Comparative Analysis of Senior High School Learners' Academic Performance in Traditional Face-to-Face and Online Distance Learning Modalities

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Article Info	Abstract
	With the current stance of the educational system in the COVID-19 pandemic period, it is imperative for any academic institution to have a nuanced perspective of the academic performance of its learners. This ensures that the educational system remains attuned to the institution's vision and mission amid the global health crisis. Although a considerable study had been conducted in an online distance learning setup during the pre-pandemic period, there is a dearth of literature comparing the academic performance of senior high school (SHS) learners in traditional face-to-face and online distance learning modalities. Hence, this study compared the academic performance of SHS learners in the traditional face-to-face and online distance learning modalities. The average final grades of 1,913 enrolled in the traditional face-to-face, and 1,449 enrolled in the online distance learning modality were used to determine which instructional modality improved learners' academic performance. Results revealed that the learners' academic performance in the traditional face-to-face and online distance learning modality was generally considered proficient. Furthermore, a statistically significant increase ($p<0.05$) in learners' academic performance in the online distance learning modality was observed. This study supports that online distance learning modality can improve the academic performance of SHS learners amid COVID-19 pandemic.

Introduction

The world has faced an unprecedented health crisis due to the COVID-19 virus. The global health crisis profoundly affected the educational system's foundations, requiring a shift from the traditional face-to-face to online distance learning modality (Dukes, 2020; Huang, 2020; Masoud & Bohra, 2020; Mahaffey, 2020; Van der Spoel et al., 2020). Even before the crisis, the world had already seen significant changes in the educational landscape due to technology's ever-expanding influence. One such trend is the widespread utilization of online distance learning across various educational settings, whether formal and informal, academic and non-academic, and residential and remote (Mehrvarz et al., 2021). In contrast to traditional face-to-face learning, online distance learning empowers the delivery of instruction globally through a single internet connection. Various academic

institutions are increasingly adopting e-learning technologies to deliver instruction interactively, seamlessly exchange materials, enhance engagement (Banihashem et al., 2022; Elaish et al., 2019; Latifi et al., 2020, 2021; Zwart et al., 2020), collaboration and argumentation (Taghizadeh Kerman et al., 2022; Noroozi, 2018, 2022; Noroozi et al., 2012, , 2020; Valero Haro et al., 2019; 2022). Although the academic community has long recognized the advantages of online distance learning (Badali et al., 2022; Cavanaugh et al., 2009; Kebritchi et al., 2017; Barrot, 2021; Cano, 2022), it does have certain shortcomings, including restricted communal synergies (Rasheed et al., 2020).

The Department of Education Region XII defines online distance learning as an instructional modality in which the teacher serves as the facilitator and actively engages learners by using a variety of technology-based instructional materials that can be accessed even when teachers and learners are geographically separated. The internet promotes learner-teacher and learner-to-learner interaction in this type of modality. It also enables live synchronous sessions, which need learners to have a reliable internet connection and interact with the teachers and peers in real-time. Through the utilization of a Learning Management System or other similar technology, learners may access learning materials, submit homework, and participate in classes in an online distance setup (Llego, 2020).

On the other hand, traditional face-to-face learning is characterized as an instructional modality in which both learners and teachers are physically present in the classroom that empowers active involvement, immediate feedback, and socio-emotional growth (Paul & Jefferson, 2019). Salcedo (2019) asserted that the teacher typically controls classroom dynamics in a traditional face-to-face learning modality. While traditional face-to-face and online distance learning modalities vary in several aspects, Paul and Jefferson (2020) remarked that they share numerous characteristics, including the need for learners to attend classes, learn instructional materials, and complete class projects. Similarly, teachers are responsible for developing subject curricula, maximizing instructional quality, responding to learners' inquiries, motivating learners to learn, and grading homework.

While some studies promote online distance learning modality (Kaplan & Haenlein, 2016; Watts, 2016; Nortvig et al., 2018; Pulham & Graham, 2018), researchers tend to cast doubt on its efficacy. Cost-benefit analysis, learner experience, and academic achievement are all being carefully studied to determine if online distance learning is viable for traditional face-to-face learning (Saritas, 2005). According to Driscoll et al. (2012), the body of literature on the efficacy of online distance learning is extensive and diverse. For example, in the Philippines, the quality of online distance learning has been questioned after surveying teachers and learners from different parts of the country. Bernardo (2021) reports that only 47% of learners in online classrooms express confidence in their learning, while only 42% of parents express confidence in their children's education in an online learning setup. The preponderance concerns limited internet access, insufficient learning resources, overloaded instructional activities, poor peer communication, and ambiguous learning materials (Rotas & Cahapay, 2020; Bernardo, 2021; Muthuprasad et al., 2021; Ashraf, 2020). These deficiencies may compromise learner retention, satisfaction, and performance.

The Notre Dame of Marbel University-Integrated Basic Education Department Senior High School (NDMU-

IBED SHS), a sectarian school, is only one of the academic institutions in the Philippines impacted by the abrupt change in the educational landscape. COVID-19's abruptness, ambiguity, and instability made the institution haste to handle the shifting educational context. As a result, it has implemented crisis measures to alleviate the pandemic's detrimental effect on its educational system. This response includes, but is not limited to, curriculum modifications, the provision of technical resources, calendar adjustments, and modifications in the instructional delivery and assessment designs. Consequently, these advancements prompted the institution to transition from traditional face-to-face to fully online distance learning. However, the present circumstance is peculiar, for it can potentially exacerbate the challenges faced by both teachers and learners in an online distance learning modality due to mobility restrictions and health regulations (Gonzales et al., 2020).

Given today's challenges, it is imperative for every academic institution to have a nuanced perspective of its learners' academic performance. This ensures that instructional delivery remains attuned with the institution's vision and mission amid the global health crisis. Additionally, the literature indicates that online distance learning offers several challenges for both teachers and learners (Arinto, 2016; Gillet-Swan, 2017; Baticulon et al., 2020). Such challenges are more apparent when it comes to collaborative learning activities (e.g. peer learning, peer feedback) in online settings (Latifi & Noroozi, 2021; Latifi et al., 2020, 2021; Noroozi et al., 2012) Although a considerable study was conducted in an online distance learning setup during the pre-pandemic period, its SHS level implementation had only received far less attention. Additionally, there is a lack of local literature comparing the academic performance of SHS learners in traditional face-to-face and online distance learning modalities. Hence, this study was conducted.

Objectives of the Study

This study aimed to compare the academic performance of SHS learners in traditional face-to-face and online distance learning modalities. Specifically, it sought to: (1) determine the demographic profiles of the SHS learners in the traditional face-to-face and online distance learning modalities in terms of strands and class ranks; (2) determine the academic performance of the SHS learners in traditional face-to-face and online distance learning modalities; and (3) determine if there is a significant difference in the academic performance of SHS learners in traditional face-to-face compared to online distance learning modality in terms of strands and class ranks.

