Distance learning delivery modalities and the Mathematics performance of senior high school students in Biñan Integrated National High School S.Y. 2021-2022

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1.1. Abstract

The sudden shift from face-to-face to distance learning platforms posed challenges to students and teachers in facing the new normal. As a response to this, schools offered two classifications of modality: modular and online distance learning delivery modality. The most common type of distance learning is modular learning where learners learn through printed and digital modules. In addition, students can use other platforms such as email, text messages, Facebook messenger, and alike, to ask for assistance from their teachers in answering their modules. While online distance learning requires the use of technology such as computers, webcams, mobile phones, and internet or data connection to access and conduct virtual classes during the specific schedule assigned through video recording or video conferencing in remote locations. Learners may face challenges due to their level and way of understanding, ability to communicate, and taking control and responsibility for their learning, both in terms of what they learn and how they learn it. It is also important to assess how students learn in distance learning through the quality of instructions given by their teachers, the way how they can communicate, and their ability to practice their autonomy over their study. Hence, it is essential to understand the relationship of these variables with the mathematics performance of the students in a distance learning environment.

The study revealed that the mathematics performance of students who undergo online modality was high compared to the mathematics performance of students who undergo modular modality considering the transactional aspect of distance learning. It is also found that there is no significant relationship between the transactional aspects of distance learning and the mathematics performance of students in the online distance learning delivery modality. While the study found that the teacher's instruction and student-teacher communication is significantly related and student autonomy is not significantly related to the mathematics performance of students in the modular distance learning delivery modality.

The study suggests and recommends the school and teachers expand the strategies and techniques implemented during the transaction of distance learning. The teachers may improve the way how they deliver their instructions. It also suggests that teachers must be approachable and reachable to all students and let students properly explore and practice their autonomy over their studies. Future researchers may look for other factors that may correlate to the mathematics performance of students, especially in the conduct of distance learning.

Keywords: transactional aspects of distance learning, online distance learning, modular distance learning, teacher's instruction, student-teacher communication, students' autonomy, mathematics performance

2. Main text

Introduction

Educational institutes across the world have closed due to the COVID-19 pandemic jeopardizing the academic calendars. Most educational institutes have shifted from face-to-face to online learning platforms to keep academic activities going. Moreover, due to the indefinite closure of schools and colleges, both educational institutions and students are experimenting with strategies to fulfill their mandated syllabi within the time window set by the academic calendar. These restrictions have probably caused some discomfort, but they have

also stimulated remarkable examples of educational innovation including digital inputs.

On the other hand, the Basic Education- Learning Continuity Plan or BE-LCP under DepEd Order no. 12 series of 2020, aims to ensure the health, safety, and well-being of the learners, teachers, and personnel in the time of COVID-19, while finding ways for education to continue amidst the crisis. In particular, the BE-LCP has been designed with a legal framework responsive to the "new normal," keeping in mind the constitutional mandate to uphold the right of all citizens to quality education at all times. In context, there is various learning delivery method in which learning takes happen between a teacher and students who are geographically separated during teaching. Modular Distance Learning (MDL), Online Distance Learning (ODL), and TV/Radio-Based Instruction are the three forms of this modality.

Most of the time, schools offered two classifications of modality, modular distance learning, and online distance learning. The most common type of Distance Learning is modular learning. Learning through printed and digital modules, according to the Department of Education (DepEd), has emerged as the most preferred distance learning method among parents with children enrolled this academic year. This also takes into account the learners in rural areas where the internet is not available for online learning.

The teacher is responsible for monitoring the progress of the learner. The printed modules should be distributed and retrieved by teachers or through the help of Local Government Officials in cooperation with the parents or guardians that serve as partners of teachers in new normal education. In addition, students can also use other platforms such as email, text messages, Facebook messenger, and alike, to ask for assistance from their teachers in answering their modules. While online distance learning requires the use of technology such as computers, webcams, mobile phones, and internet or data connection to access and conduct virtual classes during the specific schedule assigned through video recording or video conferencing in remote locations. Students and teachers can interact through the use of the different online platforms that serve as their means of communication. Students who are enrolled in this modality are expected to submit and receive all the given tasks online every week. These two modalities will be highlighted in this study. The researcher would find out the relationship between transactional aspects of distance learning and the students' Mathematics performance.

Theoretical Framework

Distance learning, also known as distance education, is a type of education in which teachers and students are physically separated during instruction and various technologies and resources are used to facilitate student-teacher and student-student communication. Distance education is widely used nowadays. Its scope has expanded tremendously and rapidly. This becomes an integral part of many national educational systems as well as a distinct academic delivery. In Moore & Kearsley, 2012 transactional theory of distance education consists of a set of principles and a model that defines the pedagogical aspects of education (as contrasted with others such as management and policy) in three sets of variables. The first set consists of elements describing the structure of what is designed to be learned, the second in the interaction or dialog between teacher and learners when that structured program is implemented, and the third is the habits of each learner with priority given to the potential self-management or autonomy of the students who interact with teachers within the designed structure.

