By documenting and recording the session, student can review the learning discussion at their own pace and convenience. Instructor and social presence are perceived important in the digital realm. It influences student learning and motivation towards the course. Teacher immediacy and ability to provide feedback and direct instructions are also an important factor to consider when conducting synchronous online discussion. It was examined that "instructor to student' over 'student to student'

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interaction was found to be the very significant variable affecting student satisfaction in a survey of online students (Ladyshewsky, 2013). An excerpt to support this claim is presented below:

"The things that I dislike in terms of synchronous class/ activities are: (1) It was not favorable for the students who have slow internet connection and sometimes it was lagging, so it is a bit difficult. (2) It requires a lot of time, maybe because of the internet connection also. (3) Lastly, there are times where there could be a distraction, either in the students' pace or in the teacher and again, it is really difficult to handle. However, I am grateful that for the first whole semester of general chemistry we are able to handle these difficulties."- Student E

Distraction. Some students find it difficult to listen and understand the lessons being discussed since a lot of distractions and interruptions on both teacher and students' ends were intervening along the learning process. There are students with poor conducive learning environment which affects their concentration on the synchronous meeting.

Congestion of Learning Lessons. Due to the nature of the classroom schedule in the new virtual set-up, collective topics were forcefully covered in a single meeting since lessons are presented in progressive and modular manner. This results to fast-paced discussion where students find it hard to cope up with the lessons. Students reported that the amount of learning information was quite numerous and overwhelming. This answers why learning activities in the distance learning elements perceived the least appreciated aspect of online learning as reflected in the survey responses.

Lack of Laboratory Activities. The new learning set-up restricts the conduct of laboratory activities which is very unconventional to the nature of the subject. Students did not have the chance to perform practical work in laboratory, though virtual simulations were used as supplementary tools to hands-on laboratory activities.

B. Asynchronous Learning Modality

Positive Features of Asynchronous Learning Modality. Asynchronous method provides a more self-directed and personalized learning. It does not require the students to be online and present. Learning materials and contents are presented in an organized and bite-sized modular manner through online via LMS and offline via printed coursework package. The asynchronous set-up of learning provides students choices with the array of learning tools and available supporting resources. The following statements entails the advantages of asynchronous learning modality as perceived by the students.

Convenience and Flexibility. Time frames are more likely student control in which they are learning at their own pace independently by convenience. They managed their own time and were not pressured to absorb all the modules in a single sitting. This claim is supported by a sample of a student's response on the exit poll item as presented below:

"First, I like that we can accomplish our tasks in our own time because it's very convenient and hassle-free especially if there are other events that I need to participate in. Second, I like that the lecture videos provided gives us an ample amount of knowledge that we need without having the need for the respective teacher to discuss the lesson further because if we forget the lesson, we could just re-watch the lecture videos and we'll be on track. Lastly, I like that the tasks given and manageable, also that most performance tasks are done in groups because group works means less work for the students and less checking for the teacher. It also helps us communicate better with our classmates whenever doing tasks etc."- Student F

Access to learning materials. Lecture videos were highly perceived very helpful in understanding the lessons and concepts as it is explained in a bite-sized manner. They could always review the lessons at any time of their convenience. Provided slide presentation, modules and relevant websites helped

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students immensely during studying as they are easy to comprehend and constructed with quality. Worksheets helped students to apply what they have learned on their own pace. Aside from the learning materials being provided by the teacher, students also became more resourceful and ingenious when it comes to searching better learning tools online to support their understanding. Student G and Student H emphasized what they liked about the asynchronous set-up of distance learning.

"I enjoyed this class a lot since it's interactive, fun, and challenging. The topics are well-explained by the videos and it really challenges us to go beyond and above to fully grasp the topic better. I like how every learning material is already provided to us, which also makes our learning experience a little bit more bearable."-Student G

"I like (1) the comprehensive yet straightforward modules that assist us to study the lessons independently. (2) The creation of My InstaChem Story where we can share our insights and keep in touch with our instructor when we have queries. This helps us catch up with the progress of our classmates asynchronously, thereby creating an ambiance that we are not learning alone." – Student H

Enhanced and active learning through threaded discussion. Students were able to interact and learn from each other through exchange of ideas, thoughts, and opinions in the discussion page published on the Learning Management System. They were presented with varied questions in which they have the freedom to choose what prompt/s they want to answer. Rich-content discussions were shared by students. Students also monitored and evaluated each other's participation. Thus, communication among students was encouraged and promoted because they can react and comment to anyone's post in the discussion section. In this way, it promotes a sense of community for a shared purpose. Hence, students are learning from one another.