Review of Related Literature

Qualities of Online Distance Learning Modality

The global crisis has prompted educational institutions worldwide to embrace online distance learning modality as a viable option. Teachers and learners have easy access to various teaching and learning resources from anywhere and at any time, and teaching and learning processes are even more flexible. However, even before the COVID-19 epidemic, online distance learning has been considered by learners to be a feasible and enticing option. Wladis et al. (2015) argued that flexibility, access, and varieties of additional face value advantages, i.e., such as time efficiency, have boosted the allure of online distance learning.

Richardson and Swan (2003) theorized that prospective online distance learners preferred to get a quality education without compromising spending time with family or even costs for traveling. Instead of being confined to a particular location at a specific time, online distance learners may communicate with teachers, address peers, access learning materials, and complete assigned homework from any Internet-connected location. These instances provide online learners with much-needed flexibility, making online distance learning more appealing (Lundberg et al., 2008). For instance, a learner could attend virtual classes after work hours, watch instructional videos and pre-recorded lectures. Literature suggested that greater learning time may lead to improved academic performance. Richardson and Swan (2003) posited that online learners could use the extra time to enhance their academic performance.

Similarly, online distance learning allows passive learners to articulate their ideas and reservations. Passive learners may feel comfortable participating in class discussions without being criticized since they are not in a traditional classroom environment. As a result, overall average grades may improve (Driscoll et al., 2012).

Qualities of Traditional Face-to-Face Learning Modality

The traditional face-to-face learning modality is an instructional method that has been improved over many centuries in terms of teaching style and structure. Xu and Jaggars (2016) highlighted many advantages not apparent in the online distance learning modality. Traditional face-to-face learning modality is considered a very dynamic learning modality. It delivers instructions in real-time, stimulates and engages learners to generate thought-provoking questions, and intensifies interactions. Similarly, it enables immediate feedbacking on the learners' performance and offers a more adaptable instructional delivery. According to Salcedo (2019), the traditional face-to-face learning modality is advantageous to online distance learning because it does not restrict learners' queries to snippets. It gives an avenue to an in-depth discussion and interaction between the teacher and learners. It also offers dynamic learning qualities not seen in the online distance learning modality (Kemp & Grieve, 2014).

Similarly, some learners are resistant to change and have a poor impression of online distance learning due to technological barriers. These learners may be technophobes, and they prefer to learn in a classroom setting rather than absorbing information at a computer. Others may prefer one-on-one interaction, pre-and-post-class discussions, collaborative learning, and spontaneous interactions (Rovai & Jordan, 2004), for they may see the internet as a barrier to learning. If learners are not comfortable with the instructional medium, they may avoid classroom activities; grades may decline, educational interest may wane, and eventually affect their academic performance in general. On the other hand, learners may ultimately get used to online distance learning. Learners may be required to take internet-based subjects as more academic institutions adopt computer-based instruction. Although this is true, it does not negate the reality that some learners enjoy traditional face-to-face interaction.

Likewise, one of the qualities of traditional face-to-face learning is that it is not significantly dependent on technology. In an online distance learning setup, the learner is heavily reliant on having unrestricted Internet access. Online distance learners may be unable to interact, submit homework, or access learning materials if

technical difficulties arise. This issue may impede learners' performance and may deter the learning process. Likewise, research has shown that learners who dislike the teacher, the structure, or the interaction are more likely to drop the class (Kuzmanovic et al., 2019). Online learners work individually and rely nearly entirely on self-motivation and self-direction; hence, they may be more tempted to disengage from class if they do not see immediate results.

Nonetheless, the class setting of the traditional face-to-face learning modality gives additional motivation, encouragement, and guidance to the learners. Even if a learner wishes to withdraw within the first few weeks of class, the teacher and other learners may prevent them from doing so. Teachers conducting face-to-face instructional delivery may change the structure and teaching style of the class to increase learner retention (Kemp & Grieve, 2014).

Learner-Related Online Learning Factors

In the traditional face-to-face learning modality, much about the learner traits, learning styles, and learning methods is often assumed (Kuzmanovic et al., 2019). Learner characteristics, abilities, and needs must be considered in designing instructional materials, media use in instruction, design for interaction, and evaluation and feedback in online distance learning (Ong et al., 2021; Chen, 2021; Bower, 2017; Kuzmanovic et al. 2019). On the other hand, factoring in learner characteristics is especially difficult in online distance learning since there is a wide range of learners and learning contexts (Muthuprasad, et al., 2021).

Online learning is a teaching-learning process strategy that focuses more on learners and leads to learning experiences in synchronous or asynchronous circumstances utilizing devices and internet connections (Kuzmanovic et al. 2019; Dhawan, 2020; Atim et al., 2021), is centered on the concern for access. By broadening the reach of online learning while confining it to those learners who have access to the internet, the access to technology simultaneously facilitates and constrains the purpose. Likewise, learner autonomy is at the core of several seminal theories (Anderson et al., 2005; Garrison, 2009). Among which are Moore's theory of transactional distance, Wedemeyer's theory of independent study, and Holmberg's theory of guided didactic conversation (Anderson et al., 2005; Garrison, 2009). For instance, in the transactional distance theory, which is generally regarded as one of the foundational theories in online learning (Simonson et al., 2012), Moore (2012) posited the separation between teacher and learners creates transactional distance, which is a psychological and communicative gap that must be bridged. This transactional distance is a space of possible misunderstanding between the teacher's and learner's inputs. Hence, teachers must reflect on how the design of learning activities affects online distance learners' ability to practice self-directed learning (Simonson et al., 2012; Bower, 2017). It should allow learners to interpret the subject for themselves as they engage with various learning tools, acquire and use information literacy skills, and make sense of concepts shared during discussions.

Meanwhile, in every learning situation, particularly online learning, it is vital to promote interaction (Anderson et al., 2005; Simonson et al., 2012; Bower, 2017). Interaction is a specific and essential component of the educational process since it enhances learner motivation and performance (Anderson, 2003). Moore (2012) posited that

interactions can be generally classified into three types: (a) learner-content, (b) learner-learner, and (c) learner-teacher interaction. In the learner-content interaction, the learning process of the learners is facilitated by learning materials designed according to the principles of guided didactic conversation. Meanwhile, in the learner-teacher interaction, learners receive feedback from the teacher on how well they are learning. At the same time, the learner-learner interaction allows learners to engage in social interaction among their peers, which increases motivation and allows for the social construction of knowledge (Simonson et al., 2012). According to Simonson et al., 2012, these types of interactions are particularly effective in elevating learners' academic performance if they are properly incorporated in creating online learning instructional material.

Method

Locale of the Study

The study was conducted in the Notre Dame of Marbel University-Integrated Basic Education Department Senior High School (NDMU-IBED SHS). NDMU-IBED SHS is a Catholic educational institution managed by the Marist Brothers, or FMS (Fratres Maristae a Scholis), a French-based Catholic religious order located in Koronadal City, Philippines. The institution provides Academic Track programs for SHS such as Accountancy and Business Management (ABM), Humanities and Social Sciences (HUMSS), and Science, Technology, Engineering, and Mathematics (STEM) strands.

Participants of the Study

The study participants consisted of two independent groups of SHS learners - the 1,913 learners officially enrolled in the Traditional Face-to-Face Learning Modality in School Year 2019-2020, and the 1,449 learners officially enrolled in the Online Distance Learning Modality in SY 2020-2021. The disparity in the number of participants in the two learning modalities was considered a limitation of the study. More so, the participants' average final grades were considered the primary comparative variable in examining the differences in the academic performance between the traditional face-to-face and online distance learning modalities in this study.

