Covid-19 Distance Teaching-Learning Modes: Which do Mathematics Education Students Appreciate and Prefer?

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Abstract

The study determined which distance teaching-learning mode of instruction during COVID-19 pandemic period is best appreciated and preferred by mathematics education students. It utilized a qualitative method of research which does not use standard instruments. It used the actual mode of instruction the respondents received from their teachers which they have listed and from among the list, they chose one as the best. It utilized BSED mathematics major students for school year 2020-2021 and 2021-2022, taking mathematics subjects of the University of Science and Technology of the Philippines, Cagayan de Oro City campus. Frequency, percentages and qualitative analysis of the data from respondents' feedback on the mode of online instruction they experienced and the results revealed that the distance teaching-learning mode using Work text with whiteboard in Google meet for discussion and recording of classroom discourse was chosen the best mode of instruction. The researchers recommend that teachers in distance teaching-learning process may use the mode which uses Work text, whiteboard for discussion with recording of the whole classroom discourse episodes.

Keywords: *Distance learning; COVID-19 Pandemic; Online Teaching-Learning Modes.*

A. Introduction

Man was not created to be self-contained, but to relate to his Creator and to one another which is essential in the teaching-learning educational process to achieve a high-level of conceptual understanding especially for mathematics which develops a person's critical thinking skills for decision making. The COVID-19 pandemic has created unprecedented challenges economically, socially, and politically across the globe. More than just a health crisis, it has resulted in an educational crisis (Dayagbil, Palompon, Garcia, & Olvido, 2021). The COVID-19 phenomenon has created a barrier on the process and has forced the education industry to adapt distance teaching-learning modes through online using technology to bring the lessons to students which become a common element in educating the youth. Although, not all teachers are prepared to use the technology for online instruction especially for mathematics due to its abstract nature of the course and other new instructional materials, educational institution administrators have pushed them to implement the online teaching-learning mode. The aim is to prevent the spread of the virus, even with the problems of internet connections and gadgets for both students and teachers in the Philippines.

Distance teaching-learning existed many years ago and online learning has been the trend in some colleges and universities even before the COVID-19 pandemic (Bejerano 2008; Harasima 2009; Lorenzetti 2008). However most of the schools preferred face to face classroom instruction because of the importance of social interaction which is necessary in the development of the whole being of the youth and also needed in hard science courses which require hands on laboratory experience. But due to the pandemic, online teaching learning is adapted in almost all educational institutions at all levels be it kindergarten, primary, junior or senior high schools to allow students grow in their mental state, hand in hand with their chronological age and also to avoid a vacuum in the supply of appropriate manpower to sustain the country's economic activities for growth.

Due to connectivity limitations, the notion of flexible learning has evolved as an option for online learning, particularly in higher education

institutions in the Philippines. Flexible learning focuses on offering students control over their learning pace, location, and medium, which can be facilitated by suitable pedagogical practice (Gordon, 2014). Teachers used varied distance teaching-learning modes, many used technology in synchronous and asynchronous style with interactive communication common to digital platform which unfortunately have few documented study are available (Edwards, 2012) and some used printed modules only. For modules, students are left to learn the contents of the course alone by reading the printed module and answering the activities to assess whether students understand the lesson by themselves or as may be helped by their parents and other elders at home where students do not have interaction with school teachers. A question may be asked, which mode of distance teaching - learning mode is appreciated or preferred by students? Are the modes of distance learning following some of the appropriate established principles and theories of learning?

Dewey (1938) in his experiential learning theory posited that learning is facilitated by doing. However it seems distance learning modes mostly allow students to be passive learner, especially when the mode is only video clips, power point presentations only without discussion, film showing, module only and others methods which do not involve participation of learners. In addition, Vygotsky (1978) believed that if students can be in a group of learners where they can interact using group chat, learning may take place with the help of others who may understood the lesson well. It is necessary that the teacher in the distance learning mode will incorporate in their learning episodes the theory of Dewey (1938) and Vygotsky (1978) for better assimilation of the concepts and theories being taught. But who will be the best judge of which mode preferable and best appreciated?