Learning can happen at any place as long as students can understand what they are doing and reading. Because of the pandemic, the education set-up changed from the traditional classroom into their home as their environment in learning. Willinghams (2008) agree with this theory and suggests that learning is a dynamic process that may evolve and change from one classroom to another, from one subject to another, and from one day to another. Furthermore, problem-solving lies beyond mathematics teaching dimensions so that students experience the influence of mathematics in the world around them (Taplin, 2012).

Statement of the Problem

The study concentrates on the investigation and exploration of the relationship of transactional aspects

of distance learning delivery modalities to the mathematics performance of senior high school students at Biñan Integrated National High School, S.Y. 2021-2022.

Specifically, the researcher sought to answer the following questions:

1. What is the level of transactional aspects of distance learning delivery modalities in terms of online modality as to:
   1.1. teacher's instruction;
   1.2. student-teacher communication; and
   1.3. student autonomy?
2. What is the level of transactional aspects of distance learning delivery modalities in terms of modular modality as to:
   2.1. teacher's instruction;
   2.2. student-teacher communication; and
   2.3. student autonomy?
3. What is the level of student's mathematics performance in the online and modular distance learning delivery modalities in terms of first-semester grade?
4. Is there a significant difference between the transactional aspects of distance learning in online and modular?
5. Is there a significant difference in the mathematics performance of students in online and modular distance learning delivery modalities?
6. Is there a significant relationship between transactional aspects of distance learning delivery modalities and the mathematics performance of senior high school students?

Research Methodology

The research design used in this study was a descriptive correlative survey method to determine the significant relationship of distance learning delivery modality to the mathematics performance of selected 339 Senior High School students at Biñan Integrated National High School, S.Y. 2021-2022. This approach was used to show the variables are related. It does not imply causation.

The Grade 11 students of Biñan Integrated National High School with a total of 1, 412 were chosen to be the respondent to this study.

The researcher used the purposive sampling technique in selecting the respondents with a sample size of 339 respondents.

The research instrument used in this study was a survey questionnaire administered and distributed to the selected 339 Senior High School students under online and modular distance learning modalities at Biñan Integrated National High School, S.Y. 2021-2022.

The statistical treatment employed in this study were the following:

Mean and standard deviation was used to determine the level of transactional aspects of distance learning delivery modalities in terms of online and modular modality as to teacher's instruction, student-teacher communication, and student autonomy.

Mean and standard deviation was also used to determine the level of students' mathematics performance in terms of first-semester grades.

Analysis of variance was used to determine the significant difference in online and modular distance learning delivery modalities to the transactional aspects of distance learning delivery modalities and difference in the mathematics performance of students in online and modular distance learning delivery modalities.

Pearson-r is used to determine if there is a significant relationship between transactional aspects of distance learning delivery modalities and the mathematics performance of senior high school students.

Results and Discussion

In the table below, the transactional aspects of distance learning delivery modalities in terms of teacher's instruction appeared to be *Very High* obtaining the overall (M= 4.57, SD= 0.56) ABM, (M= 4.31, SD= 0.59) HUMSS, and o (M= 4.37, SD= 0.69) STEM. On the other hand, *High* level in the perception of ICT overall (M= 3.80, SD= 0.89).

The three groups of students from different strands observed the clear and precise instruction of the teachers during synchronous and asynchronous classes with the (M=4.50, SD= 0.52) ABM, (M= 4.31, SD= 0.50) HUMMS, and (M= 4.24, SD= 0.65) STEM. Through the ICT as the other group of students evaluated the High level of teachers' instruction in online modality with the (M= 3.67, SD= 1.03). The manageable, simple, easy-to-understand instruction was also used in the examples and illustration of the teacher (M= 4.59, SD=0.56) ABM, (M= 4.30, SD= 0.98) ICT.

The three groups of respondents *strongly agree* that the teacher's instruction was engaging especially when teaching mathematics was applied. This means that teachers' instruction for students is important for the students to engage in the online modalities of learning. Technique and appropriate use of the word in the discussion and reminders are considered. The standard deviations which are mostly less than 1 shows a homogenous level of teacher's instruction.

