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Comparing Middle School Student Learning Outcomes from In-Person, Online, and Hybrid Instructions: A Consideration of Learning Engagement during a Pandemic

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Learning engagement varies in different modes of instructions. With such consideration, the authors of this article conducted comparative analyses on student learning outcomes measured by their final mean grade point averages (GPAs) during three time-periods (before, at the onset of, and during pandemic) when in-person, online, and hybrid instructions were delivered. The records of 600 middle school students in a school district from a western state, across three academic years, were used as the sample (2018-2019 before pandemic when they were in sixth grade with in-person instruction, 2019-2020 at the onset of the COVID-19 pandemic in seventh grade with online instruction, and 2020-2021 during pandemic in eighth grade with both online and hybrid instructions). Results showed that no difference was found (from paired *t*-test) in student final GPAs when they transferred from in-person instruction before pandemic to online instruction at the onset of pandemic, but differences were found (a) between in-person instruction and hybrid instruction (from one-way repeated ANOVA), and (b) between online instruction and hybrid instruction (from both one-way repeated ANOVA and an independent samples *t*-test) at and during pandemic. Recommendations for practice and future research focusing on students' needs were presented.

Keywords: hybrid, online, in-person, instruction, learning, student engagement

INTRODUCTION

In the Spring of 2020, the COVID-19 pandemic impacted education concerning how nearly 55.1 million K-12 public school students acquired learning throughout the nation

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(Bond, 2020; Malkus & American Enterprise Institute, 2020; Stelitano et al. 2020; & Tinubu Ali & Herrera, 2020). As federal mandates required the closure of all nonessential businesses, the majority of the school districts were faced with the challenge of instantaneously transitioning educational platforms from face-to-face classroom learning to distance learning (Asio & Bayucca, 2020; Birch & Lewis, 2020; Davis et al., 2021; Jimenez & Center for American Progress, 2020; & Kamble et al., 2021). This abrupt change to the K-12 public school learning environment may have potentially influenced the students' social interactions, which then possibly affected student engagement when assessed in multiple modes of instruction (Data Quality Campaign, 2020; & Tinubu Ali & Herrera, 2020). These prompt changes to instruction may have altered students' learning outcomes, depicted in their final grade point averages (GPAs).

Initial studies regarding the effects of the pandemic on education have highlighted the experiences of instructors (e.g., K-12 teachers) and college students (Birch & Lewis, 2020; Lee, 2021; Seward & Nguyen, 2019; & Yates et al., 2014); however, not enough studies have been completed on the perceptions of and the impact on middle school students in the U.S. (Scales et al., 2020; & Tinubu Ali & Herrera, 2020). The study focusing on the perception of as well as the impact on middle school students has been deemed important because, at this stage in a student's education life cycle (Gentle-Genitty, 2019; & Scales et al., 2020), the degree of learning is dependent on social interactions (Bond, 2020; & Gentle-Genitty, 2019).

Before the pandemic, research indicated that academic achievement was measured by students' standardized assessment scores (Lake et al., 2021). However, because of the transition from in-person to online instruction, the evaluation of academic achievement through other measures has become essential when assessing all aspects of distance learning (Bond, 2020). Lake et al. (2021) suggested that the need for establishing alternative accountability measures, which provided insight into students' ability to accomplish set learning outcomes, was determined based on the necessary improvements in academic performance and overall achievement.

Because of the change to online instruction due to the pandemic, where testing could not be properly administered, most school districts canceled the End of Course assessments (Western State Department of Education, 2021). The postponement of administering most standardized testing required academic leaders to determine another method for assessing students' academic performance (Bond, 2020). As a result of the pandemic, in many instances, academic achievement has been evaluated by students' final GPAs in place of standardized assessment scores (El Refae et al., 2021; & Yates et al., 2014).

CONTEXT OF THE RESEARCH

The basis for this study was rooted in the dependency of social interactions during learning and its consideration for how it has potentially influenced student engagement within online learning environments OLEs (Thijs & Fleischmann, 2015). A comparative analysis of three modes of instruction (e.g., in-person, online, and hybrid) evaluated during three timeframes (e.g., before, at the onset of, and during the pandemic) has suggested differences in the level of student engagement. These differences have been based on social interactions and how students engaged within each mode of instruction. Because the majority of K-12 students in the U.S. transitioned to remote education due to quarantine protocols during the first quarter of 2020, academic leaders were required to provide a mode of instruction and access to learning resources to accommodate students in distance learning (Asio & Bayucca, 2020; Birch & Lewis, 2020; Davis et al., 2021; & Jimenez & Center for American Progress, 2020).

In traditional instruction, education occurs within an in-person classroom environment where the teacher facilitates learning and students acquire new knowledge through the

reinforcement of practice (e.g., observing, asking questions, listening, reading, writing, and collaborating with other students) (Aydin & Erol, 2021). Students may obtain feedback that could be immediately applied to learning. In this traditional learning forum, social interaction among students primarily consists of the student-instructor, student-content, and student-student interactions as well as the student-activity and student-technology interactions that are utilized to develop innovative relationships for technology-based learning (Moore, 1989; & Nilson & Goodson, 2017).

The student-instructor interaction includes formal direct instruction (e.g., guided facilitation from teacher to student) as well as informal guidance through mentoring and other supportive measures beyond in-class learning. The student-content interaction allows for students to actively read resources (i.e., textbooks, guides, library resources, etc.), write responses that strengthen conceptualization, and devise inferences aligned with developing reading comprehension skills (Nilson & Goodson, 2017). The student-student interaction serves as a reinforcement for the student-instructor and student-content interactions which allow students to develop knowledge through communication with one another.