It is believed that the one who were subjected to the process are the ones who can appreciate the process. It is likely that those who received or experiences such process may adapt it for their own use or share the idea to others. Based on this premise, a survey is done to determine which distance teaching-learning mode is best appreciated and preferred by mathematics

education students of the University of Science and Technology of the Philippines (USTP) in Cagayan de Oro City campus.

B. Method

The study is a qualitative-survey design. It used a qualitative method since it examined the respondents' statement of their appreciation and preference of the type of instructions they experienced from their teachers during the pandemic in different subjects they have enrolled during the school years from 2020 to 2022. Each respondent indicated their best choice and wrote their appreciation or disapproval about their experiences in each kind of mode. The choices described each instruction used by teachers be it online with technology or without technology using printed modules in lieu of face to face classroom instruction. The instruction is a teaching-learning episode where the learning process happens without physical presence of both the teacher and students in the particular lesson discussion.

The study was conducted at the University of Science and Technology of the Philippines (USTP), a government university in Cagayan de Oro City campus, Philippines. The respondents were students the College of Science and Technology Education (CSTE) with 123 students in Bachelor of Science in Education major in mathematics (BSED-Math) enrolled in Mathematics 211 (Logic and Set Theory) and Mathematics 323 (Modern Geometry) for the school year 2020-2021. For the school year 2021-2022, 110 BSED-Math students enrolled in Mathematics 211 (Logic and Set Theory) and 24 Master of Science in Mathematics Education (MSME) students enrolled in Mathematics 524 (Logic and Set Theory) with a total of 134 respondents. These students experienced the varied distance teaching-learning approaches in this pandemic period be it online or by printed material like modules.

The standard survey instrument was not used in this study. The researcher simply asked the student respondents in 2020 to list down all the mode of instructions they have experienced from their teachers in different subjects. They have come up with five (5) distance teaching-learning modes.

They were asked to indicate which of the five they liked best because they can learn despite the absence of face to face interaction physically and to write some comments about their experienced in such mode of instruction. The 2020 list are: A. Worktext, using Google meet for discussion, explanation and illustration with whiteboard, interaction with classmate and teacher virtually, activities to be submitted and recording of virtual discussion, B. Module, with Google classroom for discussion, without whiteboard but with activities, C. Module, with You Tube presentation, and activities as assignment, D. Module, using video clip and activities and E. Module, with film showing and activities. In 2021, the researcher asked another group of students to list down all the mode of instructions they experienced and seven (7) distance teaching-learning modes were in the list. These were the modes: 1. Discussion with power point, activities on University of Science and Technology e-learning Platform (USTeP), 2. Reporting by groups, reporter give quiz, and teacher give quiz to validate student's learning, 3. Module from USTeP, discussion with PowerPoint, activity and quizzes, 4. Module on USTeP, no synchronous class, activities per week and major exam, 5. Discussion with power point, activities on Google classroom, 6. Module on USTeP, discussion with power point, quizzes and major exam, 7. Worktext, using Google meet for discussion with class participation virtually, quizzes, activities, major exam, and journal and recorded virtual discussion. The student respondents were requested to select which mode they liked best and desired to use if they will be a teacher in the future in any situation be it normal or pandemic. They were encouraged to reason why they selected such mode.

On the onset of the pandemic in 2020, teachers were unprepared to adapt any of the distance teaching-learning modes. The University of Science and Technology of the Philippines administration initiated to conduct a training to help teachers become familiar with the online program of instruction using the University of Science and Technology e-learning Platform (USTeP), but some teachers found it complicated so they were given options to use programs which they are compatible and familiar. Some used Google meet, Google classroom, modules, you-tube

and video-clips to convey the contents of the course. The students were subjected with varied instructional strategies to get through the lesson to effect learning.

