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KNOWLEDGE, ATTITUDES, AND PRACTICES OF MEDICAL TECHNOLOGY STUDENTS ON REMOTE TEACHING IN TWO UNIVERSITIES IN MANILA

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Abstract: The current COVID-19 disease pandemic forced education institutions related to medical technology in the Philippines to use distance learning through technology to continue to educate their students. Previous studies indicated the effectiveness of remote learning practices in improving a student's performance and laboratory skills. Thus, this study aimed to determine an effective remote learning modality for skill-based courses, specifically medical technology, in the Philippines. The study utilized a mixed method of a quantitative study utilized a knowledge, attitudes, and practices (KAP) questionnaire answered by students from a Medical Technology program from two universities in the Philippines and a qualitative study utilized a focused group discussion from students who answered the questionnaire. A total of 353 participants responded to the questionnaire where 8 representatives for each year level in each university participated in the focus group discussion. Results have shown that students generally have a good foundation in the usage of the technology but have a less than desirable attitude that also contributed to the neutral level of practices done by the students. Overall, the different online learning modalities (synchronous, asynchronous, mixed) appear to have no significant difference among students of the two universities based on knowledge ($p>0.0.05$) and practices ($p>0.05$) but have a significant difference based on attitudes ($p<0.05$) related to remote learning. There was also a significant difference in the attitudes of the students from different universities ($p<0.05$) and year levels ($p<0.01$) and in the practices of students from different year levels ($p<0.05$) towards online learning. Further evaluation of laboratory skills of medical technology students attending online learning modalities is necessary to produce a more representative result on the efficacy of these learning modalities on laboratory skill development necessary for the practice of medical technology

Keywords: *Education, medical; knowledge, attitudes, practices; medical technology; online systems*

I. INTRODUCTION

The continuous utilization of technology in medical education has developed and progressed over the years to cater to a digitized healthcare system. Technologies such as podcasts and videos with flipped classrooms, mobile devices with apps, video games, simulations (part-time trainers, integrated simulators, virtual reality), and wearable devices (Google Glass) are some of the techniques available to address the changing educational environment [1]. However, while the use of technology has prepared students for an increasingly digitized system, health-allied programs, Medical Technology, in particular, is still a skill-based program that requires hands-on learning

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and practice? Furthermore, few (schools) integrate digital health training into required curricula [2] and educational institutions are being overwhelmed with these new modes of learning.

However, with the emergence of the COVID-19 pandemic, there appears to be no choice for health-allied students, particularly medical technology students in the Philippines, but to continue their education through the means of technology and distance learning. Therefore, students from the Faculty of Pharmacy – Medical Technology of the University of Santo Tomas have conducted a study to evaluate the effectiveness of remote teaching for medical technology students in the Philippines.

Data were collected by sending questionnaires to medical technology students currently enrolled who are utilizing online learning. From common responses and insights in the survey, a significant number were then selected as representatives of medical technology students for a focus group discussion (FGD). Results from the survey and the focus group discussion were collated via statistical analysis and thematic analysis, respectively. With the data gathered from the analyses, the efficacy of remote teaching and its modalities (asynchronous, synchronous, and mixed) for medical technology students were evaluated by using the Knowledge, Attitude, and Practices (KAP) model.

The methodological framework used was a Knowledge, Attitudes, and Practices (KAP) survey which is a quantitative method to obtain information that is both quantitative and qualitative by nature [3]. It also targets a specific population and asks questions about what is known, believed, and done about a certain topic [4]. This method is commonly used in health and education and it is an easy way to get a grasp of the perspective of a certain population and define them quantitatively. It is also considered to be cost-effective and conserve resources [3].

A KAP study has also been done to evaluate the e-learning adoption of certain universities in Jordan with respect to the academic staff [5]. In this study, a KAP questionnaire was provided to educators to determine whether or not a positive stance was present to adopt e-learning in the midst of COVID-19. They found that the academic staff had enough knowledge and a positive attitude towards implementing e-learning in their universities. This however did not include the possible experience that the students might have.

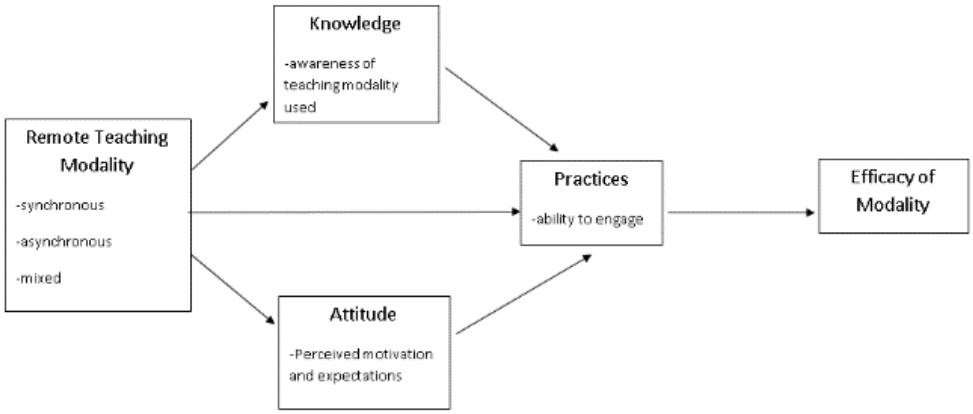

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Figure 1. Conceptual framework. Adopted and modified from Wan et. al (2016) [6].

This figure shows the relationship between the variables we will use with the remote teaching modality being the independent variable and the KAP is the measurement of that variable which will determine the outcome or dependent variable which is the efficacy of the remote teaching modalities. This will be done through questionnaires and a focus group discussion to obtain congruent themes that could explain the results obtained.

II. METHODOLOGY

A. Research Design

The method utilized for this research was a mixed method of quantitative (KAP questionnaire) and qualitative (Focus Group Discussion) studies. The descriptive quantitative study was done with the use of a questionnaire that contains 25 questions, with items subdivided into knowledge, attitude, and practices on remote teaching modalities. The dissemination of questionnaires was then followed by a qualitative study, which was the focus group discussion. The focus group discussion, which constitutes the narrative qualitative data, was conducted online via the "Zoom" software application. Participants for the focus group discussion were selected randomly and each represented a year level and school.

Data obtained was then analyzed using the KAP model, which takes into account the knowledge, attitude, and practices of the students towards various learning modalities (synchronous, asynchronous, mixed). This study determined the efficacy of these learning modalities in Medical Technology.