These three student interaction criteria (student-instructor, student-content, and student-student) serve as the guiding principles for gauging student engagement during in-person classroom learning. However, to encourage student engagement within OLEs, student-activity and student-technology interactions are the suggestive measures essential for enhancing student learning (Dennie et al., 2018; & Meyer, 2014). The student-activity interaction incorporates student engagement with active learning through performative measures that are best illustrated through experiential learning, game-based learning, and service learning which embody the scope of simulated activities. Lastly, to engage the student-technology interaction, students must be able to access the learning tool or instrument (i.e., computer and access to the Internet or Learning Management System) and possess the required skills for navigation (i.e., using the keyboard and functions within the operating system) and software system (i.e., using browsers, emails, files, and document uploads or downloads) (Nilson & Goodson, 2017).

STATEMENT OF THE PROBLEM AND PURPOSE OF THE STUDY

Research conducted on distant learning has suggested that students who have completed distance learning by attending OLEs often earned lower course completion grades than students that attended in-person learning (Yates et al., 2014). This indication of students' performance during online learning has been tested as the result of health and safety protocols enacted by federal mandates resulting from the COVID-19 pandemic (Birch & Lewis, 2020; & Lake et al., 2021). Because of the abrupt and disruptive transition to online learning practices, the accountability for evaluating learning practices once upheld in traditional, in-person instruction has been challenged (Lake et al., 2021).

The purpose of the study was to explore how middle school students' learning outcomes could be influenced by the three different modes of instruction (in-person, online, and hybrid) by considering the level of engagement students could receive from the three modes of instruction throughout the pandemic.

LITERATURE REVIEW

Reviewed through the lenses of the (a) Sociocultural Theory, (b) Social Constructivism Theory, and (c) Social Control Theory, this study's theoretical framework summarized cognitive learning theories that connected the need for enhancing student engagement through the design of the three different modes of instruction (in-person, online, and hybrid), and the possibility for improving overall academic achievement.

The association of the cognitive learning theories (e.g., based on the construction of learning and behavior students exhibit during learning) to the instructional design models (e.g., used for designing content and delivering instructions for in-person, online, and hybrid learning) and student engagement were utilized for creating learning. These concepts were used to describe the practices that influence student engagement and measure academic performance based on the standards designated by the study's state department of education and school district. Below, Figure 1 demonstrates the theoretical, instructional design, and student engagement process flow of these measures:

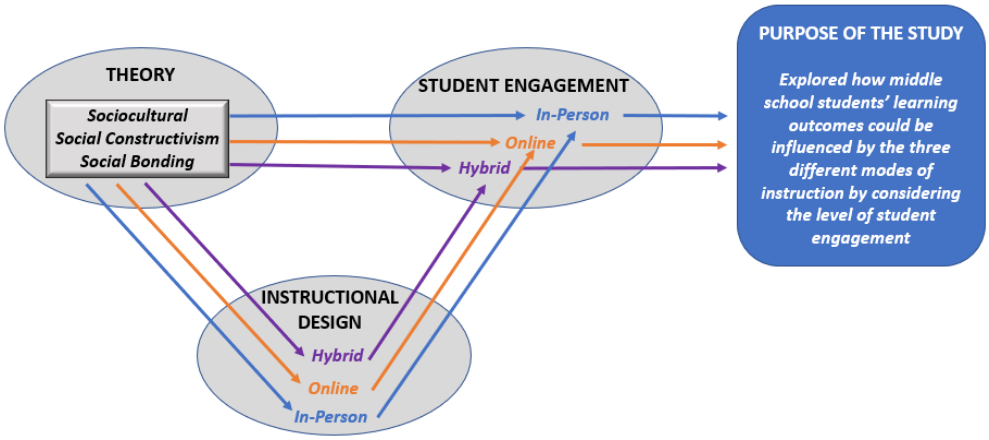

Figure 1. Theoretical Framework

LEARNING THEORIES

Theory 1. Sociocultural Theory

With the Sociocultural Theory, a person's cognitive development is mainly influenced by their culture and the historical aspects of that culture (Cherry, 2019; Fosnot, 2005; Fosnot, 2013; Furrer & Skinner, 2003; Gredler, 2009; Hendy, 2020; Paleeri, 2015; & Rovai, 2004). People within a culture become engaged in its historical context (e.g., social, religious, economic, or political conditions) when they acquire new information that offers deeper, meaningful connections with their environment. This correlation to education infers that an instructor must design content that supports instruction for fostering cognitive development to minimize the knowledge gap (Cherry, 2019; & Gredler 2009). Achieving this goal establishes learning objectives and activities that effectively satisfy learning outcomes that enable students to achieve academic success.

Theory 2. Social Constructivism Theory

With the Sociocultural Theory being the core for how knowledge is mainly acquired through the experiences in one's culture, the Social Constructivism Theory is based on the development of social interactions during learning (Fosnot, 2005; Fosnot, 2013; Hendy, 2020; Li et al., 2020; Rovai, 2003; & Yates et al., 2014).The emphasis is placed on collaboration and the interactive experiences that students engage in during active learning, which is often practiced during traditional, in-person instruction. However, when instruction abruptly shifted from in-person to online instruction at the onset of the pandemic, the concern that the student-instructor and student-student interactions would be replaced by the use of digital tools became an instant reality (Asio & Bayucca, 2020; Aydin & Erol, 2021; Birch & Lewis, 2020; Cherner, 2020; Data Quality Campaign, 2020; Davis et al., 2021; El Refae et al., 2021; Ewing & Cooper, 2021; Lake et al., 2021; & Malkus & American Enterprise Institute, 2020).

Theory 3. Social Control Theory

To understand how middle school-aged students form relationships and integrate into their culture (society or classroom environment), the Social Control Theory offers insight into how behavior factors into student engagement during learning (Gentle-Genitty, 2019). This theory serves as an extension of the concepts of social control (e.g., rules and standards set in a society that insist its members maintain a certain level of decorum) (Ontario Ministry of Children, Community and Social Services, 2016) and purports that one's positive association with family, school (community of learning), peers, and other facets of a society lessens their desire for engaging in deviant behavior.