At the end of the first semester of 2020, when the students have already been fully immersed in the instructions they experienced, the researcher requested 123 students of the College of Science and Technology education (CSTE) taking mathematics to list down all the mode of instructions they received from their teachers in all subjects they have enrolled. They came up with five (5) modes since some subjects have similar ways of teaching with the other. They were asked to select the best they think from among those listed and to describe how the instruction was done. In 2021, at the end of the first semester, another group of 134 students of CSTE were requested to list down all the kind of instructions they have experienced whether online or modular. They came up with seven (7) modes. They were requested also to select which among the seven is the best mode and they prefer to use when they will become teachers. They were asked to give reasons why they come up with such choice. The data collected from the respondents were analyzed using frequency, percentages, qualitative analysis and online interview to verify whether their responses and choices written were in congruence for triangulation.

To determine which of the distance teaching-learning mode experienced by the respondents was appreciated and preferred, the responses collected were tallied to get their frequencies and to compute the percentages for analysis. The respondents answer to the interview questions were also analyzed to determine if their answers in verbal or written were consistent.

C. Result and Discussion

The tables that follow show the frequencies and percentages of the responses of the two groups of respondents, those collected in 2020 and 2021. They were students of the College of Science and Technology Education (CSTE) taking mathematics courses.

Table 1: Frequencies and Percentages on the 5 Distance Teaching-learning Modes of Instruction used by Teachers

Mode of Instruction	Frequency	Percentage
A. Worktext for the whole semester, Google meet. For discussion, illustration, interaction and explanation with whiteboard, seat work, quizzes, activities and recording of classroom discourse. Method	104	85%
B. Module given by installment, Google classroom. For discussion without whiteboard and activities	10	8%
C. Module given by installment, You-tube presentation, and activities.	7	5.7%
D. Module given by installment, video-clip showing and activities	1	0.8%
E. Module given by installment, film showing and activities	1	0.8%
Total	**123**	**100%**

Table 1 shows that in mode (A) there are 104 or 85% of the respondents out of 123 have indicated that the mode using Worktext for the whole semester with Google meet for discussion, explanation, illustration and interaction using whiteboard, including quizzes, seat work , activities and recorded classroom discourse as their best choice. It is the mode that is best appreciated and preferred by the students. However there are few who have chosen the other modes. None preference may be due to the lack of discussion and explanation since they cannot understand the abstract concepts. Based on their written comments like that of Ana (*not her real name*) she said:

> "*I felt like I am in a classroom face to face because our teacher uses whiteboard during class discussion with interaction and explanation. I was able to ask question. If I cannot attend virtual class discussion due to internet problem the recorded discussion is posted which I can view the lesson discussion I missed*".

The table further show that the mode with module with Google classroom without whiteboard during discussion and activities have 10 respondents or 8% who considered it as their best while the mode using

module with You-tube presentation and activities has 7 or 5.7% who appreciated and preferred. In addition the last two modes which are the module with video-clip and film showing with activities both have 1 or 0.8% who appreciated and preferred. It can be observed the respondents who will be teachers in the future appreciated and preferred the mode of instruction which has student involvement, they are engaged, can verify, ask question and give opportunities to master the topics using the recorded episodes. Some additional students' comment (*not their real name*) on the mode of instruction they experienced are shown:

> Jim: *Method A has semblance to face to face classroom because there is presence of a teacher and student can directly ask question to the teacher. We can talk to our classmate because method A is interactive. I liked the recorded discussion because I can review the explanation.*

> Dan: *I liked most method A because of the use of whiteboard in the process of proving is explained. As a future teacher I will use whiteboard to discuss the lesson if pandemic will continue. This mode of distance teaching-learning helped me understand the concept clearly.*

> Angel: *I liked best method because I have understood very well the topic discussed with use of whiteboard during discussion. It helped me answer the activities correctly. If I have a problem with internet connection, I can still cope up since the discussion is recorded. I just view the posted recorded discussion in Google classroom.*

> Al: *Most of the teachers in other methods just leave the activities to us students to do, read the module provided weekly but I like best the class which has discussion in Google meet and a whiteboard with interaction, quiz and activities. When internet connection is slow, reception is very poor, I can view the recorded lesson discussion later.*

