

Studying the Influence and Analysis of Online Education on Students' Health and Education During the Pandemic

Vijay Kant Sharma, Dharm Raj Singh, Vinita Singh, Ranjana Singh



Abstract: *The biggest pandemic in the world is COVID-19 in human history. The COVID-19 epidemic had particularly a negative impact on the education sector. It became necessary for educators and students everywhere to switch to online education to compensate for educational losses. The mental effects and academic challenges brought on by the lockdowns imposed by governments to contain the pandemic have been especially harsh on students. In this paper, we investigate how online instruction affects college and university students' mental health. A survey was made to gather information for this purpose, including the participant's academic credentials, use of digital technology, sleep schedules, human interactions, emotional health, and academic success. Students at universities and colleges were given the questionnaire, and 148 of them participated. These findings were gathered and evaluated using statistical methods. The finding shows a clear relationship between online learning and students' mental health during the pandemic time. The outcomes also demonstrated a positive connection between students' academic success and the use of digital resources in online education. The negative effects of the pandemic on the educational systems were also emphasized in the results.*

Keywords: *Pandemic, Online Learning System, Statistical Methods.*

I. INTRODUCTION

Education possibilities were lost in India due to the COVID-19 pandemic. The government has chosen to use online teaching and learning to disseminate the material as there aren't any actual classrooms available. Online classes are now being offered by universities/colleges using tools like Zoom, Google Meet, and Microsoft Teams. In addition to the aforementioned platforms, some schools also leverage YouTube videos and Google Suite to make online classes as engaging as those held in traditional classrooms. Online education brings up a lot of new issues for India. In the rural areas of India, not everyone has access to laptops, multimedia

devices, or Android smartphones. It can be difficult for two or three students to participate in the online course at the same time when a household only has one Android phone. COVID-19 has led to a situation where countless teachers and students have had to transition to online teaching, a departure from the traditional classroom setting. However, this shift has also created favorable conditions for various countries to accelerate the development of innovative online education. Due to the impact of COVID-19, teachers are being compelled to make a sudden shift from conventional classroom teaching to digital or virtual instruction, often without receiving any prior training or managerial guidance. Concurrently with the emergence of COVID-19, as innovative online education gained widespread adoption, there arose a need for pertinent laws and regulations to oversee this innovation and enhance various facets of traditional online education. The study underscored that the most significant factor impacting students' satisfaction in online classes is their individual expectations. In online classes, students often have certain expectations. When instructors grasp these expectations and adapt their course design accordingly, it is anticipated that students will exhibit improved performance in their examinations. Another significant aspect impacted by online education is student satisfaction, with feedback playing a key role. Instructors should actively seek feedback after delivering a course to inform and improve their future teaching methods.

The idea of an online education system has currently become a crucial component of education. To satisfy the needs of a variety of learners, the adoption of appropriate educational technologies provides accessibility to learning resources including online learning, mobile learning, distance learning, virtual learning, and collaborative learning strategies [12][31]. Because of this, the traditional teacher-based educational system has been rapidly replaced by a more adaptable environment where students can engage and learn [13]. The difficulty of switching from conventional to online learning is something that students must deal with in the meantime. The success of online education is primarily influenced by aspects such as fast internet connections, superior learning tools, and the cost and accessibility of technology [1, 14]. Because kids with special needs require more hands-on assistance, the quality of teaching and learning declined after schools closed [15]. The traditional system can never completely be replaced by the new technology.

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The impact of face-to-face interactions between students and professors cannot be replicated online. While schools are closed, many children struggle to pay for the necessary learning technology [13,16][30].

II. LITERATURE REVIEW

Modern society has grown accustomed to digital technologies. Numerous multimedia and technological solutions are now available that have helped people who live far apart closer together [2, 3]. Additionally, by adjusting schedules, transferring dialogues online, asking for feedback from parents, and closely monitoring children, schools, and teachers are putting forth great effort to promote student involvement in the classroom [10]. The absence of an online learning environment is only one of several major problems, which also include cell phone addiction and boredom from spending the entire day alone in the study. Few students take online learning seriously since the teacher has little control over the class [4]. While assessing online teaching and learning, it's critical to consider the risk factors in addition to the satisfaction with the new integration [5]. Mishra et al. used both quantitative and qualitative data to identify how instructors and students viewed online learning environments and web-based learning methods [6]. To further this effort, researchers investigate whether there is a connection between the students' prolonged usage of online learning tools as a result of the COVID-19 epidemic and their psychological and mental health [7,8]. Shivangi provides insight into the development of educational technology startups with a focus on addressing the impacts of the COVID-19 pandemic and natural disasters. She also offers guidance to academic institutions on effectively addressing the difficulties that come with online learning[9][32]. Irawan et al[11]. analyzed the degree of academic stress encountered by online learners, as well as their coping mechanisms throughout the COVID-19 pandemic. Hodges et al made a clear distinction between well-prepared online learning experiences and courses hastily put online in response to a crisis [17]. They even went so far as to label the online education implemented during the pandemic as "emergency remote teaching," as it differs significantly from high-quality and effective online learning. The closure of schools due to the COVID-19 pandemic resulted in a disruption of traditional education, prompting schools and teachers to seek alternative ways to instruct their students. Consequently, numerous educational institutions adopted online classes as a response to this situation [18]. Numerous comparative studies have been conducted to investigate the question of whether traditional face-to-face teaching methods are more productive than online or hybrid learning approaches, as explored by Lockman and Schirmer [19]. The findings of these studies indicate that students tend to perform significantly better in online learning compared to traditional learning. Henriksen et al. also underscored the challenges encountered by educators when transitioning from offline to online modes of teaching [20]. The literature emphasizes several shortcomings, including inadequacies in online teaching infrastructures, the unfamiliarity of teachers with new technologies, information disparities, the complex home environment, and other related issues [21]. Moreover, students face a multitude of distractions while studying at