Table 2. *Level of Transactional Aspects of Distance Learning Delivery Modalities in terms of Online Modality as to Teacher's Instruction*

	ABM			***HUMSS***			***ICT***			***STEM***		
Statement	M	SD	Int.	M	SD	Int.	M	SD	Int.	M	SD	Int.
1. Clear and precise during synchronous and asynchronous classes.	4.60	0.52	SA	4.31	0.60	SA	3.67	1.03	A	4.24	0.65	SA
2. Manageable, simple, and easy to understand. She uses appropriate examples and illustrations.	4.59	0.56	SA	4.13	0.81	A	3.83	0.98	A	4.30	0.69	SA
3. Show a specific purpose of tasks and connect math concepts to everyday life.	4.49	0.59	SA	4.38	0.62	SA	4.00	0.89	A	4.36	0.76	SA
4. Engaging especially when she uses techniques in teaching mathematics.	4.48	0.59	SA	4.44	0.63	SA	4.00	0.63	A	4.37	0.66	SA

5. Delivered in an appropriate tone and appropriate use of words.	4.70	0.53	SA	4.31	0.79	SA	3.50	1.05	A	4.55	0.67	SA
Overall	**4.57**	**0.56**	**VH**	**4.31**	**0.69**	**VH**	**3.80**	**0.89**	**H**	**4.37**	**0.69**	**VH**

Legend: *SA- Strongly Agree, A- Agree, MA- Moderately Agree, DA- Disagree, SDA- Strongly Disagree*
VH-Very High, H- High, MH- Moderately High, L-Low, VL- Very Low

Table 3. *Level of Transactional Aspects of Distance Learning Delivery Modalities in terms of Online Modality as to Student-teacher Communication*

	ABM			*HUMSS*			*ICT*			*STEM*		
Statement	M	SD	Int.	M	SD	Int.	M	SD	Int.	M	SD	Int.
1. Communicate well with my teacher using different platforms.	4.37	0.73	SA	4.31	0.79	SA	3.83	0.75	A	4.26	0.73	SA
2. Freely ask questions and clarifications to our teacher during our discussion.	4.57	0.64	SA	4.13	1.09	A	3.67	1.21	A	4.30	0.87	SA
3. Talk to my teacher about my concerns without any hesitation.	4.17	0.85	A	3.75	1.29	A	3.67	0.52	A	3.93	1.02	A
4. Confidently speak my opinion and idea about the lesson because our teacher encourages us to express our thoughts.	4.17	0.71	A	4.00	1.10	A	3.67	0.82	A	3.95	1.04	A
5. Receive positive feedback and constructive criticism from my teacher.	4.44	0.64	SA	4.25	0.77	SA	4.00	0.89	A	4.23	0.86	SA

Overall	**4.35**	**0.73**	**VH**	**4.09**	**1.02**	**H**	**3.77**	**0.82**	**H**	**4.13**	**0.92**	**H**

Legend: *SA- Strongly Agree, A- Agree, MA- Moderately Agree, DA- Disagree, SDA- Strongly Disagree*
VH-Very High, H- High, MH- Moderately High, L-Low, VL- Very Low

Table above shows the level of transactional aspects of distance learning delivery modalities in terms of student-teacher communication.

The data indicate a *Very High* level obtaining the overall (M= 4.35, SD= 0.0.73) ABM, while a *high* level in HUMMS with overall (M= 4.09, SD= 1.02), ICT with overall (M= 3.77, SD= 0.87) and STEM with overall (M=. On the other hand, *High* level in the perception of ICT with the overall (M= 3.80, SD= 0.89) and the STEM students with the overall (M= 4.13, SD=0.92).

The three groups of students from different strands *strongly agree* that they can communicate well with the teacher on any platform with the (M= 4.37, SD= 0.73) ABM, (M= 4.31, SD= 0.79) HUMMS, and (M= 4.26, SD= 0.73) STEM while the last group of students coming from ICT had *agree.* Among the statement above the group's group of students from different strands and have the same level of the state and those students confidently speak opinions and ideas about the lesson because of teachers' encouragement. Student-teacher communication was observed for the students in the online modality to attain the learning competency. The standard deviations which are frequently less than 1 shows a very close level of student-teacher communication in four strands.

Table 4. *Level of Transactional Aspects of Distance Learning Delivery Modalities in terms of Online Modality as to Student Autonomy*

	ABM			***HUMSS***			***ICT***			***STEM***		
Statement	M	SD	Int.	M	SD	Int.	M	SD	Int.	M	SD	Int.
1. Access learning materials wherever and whenever I want and need to on any device available.	4.41	0.69	SA	4.38	0.78	SA	3.33	1.03	MA	4.34	0.80	SA
2. Learn at my own pace, using my schedule. I can take my necessary time to learn without pressure.	4.06	0.80	A	4.06	0.85	A	3.33	1.03	MA	3.95	0.90	A
3. Put my learnings into practice and real-life applications.	4.14	0.67	A	4.06	0.68	A	3.50	1.05	A	3.95	0.92	A

4. Easily use the platforms we navigate for our subject.	4.38	0.55	SA	4.38	0.72	SA	3.33	1.03	MA	4.15	0.79	A
5. Set my path and learning goals, giving me a chance to empower my decision-making.	4.44	0.74	SA	4.44	0.73	SA	3.67	1.21	A	4.28	0.75	SA
Overall	**4.29**	**0.71**	**VH**	**4.26**	**0.74**	**VH**	**3.43**	**1.01**	**H**	**4.13**	**0.85**	**H**

Legend: *SA- Strongly Agree, A- Agree, MA- Moderately Agree, DA- Disagree, SDA- Strongly Disagree*
VH-Very High, H- High, MH- Moderately High, L-Low, VL- Very Low

Table 4 reveals the level of the transactional aspect of online modality in terms of student autonomy. A *very high* level is given by the two groups of students from the strand of ABM and HUMMS gaining the overall (M= 4.19, SD= 0.71, and M= 4.26, SD= 0.74. on the other hand, a *high* level of students' perception of ICT and STEM students with the overall (M= 3.43. SD= 1.01, M= 4.13, SD=0.85).