Educators utilize this cognitive learning theory when considering the design of content and instruction within the learning environment's cultural systems (e.g., in-person, online, and hybrid instruction). With the understanding that positive interactions yield positive behavior, instructors utilize the Social Control Theory to create content that encourages social interactions. The more students interact with the content, instructor, peers, and technology; the more likely engagement increases within the learning activities. An increase in these direct relationships contributes to improving academic performance (Gentle-Genitty, 2019; & Wang et al., 2014). This premise of social interaction serves as an aid in fostering performance in OLEs by increasing student engagement which leads to achieving academic success. However, the issue is how the positive interactions in different learning platforms (e.g., in-person, online, and hybrid) could be created and implemented through a systematical design system.

INSTRUCTIONAL DESIGN MODELS

To create content that is concise and easy to follow, yet engaging while meeting the needs of learners, the creators of the content (i.e., instructional designers) must possess an understanding of how to deliver quality instruction and learning that is creative, active, and iterative: instructional design (ID) (Czerkawski & Lyman, 2016; Gustafson & Branch, 2002; Khalil Elkhider, 2016; Kilgore et al., 2019; Liu & Velasquez-Bryant, 2003; & Pina & Harris, 2019). This systematic approach for developing learning experiences has extended to the need for understanding how learners think, feel, behave, act, react, and perform during learning. To connect instructional strategies to the theoretical evidence for learning, ID models must refer to various cognitive theories that have assisted in understanding how students engage during learning (Czerkawski & Lyman, 2016; Gustafson & Branch, 2002; & Khalil & Elkhider, 2016).

Design Model 1. ITD Integration Model

To accommodate the need for accessing technology, students must be connected to adequate information through the facilitation of effective instruction. This connection must be linked to how technology is used during online learning (Liu & Velasquez-Bryant, 2003). To improve learning within OLEs, the incorporation of technology-based designs must be included within the ID model (Aydin & Erol, 2021; Kimmons & Hall, 2018; & Liu & Velasquez-Bryant, 2003). Technology-based learning is only achieved with the integration of three components of learning: information, technology, and instructional design (Liu & Velasquez-Bryant, 2003) that are depicted in the Information Technology Design (ITD) model. The ITD model demonstrates the use of a conceptual framework to support student engagement (Liu, 2008; & Liu & Velasquez-Bryant, 2003). The ITD procedural system follows the same theories, logic, and models of standard ID methods; therefore, its application, in creating content that encompasses the necessary components for learning and technical skill, is ideal for use in OLEs (Liu, 2008; & Liu & Velasquez-Bryant, 2003).

The integration of the ITD model suggests that the dimensions of information, technology, and instructional design are functions of learning (Liu et al., 2018). The information dimension exemplifies the facilitation of content and presentation of

supporting materials and resources. Instructors must make a series of decisions that determine the: (a) facts, ideas, or generalizations to be made about the content, (b) order the information is presented for learning based on the degree of difficulty, and (c) scope and focus of the content that is developed within a lesson or unit (Liu et al., 2018). The technology dimension symbolizes the software and hardware tools used to support or enrich pedagogy. When the content is designed, decisions must be made regarding; what technology to use, how the technology promotes learning, and how the use of technology applies to all learning environments. And, the instructional design dimension describes the set of rules or guidelines for delivering instruction (Liu & Velasquez-Bryant, 2003). The guidelines are developed to address how the content is created, delivered, and evaluated. Below, Figure 2 illustrates the relationship between each dimension within the framework.

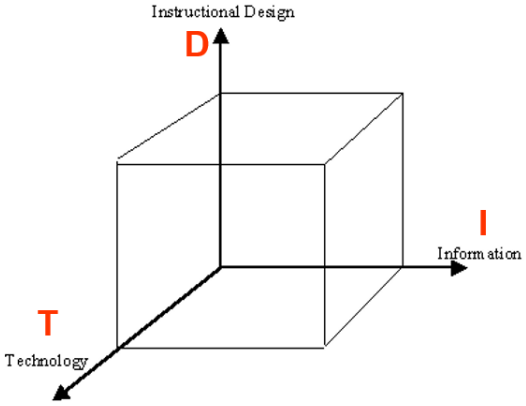

Figure 2. ITD Information Technology Design Model (Liu et al. 2018)

The operational tasks in the dimension of Design, including the design of content and design of technology use (e.g., in online learning and hybrid learning), are systematically summarized in the *ADDIE* model.

Design Model 2. ADDIE Model

Though many models have been developed and used for ID, the primary model that serves as the guide for others is the ADDIE model (Gustafson & Branch, 2002; & Khalil & Elkhider, 2016). ADDIE is the acronym for Analyze, Design, Development, Implementation, and Evaluation which describes the various phases of content design (Khalil & Elkhider, 2016). Below, Figure 3 illustrates the process flow of the stages for designing content and instruction.

Figure 3. ADDIE Model Process Flow

Though often presented linearly, the ADDIE model does not necessarily follow an end-to-end process flow. In the initial step of the ADDIE model, the analysis phase determines the instructional goals and learning objective through a process called a needs assessment. Also, learner assessment, content assessment, and task analysis are all determined during this phase (Gustafson & Branch, 2002; & Khalil & Elkhider, 2016). In the next step, an operational to-do list of all the tasks is formulated through the design phase. The following step, the development phase, includes the creation of the content, the preliminary model of the actual course, and assessment tools (Gustafson & Branch, 2002; & Khalil & Elkhider, 2016). During the implementation phase, the actual content and materials that are used to support the students' competency and mastery of the learning objectives are delivered to the target audience (Gustafson & Branch, 2002; & Khalil & Elkhider, 2016). Lastly, data that is collected for identifying the areas of content that need revision occurs during the evaluation phase (Gustafson & Branch, 2002; & Khalil & Elkhider, 2016).