> Sonny: *I am learning more in method A where there is a learning material for whole semester, the Worktext, the topics are discussed and explained with a whiteboard, there is interaction, seat work and activities than other distance learning method I experienced.*

> Mar: *Method A is the best. Google meet is helpful but unfair for me. I have bad internet connection.*

> Gene: *Method A is very helpful for me, but I felt bored with other method like video clip and film showing which are too long.*

> Mary: *I learn much in method A because there is illustration and solution in the whiteboard and I feel like we are in the normal class before pandemic.*

Susan: *I have printed the Worktext for the whole semester because I do not have gadget to attend on line. I can answer the quiz if I borrow cell phone and view recorded discussion.*

There are still other respondent's comments but are similar to those included here. Following are some participants' answer to the interview to validate the authenticity of their written responses:

Question: What is your best from among the listed distance teaching-learning modes? And why such choice?

Jim: *I chose method A because it is just like we have face to face class before pandemic and if I miss the virtual discussion, I can view the recorded discussion.*

Dan: *I chose method A as best because I can understand the concepts very well with the whiteboard and build a good foundation of mathematics. I understand the discussion even not in face to face.*

Gene: *I chose method A as best because it is not boring, and I can participate, interact and ask questions.*

Susan: *I chose method A even if I cannot attend the virtual discussion because I have no gadget, but I have printed the Worktext for the whole semester lesson. I can view the recorded lesson if I can borrow cell phone.*

It can be observed that the 2020 respondents' oral answers during the interview agree with what they say in the written comments. Their answers to the question in the interview were consistent both verbal and written. It can be seen further that what the respondents appreciate and preferred is the distance teaching-learning mode that has the features of printed learning material for the whole course, discussion and illustration of concepts, explanation of abstract ideas, interaction, participation and being engaged during class discussion using whiteboard and most importantly that the classroom discourse episodes are recorded for them to review. It can be noted that the respondents appreciation and preference supports the theory of Dewey (1934) of experiential learning and Vygotsky (1978) theory that learning best occur with the support of others who understood the concept well.

Table 2: Frequencies and Percentages on the Seven (7) Distance Teaching-Learning Modes of Instruction Used by Teachers

	Mode of Instruction	Frequency	Percentage
a)	Module on USTeP ,no synchronous class activity once a week	0	0%
b)	Discussion with PowerPoint, activities in	1	0.75%

	Mode of Instruction	Frequency	Percentage
	USTeP		
c)	Discussion with PowerPoint, activities in Google classroom	1	0.75%
d)	Reporting by groups, quiz given by reporter and teacher activities in Google classroom	2	1.5%
e)	Module from USTeP with PowerPoint and activities and quiz.	2	1.5%
f)	Module from USTeP, activities and quiz	2	1.5%
g)	Worktext for the whole for the whole semester, discussion in Socratic method every meeting with interaction using whiteboard, quizzes, journal and recorded class discussion	126	94%
	Total	**134**	**100%**

Table 2 shows the frequencies and percentages of student's responses on each of the distance teaching-learning mode experiences. It can be observed that majority of the respondents chose the mode of instruction which has interaction, illustration with the use of whiteboard, and other more engaging tasks like journal writing, activities, seat work and student-teacher discourse recorded during class discussion episodes. Other modes have lesser student attraction to choose due to lack of discussion and engagement where the respondents can participate. The mode with Worktext accompanied by virtual discussion and explanation of topics every meeting was more appreciated and preferred by student respondents. In addition the recording of classroom discourse episodes attracted the students to choose mode 7 because students with poor internet connection can view the recorded lessons and can allow them to cope up the topics missed with understanding.

From the students written responses in matrix or paragraphs, it can be gleaned that their choices was influenced by their interest to learn , they wanted to participate, interact, ask questions for clarification and do more tasks. It may be due to their desire to master the concepts because the respondents are teacher education students major in mathematics, who will be mathematics teachers after graduation. Following are the

written reasons and their choices for the best by ranking the modes from 1 as best and 7 as last, but some rank only until 5. The names are not written for anonymity but letter are used.