The three groups of students from different strands *strongly agree* that they can access the learning materials on any available device with the (M= 4.41, SD=0.69) ABM, (M=4.38, SD= 0.80) HUMMS, (M= 4.34, SD= 0.80) STEM. The ICT students as the other group of respondents moderately agree with this statement. This means that the learning materials, platform and learning goals of the students was observe otherwise need to be focused on their own and value learning. The standard deviation which are mostly less than 1 shows a very close spread on students' responses when it comes to their autonomy.

Table 5 indicates the level of transactional aspect of modular delivery modality in terms of teacher instruction.

In the table below, the responses of students in the strand of ABM and STEM appeared to be *very high* obtaining the overall (M= 4.38, SD= 0.72) for ABM students, overall (M= 4.44, SD= 0.72) for STEM students. The ratings of the other strand appeared *high* with the overall (M=4.13, SD= 0.91) and overall (M= 3.88, SD=0.72).

Table 5. *Level of Transactional Aspects of Distance Learning Delivery Modalities in terms of Modular Modality as to Teacher's Instruction*

	ABM			***HUMSS***			***ICT***			***STEM***		
Statement	M	SD	Int.	M	SD	Int.	M	SD	Int.	M	SD	Int.
1. Written in a clear and precise manner.	4.51	0.63	SA	4.21	0.78	SA	3.75	0.71	A	4.49	0.63	SA
2. Manageable, simple, and easy to understand	4.40	0.66	SA	4.21	0.51	SA	4.00	0.76	A	4.41	0.78	A

because she uses appropriate examples and illustrations.												
3. Given a specific purpose of tasks and connects our module with math concepts to everyday life.	4.33	0.75	SA	4.21	0.66	SA	3.88	0.64	A	4.44	0.69	A
4. Repeated in case we missed and misunderstood it.	4.24	0.88	SA	3.67	1.27	A	3.75	0.89	A	4.32	0.85	A
5. Delivered in the appropriate use of words.	4.44	0.66	SA	3.88	1,03	A	4.00	0.76	A	4.56	0.65	SA
Overall	**4.38**	**0.72**	**VH**	**4.03**	**0.91**	**H**	**3.88**	**0.72**	**H**	**4.44**	**0.72**	**VH**

Legend: *SA- Strongly Agree, A- Agree, MA- Moderately Agree, DA- Disagree, SDA- Strongly Disagree*
VH-Very High, H- High, MH- Moderately High, L-Low, VL- Very Low

The three groups of students from different strands *strongly agree* that the teacher instruction in modular modality is clear and written in a precise manner with the overall (M= 4.51, SD= 0.63), (M= 4.21, SD= 0.78), (M= 4.49, SD= 0.63) while students under the strand of ICT *agree* in the same statement with the (M= 3.75, SD= 0.71). The purpose of the task in the module is specific and can connect to everyday life with the (M= 4.33, SD= 0.75), (M=4.21, SD= 0.66) as the rating given by the students in ABM and HUMMS with the remarks of *strongly agree* while the other group from ICT and STEM *agree* in the same statement with the (M= 3.88, SD=0.64), M= 4.44, SD= 0.69) This means that teachers give clear, easy to understand instruction in the module. The standard deviation which are generally less than 1 shows a very close level of student-teacher communication.

Table 6 indicates the level of transactional aspect of modular delivery modality in terms of student-teacher communication.

The responses of students in the strand of ABM and STEM appeared to be *very high* obtaining the overall (M= 4.31, SD=0.73) and (M= 4.45, SD= 0.71). The perception of the other strand appeared *high* with the overall (M=4.15, SD= 0.87) and overall (M= 3.78, SD=0.92). The two groups of students from different strands *strongly agree* that even if they are in modular modality, they can communicate with their teacher using the available platform with the overall (M= 4.51, SD= 0.63), (M= 4.38, SD= 0.77), (M= 4.60, SD= 0.59) while students under the strand of ICT *agree* in the same statement with the (M=3.88, SD= 0. 99). This means that even if students are in modular modality teachers give feedback and encourage the learners to communicate with them about the concern of their lesson.