Again, the design may vary for different modes of instructional (e.g., in-person, online, and hybrid), and may enhance the engagement of student learning in different ways. Throughout the pandemic, administrators from the district interchanged the modes of instruction among in-person, online, and hybrid. The hypothetical logic is that different levels or ways of engagement may align with different learning outcomes during the special conditions of the pandemic. The purpose of the study was to explore how middle school students' learning outcomes could be influenced by the three different modes of instruction (in-person, online, and hybrid) by considering the level of engagement students could experience from the three modes of instruction during the pandemic.

RESEARCH QUESTIONS

This study determined if there were any significant mean differences in students' final GPAs, based on social interaction learning theories, during in-person, online, and/or hybrid instruction in the three time periods of before the pandemic, at the onset of the pandemic, and during the pandemic, respectively. The social interactions in the three modes of instructional were considered a potential factor of student engagement with the instructor, content, other students, activities, and use of technology while learning, and therefore a potential factor that may align with student learning outcomes (their final mean GPAs across the three different timeframes and modes of instruction). The following research questions were used as a guide through the study and data analyses:

1. Are there any differences between the means of students' final-mean-GPAs that were measured from *in-person instruction* (before the pandemic when they were in sixth grade) and *online instruction* (at the onset of the pandemic when they were promoted to seventh grade)?
2. Are there any differences in means of students' final-mean-GPAs that were measured from *in-person instruction* (before the pandemic), *online instruction* (at the onset of the pandemic), and *hybrid instruction* (during the pandemic) across their sixth, seventh, and eighth grade school years?
3. Are there any differences in the means of the students' final-mean-GPAs between students who were taught with *online instruction* and those who were taught with *hybrid instruction* during the pandemic when they were in eighth grade?

METHOD AND DESIGN

PARTICIPANTS AND SMAPLING

When establishing the study's population, an assessment of GPA scores for the two groups of participants that attended one of the three modes of instruction, across the three

timeframes, was reviewed. For the first timeframe (before the pandemic), the GPA scores of all participants were explored based on attending in-person instruction. During the second timeframe (at the onset of the pandemic), an assessment of GPA scores obtained from all participants that attended online instruction was reviewed. Lastly, the GPA scores of each participant were explored during the third timeframe (during the pandemic). The assessment in the third timeframe was based on attendance in one of the two modes of instruction: online or hybrid.

Levels of the Population

The levels of the population used in this study included the: (a) total population, (b) target population, and (c) study population. Below, Figure 4 illustrates the correlation between the levels of the population and the overall sample:

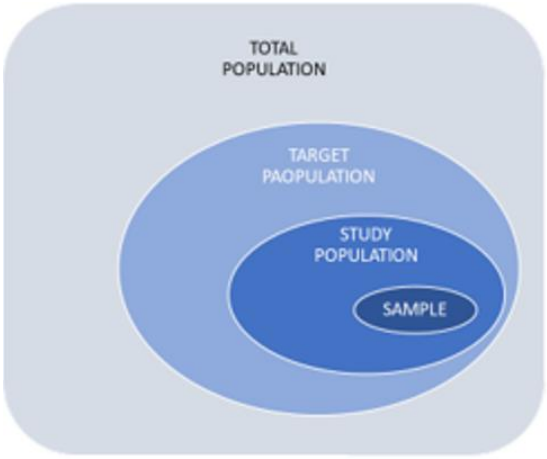

Figure 4. Levels of Population

Total Population. In this study, the total population was classified as the total number of students within the County School District, in a western state. This school district was categorized as urban-based which was dependent on the number of students attending elementary, middle, and high school (Guinn Center, 2020). During the timeframe of this study, approximately 64,400 students attended one of 117 public or academy K-8 and K-12 schools (Western Department of Education, 2021). Based on the criteria for this study, students that did not attend one of the schools for sixth, seventh, or eighth grade from the beginning of Spring 2018 through the end of Spring 2021 were not included in the results. The results, from the report, were obtained from the County School District. The data that met this criterion was considered inclusive for this study and thus, classified as the target population.

Target Population. In this study, the target population was classified as the total number of students that attended sixth, seventh, or eighth grade, at any time between the beginning of Spring 2018 through the end of Spring 2021. The initial dataset received contained an exhaustive list of multiple line items for each student. The line items included data from the following criteria, across the three school-year timeframes:

- Term (T2 or T4).
- Course name for each class attended, per term.
- Course completion grade for each class, per term.
- Classification of each mode of instruction (in-person, online, or hybrid), per term.

The completion grades (for T2 and T4) for the following five courses were provided within the dataset that met the criterion requirement: English/Language Arts, Mathematics, Science, Social Studies, and an Elective (i.e., four core plus one elective). These courses

were recommended for satisfying an academic performative standard for a student to be promoted from one grade level to the next grade level (County School District, 2021). To narrow the dataset to the specific criterion that was met for the study, data was extracted. The results from the data extraction yielded the target population. Below, Table 1 illustrates the descriptors that were included in the target population.

Table 1.*Target Population and Term Description*

Grade	Term	School Year	Instruction
6th	T2, T4	Beginning of Fall 2018 – End of Spring 2019	In-person
7th	T2	Throughout Fall 2019	In-person
	T4	Throughout Spring 2020	Online
8th	T2, T4	Beginning of Fall 2020 – End of Spring 2021	Online or Hybrid

The description of Grades 6, 7, and 8; Terms T2 and T4; and each school year's timeframe (2018-2019, 2019-2020, and 2020-2021) were aligned with the corresponding mode of instruction to describe the dataset. Based on these specifications, any criterion within the dataset that did not meet the guidelines was removed. The results from this additional extraction were classified as the study population.