B. Subjects and Study Site

The researchers used a purposive sampling technique to collect data from the students enrolled in two different universities offering medical technology programs with at least 5 years of establishment around Manila, Philippines. One of the universities established its medical technology department not later than 1961 (university A) while the other university started to offer the program in 1960 (university B). The study had a confidence level of 95% with a 5% margin of error. The approximate number of currently enrolled medical technology students for University A is around 2000 students while for University B with an approximate number of 2000 students. A total of approximately 4000 medical technology students all combined from both universities. To achieve the said confidence level and margin of error, the researchers will then adjust the sample size of an estimated population of 4000 students in total. The formula used is based on Raosoft survey tool software that uses the formula:

$$x = Z\left(\frac{c}{100}\right)^2 r(100-r) \quad \Rightarrow \quad n = \frac{Nx}{E^2(N-1)+x} \quad \Rightarrow \quad E = \sqrt{\frac{x(N-n)}{n(N-1)}}$$

The researchers had to survey 351 total students that comprised 65% for University A's students and 35% for University B's students. The division of respondents required for each university was done due to the logistics issue and sampling technique. The survey questionnaires were only given to the students whose age ranges from 18-25 yrs old. The questionnaire was disseminated through

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Google Forms, an electronic internet-based software, by the researchers in a specific length of time. Recent graduates of Medical Technology or similar programs were excluded from the study.

Participants for the focus group discussion were taken from those who answered the questionnaire who agreed to be part of the FGD representing each year level in each university.

Criteria to the participation of this study were students who are currently enrolled in BS Medical Technology in Manila Philippines and who have undergone or are currently experiencing remote or online learning.

C. Data measure/ Instrumentation

The study utilized a questionnaire to gather data. The questionnaire is based on and adapted from a 2020 study by Abuhashesh, et al. entitled "E-Learning Adoption among Academic Staff during COVID-19 Pandemic Outbreak: The KAP Model" which was adjusted to fit better with the objectives of the study; most specifically, to address students instead of the teaching staff. The questionnaire was divided into three parts wherein the first part has questions involving general and demographic information while the second part has items involving the knowledge, attitudes, and practices on remote teaching modalities of students, and the third part includes the form for interest in taking part in the focus group discussion. Included in the first part, aside from an optional name, age, and sex, the recipient's course or program, year level, and type of online learning used, which includes synchronous, asynchronous, and mixed. The second part included 25 items describing the knowledge, attitudes, and practices on remote teaching modalities of the recipient using a Likert scale of 1 to 5 where 1 indicates strong disagreement and 5 indicates strong agreement to each item.

To evaluate the validity of the questionnaire, the questionnaire was distributed to a pilot group of medical technology undergraduates in Manila. Comments on the construction of the questions and their clarity were obtained from the pilot group. Afterward, the data collected from the questionnaire were analyzed using principal components analysis and coefficient alpha using R via RStudio to check for accuracy and consistency. Finally, the questionnaire was revised based on the data from previous steps. If major changes are done, the questionnaire would have undergone another pilot test that would have been analyzed using principal components analysis and coefficient alpha using R via RStudio. After revisions, the results of the final alpha score was found to be 0.81 which was acceptable. [7]

Subsequently, a focused group discussion (FGD) was conducted to rationalize the quantitative results from the survey. Zoom, a video conferencing software, was used to connect with FGD participants. FGD participants were randomly selected from survey participants wherein one representative for each year level and school was selected. In the questionnaire, a question asked the consent of the participant to join the FGD. After checking, the participant was contacted when selected.

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D. Data Gathering Procedure

Participants were gathered through social media and the questionnaire was disseminated in Google Forms through UST email with the assistance of the Faculty of Pharmacy and approval from the Dean's Office.

Selected participants included two (2) schools within Manila who will be answering the questionnaires for the FGD which included a checkbox if they would be joining the FGD and would be contacted when selected for the said FGD. For each year level, a representative was taken from a variety of students from the two universities that were chosen.

The entire session which lasted for about 80 minutes was recorded following each participant's written and verbal consent. The questions asked were classified into three parts which are under the knowledge, attitude, and practices categories. For the knowledge part, experience on E-learning software and operability on learning platforms were asked. For the attitudes part, their beliefs and insights towards E-learning were asked. Lastly, for the part of the practice, the adequacy of materials, competency of instructions, strategies in the employment of E-learning, and then accessibility of learning materials were asked. There were a total of seven questions that each participant must answer, and the discussion ended with everyone's final thoughts on remote teaching.

E. Ethical Considerations

The researchers made sure that voluntary participation and full consent were obtained from the participants prior to the study. Verbal and written consent from FGD participants were also obtained. This study was reviewed and approved by the Faculty of Pharmacy Research Ethics Committee of the University of Santo Tomas, Manila.

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F. Data Analysis

The data obtained from the study were analyzed and computed using the Microsoft Excel SpreadSheet and SPSS. The SPSS (Statistical Package for Social Sciences) software was utilized to analyze the gathered survey data in which a mixture of descriptive statistics, nonparametric tests, graphs, and models are employed. Descriptive statistics were applied to summarize the demographic information. Then, the answers obtained from the survey were analyzed by obtaining the frequency and the weighted mean of each response. Then, each weighted mean had a corresponding verbal interpretation. The weighted mean that falls under 1-1.79 corresponds to 'strongly disagree'; 1.8 - 2.59 corresponds to 'disagree'; 2.60-3.39 corresponds to 'neutral'; 3.40-4.19 corresponds to 'agree'; and finally, 4.20-5.00 corresponds to 'strongly agree'. Furthermore, non-parametric tests such as Kruskal-Wallis and Mann-Whitney tests were utilized to determine if there were significant differences between the independent variables such as gender, university, year level, and type of online learning used. For the gender and university, the Kruskal-Wallis test was used while the Mann-Whitney test was utilized for the year level and type of online learning used. If its p-value falls above 0.05 the null hypothesis will be retained which means that there is no significant difference. On the other hand, if it falls below 0.05, the null hypothesis will be rejected which means that there is a significant difference between the obtained results.

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In the FGD, the whole discussion was transcribed and was analyzed using thematic analysis where related themes in the participants' answers were grouped to derive inferences on their answers for the questionnaire and the interview.

III. RESULTS

The data obtained from both the questionnaire (quantitative) and focus group discussion (qualitative) are presented in the following text, tables, and figures. A significance level of 0.05 was utilized in this study.