Table 6. *Level of Transactional Aspects of Distance Learning Delivery Modalities in terms of Modular Modality as to Student-teacher Communication*

Statement	ABM			HUMSS			ICT			STEM		
	M	SD	Int.	M	SD	Int.	M	SD	Int.	M	SD	Int.
1. Communicate well with my teacher using available platforms.	4.51	0.63	SA	4.38	0.77	SA	3.88	0.99	A	4.60	0.59	SA
2. Freely ask questions and clarifications to our teacher while I'm doing my tasks.	4.35	0.78	SA	4.29	0.95	SA	3.63	0.92	A	4.48	0.78	A
3. Ask or message my teacher about my concerns without any hesitation.	4.07	0.81	A	4.17	0.76	A	3.75	0.89	A	4.44	0.67	A
4. Confidently write my opinion and idea about the lesson because our teacher encourages us to share our thoughts.	4.24	0.67	SA	4.00	0.78	A	3.88	0.99	A	4.26	0.76	A
5. Receive positive feedback and constructive criticism from my teacher.	4.36	0.70	SA	3.92	1.02	A	3.75	1.04	A	4.45	0.69	SA
Overall	**4.31**	**0.73**	**VH**	**4.15**	**0.87**	**H**	**3.78**	**0.92**	**H**	**4.45**	**0.71**	**VH**

Legend: *SA- Strongly Agree, A- Agree, MA- Moderately Agree, DA- Disagree, SDA- Strongly Disagree*
VH-Very High, H- High, MH- Moderately High, L-Low, VL- Very Low

The standard deviation of generally less 1 implies that the student-teacher communication was not highly different from strands.

Table 7 indicates the level of transactional aspect of modular delivery modality in terms of student autonomy.

In the table below, the responses in all strands appeared on the same level to be *high* obtaining the overall (M= 4.15, SD= 0.81) for ABM students, overall (M= 3.99, SD= 0.75) for HUMMs students, overall (M= 3.83, SD= 0.71) for ICT students and overall (M= 4.16, SD= 0,81).

The students *agree* that they easily use the available materials for the subject with the (M= 4.15, SD= 0.73) (M=4.17, SD= 0.70) and (M= 3.88, SD= 0.64) respectively. Students *agree* that learning individual pace using the set schedule without pressure makes them comfortable with the (M= 4.09, SD= 0.95, M= 3.88, SD= 0.80, M= 3.88, SD= 0.83 and M= 3.93, SD=0.92). This means that students learning goals and decision- making help them to do task confidently. The standard deviation which are all less than 1 implies that the autonomy of student in four strands was close to each other.

Table 7. *Level of Transactional Aspects of Distance Learning Delivery Modalities in terms of Modular Modality as to Student Autonomy*

	ABM			***HUMSS***			***ICT***			***STEM***		
Statement	M	SD	Int.	M	SD	Int.	M	SD	Int.	M	SD	Int.
1. Access learning materials wherever and whenever I want and need to on any device available.	4.15	0.80	A	3.79	0.88	A	3.75	0.46	A	4.32	0.76	SA
2. Learn at my own pace, using my schedule. I can take my necessary time to learn without pressure.	4.09	0.95	A	3.88	0.80	A	3.88	0.83	A	3.93	0.92	A
3. Put my learnings into practice and real-life applications.	4.07	0.69	A	3.96	0.69	A	3.63	0.74	A	4.05	0.81	A

4. Easily use the materials available for our subject.	4.15	0.73	A	4.17	0.70	A	3.88	0.64	A	4.22	0.73	SA
5. Set my path and learning goals, giving me a chance to empower my decision-making.	4.31	0.84	SA	4.17	0.64	A	4.00	0.93	A	4.26	0.75	SA
Overall	**4.15**	**0.81**	**H**	**3.99**	**0.75**	**H**	**3.83**	**0.71**	**H**	**4.16**	**0.81**	**H**

Students' Mathematics Performance in First Semester Grade

The following table shows the level of students' mathematics performance in the online and modular modality in terms of first-semester grades. The following table also shows the difference between the mathematics performance in the online and modular modality in terms of first-semester grades.

Table 8. *Students' mathematics performance in the online and modular distance learning delivery modalities in terms of first-semester grade*

	Modular			***Online***		
Strand	*Mean*	*SD*	*Verbal Interpretation*	*Mean*	*SD*	*Verbal Interpretation*
ABM	86.00	4.79	Very Satisfactory	88.23	3.67	Very Satisfactory
HUMSS	85.75	8.34	Very Satisfactory	91.63	5.98	Outstanding
ICT	91.00	3.02	Outstanding	90.00	5.55	Outstanding
STEM	93.26	4.60	Outstanding	93.12	4.03	Outstanding

Legend	***Range***	***Verbal Interpretation***
5	*90.00-100.00*	*Outstanding*
4	*85.00-89.99*	*Very Satisfactory*
3	*80.00-84.99*	*Satisfactory*
2	*75.00-79.99*	*Fairly Satisfactory*
1	*Below 74.99*	*Did Not Meet Expectations*

Table 8 indicates the student's mathematics performance in the modular and online modality.