Study Population. In this study, the study population (*N*) was classified as the dataset that provided the descriptors (an indication of each student) which included the designated five courses for students enrolled in elementary (sixth grade only) and/or middle school (sixth, seventh, and eighth grades) during the specified timeframes and the associated mode of instruction. The remaining dataset included useable data for $N = 4{,}094$ students that attended 66 elementary and middle schools throughout the school district.

Sample Size

In this study, the sample size was classified as the representative group taken from the study population. Here, the participants were not randomly assigned, but rather randomly selected from the study population. Observations or information obtained from a questionnaire/survey were not the source of data collection for this sample. Because the dataset was obtained from a preexisting database, there was not a control group or an experimental group that utilized random assignment for designating which group a participant was assigned. Instead, specified characteristics from the population (i.e., one of the three modes of instruction) were proportionately represented within the sample. To achieve this representation, the target population was separated by the identifiable strata to form the subgroup (e.g., the study population). Then, each participant aligned with the specific characteristic was randomly selected to form the overall sample.

The sample was then strategically defined and divided into the three sets of strata (i.e., modes of instruction: in-person, online, and hybrid). Each distinct subset of the sample was needed for improving the statistical quality of the findings. Once the strata were formed, the researcher randomly selected a sample within each stratum. This sampling technique allowed the researcher to divide a broader population into smaller subgroups that met separate criteria while representing the entire population.

Two groups were formulated with random selection. Each participant from the target population was assigned an 8-digit unique identifier to maintain the anonymity of each participant. They were then randomly selected (per order of the assigned Identification Number) and became members of Group A or Group B (QuestionPro, 2022). Each group consisted of 300 students and both groups attended in-person instruction in sixth grade during the first timeframe, and online instruction in seventh grade during the second timeframe. However, during the third timeframe in eighth grade, Group A attended online instruction and Group B attended hybrid instruction.

In short, the sample for this study consisted of the records of 600 middle school students in a school district from a western state across three fall-spring academic years (2018-2019 before the COVID-19 pandemic when they were in sixth grade with in-person instruction, 2019-2020 at the onset of the COVID-19 pandemic when they were in seventh grade with online instruction, and 2020-2021 during the COVID-19 pandemic in eighth grade with both online and hybrid instructions). The data source of the groups and modes of instruction modes are shown in Table 2.

Table 2. *Groups and Modes of Instruction*

	First Timeframe (6th grade)	**Second Timeframe** (7th grade)	**Third Timeframe** (8th grade)
Group A (*n*=300)	In-person	Online	***Online***
Group B (*n*=300)	In-person	Online	***Hybrid***

Power Analysis

Before the researcher finalized the sample size, a power analysis was conducted. The use of *GPower 3.1* analysis tool depicted the approximate number of students required for making broad inferences about unexplored populations of interest (e.g., generalizations). Although the current study did not apply an experimental design, the results may serve for the purpose of broader inferences, as a sample with enough size is a strength for the study. Based upon the *GPower* analysis for each statistical test and the partial sample sizes (see Table 3), the sample size for this study (300*2 = 600) can be considered sufficient.

Table 3.*GPower Analysis Description*

Data Analysis Method	**Statistical Test**	**Effect Size**	**Partial Sample**
Paired *t*-test	Means: Difference between two dependent means (matched pairs) Alpha level .05 Confidence level .95	*d* = .50 (medium)	*n* = 45
One-way Repeated ANOVA	ANOVA: Repeated measures within factors Alpha level .05 Confidence level .95	*f* = .025 (medium)	*n* = 44
Independent Samples *t*-test	Means: Difference between two independent means (two groups) Alpha level .05 Confidence level .95	*d* = .50 (medium)	*n* = 176

Demographics Information

The participants' demographic characteristics such as gender, free and reduced lunch (FRL), individualized education program (IEP), and English learner (EL) statuses were not evaluated in this study, but the information is reported here for the readers' information. In Group A (the 300 students who attended online instruction), there were 137 male (45.67%), 163 female (54.33%), 28 *FRL* (42.67%), 26 *IEP* (8.67%), and 9 *EL* (3%). In Group B (the 300 students who attended hybrid instruction), there were 155 male (56.67%), 145 female (48.33%), 121 *FRL* (40.33%), 22 *IEP* (7.33%), and 25 *EL* (8.33%). Previous research has overwhelmingly indicated there were no statistically significant differences found between these variables when the final mean GPAs were compared (Hobson & Puruhito, 2018; & Scales et al., 2020).

DATA COLLECTION PROCEDURES

The request to conduct current research and to obtain the data was approved by (a) the university's Institutional Review Board (IRB), (b) the County School District's Department of Accountability, and (c) the school district's Data Analytics Team. This team then provided data consisting of the students' course completion letter grades (i.e., A, B, C, D, or F), course names, and details regarding the timeframe for when the three modes of instruction were attended. Specifically, the data collected across three academic school years (as shown in Table 1), and the three timeframes associated with the three modes of instruction students received were aligned in Table 2.

The school district assigned each participant a random 8-digit unique identifier. No other pertinent information relating to the participants' identification was utilized for this study. There were three criteria needed to be met for a participant to be included in the study population. First, the grade level was used to align a participant's level of education with the appropriate school year required for this study. For example, a participant's information must have aligned as being (a) a sixth-grader during the 2018-2019 school year, (b) a seventh-grader during the 2019-2020 school year, and (c) an eighth-grader during the 2020-2021 school year. All other participants that did not meet these criteria were extracted from the results to be analyzed. Next, the reporting of course subjects and semester terms that met the minimum requirement of the four core plus one elective course, classified as Term 2 (T2) plus Term 4 (T4) criteria, were shown in Table 1. If the criteria were missing or not reported, the corresponding participant data was removed from consideration for this study. Lastly, the mode of instruction each participant attended, per grade level and timeframe, aligned according to the criteria for the study. If students in the sixth grade did not attend in-person instruction, seventh-grade students did not attend online instruction, and eighth-grade students did not attend online or hybrid instruction, the corresponding data was also removed from consideration.