Sampling Technique

The participants of this study were mainly selected based on the purposive sampling technique. It was a non-probability sampling technique in which the researcher carefully selected the samples with the assumption that the participants would be able to provide specific and rich data that are important to achieve the purpose of the study. The participants did not have particular preferences based upon their strand or class rank. Each participant was considered a single, discrete entity or statistic in this study.

Test Instruments

The academic performance of the SHS learners was determined by their average final grades. The average final grades were computed based on the learners' scores in the written works (e.g., pen-and-paper tests/quizzes,

homework), performance tasks (e.g., projects, laboratory reports), and quarterly examinations. The individual weights of the three assessments mentioned above were based on the Department of Education Order No. 8, series of 2015. The average final grades were in the form of numerical values with a base grade of 75%. The lowest numerical average final grade was 60%, while the highest numerical average final grade was 100%.

Data Collection

The researcher initially wrote a permission letter explaining the purpose and nature of the study to the Director and School Principal of NDMU-IBED SHS. Subsequently, with the approval to request the necessary data for the realization of this study, the average final grades of the 1,913 officially enrolled learners in the Traditional Face-to-Face Learning Modality in School Year 2019-2020, and the average final grades of the 1,449 officially enrolled learners in the Online Distance Learning Modality in SY 2020-2021 were obtained from the NDMU-IBED SHS Registrar's Office. The obtained data were analyzed and processed using the SPSS software to calculate the necessary values. The generated values from the data were subsequently used to answer the study's objectives and draw conclusions.

Ethical Consideration

The researcher conducted this study in complete accordance with established research protocols. The researcher ensured that the obtained final grades of the SHS learners would be utilized solely for academic purposes and would be kept with the utmost confidentiality.

Data Analysis

To conduct an objective analysis of the gathered data, the researcher used descriptive statistics such as frequency, weighted mean, and percentage to determine the demographic profile of the SHS learners in terms of (a) strand and (b) class rank. An exploratory data analysis on the average final grades of the learners in SY 2019-2020 and SY 2020-201 was initially employed, i.e., normality test. The Shapiro-Wilk test results showed that the average grades of the learners in SY 2019-2020 and SY 2020-2021 were not normally distributed with p=0.000 in both school years. Hence, nonparametric tests - Mann-Whitney test and Kruskal-Wallis test were utilized to compare the academic performance of SHS learners in traditional face-to-face and online distance learning modalities.

Results

Demographic Profile of Senior High School Learners

This study sought to determine the demographic profile of SHS learners in terms of (a) strand and (b) class rank. The frequency, mean, and percentage were computed. The demographic profiles of SHS learners in the traditional face-to-face and online distance learning modalities are presented in Table 1.

Based on Table 1, there were 1,913 officially enrolled learners in the Traditional Face-to-Face learning modality

in SY 2019-2020. The highest number of learners in the population was observed in Grade 11 with 995 learners, followed by Grade 12 with 918 learners. Meanwhile, there were 1,449 officially enrolled learners in the Online Distance learning modality in SY 2020-2021. The highest number of officially enrolled learners was observed in Grade 12 with 814 learners, while Grade 11 registered a total of 635 learners.

Table 1. Demographic Profile of SHS Learners

	Modality			
	Traditional F2F (SY 2019-2020)		Online Distance (SY 2020-2021)	
	N	*%*	*N*	*%*
Grade 11				
ABM	164	16.5	75	11.8
HUMSS	205	20.6	94	14.8
STEM	626	62.9	466	73.4
Total	995		635	
Grade 12				
ABM	205	22.3	121	14.9
HUMSS	171	18.6	148	18.2
STEM	542	59.0	545	67.0
Total	918		814	
Overall	1913		1449	

On this note, Science, Technology, Engineering, and Mathematics (STEM) strand registered the highest number of learners in both grade levels in all learning modalities. Meanwhile, the Accountancy and Business Management (ABM) strand registered the lowest number of learners in both grade levels, except for the Grade 12 in the traditional face-to-face learning modality in SY 2019-2020, wherein the strand registered a population of 202 or 23.3%, which is higher than the registered population of Grade 12 Humanities and Social Science learners which is 171 or 18.6%.

Academic Performance of Senior High School Learners

This study also sought to determine the academic performance of SHS learners in the traditional face-to-face and online distance learning modalities. This is to examine if the changes in the learning modality and instructional delivery employed by the school to mitigate the constraints brought by the COVID-19 pandemic, i.e., the shift from traditional face-to-face to online distance learning modalities, affect the academic performance of the learners. Hence, to realize this goal, the average final grades of the officially enrolled learners in SY 2019-2020 (exposed to the traditional face-to-face modality) and SY 2020-2021 (exposed to the online distance learning modality) were considered for analysis.

Table 2 shows the comparison of SHS learners' academic performance in traditional face-to-face and online

distance learning modalities across class ranks and strands. Based on Table 2, the academic performance of learners exposed to traditional face-to-face learning modality was generally considered "proficient" (M = 86.203 ± 7.4653). However, it was observed that the academic performance of Grade 11 and 12 HUMSS learners exposed to traditional face-to-face learning modality were both considered "approaching proficiency" with the average grades of 81.906 ± 9.75.34 and 83.989 ± 7.9591, respectively. Further, the Grade 12 ABM learners registered the highest average grade of 89.075 ± 6.2102, while the Grade 11 HUMSS learners showed the lowest average grade of 81.906 ± 9.7534 in the traditional face-to-face learning modality.

Table 2. Comparison of SHS Learners' Academic Performance

		Modality		*Difference*	*%*
		Traditional F2F (SY 2019-2020)	Online Distance (SY 2020-2021)		
		Weighted Average Grade ± SD	*Weighted Average Grade ± SD*		
Grade 11	ABM	85.784 ± 7.9037[(P)]	86.566 ± 8.3672[(P)]	0.782[a]	0.91
	HUMSS	81.906 ± 9.7534[(AP)]	84.902 ± 7.2588[(AP)]	2.996*[b]	3.66
	STEM	86.817 ± 7.0524[(P)]	88.185 ± 5.9161[(P)]	1.368*[c]	1.58
	Total	85.624 ± 8.0577[(P)]	87.279 ± 6.7406[(P)]	1.655*	1.93
Grade 12	ABM	89.075 ± 6.2102[(P)]	87.388 ± 3.9589[(P)]	-1.687*[d]	-1.89
	HUMSS	83.989 ± 7.9591[(AP)]	86.639 ± 4.4382[(P)]	2.650*[e]	3.16
	STEM	87.171 ± 6.1087[(P)]	88.020 ± 5.0626[(P)]	0.849*[d]	0.97
	Total	86.829 ± 6.7160[(P)]	87.676 ± 4.8282[(P)]	0.847*	0.98
	Overall	86.203 ± 7.4653[(P)]	87.466 ± 5.9180[(P)]	1.263*	1.47

Note.   a. * mean difference is significant at 0.05 level of significance.

b. Values per grade level with different superscripts on the *"Difference"* column have a significant mean difference at 0.05 level of significance.

c. [(A)]Advanced = 90.00% and above   [(D)]Developing = 75.00% - 79.99%

[(P)]Proficient = 85.00% - 89.99%   [(B)]Beginning = 74.99% and below

[(AP)]Approaching Proficiency = 80.00% - 84.99%

Meanwhile, the academic performance of the learners exposed to online distance learning modality was generally considered "proficient" (M = 87.466 ± 5.9180). However, the Grade 11 HUMSS learners were considered "approaching proficiency" (M = 84.902 ± 7.2588). Nonetheless, the Grade 11 STEM learners showed the highest average grade of 88.185 ± 5.916, while Grade 11 HUMSS learners showed the lowest average grade of 84.902 ± 7.2588 in the online distance learning modality.