The ICT and STEM students gain the (M= 91.00, SD= 3.02) and (M= 93.26, SD= 4.60) both verbally interpreted as *Outstanding* while the ABM and HUMMs student gain the (M= 86.00, SD= 4.79) and (M= 85.75, SD= 8.34) verbally interpreted as *Very Satisfactory*. On the other hand, three groups of students under the online modality got the Outstanding Performance with the (M= 93.12, SD= 4.03), (M= 90.00, SD= 5.55) and (M= 91.63, 5.98) respectively, and *Very Satisfactory* performance with the (M= 88.23, SD= 3.67) ABM students. As shown by standard deviations which are greater than 1 signify heterogeneity of learners coming from different strands when it comes to their mathematics performance. This means the students under the online modality perform better. The availability of different resources in learning and the presence of the teachers in online discussions help the students to understand and learn better.

Table 9 revealed the difference between transactional aspects of distance learning delivery modalities.

It was found that all the transactional aspects of distance learning have no significant difference in online learning delivery modality with (M= 4.41, SD- 0.67; M= 4.19, SD=0.87; and M=4.18, SD=0.81) and modular learning delivery modality with (M=4.33, SD=0.77; M=4.32, 0.77; and M=4.11, SD= 0.80). The teacher's instruction with (F=1.728, p= 0.190) means that the delivery of instruction was given fairly to both modalities. The student-teacher communication with (F=3.196, p=0.075) means that students in different strands freely ask questions and clarification during the discussion. And student-autonomy with (F=0.803, p=0.371) means that students either online or modular have autonomy over their study. All of the computed values were found below the critical value of 3.869 and all p-value greater than the alpha of 0.05 which means that there is no significant difference in the transactional aspects of distance learning delivery modalities. As show by standard deviations which less than 1 signifies a close rating of the students in transactional aspects of distance learning delivery modalities.

Table 9. *Difference of transactional aspects of distance learning delivery modalities*

Transactional Aspects of Distance Learning	Online		Modular		F	F-crit	p-value	Decision
	Mean	SD	Mean	SD				
Teacher's Instruction	4.41	0.67	4.33	0.77	1.728	3.869	0.190	NS
Student Teacher Communication	4.19	0.87	4.32	0.77	3.196		0.075	NS
Student Autonomy	4.18	0.81	4.11	0.80	0.803		0.371	NS

alpha= 0.05 *NS- Not Significant*

The results of the study were supported by Moore (2012) which provides favorable evidence of online learning among students during the pandemic with a majority reporting that they became independent, adapted to online learning, and became more self-motivated, reinforcing that online pedagogy certainly has its benefits in encouraging students to work independently and enhance their self-efficacy. Evidence has suggested that students who are independent learners, work to higher standards, use a range of strategies in their learning, are competent in their problem-solving skills, are more motivated, and have higher self-esteem. In addition, such a pedagogical method can enhance students to become self-directed learners, which is an important competency required to be a life-long learner. Since it has been misinterpreted, it must be noticed that it was not proposed that all students are completely or even exceptionally independent. It is perceived that students shift in their capacity to practice autonomy, and should have more notable freedom in certain courses than others. It is exceptionally suitable for teachers to allow the activity with independence. Additionally, it is not proposed that students with autonomy do not need teachers. It is the relationship of such students to teachers that is not quite the same as those teachers and less autonomy students, with the last option requiring additional consistent encouragement from the teacher and the previous just requiring instrumental help, for example data and the guidance important to let the make the work done.

Table 10. *Difference in the mathematics performance of students in online and modular distance learning delivery modalities*

Strand	***Modular***		***Online***		***Mathematics Performance***		
	Mean	***SD***	***Mean***	***SD***	***F***	***p-value***	***Decision***
ABM	86.00	4.79	88.23	3.67	8.161	0.005	Significant
HUMSS	85.75	8.34	91.63	5.98	5.9	0.02	Significant

ICT	91.00	3.02	90.00	5.55	0.189	0.672	Not Significant
STEM	93.26	4.60	93.12	4.03	0.046	0.831	Not Significant

Table 10 shows the difference in the mathematics performance of the students in different strands under modular and online distance learning delivery modalities. As seen in the table there is a significant difference in the performance in mathematics of students in ABM and HUMMS with (f= 8.161, p= 0.0050) and (f= 5.900, p= 0.020). The p-value is less than the alpha value of 0.05. This means that students in ABM and HUMMS have different levels of understanding of mathematics subjects, particularly the topics that reflect in their grades. The Transactional aspect of different learning modalities also affects the grade of the students. The grade of the students in the online distance learning modality is higher than the modular students.