MEASUREMENT AND INSTRUMENTATION

This study explored the difference in learning outcomes among students who attended three different modes of instruction (in-person, online, and hybrid), across three timeframes (before, at the onset of, and during the pandemic), with the consideration of the influence of student engagement. Because the standardized assessments were modified and/or waived, the anticipated results were used as the measurement indicator of academic achievement. In this study, the final mean GPAs for each student were used to measure student learning outcomes. The procedures to calculate the final mean GPAs were:

1. Converting the letter grade from each course to GPA points (A, B, C, D, E, and F to 4, 3, 2, 1, and 0 respectively);
2. Determine the GPA points for T2 and T4. That is, to determine the GPA points at the end of the fall semester and at the end of the spring semester of an academic school year.
3. Calculate the mean of the GPAs of T2 and T4. That is, to obtain the mean GPA for each academic school year.

The final mean GPAs represented students' quantitative ability (e.g., students' ability to solve Aptitude test questions) and academic achievement in ELA, Mathematics, Science, Social Studies, and an elective (i.e., four core plus one elective) course taken among the students within the overall sample. A note of contention was though the assessment criteria may have varied across the three timeframes (before, at the onset of, and during the pandemic), the assessment criteria was the same for all student participants within each timeframe. After the mean GPAs were calculated, the data analysis was conducted.

DATA ANALYSIS AND RESULTS

DATA ANALYSIS AND RESULTS FOR RESEARCH QUESTION 1

Are there any differences between the means of students' final-mean-GPAs that were measured from in-person instruction (before the pandemic when they were in sixth grade) and online instruction (at the onset of the pandemic when they were promoted to seventh grade)?

In the data analysis for research question 1, the final mean GPAs of the entire sample (Groups A and B, $N = 600$ participants) from the two modes of instruction (in-person, and online) were compared. A paired *t*-test was conducted where the two paired variables were (a) students' final mean GPAs that were measured before pandemic with in-person instruction when they were in sixth grade, and (b) students' final mean GPAs that were measured at the onset of the pandemic with online instruction when they were promoted to seventh grade.

Results from the paired *t*-test were not significant ($t_{(599)} = .543$, $p = .587$), indicating that there was no significant difference between students' final-mean-GPAs from in-person instruction ($N = 600$, $M = 3.21$, $SD = .76$) and from online instruction ($N = 600$, $M = 3.23$, $SD = .75$). The effect size of this paired *t*-test, Cohen's *d*, equals 0.022, which is considered a small effect size based on Cohen's (1988) conventions (e.g., 0.2 = small effect; 0.5 = medium effect; and 0.8 = large effect).

In summary, there was no difference in the means of student final-mean-GPAs when measured from in-person instruction, then followed by online instruction.

DATA ANALYSIS AND RESULTS FOR RESEARCH QUESTION 2

Are there any differences in the means of students' final-mean-GPAs that were measured from in-person instruction (before the pandemic), online instruction (at the onset of the pandemic), and hybrid instruction (during the pandemic) across their sixth, seventh, and eighth grade school years?

In the data analysis for research question 2, the final mean GPAs of students in Group B (the group that had hybrid instruction in eighth grade during the pandemic, $N = 300$) were compared among the three modes of instruction (in-person, online, and hybrid). A one-way repeated measures ANOVA was conducted, where the dependent variable was the final-mean-GPAs, the within subject factor was timeframe/mode of instruction at three levels: (a) sixth grade timeframe with in-person instruction, (b) seventh grade timeframe with online instruction, and (c) eighth grade timeframe with hybrid instruction.

The Mauchly's Test for Sphericity Assumption of repeated measures was performed and the results showed a violation of Sphericity Assumption (Mauchly's $W = .83$, $\chi^2 = 54.11$, $p < .001$), which indicated that the variance between each of the pairs was not equal (e.g., in-person and online, in-person and hybrid, or online and hybrid). Therefore, the results of the multivariate tests were checked to determine if there was a difference in the final mean GPAs.

The results of the multivariate tests were significant (*Wilks' Lambda* = .79, $F_{(2, 298)} = 38.84$, $p < .001$, and multivariate $\eta^2 = .21$ with a large effect size), indicating that the difference in final-mean-GPAs existed between at least one pairwise comparison of in-person instruction ($n = 300$, $M = 3.20$, $SD = .76$), online instruction ($n = 300$, $M = 3.25$, $SD = .75$), and hybrid instruction ($n = 300$, $M = 2.93$, $SD = .93$).

Pairwise comparison results showed that significant differences in the means of the final-mean GPAs existed between in-person and hybrid instruction ($p < .001$), and between online and hybrid instruction ($p < .001$). Specifically, the mean of the final-mean-GPAs from the in-person instruction ($M = 3.20$, $SD = .76$) was higher than that from hybrid instruction ($M = 2.93$, $SD = .93$), and the mean of the final-mean-GPAs from online instruction ($M = 3.25$, $SD = .75$) was higher than that from hybrid instruction ($M = 2.93$,

SD = .93). Finally, no difference was found between in-person and online instruction (p = .409).

In summary, for the same group of students, their final-mean-GPAs from both in-person instruction and online instruction were higher than that from hybrid instruction; where the comparison was across three different timeframes (before, at the onset of, and during the pandemic); and at the grade level where the students started from sixth grade, through seventh grade, then advancing to eighth grade.

DATA ANALYSIS AND RESULTS FOR RESEARCH QUESTION 3

Are there any differences in the means of the students' final-mean-GPAs between students who were taught with online instruction and those who were taught with hybrid instruction during the pandemic when they were in eighth grade?