A. Profile of the Participants

A total of 362 participants answered the survey. Nine (9) participants were rejected as they did not meet the inclusion criteria (i.e. not taking Medical Technology) or have duplicate responses, resulting in 353 valid responses. Most participants were second- and third-year students (82.1%), mirroring the percentage of age as well that most participants were between the ages of 20-21 years old (71.8%). The desired percentage split of participants between university A and B was achieved — 65% and 35% respectively. As for the type of online learning used among participants, 83.6% of the participants had a mixed learning set-up (both synchronous and asynchronous), 12.5% of participants had a full synchronous learning set-up and 4% had a full asynchronous learning set-up. The participants' characteristics are summarized in Table 1.

Table 1. Frequency and percentage of participants' characteristics

Characteristic		**Frequency**	**Percentage %**
Age	18 yrs	26	7.4
	19 yrs	56	15.9
	20 yrs	131	37.1
	21 yrs	122	34.6
	22 yrs	18	5.1
	Total	**353**	**100.0**
Gender	Male	108	30.6
	Female	245	69.4
	Total	**353**	**100**
Year Level	1st year	51	14.4
	2nd year	125	35.4
	3rd year	165	46.7
	4th year	12	3.4
	Total	**353**	**100**
University	A	230	65.2
	B	123	34.8
	Total	**353**	**100**
Type of Online Learning Used	Synchronous	44	12.5
	Asynchronous	14	4.0
	Mixed	295	83.6
	Total	**353**	**100**

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B. Quantitative Results on Knowledge

The weighted mean was obtained from the frequency of each response under the knowledge category and the verbal interpretation corresponds to the value of the weighted mean. As seen in Table 2, four questions fell under strongly agree, two questions fell under agree, and only one question fell under neutral. The questions with a verbal interpretation of strongly agree are those that asked how knowledgeable they are in terms of maneuvering with online platforms and how to use its functions while those questions that fell under the interpretation of agree have something to do with troubleshooting and freedom of access. A question with a verbal interpretation of neutral asked about the online infrastructure of the university. With all of these being considered, an overall weighted mean of 4.30 with an overall interpretation of strongly agree was obtained for the knowledge part.

Table 2. Evaluation of Results in terms on the Knowledge in Remote Learning using Weighted Mean

Knowledge	1	2	3	4	5	Weighted Mean	Verbal Interpretation
	Frequency						
Our university/college has good online infrastructure.	2	18	78	184	71	3.86	Neutral
I know how to use our learning management system/platform well.	1	4	32	143	173	4.37	Strongly Agree
I know how to download and save files for study.	-	2	4	35	213	4.86	Strongly Agree
I know how to upload assignments of different formats.	-	2	7	50	294	4.80	Strongly Agree
Our university/college allows the use of other platforms for study	8	22	58	131	134	4.02	Agree
I am well versed with the use of the internet and am aware of its functions.	-	2	17	102	232	4.60	Strongly Agree
I know how to troubleshoot when technical problems arise	9	41	96	136	71	3.62	Agree
Overall Weighted Mean						**4.30**	**Strongly Agree**

Table 3 shows the statistical difference of each group based on the knowledge part. The mean rank for each group, including its p-value and statistical interpretation, was indicated. No significant difference in terms of knowledge of remote learning was found among gender ($p = 0.281$), university attended ($p = 0.966$), year level ($p = 0.278$), and type of online learning used ($p = 0.127$) groups.

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Table 3. Evaluation of the Knowledge Towards Remote Learning in terms of Gender, University, Year Level, and Mode of Online Learning (Mann-Whitney & Kruskal-Wallis)

	Category	Mean Rank	p-value
GENDER	Male	184.74	0.281
	Female	173.59	
UNIVERSITY	A	177.15	0.966
	B	176.72	
YEAR LEVEL	1st year	187.60	0.278
	2nd year	173.22	
	3rd year	164.19	
	4th year	169.3	
TYPE OF ONLINE LEARNING USED	Asynchronous	188.00	0.127
	Synchronous	132.43	
	Mixed	177.47	

C. Quantitative Results on Attitudes

Table 4 contains the questions on attitudes and showcases the frequency, weighted mean, and verbal interpretation of each of the responses gathered for each question under attitudes towards remote learning. The weighted mean is garnered from the frequency of responses gathered and is verbally interpreted in correlation with a specific range which may fall under strongly agree, agree, neutral, disagree, and strongly disagree. In terms of verbally expressing the results garnered from the following questions under attitudes, one question was interpreted as agree, two questions were interpreted as neutral, and four questions were interpreted as disagree. An overall weighted mean of 2.65 can be correlated and verbally interpreted overall as neutral for the attitudes part of the study.

Table 4. Evaluation of Results in terms on the Attitude in Remote Learning using Weighted Mean

Attitude	1	2	3	4	5	Weighted Mean	Verbal Interpretation
	Frequency						
I like using remote learning systems.	2	18	78	184	71	2.80	Neutral
I like learning in a home type environment.	19	27	46	113	148	2.22	Disagree
I prefer online teaching techniques from conventional teaching methods.	29	22	18	32	252	1.89	Disagree
I like having online tasks for academic purposes.	15	12	36	49	241	2.46	Disagree
I enjoy using online lectures.	19	39	69	109	117	2.41	Disagree
I am willing to comply with changes in teaching method that is based on technology.	2	7	47	101	196	3.29	Neutral
I like the interface of the platform our university/college uses for online learning.	7	31	91	131	93	3.50	Agree

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Overall Weighted Mean	**2.65**	**Neutral**

In terms of gender, university, year level, and type of online learning used under the attitudes towards remote learning, this table showcases the significant differences observed under each category. Indicated in Table 5 are p-values and their corresponding statistical interpretation of the gender, university attended, year level, and type of online learning used groups. Overall, university attended ($p=0.019$), year level ($p<0.01$), and type of online learning used ($p=0.045$) showed a significant difference in terms of attitudes towards remote learning

Table 5. Evaluation of the Attitude Towards Remote Learning in terms of Gender, University, Year Level, and Mode of Online Learning (Mann-Whitney & Kruskal-Wallis)

	Category	Mean Rank	p-value
GENDER	Male	178.66	0.83
	Female	176.27	
UNIVERSITY	A	185.81	0.019
	B	160.52	
YEAR LEVEL	1st year	207.15	<0.01
	2nd year	184.71	
	3rd year	149.44	
	4th year	172.71	
TYPE OF ONLINE LEARNING USED	Asynchronous	193.60	0.045
	Synchronous	167.00	
	Mixed	174.56	

D. Quantitative Results on Practices

Table 6 shows the frequency of the responses of the participants to items related to practices towards remote learning. Overall, the participants have a neutral response to most items. Meanwhile, they agreed on a few items such as the capability to use learning materials provided online, attending classes on time, understanding the topic before moving on, and accessibility of learning materials.