On the other hand, there is no significant difference in the mathematics performance of the students in ICT and STEM with the (f=0.189, p= 0.672), (f= 0.046, p= 0.0831) the p-value greater than the alpha value of 0.050. This means that the level of understanding of students in mathematics subjects
particularly the topics that reflect in their grades is the same.

Transactional Aspects of Distance Learning Delivery Modalities and the Mathematics Performance of Senior High School Students

The following table shows the relationship between the transactional aspects of distance learning delivery modalities in terms of teacher's instruction, student-teacher communication, and student autonomy, and the mathematics performance in the first semester of the senior high school students.

It can be seen that a significant correlation exists between the transactional aspect of modular distance learning modality in terms of teachers' instruction and the mathematics performance of ABM modular students (r= 3.14, p= 0.02). While no significant relationship exists in student-teacher communication and student autonomy to mathematics performance of ABM (r=0.11, p= 0.426), (r= 0.108, p=0.434) the correlation is all positive and ranged from very weak to weak. This means that teacher instruction is very important for the students to attain the learning goal and set competency.

Table indicated significant correlation exist between transactional aspect of distance learning modality in terms student-teacher communication and autonomy to mathematics performance of HUMMS students (r= 0.586, p=0.003), (r= 0.611, p= 0.002). On the other hand, no significant correlation exists in teacher instruction to students' performance (r= 0.356, p= 0.088).

Table 11. *Relationship between transactional aspects of distance learning delivery modalities and the mathematics performance of modular senior high school students*

Transactional Aspects of Distance Learning	**Mathematics Performance**							
	ABM		*HUMSS*		*ICT*		*STEM*	
	R	*p-value*	*r*	*p-value*	*r*	*p-value*	*r*	*p-value*
Teacher's Instruction	0.314*	0.02	0.356	0.088	0.015	0.973	0.169	0.103
Student-teacher Communication	0.110	0.426	0.586**	0.003	0.011	0.979	0.086	0.409
Student Autonomy	0.108	0.434	0.611**	0.002	0.250	0.550	0.010	0.927

**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

Legend:
$\pm 0.80 - \pm 1.00$ *Very strong*

$\pm 0.60 - \pm 0.79$ *Strong*
$\pm 0.40 - \pm 0.59$ *Moderate*
$\pm 0.20 - \pm 0.39$ *Weak*
$\pm 0.00 - \pm 0.19$ *Very weak*

The correlation is all positive and ranges from weak to strong. This means that student-teacher communication encourages the student to perform the assigned task.

There is no significant correlation exists between the transactional aspect of distance learning modality in terms of teachers' instruction, student-teacher communication, and students' autonomy and mathematics performance of ICT students (r= 0.015, p= 0.973). (r= 0.11, p=0.973), (r= 0.250, p= 0.550). The correlation is negative and ranges from very weak to weak.

The same findings in STEM students, there is no significant correlation exist in the transactional aspect of distance learning and students' mathematics performance with the (r= 0.169, p= 0.103) teacher instruction, (r= 0.086, p= 0.409) student-teacher communication (r= 0.01, p= 0.927) student autonomy. The correlation is all positive and very weak. This means that ICT and STEM students practiced their autonomy and had experienced a goof communication with their teacher that helped them especially in the new normal set-up of classes. It clearly shows that allowing students learn at their own pace can help them develop more competitive mathematics performance. This also implies that a good communication between the teacher and students can improve the students' understanding and performance.

Table 12. *Relationship between transactional aspects of distance learning delivery modalities and the mathematics performance of online senior high school students*

Transactional Aspects of Distance Learning	**Mathematics Performance**							
	ABM		*HUMSS*		*ICT*		*STEM*	
	r	*p-value*	*r*	*p-value*	*r*	*p-value*	*r*	*p-value*
Teacher's Instruction	0.115	0.369	0.342	0.194	0.420	0.408	0.126	0.225
Student-teacher Communication	0.210	0.098	0.365	0.165	0.620	0.189	0.159	0.127
Student Autonomy	0.203	0.111	0.369	0.160	0.343	0.505	0.178	0.086

**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

Legend:
$\pm 0.80 - \pm 1.00$ *Very strong*
$\pm 0.60 - \pm 0.79$ *Strong*
$\pm 0.40 - \pm 0.59$ *Moderate*
$\pm 0.20 - \pm 0.39$ *Weak*
$\pm 0.00 - \pm 0.19$ *Very weak*