This study also sought to determine if there is a significant difference in the academic performance of SHS learners in traditional face-to-face compared to online distance learning modality in terms of (a) strand and class rank. An exploratory data analysis on the average grades of the learners in SY 2019-2020 and SY 2020-201 was initially employed, i.e., normality test. The Shapiro-Wilk test results showed that the average grades of the learners in SY 2019-2020 and SY 2020-2021 were not normally distributed with p=0.000 in both school years. Hence,

nonparametric tests were utilized to analyze data to compare the academic performance of SHS learners in traditional face-to-face and online distance learning modalities.

The Mann-Whitney test was utilized to examine if there is a significant difference in the academic performance of SHS learners in traditional face-to-face and online distance learning modalities. The analysis results showed a statistically significant increase of 1.655 and 0.847 in the academic performance of Grade 11 and Grade 12 in the online distance learning modality, respectively. Specifically, the Grade 11 HUMSS and STEM strand learners showed a significant increase of 2.996 and 1.368, respectively. While there was an increase of 0.782 in the academic performance of Grade 11 ABM learners, the increase was found to be not statistically significant.

Meanwhile, in the case of Grade 12 learners, HUMSS and STEM learners registered a statistically significant increase of 2.650 and 0.849 in their academic performance, respectively. On the contrary, the Grade 12 ABM learners showed a significant decrease of 1.687 in their academic performance in the online distance learning modality. Furthermore, the results of the Mann-Whitney test (see Table 3 and 4) revealed a statistically significant difference ($p<0.05$) between the academic performance of SHS learners in the traditional face-to-face and online distance learning modalities.

Table 3. Ranks of the Overall SHS Learners' Academic Performance

	Modality	N	Mean Rank	Sum of Ranks
Academic	Traditional Face-to-Face	1913	1742.69	3399985.50
Performance	Online Distance	1449	1943.85	3347315.50
	Total	3362		

The academic performance of SHS learners in online distance learning modality (mean rank = 1943.85) was statistically higher than the traditional face-to-face learning modality (mean rank = 1742.69), U = 1495809.500, z = -5.752, p = .000. A statistically significant increase of 1.263 or 1.47% in learners' academic performance exposed to online distance learning modality was observed.

Table 4. Test Statistics of the Overall SHS Learners' Academic Performance

	Academic Performance
Mann-Whitney U	1495809.500
Wilcoxon W	3399985.500
Z	-5.752
Asymp. Sig. (2-tailed)	.000

Note. a. Grouping Variable: Modality

As shown in Table 2, empirical evidence suggested that the significant differences in academic performance were due to the increase in the average grades of learners in the online distance learning modality. Hence, the Kruskal-Wallis test was employed to determine if there were differences in the academic performance of SHS learners among strands per grade level in the online distance learning modality, namely: Grade 11 ABM (N=75), Grade

11 HUMSS (N=94), Grade 11 STEM (N=466), and Grade 12 ABM (121), Grade 12 HUMSS (148), Grade 12 STEM (545).

The academic performance of SHS learners was not similar for all strands per grade level, as assessed by visual inspection of boxplots. The results of the Kruskal-Wallis test (see Table 5 and 6) showed a statistically significant difference in the academic performance of SHS learners in online distance learning modality among the Grade 11 strands, $\chi2(2) = 145.853$, p = .000. Likewise, statistically significant differences in the academic performance among the Grade 12 strands, $\chi2(2) = 76.637$, p = .000, were observed.

Table 5. Ranks of the SHS Learners' Academic Performance in Online Distance Learning Modality

	Strand	N	Mean Ranks
Grade 11	ABM	75	943.52
	HUMSS	94	673.38
	STEM	466	1059.48
Total		635	
Grade 12	ABM	121	987.68
	HUMSS	148	666.09
	STEM	545	910.52
Total		814	

Results of the Least Significant Difference (LSD) revealed statistically significant differences in the academic performance of SHS among strands per grade level. For the Grade 11, a significant difference between ABM and HUMSS strand was observed with a mean difference of 2.8430, p=0.000. Likewise, a significant difference between STEM and ABM strands was observed with a mean difference of 1.3326, p=0.005. Accordingly, a significant difference between STEM and HUMSS strands was observed with a mean difference of 4.1756, p=0.000.

Table 6. Test Statistics of the SHS Learners' Academic Performance in Online Distance Learning Modality

		Academic Performance
Grade 11	Chi-Square	145.853
	df	2
	Asymp. Sig.	.000
Grade 12	Chi-Square	76.637
	df	2
	Asymp. Sig.	.000

a. Kruskal Wallis Test; b. Grouping Variable: Strand

Meanwhile, for Grade 12, a significant difference between ABM and HUMSS strands was observed with a mean difference of 3.1586, p=0.000. Similarly, a significant difference was observed between STEM and HUMSS with a mean difference of 2.4209, p=0.000

Discussion

This study compared the academic performance of SHS learners in an online distance learning to traditional face-to-face learning modalities. The within-group analyses of learners' academic performance in the online distance learning modality suggest an increase compared to the traditional face-to-face learning modality. The results of this study are in consonance with the previous research (Patrick & Powell, 2009; Sptizer & Musslick, 2021; Gopal et al., 2021; Cano et al., 2022). Overall, the findings suggest that in the aftermath of the COVID-19 pandemic, the abrupt shift and adjustments in the instructional implementation positively influenced learners' academic performance.

On the other hand, the findings of this study contradict previous research findings that shifting the mode of instructional delivery from traditional face-to-face to online distance learning had a detrimental impact on the learners' academic performance (Engzell et al., 2020; UNESCO, 2020; Husky et al., 2020; Marelli et al., 2020). However, this study is not the first to show that learners' academic performance can be improved in an online distance learning environment. For instance, Gonzalez et al. (2020) assessed learner performance on weekly assessments in an online learning class on metabolism. They discovered that learners scored better than two cohorts of learners who completed the same online program in the previous two years. Furthermore, they discovered that more learners passed the subject and finished the tasks in an online distance learning setting than in a typical face-to-face setting. The authors credit this improvement in performance to the online setting's improved consistency in learning compared to the traditional face-to-face instructional delivery. On the other hand, Gonzalez and colleagues' study varies from the current study regarding learners' age and educational background.