Table 6. Evaluation of Responses Based on Practices Towards Remote Learning using Weighted Mean

Practices	1	2	3	4	5	Weighted Mean	Verbal Interpretation
	Frequency						
I have a conducive learning environment.	48	62	136	85	22	2.92	Neutral
I manage my time well when engaging with my lessons.	45	102	110	81	15	2.77	Neutral
I am able to use all learning materials provided online	13	62	84	135	59	3.47	Agree

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(class discussions or recordings).							
I only use online learning for the purposes of passing requirements.	18	68	95	107	65	3.38	Neutral
I attend all my classes on time.	18	37	69	110	119	3.78	Agree
I am able to make use of additional learning materials (e.g. Virtual Labs).	49	62	103	99	40	3.05	Neutral
I participate actively during class discussions.	34	71	146	73	29	2.98	Neutral
I ask questions to my professors (message privately or during class discussions).	43	74	99	78	59	3.10	Neutral
I make sure to understand a topic first before moving to another topic.	13	50	110	118	62	3.47	Agree
I actively study with my classmates online.	58	96	76	82	41	2.86	Neutral
I don't have trouble accessing learning materials.	12	48	92	120	81	3.59	Agree
Overall Weighted Mean						**3.22**	**Neutral**

Table 7 shows the rank analysis of different groups according to gender, university attended, year level, and type of online learning used based on practices towards remote learning. Overall, only the group according to year level shows a significant difference in their practices towards remote learning (p=0.029). Groups based on gender (p=0.055), university attended (p=0.977), and type of online learning used (p=0.578) have no significant difference in their practices towards remote learning.

Table 7. Evaluation of Difference Between Gender, University, Year Level, and Type of Online Learning Used on Their Practices Towards Remote Learning (Mann-Whitney & Kruskal-Wallis)

	Category	Mean Rank	p-value
GENDER	Male	172.50	0.055
	Female	178.98	
UNIVERSITY	A	176.90	0.977
	B	177.20	
	1st Year	179.18	0.029
	2nd Year	184.54	

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YEAR LEVEL	3rd Year	158.21	
	4th Year	161.33	
TYPE OF ONLINE LEARNING USED	Asynchronous	147.77	0.578
	Synchronous	150.10	
	Mixed	159.00	

E. Qualitative results from the focus group discussion

The FGD was conducted on March 29, 2021, via Zoom, with eight participants — one representative from each year level of the two universities. Seven participants came thirty minutes before the scheduled time, but one participant stated that he cannot participate. Each participant was asked for both written and verbal consent before the session started. The entire discussion lasted for about 80 minutes. Questions asked were classified into three themes — knowledge, attitude, and practices. For the knowledge part, experience on E-learning software and operability on learning platforms were asked. For the attitudes part, their belief and insights towards E-learning were asked. Lastly, for the practices part, the adequacy of materials, competency of instructions, strategies in the employment of E-learning, and the accessibility of learning materials were asked. There are a total of seven questions that each participant must answer. The discussion ends with everyone's final thoughts on remote teaching. To analyze the data obtained from the discussion, the main themes based on the participants' answers were determined by using an inductive approach and a coding system. Each author has their own assigned part to read through the transcription and find relevant themes that can be used in the study. Then, through a discussion via Zoom, the initial coding was reviewed, compared, arranged based on the final consensus among authors, leading to a more representative coding scheme and themes. Presented in the table are the identified themes along with the translated sample responses from the participants. Six (6) themes were identified under the knowledge category, fifteen (15) themes under the attitudes category, and eight (8) themes under the practices category. These themes are summarized in Table 8. The statements are translated into English from the colloquial language.

Table 8. Summary of themes (Knowledge, Attitudes, and Practices)

Category	Themes	Sample statement of the students
Knowledge	University handled online learning adequately	**"**University A handled online learning quite well"
	University handled online learning somewhat adequately	"University B handled it somewhat adequately and somewhat inadequately at the same time; because there is no difference between AOL (asynchronous online learning) and MOL (mixed online learning) and this is unfair for those chose the AOL"
	Proficiency of the professors in using modern day technology in teaching	
	Ability to be more proficient in using their gadgets, the internet, and their online platforms	

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	University regularly checks up on the mental health	"Especially if the prof is not techy, they could go as much as 20 min just to figure out how to screen share"
	Medical technology is a skill-based program	"It became part of your day-to-day living so of course you'll adapt and eventually you'll be faster and more efficient in using your devices"
	Laboratory work is not experienced	"Our course is more on skill based or practical based"
Attitudes	Online Learning is not effective; It is pure knowledge and practice and lacks practice and application	"It is really not effective, and I'm disappointed at my academic proficiency because I can't apply what I've learned"
	Real time interactions with professors are better	"As a first year [student], imagine not being able to hold a microscope. Isn't that supposed to be our foundation?"
	Having others with me make it easier to learn	"I'm used to an environment where there is a teacher and I'm surrounded by classmates"
	Incompetency of the professors in teaching during online learning	"Aren't they supposed to be properly explaining, and not only reading where we feel as if it's from a script"
	Online learning is more of compliance than actual learning	"How can we work in the future if there will be a prejudice that we are incompetent just because we studied these through online leaning and without having the actual experience of doing these procedures?"
	Our time and academic proficiency is wasted	"Remote teaching is not sustainable most especially for us first year students because the set-up is just mere compliance"
	Remote teaching makes us incompetent	"I can't say that I have an enough understanding of my program because I lack the skill; all i do is read and there's no application at all"
	Focusing on academics is harder because we are at home	"I like asynchronous sessions because it gives me freedom to study at my own pace"
	Lecture and laboratory feel the same	
	Asynchronous sessions give freedom and time to pace ourselves	
	Synchronous sessions forces us to act	
	Fear and frustration on board exam and internship	

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	Conducting online learning is not necessary	

Table 8 (Cont'd). Summary of themes (Knowledge, Attitudes, and Practices)

Category	Themes	Sample statement of the students
Attitudes	Forced to be more proficient in using their gadgets, the internet, and their online platforms to cope up.	"I am frustrated for the upcoming internship and board examination because I did half of my college years online which means I lack the proper skills of a Medical Technologist"
	Online learning is not sustainable	
Practices	A conducive environment is a big factor in online learning	"A conducive environment is a major contributor to learning because it helps me focus"
	The type of environment affects priorities	
	Planning and scheduling are important	"For me, I understand the concepts better when I am part of a study group as compared when I study alone here at home"
	Usage of applications aid in online learning	
	Procrastination and cramming due to distractions must be avoided	"The use of productivity applications just like 'Forest', a Pomodoro application, helps me to focus on my task"
	The use of Pomodoro technique	"I plan everything, even my lunchtime so that I don't have to cram my requirements later in the day."
	Group studies	
	Asking questions about the topic help me learn	"Your environment affects the way you learn. For instance, even if I live in the city, there are times that the internet connectivity is down. It affects everything which causes more inconvenience."