Drawbacks of Asynchronous Learning Modalities.

Lack of immediate feedback and communication. Along with self-learning mode of studying, there are students who cannot fully grasp the lessons, thereby, need more assistance and guidance from the teacher. However, the asynchronous modality delays feedbacking especially when students would like to clarify a certain concept or instructions they have read from the modules or leaning materials. They felt distant as well from the instructor. Some parts of the lessons were difficult to study independently, hence, it needs more explanation. Moreover, it lessens interaction among students. Group tasks and coordinating with group members are difficult to accomplish since some of them are not yet familiar with each other. Hence, task-oriented discussion and collaboration have created a less satisfying experience for team members during the asynchronous method.

Overwhelming tasks and activities. Students' workloads are piled up gradually. Performance tasks and worksheets were quite numerous until students could hardly managed it in a single sitting causing them to cram the requirement when almost due.

Poor time management. Students find hard to balance their academic activities during asynchronous learning. Some students are still adjusting since they are not yet accustomed on the new set-up of asynchronous learning. They tend to lose focused sometimes when not monitored or pressured. As suggested by Berge & Muilenberg (2005), learners need time to seek and adjust their learning routine that will help them manage online activities related to the course and other family and work responsibilities.

Overall, the delayed feedback, difficulty in coordinating group members' interactions, lack of emotional connection and overwhelming tasks and activities entailed as the barriers of the distance learning during the asynchronous method.

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CONCLUSION

This study was conducted in real-life context to identify and examine students' perceptions toward the utilization of the alternative learning modalities in the new normal classroom setting in the context of General Chemistry. It also sought to answer which among the two modalities-synchronous and asynchronous methods is highly perceived by students as more convenient medium for the delivery of instruction. In general, this study found that the surveyed Grade 12 students from a private medical school in Dasmarinas have greater interest in the teaching approach done in asynchronous method. This finding is consistent with students' performance on 20-item parallel assessments conducted both in synchronous and asynchronous set-ups.

Based on the conducted assessment to measure conceptual understanding in the context of General Chemistry, students performed better on an asynchronous method rather than in synchronous. Furthermore, the study revealed that while creating immediacy is easier in the synchronous method, it is likely that convenience, flexibility, interactive and collaboration occur prominently in asynchronous method with the use of discussion boards and innovative teaching strategies. With this, building a dynamic online learning community was made possible when learners connect to their peers, work collaboratively, and are well facilitated by their teachers in the entire learning process. The findings revealed that students perceived the placement of alternative learning modalities as useful methods that promote interest and learning positively. Moreover, the findings of the study indicated that both synchronous and asynchronous methods were effective in delivering instruction. Similar results were also observed on the works of several research studies (Jarmon et al., 2009; Skylar, 2015; Vonderwell & Alderman, 2007; Dziuban et al., 2018; Malik et al., 2017). A satisfactory and positive feedback was obtained thoroughly based on students' experiences in an online environment through survey or exit poll. It is highly evident that the positive features of resorting to alternative learning modalities (synchronous or asynchronous) outweighed the perceived drawbacks.

Based on students' responses, both modalities have their own advantages and pitfalls towards learning, however, these alternative modalities are undeniably effective and efficient tools as supplement to traditional classes during pandemic and community lockdown. It positively enhanced pedagogical instructions and students' conceptual understanding with the integration of other interactive technology-based applications which make virtual learning more meaningful and worthwhile. The use of technology enhanced students' learning experiences and provided wide array of information network. Online teacher as facilitator plays a vital role in the implementation of the alternative learning modalities. They hold a control to set the virtual learning climate conducive and comfortable, hence, creating a positive atmosphere. Despite the gap in space and time between teachers and students, learning still continues within the comfort of everyone's home and is effectively managed through the utilization of alternative learning modalities. It can be suggested that a blend of the best practices in synchronous and asynchronous methods could possibly create an ideal environment for distance learning. The findings and results of this study can be added in the pool of literature related to the use of alternative learning modalities in the new normal education.

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