Meanwhile, the improvements of SHS learners' academic performance in the online distance learning modality, as observed in this study, could be caused by several factors. Literature suggests that three critical success factors are especially relevant in online distance learning: access, learner autonomy, and interaction (Kuzmanović et al. 2019; Simonson et al., 2012; Atim et al., 2021; Conrad & Openo, 2018). The concern for access is vital to online distance learning. Since this type of learning modality focuses more on learners, leading to learning experiences in synchronous or asynchronous situations using online learning platforms (Kuzmanović et al. 2019; Dhawan, 2020; Atim et al., 2021); hence, access of learners to online learning platforms is imperative. The use of an online learning platform was proven to be effective in translating information in a study conducted by Herman and Banister (2007) on evaluating teachers' ability to design curricula for online delivery. Their study revealed that online distance learners successfully achieved learning outcomes comparable to learners taking the traditional face-to-face learning modality. Similarly, two meta-analyses found that increased exposure to online learning environments can enhance high school learners' academic performance (Means et al., 2009; Ran et al., 2020).

Nonetheless, the use of technology facilitates and constrains the purpose by expanding the reach of online learning while restricting it to learners who have access to the internet. As a result, it is critical to think about how the logistical requirements of particular online learning designs, such as bandwidth for accessing the learning management system, participating in synchronous sessions or activities, and accessing and using specific content

formats like videos, affect learner access (Bower, 2017). The technical literacy abilities and efficacy necessary for successful online learning can also explain the results of the study. For instance, learners with a high level of technology literacy and efficacy may be given higher incentives for submitting homework on time or before the deadline or actively engaging in online classes. Learners with stable access to the online learning platform and have devices, i.e., cell phones, may also obtain immediate feedback on their performance through online academic consultation. According to motivational theories of effort allocation, there is a relationship between incentivization and academic achievement (Shenhav et al., 2013; Musslick et al., 2015). As a result, the reported improvements in academic performance in this study may be due to higher teacher incentives given to the learners in the online learning compared to the traditional face-to-face learning modality. Similarly, the notion that learners who employed online learning resources at home received additional mentoring from adults, i.e., parents or tutors, and had ready access to the internet for assessment responses may cloud the significantly increased academic performance.

Meanwhile, previous research (Andrew et al., 2020; Azevedo et al., 2020; Engzell et al., 2020) suggests that the performance of approximately 350,000 K–12 learners in the Netherlands on national exams decreased significantly after the closure of schools that used online distance learning modality for instructional delivery. It was shown that learners from less-educated families experienced a significant decrease than those from highly educated families. Thus, the impacts of online distance learning on learners' performance in national exams need further research and may provide answers to critical educational problems such as whether online distance learning is a viable option suited when learners need to be taught amid crisis.

In terms of learner autonomy, studying without direct teacher observation requires learners to engage more autonomously (Simonson et al., 2012). In that light, learning autonomously might be a variable in understanding learners' higher academic performance in this study. It is indeed possible that at home, learners were less distracted by other learners, teachers, or even potentially unpleasant classroom conditions that might cause learning anxiety which is the feeling of oppression and alarm unconsciously felt by learners in trying something new for the fear that it will be too difficult. Learning anxiety has been linked to reducing cognitive capacities crucial for high performance in activities such as mental ability (England et al., 2019; Ajmad & Ahmad, 2019). A recent study reveals that learning anxiety may be reduced in online distance learning settings compared to more stress-inducing face-to-face settings. Learner autonomy is essential to several online learning theories (Anderson et al., 2005; Garrison, 2009) Moore's theory of transactional distance. Moore (2012) proposed that the separation of teacher and learner causes transactional distance, a psychological and communication space to be crossed, and potential misunderstanding between the teacher's and the learner's inputs (Simonson et al., 2012). The level of transactional distance is determined by three factors: dialogue, structure, and learner autonomy. Moore (2012) identifies a link between the three factors, noting that the more organized an instructional design is, the fewer opportunities for discourse between the teacher and the learner, necessitating learners to exercise greater autonomy. On that note, learner autonomy is vital even when transactional distance is relatively low, as in the case of traditional face-to-face learning. The degree of learner control, a component of learner autonomy, is vital to a learner's academic achievement (Simonson et al., 2012). It must be balanced with the other elements that influence transactional distance. A learner with competing life demands may be forced to drop out if there is too much organization in

the pace, sequencing, and timing of assessments, while too little structure may lead to confusion and alienation (Simonson et al., 2012). Therefore, it is imperative to think about how the design of learning activities affects online distance learners' capacity to practice self-directed learning (Simonson et al., 2012; Bower, 2017).

In addition to fostering academic performance, online learning environments may hold promise for reducing academic performance differences between learners. One possible explanation is that online learning environments, such as the one explored in this study, allow teachers to contextualize learning instructional design to the online distance setup and the needs of the learners. Despite the challenges posed by online distance learning, such contextualization has been acknowledged as an effective measure for bridging educational gaps since it intensifies interaction (Duflo et al., 2011). The literature posits that it is essential to design for interaction in any learning context, especially in online learning (Anderson et al., 2005; Simonson et al., 2012; Bower, 2017). Interaction is a specific and vital component of the educational process since it enhances learner motivation and academic performance (Anderson, 2003). Moore (2012) classified interaction into three types: learner-content, learner-learner, and learner-teacher interaction. These types of interactions are particularly effective in designing online learning instructional materials that can increase learners' academic performance. Learning materials built according to the principles of guided didactic conversation, Holmberg's term for conversational style, as noted by Moree (2012) of delivering content that engages the learner both intellectually and affectively, enable learner-content interaction. Learners' internal dialogue with learning materials (Simonson et al., 2012) leads to the development of learner autonomy. Most theories of formal education place emphasis on learner-teacher interaction. Learners receive feedback on how well they learn through this type of engagement. Learner-to-learner interaction allows learners to engage in social interaction, boosting motivation and social knowledge construction (Simonson et al., 2012). Transactional distance is reduced through dialogue from learner-teacher and learner-learner interactions that can eventually help improve learners' academic performance.

Limitations of the Study

The limitations of this study were on the learner's skills/abilities in online distance learning modality, the operationalization of the indicator for the learner's academic performance, and the nature of the learners and the sample group. The comparison groups were identified in this study without regard for the learners' intellectual and ability levels. There is a possibility that the online distance learners were more competent than the traditional face-to-face learners in this study, and vice versa. This restriction also applies to gender and class ranks (Friday et al., 2006). On the other hand, the operationalization measure of "grade" or "score" used to establish the learners' academic performance may be inadequate in terms of scope and depth. Grades obtained in a particular class may not always reflect the actual abilities and skills of the learners, particularly if the weights have been skewed excessively toward group work and writing projects. Other performance measures may be more appropriate for assessing learner performance accurately. Additionally, the learner population's composition must be analyzed further. It is conceivable that the online learners in this research had more time to master the content and receive higher grades than their peers (Summers et al., 2005). Finally, obtaining a representative group was limited because the study employed a purposive sampling approach.