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IV. DISCUSSION

A. Knowledge of Medical Technology Students on the Use of Online Learning

The knowledge indicator of the study seeks to determine how adequate the knowledge of the students is in terms of internet-based capabilities and functions. The results did not show any significant difference for the knowledge indicator regardless of gender, university, year level, and type of online learning used. A study conducted by Zhan, Fong, Mei, Liang [8] posited that "no significant difference were found in male and female students' learning achievements in the full sample, mixed-gender groups, gender-balanced groups, gender-majority groups or gender-minority groups" in terms of the effect of gender difference in computer-supported collaborative learning. Age, in addition, is not a significant factor impacting the future use intentions or satisfaction with e-learning [9] the type of online learning used did not have any significant difference in terms of knowledge, supported by studies saying the type of e-learning still offers advantages such as instantaneous feedback as seen in the synchronous type of learning. Asynchronous learning allows students to discuss not only with the instructors but as well as among themselves over the internet at different times. On the other hand, mixed learning offers traditional methods and e-learning methods [10].

The university plays a significant role in influencing how their chosen online platforms and existing policies and guidelines would help their students to their day-to-day online learning. Implementing online learning requires a thorough plan of remote learning to be possible. This included investing in a learning management system, training of faculty and institutionalization of policy on instructional processes maximizing ICT tools and educational learning platforms according to Javier (2020) [11]. E-learning is a powerful tool, but it requires a well-thought strategy to be successful [12]. Discrepancies and unclear guidelines could lead to misunderstanding, affecting their practices as said by one of the students from university B, "*The designation of information between students and professors was not clear. I chose AOL (Asynchronous Online Learning) so I expected that attendance is not recorded as we are not required to attend classes [synchronously]. But to my surprise, some of the professors messaged me angrily, pointing out that I must attend their [synchronous] lectures*." Although university B may have some discrepancies in their guidelines, it is noticeable how they check their student's mental health. University students are already vulnerable to anxiety and depression; learning during the pandemic places a heavy burden on their mental health [13].

Almost all of the students were able to adapt to using their respective gadgets, the internet, and their online platforms. The students agreed and said that "almost every day we use these things that is why sooner or later we would be accustomed to using them and eventually becoming more efficient." Proficiency would greatly affect the practices of the students in using other applications and techniques to cope up in facing the challenges brought upon by utilizing fully online learning methods.

The Medical Technology program is a 4-year program that includes 3 years of academic learning and a year of laboratory duty [14]. All of the students know how important laboratory skills are and how online learning acts as a barrier to learning. Student 4A said *"I already know all the hardships of going through the third year. I could say for myself that the very essence of becoming a medical technologist cannot be found in books"* which further justified how the lack of laboratory skills in online learning deteriorates how they learn. Furthermore, *"We cannot really be just good*

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in the knowledge part as we must also know the practical parts. That is why it is really best that we move face to face as remote or online learning is not effective to our course," a student said. The principle of learning by doing can be seen as lacking in online learning. A study by Mekonnen [15] shows that learning by doing together with a group does not only enhance the participation of the students but is also believed to have improved their overall confidence towards a subject matter.

B. Attitudes of Medical Technology Students on the Use of Online Learning

The attitude indicator shows the outlook of the students concerning certain aspects of online learning such as the willingness to learn in online mode and the perspective of the student towards the platform used. Overall, the students' attitudes toward online learning are neutral. This means that the students neither have a positive nor a negative attitude towards online learning in general. Breaking down the responses per question, however, reveals that the only positive attitude students have is towards the interface used by their universities. Most questions regarding attitudes towards the appeal of online learning as the main platform have the students disagreeing to prefer this type of set-up. A neutral attitude towards online learning is undesirable in this set-up as a positive online learning attitude is needed to achieve positive outcomes and influence the behavior and learning practices [15][16].

Significant differences were found between attitudes of those in different universities, year levels, and modes of online learning used. These differences can be attributed to university culture, courses taken per year level, and time-management respectively. However, further study needs to be done to elucidate and account for the differences in attitudes between these groups. Figuring out differences could be key in producing more positive attitudes to provide for better outcomes in online learning.

Medical students in the Philippines are confronted with several interrelated barriers as they adapt to online learning. Most frequently encountered were difficulty adjusting learning styles, having to perform responsibilities at home, and poor communication between educators and learners. By implementing student-centered interventions, medical schools and educators play a significant role in addressing these challenges during the COVID-19 pandemic and beyond [17]. In addition, in a short period, medical educators had to adapt, innovate, and design online learning experiences to substitute for the lost time that would have been spent inside the classroom, laboratory, or patient's bedside [18]. Other than that, the use of the media and technology to deliver and improve both learning and teaching involves proper communication between learners and teachers. A higher percentage of students had experienced challenges relating to their study habits, situations at home, and interaction with their educators. Studies on online learning in developing countries were often concentrated on students' limited accessibility to devices and the internet [19]. Thus, it has led to further claims that the attitude of both educators and students towards online learning greatly hinders maximum potential in garnering essential skills or getting ample patient exposure, which can contribute to the factors of achieving academic success.

From the results of the FGD, it can be said that students find online learning to be ineffective. The students from both universities and across the year levels all agreed on that conclusion although the degree of ineffectiveness differs among the students. Most seem to justify this from perceived incompetence of the instructor, or according to deNoyelles et al. [20], a lack of teaching presence in online learning, defined by citing Garrison et al. (2000), as "the design, facilitation, and direction

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of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes." In online learning, the students feel as if they are not being taught to, but instead merely being read the information needed for the tests to come. According to student B3, *"the professors aren't teaching everything needed, and when they do, they are merely reading".* As a result of this, the online classroom loses its distinction of being a classroom to being something simply attended online. In addition, two students from University A felt that they are forced to be more proficient in using online platforms as well as to know how to troubleshoot computers and routers in online learning. The same concerns were raised in a study conducted by Baticulon et al. [17] that two of the highlighted technological barriers are issues concerning the online learning platform and the lack of technical mastery. In fact, the lesser anxiety in the use of technology among students, the more positive attitudes are conveyed towards their use of the Internet according to Javier [18].