In the data analysis for research question 3, the data used were the final mean GPAs of students in both Group A (n = 300, with online instruction) and Group B (n = 300, with hybrid instruction) during the pandemic when they were in eighth grade (in the third timeframe). An independent samples t-test was conducted, where the final-mean-GPA was the dependent variable, and the factor variable was the mode of instruction with two levels (online versus hybrid).

The Levene's test was significant, indicating that the equal variance assumption was violated (F = 40.26, p < .001); therefore, the results for "equal variances were not assumed" were checked. Results for the independent samples t-test were significant ($t_{(555)}$ = -6.48, p < .001), with a moderate effect size (d = .53). The 95% confidence interval of the mean difference between the two groups was from .37 to .69. The researcher rejected the null hypothesis and concluded that a difference was found in the final mean GPAs between online and hybrid instruction (during the pandemic during the eighth-grade timeframe). The final mean GPAs from the hybrid mode of instruction (M = 2.93, SD = .94) was significantly higher than that from the online mode of instruction (M = 2.35, SD = 1.25).

In summary, between two groups of students who were taught with online instruction and hybrid instruction, the final mean GPAs from the hybrid instruction (Group B) were higher than that from the online instruction (Group A). Different from the results of research question 2 that the final mean GPAs from online instruction were higher than that from hybrid instruction (which were calculated from comparing the learning outcomes of the same group of students across three timeframes), the results of question 3 were from the comparison of two different groups of students at the same eighth grade timeframe during the pandemic.

DISCUSSION AND CONCLUSION

The purpose of the study was to explore how middle school students' learning outcomes could be influenced by the three different modes of instruction (in-person, online, and hybrid) by considering the level of engagement students could receive from the three modes of instruction during the pandemic. The results of the data analysis provided answers to the research questions, and offered some insight into subjective reasoning based on the intrinsic and extrinsic factors that could have potentially impacted the final mean GPAs. A discussion regarding the inferences that potentially affected learning outcomes that resulted from the change in the modes of instruction (e.g., *online instruction* at the onset of the pandemic to *hybrid instruction* during the pandemic) was necessary to explore strategies needed for improving academic achievement.

The results from the three data analyses indicated that there were no statistically significant differences in the final mean GPAs when the mode of instruction transitioned from in-person (before the pandemic) to online instruction (at the onset of the pandemic). However, the results revealed a significant decline in the final mean GPAs in the third timeframe (during the pandemic). The Independent Samples t-test analysis indicated that the final mean GPAs of the students who attended online instruction were significantly lower than the final mean GPAs of the students who attended hybrid instruction during the same timeframe. A notation was also made that indicated there was a significant decline in the final mean GPAs when students remained in the same mode of instruction, over two school years. In this instance, Group A students attended online instruction at the onset of the pandemic, and during the pandemic. Because there were two instances of significant declines in academic achievement when Groups A and B transitioned from learning at the onset of the pandemic to during the pandemic, an understanding of the underlying reasons for significant differences occurred must be further investigated.

While specific qualitative data based on students' experiences and K-12 teachers' perceptions during this timeframe could not be obtained for analysis, a review of student engagement in conjunction with the effects of the pandemic from current studies was used as a suggestive measure for the analyses. To ensure students achieve the learning outcomes set by local, state, and federal education standards, the entire community of learning must work as a cohesive support system to provide students with the necessary tools and assistance for learning. Therefore, policymakers, academic leaders within school districts, students' families, and K-12 teachers must partner with one another to best serve the needs of students (Ishmael et al., 2020; Jimenez & Center for American Progress, 2020; Kuhfield et al., 2020; Stelitano et al., 2020; Tinubu Ali & Herrera, 2020; & Zhou et al., 2021).

CONCLUSION

There were four unique findings obtained from this study. The first finding taken from the Paired t-test data analysis indicated no statistically significant difference among the entire sample's final mean GPAs between in-person and online modes of instruction. The data analyzed was collected at the timeframes before the pandemic (in-person instruction during the sixth-grade school year of 2018 to 2019) and at the onset of the pandemic (online instruction during the seventh-grade school year of 2019 to 2020). This finding suggested that when the middle school students abruptly transitioned from in-person to online instruction due to nonessential business closures throughout the nation, the students' academic achievement did not change.

The second finding taken from the One-Way Repeated Measures ANOVA data analysis indicated no statistically significant difference between a subgroup's (students from Group B) final mean GPAs between in-person to online, then hybrid modes of instruction. The data analyzed was collected at the timeframes before the pandemic (in-person instruction during the sixth-grade school year of 2018 to 2019), at the onset of the pandemic (online instruction during the seventh-grade school year of 2019 to 2020), and during the pandemic (hybrid instruction during the eight-grade school year of 2020 to 2021). This finding suggested that when Group B abruptly transitioned from in-person to online instruction, students' academic achievement did not change. However, when the same group of students transitioned from online to hybrid instruction, there was a statistically significant difference in the students' final mean GPAs.

The third finding taken from the Independent Samples t-test data analysis indicated a statistically significant difference between the comparison of Groups A and B final mean GPAs in online and hybrid modes of instruction. The data analyzed was collected during the pandemic. Here, Group A attended online instruction during the eighth-grade school

year of 2020 to 2021; while Group B attended hybrid instruction also during the eighth-grade school year of 2020 to 2021.

Lastly, the fourth finding was obtained after reviewing the results from all three data analyses. Here, an observation was made regarding the comparison of Group A final mean GPAs when students remained in online instruction. This timeframe included the comparison of the measure of academic achievement at the onset of the pandemic with academic achievement during the pandemic. Then, a separate observation regarding the comparison of the means of Group B final GPAs when students transitioned from online to hybrid instruction. This timeframe also included the same comparison of the measure of academic achievement at the onset of the pandemic with academic achievement during the pandemic.