Conclusion

This study sought to compare the academic performance of SHS learners in the traditional face-to-face and online distance learning modalities in terms of strands and class ranks. The study revealed that the learners' academic performance in the traditional face-to-face and online distance learning modality was generally considered proficient. Furthermore, a statistically significant difference (p<0.05) between the learners' academic performance in the traditional face-to-face and online distance learning modalities was observed across strands and class ranks. More so, it was observed that the learners' academic performance in the online distance learning modality was statistically higher than the traditional face-to-face learning modality.

Recommendations

While the current study sheds light on the impact of the sudden shift in instructional implementation on the academic performance of SHS learners in a traditional face-to-face vis a vis an online learning environment, additional research is necessary to elucidate the factors that contributed to the learners' reported academic performance improvements. Future research may benefit by including characteristics of teachers in online learning environments, particularly their use of incentives. Additionally, it is uncertain if teachers used more or less formative instructional materials than traditional face-to-face learning. Additionally, learners who lack access to e-learning platforms (e.g., due to a lower socioeconomic status) may have received degraded instructional material, resulting in lower overall academic performance rather than improved academic performance. Consequently, the present findings do not support conclusions concerning the effect of instructional modality modifications on learners affected by the digital divide

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References

Ajmal, M., & Ahmad, S. (2019). Exploration of anxiety factors among students of distance learning: a case study of Allama Iqbal Open University. *Bulletin of Education and Research*, *41*(2), 67-78. https://files.eric.ed.gov/fulltext/EJ1229454.pdf.

Anderson, T. (2003). Getting the mix right again: an updated and theoretical rationale for interaction. *The International Review of Research in Open and Distributed Learning*, *4*(2). https://doi.org/10.19173/irrodl.v4i2.149.

Anderson, W.L., Mitchell, S.M., & Osgood, M.P. (2005). Comparison of student performance in cooperative

learning and traditional lecture-based biochemistry classes. *Biochem Mol Biol Educ*, *33*(6), 87-93. https://doi.org/10.1002/bmb.2005.49403306387.

Andrew, A.,Cattan, S., Dias, M.C., Farquharson, C., Kraftman, L., Krutikova, S., Phimister, A., & Sevilla, A. (2020). Inequalities in children's experiences of home learning during the COVID-19 lockdown in England. *The COVID-19 Economic Crisis, 41*(3). https://doi.org/10.1111/1475-5890.12240.

Arinto, P. B. (2016). Issues and challenges in open and distance e-learning: perspectives from the Philippines. *The International Review of Research in Open and Distributed Learning*, *17*(2). https://doi.org/10.19173/irrodl.v17i2.1913.

Ashraf B. N. (2020). Stock markets' reaction to COVID-19: cases or fatalities? *Research in international business and finance*, *54*(10), 12-49. https://doi.org/10.1016/j.ribaf.2020.101249.

Atim, A., Mahadi, I., Malik, N. E. D. A., & Kiziltas, E. (2021). Critical success factors in e-learning - a case study. *E-bangi, 18*(4), 42-58. https://www.proquest.com/scholarly-journals/critical-success-factors-e-learning-case-study/docview/2563499300/se-2?accountid=33511

Azevedo, J. P., Hasan, A., Goldemberg, D., Iqbal, S. A., & Geven, K. (2020). *Simulating the potential impacts of COVID-19 school closures on schooling and learning outcomes: a set of globalestimates*. https://openknowledge.worldbank.org/handle/10986/33945.

Badali, M., Hatami, J., Farrokhnia, M., & Noroozi, O. (2022). The effects of using Merrill's first principles of instruction on learning and satisfaction in MOOC. Innovations in Education and Teaching International, 59(2) 216-225. https://doi.org/10.1080/14703297.2020.1813187.

Banihashem, S.K., Farrokhnia, M., Badali, M., & Noroozi, O. (2022). The impacts of constructivist learning design and learning analytics on students' engagement and self-regulation. Innovations in Education and Teaching International, 59(4), 442-452. https://doi.org/10.1080/14703297.2021.1890634.

Barrot, J. S. (2021). Social media as a language learning environment: a systematic review of the literature (2008–2019). *Computer Assisted Language Learning*. https://doi.org/10.1080/ 09588 221.2021.1883673.

Baticulon, R.E., Sy, J.J., & Alberto, N.R.I. (2021). Barriers to online learning in the time of COVID-19: a national survey of medical students in the Philippines. *Med.Sci.Educ. 31*, 615–626. https://doi.org/10.1007/s40670-021-01231-z.

Bernardo, J. (2021). Survey: majority of teachers doubt if distance learning effective. *ABS-CBN News.* https://news.abs-cbn.com/news/02/17/21/survey-majority-of-teachers-doubt-if-distance-learning-effective.

Bower, M. (2017). *Design of technology-enhanced learning: Integrating research and practice*. https://www.proquest.com.

Cano, J. S., Olvis, P. R., Disca, B. Y., & Docena, A. F. (2022). Simulation-based instructional materials on central dogma of molecular biology: Basis in studying genetics for grade 12 learners. *International Journal of Technology in Education (IJTE), 5*(2), 249-268. https://doi.org/10.46328/ijte.219.

Cavanaugh, C. S., Barbour, M. K., & Clark, T. (2009). Research and practice in K-12 online learning: a review of open access literature. *The International Review of Research in Open and Distributed Learning, 10*(1), 1–22. http://www.irrodl.org/index.php/irrodl/article/view/10.1.4.

Chen, C., Landa, S., Padilla, A., & Yur-Austin, J. (2021). Learners' experience and needs in online environments: adopting agility in teaching. *Journal of Research in Innovative Teaching & Learning, 14*(1), 18-31.

http://doi.org/10.1108/JRIT-11-2020-0073.

Conrad, D., & Openo, J. (2018). *Assessment strategies for online learning: Engagement and authenticity.* https://www.proquest.com.

Dhawan S. (2020). Online Learning: a panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems*. *49*(1), 5-22. https://doi.org/10.1177/0047239520934018.

Driscoll, A., Jicha, K., Hunt, A. N., Tichavsky, L., & Thompson, G. (2012). Can online courses deliver in-class results? A comparison of student performance and satisfaction in an online versus a face-to-face introductory sociology course. *American Sociology Association, 40*, 312–313. https://doi.org/10.1177/0092055X12446624.

Duflo, E., Dupas, P., & Kremer, M. (2011). Peer Effects, Teacher Incentives, and the Impact of Tracking: Evidence from a Randomized Evaluation in Kenya. *American Economic Review*, *101* (5), 1739-1774. https://doi.org/10.1257/aer.101.5.1739.

Dukes, A. (2020). Teaching an instrumental analysis laboratory course without instruments during the COVID-19 pandemic. *Journal of Chemical Education, 97*(9), 2967. https://doi.org/10.1021/acs.jchemed.0c00648.

Elaish, M. M., Shuib, L., Ghani, N. A., & Yadegaridehkordi, E. (2019). Mobile english language learning (MELL): A literature review. *Educational Review*, *71*(2), 257-276. https://www.tandfonline.com/doi/abs/10.1080/00131911.2017.1382445.

England, B. J., Brigati, J. R., Schussler, E. E., & Chen, M. M. (2019). Student anxiety and perception of difficulty impact performance and persistence in introductory biology courses. *CBE—Life Sciences Education*, *18*(2), 1-13. https://doi.org/10.1187/cbe.17-12-0284.