In the Medical Technology program, laboratory classes provide students with practical skills which are not practiced during lecture classes and reading textbooks [21]. However, in remote teaching, laboratory classes are deployed just the same as lecture classes. According to a student from University A, *"Now, I don't know the difference between lecture and laboratory classes; it feels like I am taking the lecture classes twice*." The lack of virtual laboratories and virtual practical examinations made the students feel that laboratory classes are no different from lecture classes except that concepts and principles are discussed in the lecture while procedures are explained in the laboratory. Nonetheless, the approach is the same. For all students, the classes are held synchronously or asynchronously, regardless if it is a lecture or laboratory class. Hence, the attitude towards having synchronous or asynchronous sessions are varied. One student from University B mentioned that he prefers asynchronous sessions over synchronous sessions because it helps him have a sense of freedom and the time to pace himself. Another student supported this claim by stating that synchronous sessions force students to act on a given period. A study by Sukhomlyn, et al. [22] supports this by stating that "although synchronous sessions resemble face-to-face teaching, it is not always accessible to all students. The use of technologies can limit the ability of students to participate in educational activities in real-time". Furthermore, in the same study, it was mentioned that "asynchronous sessions give students time to ponder, it stimulates reflection and independence of learners, and most importantly it is accessible and reliable."

As for the sustainability of online learning, all students agreed that remote teaching is not effective and sustainable for programs like Medical Technology. As for one student, *"Online learning is not sustainable at all because I am still a first-year student and it worries me thinking that what if the set-up is still like this until fourth year? I don't learn anything from this set-up."* Furthermore, a student from University A mentioned that *"it's not sustainable in the long run because we lack laboratory practice.*" A similar study conducted by Khalil et al. [23] mentioned that clinical practice is the critical element missing in the effectiveness of online learning. However, by enriching online learning to include virtual simulation technologies and computer-based models of real-life processes, it can serve as an efficient resource for clinical students. Furthermore, student A4 raised that aside from the negative effects of remote learning, one that he is most concerned about is the fear of being incompetent and unprepared for internship and board examination. Both the internship and board examination are needed to integrate the theoretical knowledge and practical skills of fourth-year students and graduates of the program. One student definitively expressed that if there will be an opportunity to go back to the traditional set-up,

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conducting online learning is not necessary. The student also added that a skill-based program like medical technology needs actual practice.

It is not surprising that the students would also prefer face-to-face classes with the instructors. Most share the same opinion on having understood the lessons far better when there were real interactions. During which, the instructors would stress certain parts with action and changes in speech delivery, this made it notable and easier to remember. Some students add that they learned the lessons by raising questions and having conversations with the instructors, something that has become harder to do in the online setting compared to face-to-face. As student A3 puts it, *"If you're confused, you could have always asked the professor directly. Nowadays, it feels harder to do so because everybody can see it, and it makes me feel uncomfortable."* This shows that active interaction between the instructors and students is missing, which, according to Muljana & Luo [24], must be maintained to help collapse the distance of online learning. Other students feel that it was the live environment in which they had their classmates and friends in a classroom with them that made it easier to learn. This social presence, according to deNoyelles et al. [20], is a key factor in online discussions to set the tone and support a sense of community that is important in building a shared understanding and the lack of this has negatively affected them, with student A2 stating, *"When I enter Zoom, it seems like nobody but the professor is there… it's sad to see, and this affects my mood while the professor is teaching."*

C. Practices of Medical Technology Students on the Use of Online Learning

The practices indicator shows how remote learning is done in the program Medical Technology. The results showed that practices differ among year levels but remain similar in terms of gender, university attended, and type of online learning used. This can be attributed to the idea that different year levels have different courses to learn within the medical technology program according to the Republic Act No. 5527 [13]. Although most practices apply the same in different courses, some practices might be difficult to implement in certain courses for certain topics. For example, virtual labs may be difficult for some courses because of their unavailability. Without access to a laboratory, the student may only rely on their notes, discussion, and laboratory manuals to learn a particular skill as students do not have the required materials to practice a laboratory skill most of the time. Moreover, most participants agree to attend class on time, making sure to understand the topic before proceeding to the next topic, easily accessing learning materials, and using the learning materials available online as their practices towards remote learning while remaining neutral to other practices listed on the questionnaire. This may indicate a less effective remote learning modality as these items may be used to improve a student's understanding of a particular topic.

Remote learning may improve a student's attendance due to accessibility. To attend a class, the student may only need a device such as a computer or a tablet that has an internet connection. However, access to these devices can be limited by socioeconomic status. According to Asanov et al. [25], disadvantaged groups may be less likely to use remote learning due to inaccessible technology. Because learning materials are uploaded to the internet, they can be accessed by students with an internet connection. As a result, a student may refer to the learning material often in various locations as long as there is the presence of an internet connection and a mobile device. Moreover, if the learning material can be downloaded, a student may access them as long as they have access to a device such as a mobile phone or a computer. Access to learning materials and

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flexible schedules may facilitate learning by letting the student study the material at their own pace. The utilization of additional learning materials such as virtual labs may improve a student's particular skill. According to Tubelo et al. [26], undergraduate dentistry students who used virtual simulation using virtual learning objects to practice zinc phosphate cement handling procedures have improved performance and higher knowledge retention compared to other groups. Similarly, medical technology students may use virtual labs to improve their laboratory skills. Virtual labs may be accessible to students outside of class hours, enabling them to perform the procedure repeatedly at their own pace.

Eight themes were determined for the practices category of the study. The first two themes were about the importance of a conducive environment in online learning that obtained a neutral score in the questionnaire. It should be noted that neutral does not mean indifferent; it reflects the lack of positive practice in this aspect but enough to be able to continue with online learning that is still indicative of a less desirable student outcome. Six out of the seven participants agreed that a conducive environment is a big factor in online learning as it aids in maintaining focus and eliminating distractions. A student from University A added that the type of environment affects priorities. To expound, she said: *"For example, what if you're financially struggling in life and then your parents lose their jobs, what will you do? Are you still willing to learn online, through online learning? So, (I think) it's a big factor."* This is supported by a study by Baticulon et al. (2021) by stating that "having a quiet study area with the same comfort provided by a classroom or library was a privilege not available to all."

Furthermore, the same student from University A mentioned that online learning while at home leads to a mix-up of environments wherein it is hard to focus in an environment she perceives as a place of rest. Similarly, a study by Fatonia et al. [27] states that "the online learning environment, which most students perceive as comfortable, is an important element that can positively affect academic achievement." Moreover, a study by Carter et al., [28] also said that "learners were regarded as capable of taking some responsibility for their engagement and subsequent achievement when the environment supports it."