Table shows the relationship between transactional aspects of distance learning delivery modalities and the mathematics performance of online senior high school students. It reveals that there is no significant relationship exists between the transactional aspect of distance learning delivery and the mathematics performance of online students in all strands. In ABM strand, the (r= 0.015, p= 0.369) teacher instruction, (r=0.210, p= 0.098) student-teacher communication, (r= 0.203, p= 0.111) student autonomy the correlation is positive that ranged very weak to weak. While in ICT strand the transactional aspect of distance learning delivery and the mathematics performance. The (r= 0.402, p= 0.408) teacher instruction, (r=0.620, p= 0.189) student-teacher communication, (r= 0.343, p= 0.505) student autonomy the correlation is positive that ranged weak to strong. This means that the students-teacher communication is more related compared to other factors

that influenced in determining their good mathematics performance of ABM and ICT students. In HUMSS strand the (r= 0.342, p= 0.194) teacher instruction, (r=0.365, p= 0.098) student-teacher communication, (r= 0.369, p= 0.160) student autonomy the correlation is positive that ranged weak. While STEM strand, the (r= 0.126, p= 0.225) teacher instruction, (r=0.159, p= 0.127) student-teacher communication, (r= 0.178, p= 0.086) student autonomy the correlation is positive that very weak. This implies that the students in HUMSS and STEM strands practiced a good autonomy in their study. This shows that their autonomy influenced in determining the students' good mathematics performance.

Summary of Findings

Different significant points were found after the conduct of the research. Based on the different findings of the study, the following findings are hereby enumerated based on the statement of the problem:

1. The transactional aspect of the online learning delivery modality in terms of teachers' instruction was very high as perceived by students from the strands of ABM, HUMSS, and STEM while high for the strand of ICT. The students in the online delivery modality understand the teacher's instruction well. This shows that teacher instruction was very important for students to engage in the online modality of learning. The technique, instruction, and appropriate use of words were considered. Aside from this, the students show a high level of student-teacher communication. They were able to communicate with their teachers through any platform available. They can also ask their teachers without hesitation. This shows that student-teacher communication was observed for the students to motivate in the online modality. On the other hand, students in online learning delivery modalities conclude a high level of autonomy over their studies. This shows that the learning materials, platform, and learning goals of the students were observed otherwise need to focus on learning at their own pace and value learning in real-life applications.

2. The students' perception of the transactional aspect of modular learning delivery modality in terms of teachers' instruction was very high as perceived by the students from the ABM strand and perceived high by the students from HUMSS, ICT, and STEM. This shows that the teacher gives clear, easy-to-understand, use appropriate instruction in modular modality. The student-teacher communication concluded a very high. In that sense, most of the students received a response from their teachers to any of their concerns and positive feedback motivates them to do the task. Students' autonomy was at a high level as rated by the respondents, they can also learn at their own pace, using their schedule. They can take the necessary time to learn without pressure.

3. Students' mathematics performance in the online and modular learning delivery modality was outstanding in the ABM strand. The students under the modular learning delivery modality in the HUMSS strand found that there is also a very satisfactory performance while the student in the online learning delivery modality was outstanding. This is similar also to the performance of students in online and modular learning delivery modality under the strand of ICT and STEM that were found outstanding in terms of their mathematics performance.

4. The data shows significant differences between the mathematics performance of the students from online and modular learning delivery modalities under the ABM and HUMSS strands, while found not significant for the mathematics performance of the students from online and modular learning delivery modalities under the ICT and STEM strand.

5. It was found that there is a significant relationship between the transactional aspects of distance

learning such as teachers' instruction and the mathematics performance of modular students in the ABM strand. It was also found significant to student-teacher communication, and student autonomy to the mathematics performance of modular students in the HUMSS strand. While it is found not significant to other variables in the study for the students in ICT and STEM strands.

6. It was found that there was no significant relationship existed between the transactional aspects of distance learning delivery modalities and the mathematics performance of online senior high school students under the four strands. The r- values show positive and ranged very weak to weak correlation. This means that the student-teacher communication is more related compared to other factors that influenced determining the good mathematics performance of ABM and ICT students. It also implies that the students in HUMSS and STEM strands practiced good autonomy in their studies. This shows that their autonomy influenced in determining the students' good mathematics performance.

Conclusion

The study revealed that the mathematics performance of students who undergo online modality was high compared to the mathematics performance of students who undergo modular modality considering the transactional aspect of distance learning. It is also found that there is no significant relationship between the transactional aspects of distance learning and the mathematics performance of students in the online distance learning delivery modality. While the study found that the teacher's instruction and student-teacher communication is significantly related and student autonomy is not significantly related to the mathematics performance of students in the modular distance learning delivery modality.

Recommendations

1. The school/ the division recommends providing additional support for teachers and students by having an effective way of teaching and learning in the online and modular distance learning delivery modality.
2. The teachers were highly encouraged to be approachable and reachable in communicating with their students and to provide ways for students to access learning materials wherever and whenever they want on their available devices. It also suggests that teachers motivate students to properly explore and practice their autonomy over their studies.
3. The teacher/ school suggests implementing innovative programs, activities, strategies, techniques, and best practices for the students to perform more effectively and efficiently in mathematics.
4. Future researchers may continuously look for other factors not mentioned in this study that may significantly be correlated to the performance of the students, especially in distance learning.

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