Engzell, P., Frey, A., & Verhagen, M. D. (2020). *Learning loss due to school closures during the covid-19 pandemic.* https://doi.org/10.31235/osf.io/ve4z7.

Friday, E., Shawnta, S., Green, A. L., & Hill, A. Y. (2006). A multisemester comparison of student performance between multiple traditional and online sections of two management courses. *J. Behav. Appl. Manag*, *8*, 66–81. https://doi.org/10.34532/ohg.io/kj3z0

Garrison, R. D. (2009). *Communities of inquiry in online learning*. Encyclopedia of Distance Learning, Second Edition, 352-355. https://doi.org/10.4018/978-1-60566-198-8.ch052

Gillett-Swan, J. (2017). The challenges of online learning supporting and engaging the isolated learner. *Journal of Learning Design, 10*(1), 20-30. http://dx.doi.org/10.5204/jld.v9i3.293.

Gonzalez, T., De La Rubia, M. A., Hincz, K. P., Comas-Lopez, M., Subirats, L., Fort, S., & Sacha, G. M. (2020). Influence of COVID-19 confinement on students' performance in higher education. *PLoS One, 15*(10), ttp://dx.doi.org/10.5204/e0239490.

Gopal, R., Singh, V. & Aggarwal, A. (2021). Impact of online classes on the satisfaction and performance of students during the pandemic period of COVID 19. *Educ. Inf. Technol.*, 26, 6923–6947. https://doi.org/10.1007/s10639-021-10523-1.

Herman, T., & Banister, S. (2007). Face-to-face versus online coursework: a comparison of costs and learning outcomes. *Contemp. Issues Technol. Teach. Educ., 7*, 318–326.https://www.academia.edu/1560749/Face_to_face_versus_online_coursework_A_comparison_of_costs_and_learning_outcomes.

Huang, J. (2020). Successes and challenges: Online teaching and learning of chemistry in higher education in china in the time of COVID-19. *Journal of Chemical Education, 97*(9), 10-28. http://dx.doi.org/10.1021/acs.jchemed.0c00671.

Husky, M. M., Kovess-Masfety, V., & Swendsen, J. D. (2020). Stress and anxiety among university students in France during Covid-19 mandatory confinement. *Comprehensive Psychiatry*, *102*, 1-11. https://doi.org/10.1016/j.comppsych.2020.152191.

Kaplan, A. M., & Haenlein, M. (2016). Higher education and the digital revolution: About MOOCs, SPOCs, social media, and the Cookie Monster. *Business Horizons, 59*(4), 441–450. https://doi.org/10.1016/j.bushor.2016.03.008.

Kebritchi, M., Lipschuetz, A., & Santiague, L. (2017). Issues and challenges for teaching successful online courses in higher education: A literature review. *Journal of Educational Technology Systems, 46*(1), 4–29. https://journals.sagepub.com/doi/abs/10.1177/0047239516661713.

Kemp, N., & Grieve, R. (2014). Face-to-Face or face-to-screen? Undergraduates' opinions and test performance in classroom vs. online learning. *Front. Psychol.*, *5*:1278. https://doi.org/10.3389/fpsyg.2014.01278.

Kuzmanović, M., Andjelković Labrović, J, & Nikodijević, A. (2019). Designing e-learning environment based on student preferences: conjoint analysis approach. *International Journal of Cognitive Research in Science, Engineering and Education (IJCRSEE), 7*(3), 37-47. https://www.ijcrsee.com/index.php/ijcrsee/article/view/289.

Latifi, S., & Noroozi, O. (2021). Supporting argumentative essay writing through an online supported peer-review script. Innovations in Education and Teaching International, 58(5), 501-511. https://doi.org/10.1080/14703297.2021.1961097.

Latifi, S., Noroozi, O., & Talaee, E. (2021). Peer feedback or peer feedforward? Enhancing students' argumentative peer learning processes and outcomes. British Journal of Educational Technology, 52(2), 768-784. https://doi.org/10.1111/bjet.13054.

Latifi, S., Noroozi, O., & Talaee, E. (2020). Worked example or scripting? Fostering students' online argumentative peer feedback, essay writing and learning. Interactive Learning Environments, 1-15. https://doi.org/10.1080/10494820.2020.1799032.

Llego, M.A. (2020). *DepEd learning delivery modalities for school year 2020-2021*. https://www.teacherph.com/deped-learning-delivery-modalities/.

Lundberg, J., Castillo-Merino, D., & Dahmani, M. (2008). Do online students perform better than face-to-face students? Reflections and a short review of some Empirical Findings. *Rev. Univ. Soc. Conocim, 5*, 35–44. https://doi.org/10.7238/rusc.v5i1.326.

Mahaffey, A. L. (2020). Chemistry in a cup of coffee: adapting an online lab module for teaching specific heat capacity of beverages to health sciences students during the COVID pandemic. *Biochemistry and Molecular Biology Education, 48*(5), 528–531. https://dx.doi.org/10.1002/bmb.21439.

Marelli, S., Castelnuovo, A., Somma, A., Castronovo, V., Mombelli, S., Bottoni, D., Leitner, C., Fossati, A., & Ferini-Strambi, L. (2021). Impact of COVID-19 lockdown on sleep quality in university students and administration staff. *J Neurol., 268*(1), 8-15. https://doi.org/10.1007/s00415-020-10056-6.

Masoud, N., & Bohra, O. P. (2020). Challenges and opportunities of distance learning during covid-19 in UAE.

Academy of Accounting and Financial Studies Journal, *24*, 1–12. https://search.proquest.com/scholarly-journals/challenges-opportunities-distance-learningduring/docview/2469848713/se-2?accountid=33511.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies.* https://scholar.google.com.ph/scholar?q=Means+et+al.,+2009&hl=en&as_sdt=0&as_vis=1&oi=scholart.

Mehrvarz, M., Heidari, E., Farrokhnia, M., & Noroozi, O. (2021). The mediating role of digital informal learning in the relationship between students' digital competence and their academic performance. Computers & Education, 167, 104184. https://doi.org/10.1016/j.compedu.2021.104184.

Moore, M. G. (Ed.). (2012). *Handbook of distance education*. https://www.proquest.com.

Musslick, S., Shenhav, A., Botvinick, M. M., & Cohen, J. D. (2015). *A computational model of control allocation based on the expected value of control.* https://www.researchgate.net/publication/312125287_A_Computational_Model_of_Control_Allocation_based_on_the_Expected_Value_of_Control.

Muthuprasad, T., Aiswarya, S., Aditya, K.S., & Jha, G.K. (2021). Students' perception and preference for online education in India during the COVID-19 pandemic. *Soc. Sci. Humanit, 3*(1). https://doi.org/10.1016/j.ssaho.2020.100101.

Noroozi, O. (2022). The role of students' epistemic beliefs for their argumentation performance in higher education. Innovations in Education and Teaching International.1-12. https://doi.org/10.1080/14703297.2022.2092188. (IF: 1.11, Q3; Ranking: 157/238 Education and Educational Research).