Another theme determined during the FGD is the importance of planning and scheduling in the course of online learning. Some students from University A described their style of planning, with one saying that "*I plan everything, even my lunchtime so that I don't have to cram my requirements later in the day."* Another student from the same university *said "I finish (my workload) in a span of three days. For the week, three days, as much as I can, three days. Then I won't study during the weekends because I really want to rest during the weekends."* A University B student also mentioned his style of planning which is to keep a to-do list and then finish it within the day. According to Martin et al. [29], "Some online learning readiness scales have included time management items such as managing time effectively, meeting deadlines with very few reminders, managing study time to easily complete assignments, as well as including time management as a component of self-directed learning."

Connected to the importance of planning and scheduling in online learning is the avoidance of procrastination and cramming mainly due to distractions, which is also a theme present in the discussion. To support this, the same study from Martin et al. [29] states that "The lowest time management competency was to stay on task and avoid distractions while studying. While time is

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a challenge even to the student taking a traditional on-campus course, it is even more challenging in the online environment as students have to be self-disciplined, manage their schedule, and stay on task to participate in the online course." To avoid procrastination and distractions, one participant from University B said that she keeps her space organized to maintain a conducive environment for learning since she is easily distracted. Two participants also mentioned that they use applications such as Canvas and Forest to maintain focus and discipline.

Online learning practices mentioned by participants from University A and B include the use of the Pomodoro technique and Speechify, joining group studies, and asking questions about subject topics. According to a study by Usman [30], the Pomodoro technique minimizes multitasking through reducing breaks, pleasure, and mood regulation, lessening non-study conversations and technology, and avoiding nonconducive environments before commencing Pomodoro. However, according to the same study, there are several reasons for multitasking that were not addressed by using the Pomodoro technique such as notifications from non-study activities, lack of a conducive study environment, self-efficacy and/or motivation, habitual multitasking, absence of deadlines or time pressure, peer expectations and non-study related thoughts. Therefore, further studies need to be done to determine the efficacy of the Pomodoro technique. The same goes for the efficacy of Speechify, a reading assistant application.

Other techniques mentioned by participants include group studies and asking questions regarding the subject matter. A student from University A said that she studies with friends using the Discord application. On the other hand, a student from University B mentioned "This is really my way of learning – conversation with the professor. And I always ask questions." Similar to the Pomodoro technique and applications such as Speechify, further studies are needed to determine the efficacy of group studies and asking questions in the online setting.

The themes reveal that the reason for the neutral practice outcomes is a result of the students' ability to try and adapt to the learning mode and comply, in which they have developed techniques to learn more effectively but not quite enough to produce a more positive outcome in which they agree to have great practices.

As the theoretical model in Figure 1 suggests, the mode of learning directly affects the knowledge, attitudes, and practices done by the students to be able to cope with academic requirements. The level of knowledge and the attitudes also contribute to the practices done by students which can indicate learning outcomes. As seen in the data, the students generally have a good foundation in the usage of the technology but have a neutral (less than desirable) attitude which also contributed to the neutral level of practices done by the students.

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V. CONCLUSION

Based on both qualitative and quantitative results of the study, the students have adequate knowledge in using the internet, their gadgets, and their university's online resources. Most have also been able to be more proficient in using these technologies because of the online learning set-up. Being more proficient in using the internet affects the practices of the student, especially in utilizing the lectures that their university uploads online and utilizing different applications/software they deemed to be helpful to them.

Although the statistics show that the students have neutral attitudes towards online learning, four out of the seven statement questions had a negative reception mostly concerning the willingness to transition towards online learning and their preference to use such platforms as compared to traditional learning. This is in parallel with the FGD results where students had a negative attitude towards remote learning and expressed that they still prefer traditional learning methods. There is a significant difference in the attitudes of those who have used different modes of instruction (synchronous, asynchronous, mixed), but further studies are needed to support this finding.

The findings show as well that Medical Technology students have neutral practices, which reflect how they are merely complying with academic requirements without exerting additional effort. Although they are trying to engage in remote teaching, results show that they do not have the willingness to do so. It is not enough to produce the outcome of more positive practice. This is also established in the conceptual framework (Fig. 1) where knowledge and attitudes directly affect the practices done. As stated, the students have enough knowledge to utilize online platforms but have a relatively negative attitude towards the platform for learning, decreasing their motivation, thereby producing neutral outcomes for practices.

Overall, the different online learning modalities (synchronous, asynchronous, mixed) appear to have no significant differences among the student's base knowledge on the use of the online platforms and its functions as well as in terms of the practices done by the students but show a significant difference in the attitudes shown. The efficacy of the learning modality based on these three factors depends upon how a specific modality is perceived by the individual. Further evaluation of the laboratory skills developed is needed to produce a more representative result on the efficacy of these online learning platforms.

References

[1]. Guze, Phyllis. (2015). Using Technology to Meet the Challenges of Medical Education. Transactions of the American Clinical and Climatological Association, 126. 260-70.

[2]. Chandrashekar, P. (2019). A Digital Health Preclinical Requirement for Medical Students. Academic Medicine, 94(6), 749. https://doi.org/10.1097/acm.0000000000002685

[3]. The Kap Survey model - Knowledge attitude and practices. (2011). Retrieved September 23, 2020, from http://www.medecinsdumonde.org/en/actualites/publications/2012/02/20/kap-survey-model-knowledge-attitude-and-practices

ISSN: 2799 - 1091
Volume 1 Issue 3 | October 2021
Page 185-207

[4]. Stop TB Partnership (World Health Organization). (2008). Advocacy, communication and social mobilization for TB control. World Health Organization.

[5]. Ahmad, A., Al-Refai, A. M., AlMomani, N.S. & Abuhashesh, M. (2020). E-learning adoption among academic staff during COVID-19 pandemic outbreak: The KAP model. International journal of advanced science and technology 29(3), 12260-12272.

[6]. Wan, T., Rav-Marathe, K., & Marathe, S. (2016). A systematic review of KAP-O framework for diabetes. Medical Research Archives, 3(9). Retrieved from https://esmed.org/MRA/mra/article/view/483

[7]. Tavakol, M., Dennick, R. (2011) Making sense of Cronbach's Alpha. International journal of education

[8]. Zhan, Z., Fong, P. S., Mei, H., & Liang, T. (2015). Effects of gender grouping on students' group performance, individual achievements and attitudes in computer-supported collaborative learning. Computers in Human Behavior, 48, 587–596. https://doi.org/10.1016/j.chb.2015.02.038

[9]. Fleming, J., Becker, K., & Newton, C. (2017). Factors for successful e-learning: does age matter? Education + Training, 59(1), 76–89. https://doi.org/10.1108/et-07-2015-0057

[10]. Arkorful, V., & Abaidoo, N. (2015). The role of e-learning, advantages and disadvantages of its adoption in higher education. International Journal of Instructional Technology and Distance Learning, 12(1), 29-42.