Collectively, these findings shared a unique story that seemed to partly confirm what most studies have indicated, students that attended online instruction earned lower course completion grades and overall GPAs than students that attended in-person instruction (Edwards & Rule, 2013; Furrer & Skinner, 2003; Kamble et al., 2021; & Yates et al., 2014). But, this finding was noted only when the pandemic continued, not at the onset. This confirmation was not solely based on the same apparent reasoning. Because each student in this study was provided with at-home internet connectivity and a computer to access the OLE, lack of access to technology and digital tools was not a factor. However, more research must be collected and/or provided regarding students' ability to physically access the technology during the afforded timeframes. Based on these findings, more consideration must be given to the possibility of external factors, from the effects of the pandemic, having impacted academic achievement.

LIMITATIONS OF THE STUDY

The initial limitation involved the organization of the raw data collected from the County School District's Data Analytics Team. Having received over 518,000 lines of datasets, it was a very tedious task deciphering and grouping the individual descriptors (e.g., unique identifiers, grade levels, course names, terms, and instructional learning designation). One mistake in deciphering or grouping specific data would have yielded the incorrect correlation of student information. For example, if the term (T2 or T4) was aligned with the wrong course taken that specific semester, the incorrect grade would have been mistakenly calculated for that school year's GPA. It was especially important to ensure the datasets were perfectly aligned with the correct terms to yield the student's correct GPA.

Another limitation included the manual calculation of the students' final mean GPAs. First, the students' (600 students) GPAs were manually calculated for each term (two terms) of each course (five courses). Then, the mean GPAs were manually calculated for each school year (three school years). This was a very daunting task that took over three months to complete. Each manual calculation was checked at least three times to ensure the same GPA was computed. Whenever there was a difference in computations, the GPAs were manually calculated twice more. Any incorrect calculation would have resulted in incorrect data used for the analyses.

A third limitation was due to the lack of information that would have described any modifications to the grading scale used at the onset of or during the pandemic. This limitation did not allow for a full explanation of any factors that may have influenced the independent variable (mode of instruction) or dependent variable (GPAs). The explanation of these factors could have provided more insight into how the findings were impacted and thus, could have provided clarification for potential cause-and-effect relationships. For example, an explanation of the difference in grading scales teachers used during online instruction at the onset of the pandemic could have been less rigorous than what was used

during the pandemic. If teachers expected students to have a better understanding of how to access and navigate online instruction in the second year, during the pandemic, the grading scale may have returned to a stricter evaluation of coursework and assessments.
And lastly, the fourth limitation involved the researcher's inability to connect directly with students and their families. Due to County School District's guidelines, external researchers could not interview students or their families to gain insight into their experiences during the pandemic. For obvious reasons associated with anonymity and potential HIPAA violations, obtaining such personable information relating to students' mental and physical well-being was prohibited.

RECOMMENDATIONS FOR PRACTICE AND FUTURE RESEARCH

First, additional support from outside sources (e.g., public-, private-, and volunteer-based organizations, agencies, and local charitable partners) should be sought. Dedicated funds and resources from these partners can offset much of the cost associated with accommodating students' academic and personal needs. Second, an evaluation of other sources of data should be made to gain insight from the collective community of learning. Adhering to this alternative process of assessment can allow for a more comprehensive overview of the challenges encountered during teaching and learning while implementing immediate changes that foster effective solutions. And lastly, allowing for changes to educational systems that are currently in place while viewing the modifications as opportunities to build more sound, equitable, and resilient processes that support all students would be valuable. Adopting policies and strategies that not only set accountability standards, but also promote new pedagogical approaches for achieving learning outcomes is imperative for addressing students' needs now and during a post-pandemic world.

Additionally, two recommendations for teachers to consider include first, creating a student-centered empathetic approach to learning that fosters the student-teacher interaction. Based on the findings from the study, it is apparent that students still needed the grace period that was granted during the transition from in-person to online instruction, at the onset of the pandemic. Because there was a significant decline in students' final mean GPAs when students transitioned from online to online (Group A) and online to hybrid (Group B) modes of instruction during the pandemic, teachers should assess the modifications made to learning and the instructional effectiveness to determine the root cause for the decline. Then, teachers should conclude if the modifications should be applicable for ongoing education, post-pandemic. The premise for this evaluation is for teachers to maintain the creative approaches to learning that would be a proactive measure for improving academic achievement, in any mode of instruction, instead of reactionary methods that interrupt learning and contribute to education loss. Secondly, teachers should embrace the role as the conduit of knowledge and resources for academic leaders, students, and parents as well as an empathic analyst for interactions between students and parents. For example, teachers should readily transfer vital information to and from schools and school districts that enable the fastest track for resolve to noted challenges. When collaborating with students and parents, teachers must maintain a direct line of communication to quickly address and/or report concerns and issues. For instance, teachers could assist students and/or parents with creating a home learning environment that is conducive to effective student learning.

Recommendations for future research include the following:

- Conduct more studies regarding the perceptions and experiences of students and their parents by obtaining specific data (e.g., surveys, questionnaires, and short interviews via phone or video conferencing) regarding students' needs and well-being throughout and post-pandemic;

- Collect data on the individual schools and teachers' grading modification for attendance/participation and completed coursework throughout the pandemic;
- Evaluate how teachers delivered the learning content, throughout the pandemic, to determine what decision may have influenced student engagement and behaviors;
- Explore more options for how schools can administer assessments (throughout the school year) that provide actionable data for policymakers to allocate the appropriate resources that support educational recovery and contingency planning; and
- Assess and submit more timely and actionable data to policymakers and academic leaders.

LESSONS LEARNED

Because of the pandemic, the instant transition from in-person to online instruction has forced academic leaders and teachers to innovate new instructional methods to adapt to online learning environments. These suggestive measures of academic achievement have offered some insight into how policymakers and academic leaders could minimize the extensive costs that impeded online and hybrid learning environments during the pandemic. One key takeaway from this study was that policies and procedures must be put in place to accommodate student learning in a distance learning environment to be successful in creating attainable student learning outcomes.

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