Noroozi, O., Dehghanzadeh, H., & Talaee, E. (2020). A systematic review on the impacts of game-based learning on argumentation skills. Entertainment Computing, 35, 100369. https://doi.org/10.1016/j.entcom.2020.100369.

Noroozi, O., Kirschner, P.A., Biemans, H.J.A., & Mulder, M. (2018). Promoting argumentation competence: Extending from first- to second-order scaffolding through adaptive fading. Educational Psychology Review, 30(1), 153-176. http://dx.doi.org/10.1007/s10648-017-9400-z.

Noroozi, O., Weinberger, A., Biemans, H.J.A., Mulder, M., & Chizari, M. (2012). Argumentation-based computer supported collaborative learning (ABCSCL). A systematic review and synthesis of fifteen years of research. Educational Research Review, 7(2), 79-106. http://dx.doi.org/10.1016/j.edurev.2011.11.006.

Nortvig, A. M., Petersen, A. K., & Balle, S. H. (2018). A literature review of the factors influencing e-learning and blended learning in relation to learning outcome, student satisfaction and engagement. *Electronic Journal of e-Learning*, *16*(1), 46-55. https://eric.ed.gov/?id=EJ1175336.

Ong, A.K.S., Prasetyo, Y.T., Young, M.N., Diaz, J.F.T., Chuenyindee, T., Kusonwattana, P., Yuduang, N., Nadlifatin, R., Redi, A.A.N.P. (2021). Students' preference analysis on online learning attributes in industrial engineering education during the COVID-19 Pandemic: a conjoint analysis approach for sustainable industrial engineers. *Sustainability*, *13*(15), 8339. http://dx.doi.org/10.3390/su13158339.

Patrick, S., & Powell, A. (2009). A summary of research on the effectiveness of k-12 online learning. *Intelligent Information Management*, *6*(3). https://scirp.org/reference/referencespapers.aspx?referenceid=1166118.

Paul, J., & Jefferson, F. (2019). A comparative analysis of student performance in an online vs. face-to-face environmental science course from 2009 to 2016. *Frontiers in Computer Science, 1*. https://www.frontiersin.org/article/10.3389/fcomp.2019.00007.

Pulham, E., & Graham. (2018). Comparing K-12 online and blended teaching competencies: a literature review. *Distance Education, 39(3),* 411-432. https://doi.org/10.1080/01587919.2018.1476840.

Ran, L., Chen, X., Wang, Y., Wu, W., Zhang, L., & Tan, X. (2020). Risk factors of healthcare workers with coronavirus disease 2019: a retrospective cohort study in a designated hospital of Wuhan in China. *Clin. Infect. Dis., 71*(16), 2218-2221. https://doi.org/10.1093/cid/ciaa287.

Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2020). Challenges in the online component of blended learning: a systematic review. *Computers & Education, 144*. https://doi.org/10.1016/j.compedu.2019.103701.

Richardson, J. C., & Swan, K. (2003). Examining social presence in online courses in relation to student's perceived learning and satisfaction. *J. Asynchr. Learn*, 7, 68–88. https://olj.onlinelearningconsortium.org/index.php/olj/article/view/1864.

Rotas, E. E. & Cahapay, M. B. (2020). Difficulties in Remote Learning: Voices of Philippine University Students in the Wake of COVID-19 Crisis. *Asian Journal of Distance Education*, 15(2), 147-158. https://eric.ed.gov/?id=EJ1285295.

Rovai, A. P., & Jordan, H. (2004). Blended learning and sense of community: a comparative analysis with traditional and fully online graduate courses. *The International Review of Research in Open and Distributed Learning*, 5(2). https://doi.org/10.19173/irrodl.v5i2.192.

Salcedo, C. S. (2010). Comparative analysis of learning outcomes in face-to-face foreign language classes vs. language lab and online. *J. Coll. Teach. Learn.*, 7, 43–54. https://doi.org/10.19030/tlc.v7i2.88.

Saritas, M. (2005). *Management of parent-teacher interviews*. Ankara: Pegem A Publishing.

Shenhav, A., Botvinick, M. M., & Cohen, J. D. (2013). The expected value of control: an integrative theory of anterior cingulate cortex function. *Neuron*, 79(2), 217–240. https://doi.org/10.1016/j.neuron.2013.07.007.

Simonson, M., Smaldino, S., Albright, A., & Zvacek, S. (2012). *Teaching and learning at a distance: Foundations of distance education (5th ed.)*. Boston, MA: Pearson.

Spitzer, M. W. H., & Musslick, S. (2021). Academic performance of K-12 students in an online-learning environment for mathematics increased during the shutdown of schools in wake of the COVID-19 pandemic. *PLoS ONE, 16*(8). https://doi.org/10.1371/journal.pone.0255629.

Summers, J. J., Waigandt, A., & Whittaker, T. A. (2005). A comparison of student achievement and satisfaction in an online versus a traditional face-to-face statistics class. *Innov. High. Educ.*, 29, 233–250. https://doi.org/10.1007/s10755-005-1938-x.

Taghizadeh Kerman, N., Noroozi, O., Banihashem, S. K., Karami, M. & Biemans, Harm. J. A. (2022). Online peer feedback patterns of success and failure in argumentative essay writing. Interactive Learning Environments, 1-10. https://doi.org/10.1080/10494820.2022.2093914.

UNESCO. (2020). *COVID-19 Educational disruption and response*. https://en.unesco.org/themes/educationemergencies/coronavirus-school-closures.

Valero Haro, A., Noroozi, O., Biemans, H.J.A., & Mulder, M. (2019). The effects of an online learning environment with worked examples and peer feedback on students' argumentative essay writing and

domain-specific knowledge acquisition in the field of biotechnology. Journal of Biological Education, 53(4),390-398. https://doi.org/10.1080/00219266.2018.1472132.

Valero Haro, A, Noroozi, O., Biemans, H. J. A., & Mulder, M. (2022). Argumentation Competence: Students' argumentation knowledge, behavior and attitude and their relationships with domain-specific knowledge acquisition. Journal of Constructivist Psychology, 35(1),123-145. https://doi.org/ 10.1080/10720537.2020.1734995.

Van der Spoel, I., Noroozi, O., Schuurink, E & Van Ginkel, S. (2020): Teachers' online teaching expectations and experiences during the Covid19-pandemic in the Netherlands, European Journal of Teacher Education, 43(4), 623-638. https://doi.org/10.1080/02619768.2020.1821185.

Watts, L. (2016). Synchronous and asynchronous communication in distance learning: a review of the literature. *Quarterly Review of Distance Education*, *17*(1), 23-32. https://eric.ed.gov/?id=EJ1142962.

Wladis, C., Conway, K.M., & Hachey, A. C. (2015). The online STEM classroom who succeeds? An exploration of the impact of ethnicity, gender, and non-traditional student characteristics in the community college context. *Commun. Coll.*, *43*, 142–164. https://doi.org/10.1177/0091552115571729.

Xu, D., & Jaggars, S. S. (2016). Performance gaps between online and face-to-face courses: differences across types of students and academic subject areas. *J. Higher Educ., 85*, 633–659. https://doi.org/10.1353/jhe.2014.0028.

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