[11]. Javier, B. (2020). Organizational e-learning readiness in a state university in northern Philippines: Inputs for refining instructional quality. Test Engineering and Management, 82, 5560-5569. http://www.testmagzine.biz/index.php/testmagzine/article/view/1711

[12]. Bączek, M., Zagańczyk-Bączek, M., Szpringer, M., Jaroszyński, A., & Wożakowska-Kapłon, B. (2021). Students' perception of online learning during the COVID-19 pandemic. Medicine, 100(7). doi:10.1097/md.0000000000024821

[13]. Browning, M. H. E. M., Larson, L. R., Sharaievska, I., Rigolon, A., McAnirlin, O., Mullenbach, L., Cloutier, S., Vu, T. M., Thomsen, J., Reigner, N., Metcalf, E. C., D'Antonio, A., Helbich, M., Bratman, G. N., & Alvarez, H. O. (2021). Psychological impacts from COVID-19 among university students: Risk factors across seven states in the United States. PLOS ONE, 16(1), e0245327. https://doi.org/10.1371/journal.pone.0245327

[14]. Republic Act No. 5527: Philippine Medical Technology Act of 1969. (1969, June 21). An Act Requiring the Registration of Medical Technologists, Defining Their Practice, and for Other Purposes. Philippines.

[15]. Mekonnen, F. D. (2020). Evaluating the effectiveness of 'learning by doing' teaching strategy in a research methodology course, Hargeisa, Somaliland. African Educational Research Journal, 8(1), 13-19

[16]. Prior, D. D., Mazanov, J., Meacheam, D., Heaslip, G., & Hanson, J. (2016). Attitude, digital literacy and self efficacy: Flow-on effects for online learning behavior. The Internet and Higher Education, 29, 91–97. https://doi.org/10.1016/j.iheduc.2016.01.001

[17]. Herguner, G., Son, S.B., Son, S. H., Donmez, A. (2020).The effect of online learning attitudes of university students on their online learning readiness.The Turkish journal of education technology, 29(4), 102-110

[18]. Javier, B. (2016). Computer anxiety, self-efficacy, and attitudes towards the internet among Cagayan State University students. Journal of multidisciplinary research , 1(1), 158-166

ISSN: 2799 - 1091
Volume 1 Issue 3 | October 2021
Page 185-207

[19]. Baticulon, R. E., Sy, J. J., Alberto, N. R., Baron, M. B., Mabulay, R. E., Rizada, L. G., Tiu, C. J., Clarion, C. A., & Reyes, J. C. (2021). Barriers to Online Learning in the Time of COVID-19: A National Survey of Medical Students in the Philippines. Medical Science Educator, 31(2), 615–626. https://doi.org/10.1007/s40670-021-01231-z

[20]. Calhoun K.E., Yale L.A., Whipple M.E., Allen S.M., Wood D.E., Tatum R.P. (2020). The impact of COVID-19 on medical student surgical education: implementing extreme pandemic response measures in a widely distributed surgical clerkship experience. American Journal of Surgery, 220(1), 44–47.

[21]. Nepal S., Atreya A., Menezes R.G., Joshi R.R. (2020). Students' perspective on online medical education amidst the COVID-19 pandemic in Nepal. Journal of Nepal health research council, 18(3), 551–555.

[22]. deNoyelles, A., Zydney, J., & Chen, B. (2014). Strategies for creating a community of inquiry through online asynchronous discussions. MERLOT Journal of Online Learning and Teaching, 10(1), 153-165. Retrieved from https://jolt.merlot.org/vol10no1/denoyelles_0314.pdf

[23]. Brockman, R. M., Taylor, J. M., Segars, L. W., Selke, V., & Taylor, T. A. H. (2020). Student perceptions of online and in-person microbiology laboratory experiences in undergraduate medical education. Medical Education Online, 25(1), 1710324. https://doi.org/10.1080/10872981.2019.1710324

[24]. Sukhomlyn, T., Hordiienko, L., Sukhomlyn, A., & Zaporozhets, T. (2020). Distance education of medical students during COVID-19 pandemic. Fundamental and Applied Researches in Practice of Leading Scientific Schools, 38(2), 119-121.

[25]. Khalil, R., Mansour, A. E., Fadda, W. A., Almisnid, K., Aldamegh, M., Al-Nafeesah, A., . . . Al-Wutayd, O. (2020). The sudden transition to Synchronized online learning during the COVID-19 pandemic in Saudi Arabia: A qualitative study exploring medical STUDENTS' PERSPECTIVES. BMC Medical Education, 20(1). doi:10.1186/s12909-020-02208-z

[26]. Muljana, P. S., & Luo, T. (2019). Factors contributing to student retention in online learning and recommended strategies for improvement: A systematic literature review. Journal of Information Technology Education: Research, 18, 19-57. doi:10.28945/4182

[27]. Asanov, I., Flores, F., McKenzie, D., Mensmann, M., & Schulte, M. (2021). Remote-learning, time-use, and mental health of ECUADORIAN high-school students during the Covid-19 quarantine. World Development, 138, 105-225. doi:10.1016/j.worlddev.2020.105225

[28]. Tubelo, R. A., Branco, V. L., Dahmer, A., Samuel, S. M., & Collares, F. M. (2016). The influence of a learning object with virtual simulation for dentistry: A randomized controlled trial. International Journal of Medical Informatics, 85(1), 68-75. doi:10.1016/j.ijmedinf.2015.11.005

[29]. Fatonia, N. A., Nurkhayatic, E., Nurdiawatid, E., Fidziahe, G. P., Adhag, S., Irawanh, A. P. & Azizik, E. (2020). University students online learning system during Covid-19 pandemic: Advantages, constraints and solutions. Systematic Reviews in Pharmacy, 11(7), 570-576.

[30]. Carter Jr, R. A., Rice, M., Yang, S., & Jackson, H. A. (2020). Self-regulated learning in online learning environments: strategies for remote learning. Information and Learning Sciences.

ISSN: 2799 - 1091
Volume 1 Issue 3 | October 2021
Page 185-207

[31]. Martin, F., Stamper, B., & Flowers, C. (2020). Examining Student Perception of Readiness for Online Learning: Importance and Confidence. Online Learning, 24(2), 38-58.

[32]. Usman, S. (2020). Using the Pomodoro Technique® to help undergraduate students better manage technology-based multitasking during independent study: A design-based research investigation (Doctoral dissertation, Lancaster University).