From the preceding students' point of view based on their choices of which is the best distance teaching-learning mode and the reasons for their choices, it can be observed that their statements have coherence and cohesiveness. They were active in their way of reasoning, has shown rigor in their effort to learn and desire to acquire mastery of the topics preparing themselves to become effective teachers. They are already critic of what is good teaching and learning process and has developed an aspiration of being an efficient teacher. They have already developed a value of quality of instructions for the interest and well-being of the learners. To verify further the respondents' written reasons of their choices an interview was done. Below are some of their oral answers:

Question: Why do you consider your choice as the best online instruction? And why do you say it as the best from your experience? (Not their real names)

Rey: *I considered the mode with Worktext as best because we have interaction during discussion and I can learn from others and from our teacher. Besides we can ask question immediately if we have doubts which are important in the learning process. So I will be sure of what will I answer during examination and what I will teach when I will be already a teacher. I prefer this method and not the other methods which are not concern of students' learning.*

John: *I considered the mode with Worktext best because I can read in advance , I can ask question if I have doubts, I can participate in the discussion, I can follow how the solution is done in the whiteboard especially in proving theorems. The discussion is recorded, so those without load can view the recorded discussion any time. I liked also the quizzes so I can test my understanding of the topic, also the writing of journal so I will not forget the lesson and I will be prepared for any examination in the future.*

Kent: *The one with the Worktext is my best online class. I learned much because there is discussion as if we are in face to face classroom, I can interact and participate throughout the session. I also like the quizzes and activities so I can validate what I learned of the topics. The journal can reinforce my understanding. The Worktext is my guide and I can read in advance because it is complete for the whole semester.*

Helen: *The Worktext serve as guide for learning, the best for me. I like the discussion every meeting with whiteboard to illustrate the concept. Quizzes is very good, activities and journal, the interaction and recording. I can ask questions and I am always engaged in doing tasks because we have seat work then quiz, learning is enjoyable and fruitful.*

Emelda: *The mode with Worktext is the most effective, it helps me learn because I can read in advance and give me excitement to attend class online because there is quiz that can validate what I learned. I am always attentive like when we were in face to face classroom; I participate, ask questions, interact, and can evaluate what I learned because there is always activity and journal writing. Discussion is also recorded. Other mode like module with discussion I rank 2, I do not like USTeP, because I have trouble to access the website. When I will be a teacher I will use the mode with Worktext using discussion in whiteboard with interaction, students' participation, quizzes to make students alert, journal writing, activities and recording of class discussion to help my would be students learn and love mathematics.*

Jes: *I chose the mode with Worktext as my best because the Worktext contains the concept for the whole course and it has discussion every meeting, quiz activity, journal, and interaction in Socratic Method with recording. I can watch again the recorded discussion to clarify what I did not understand. The journal reminds me of the topics we have discussed.*

From the interview of the randomly chosen student respondents, it can be observed that their oral and written choices and reasons are in congruence. What they have written were the same as their verbal answers in essence during the interview. It can be deduced that answers came their hearts because their oral answers did not deviate from they have written and shown sincerity of their answers. They further said that their class have semblance of face to face normal phenomenon. It can be observed that students want to communicate their understanding and share ideas to facilitate proficiency.

D. Conclusion

Based on the findings of the qualitative analysis of this study, the researchers concluded that the Distance Teaching-Learning Mode with Worktext for the whole semester which has discussion using whiteboard, explanation, in Socratic method of interaction and have many other tasks with recording of classroom discourse is the respondents best choice, most appreciated and most preferred . The mode which has engaged the

respondents have promoted fluency, flexibility of thinking and communication of mathematical concepts. The quizzes after discussion have kept the respondents mind focus and active that will help them prepare to teach any subject most especially mathematics in the future. The researchers recommend that mathematics teachers may use during this pandemic period the Worktext for the whole course or printed module for the whole course with discussion, participation, interaction using whiteboard for illustration and explanation of concepts, including quizzes to promote mind focus and concentration, activities and journal for reinforcement and record classroom discourse to enhance mathematical communication of concepts, fluency, flexibility of thought for all students especially for future teachers.

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