home. For instance, not all students can access suitable spaces for remote learning, and some may be hindered by inadequate hardware and unreliable internet connections, as highlighted by Zhang et al. in [22]. Moreover, a diverse range of behaviors, such as increased smartphone usage, reduced physical activity, and fewer outings to different locations, are linked to fluctuations in COVID-19 news coverage, as outlined by Huckins et al. in [23].

III. CONCEPT OF ONLINE EDUCATION

In the 21st century, technology plays a pivotal role in education. The growing integration of technology into education has transformed the role of teachers. It has shifted from the traditional approach, where teachers were primarily seen as knowledge dispensers, to a more adaptable model where they function as facilitators, mentors, and motivators. This new approach aims to inspire students to actively participate in the learning process and take ownership of their education [26]. Technology serves as a facilitator for various modes of learning, including remote learning, distance learning, virtual learning, blended learning, mobile learning, distributed learning, machine learning, ubiquitous learning, deep learning, cooperative learning, and collaborative learning. In the digital age, many facets of education are transitioning to online platforms, presenting a challenge for education stakeholders, including students. The adoption of suitable educational technologies enhances access to a wide range of learning resources, such as Massive Open Online Courses (MOOCs), and offers multiple learning approaches to accommodate the diverse needs of learners [27]. Online education is a broad concept that encompasses the use of technology tools and platforms for teaching and learning over the Internet. The effectiveness of online education hinges on various factors, including reliable internet connections, well-designed learning software, digital literacy skills, and the availability and accessibility of technology. Online education platforms play a crucial role as they serve as essential tools that facilitate inclusive education and online learning. Online education has its origins in distance education and has evolved with the emergence of digital technologies that enable the effective and dependable delivery of lectures, virtual classroom sessions, and other instructional materials and activities through the Internet (Onlineeducation.com, 2020). Given the widespread access to the internet and mobile technologies worldwide, online education platforms have the potential to be leveraged to address educational disparities, thus contributing to a reduction in global illiteracy rates.

A. Influence of the COVID-19 pandemic on online education

The COVID-19 pandemic had a substantial impact on online education, elevating it to a central position in educational approaches. Despite the obstacles and issues encountered, it has also opened doors for inventive solutions and broader educational opportunities for individuals globally.

This transformation is expected to have a lasting effect on the trajectory of education in the future. The global outbreak of the Coronavirus had a detrimental impact on educational operations worldwide. The pandemic significantly disrupted educational systems worldwide, resulting in the extensive closure of schools. This upheaval caused significant disturbances in academic pursuits and career aspirations. As part of the worldwide response to combat COVID-19, numerous countries around the globe implemented school closures as a measure to mitigate the spread of the Coronavirus pandemic according to Mustafa Nasir [24]. The disruptions caused by COVID-19 in the education sector could persist for an extended period if a more effective solution for the Coronavirus is not discovered soon, and the transmission of the disease continues. Various countries, including but not limited to others such as China, India, Japan, Iran, USA, France, Spain, Italy, North and South Korea, Vietnam, Thailand, Germany, and South Korea, etc. implemented school closures as a response to the COVID-19 pandemic. It's important to note that school closures entail significant social, educational, and economic consequences, affecting communities at large. However, these impacts are especially pronounced for disadvantaged individuals and their families, as highlighted by UNESCO [25]. The consequences of school closures can be especially harmful to the quality of education, academic progress, and learning experience, especially for students with special needs or those who encounter learning challenges requiring individualized teacher support. Although technology can be used to mitigate some of the difficulties arising from school closures, it cannot completely substitute the valuable impact of face-to-face interactions between students and educators. Furthermore, the limited access to essential technology and support systems poses a significant barrier, making it difficult to fully leverage the potential of educational technology during school closure periods.

B. Challenges in Learning from Home

The emergence of the COVID-19 pandemic has compelled millions of students to engage in remote learning from their homes. While this may seem like a recent development, it's important to note that homes have traditionally served as hubs for informal education for quite some time. Learning from home is gradually becoming a standard practice for students, signaling a shift towards a new educational norm. According to the study conducted by Hazwani et al. [28], the most crucial factor affecting the effectiveness of e-learning is the quality of internet connectivity. The researchers argue that educational institutions should prioritize the enhancement of dormitory facilities to ensure that all students have reliable access to the Internet. To achieve optimal results in e-learning, the internet connection must be at least of moderate to good quality. As per the findings of Wildana et al. in [29], online learning models employed during the COVID-19 pandemic effectively imparted knowledge to students in a manner comparable to traditional face-to-face learning. Nevertheless, online learning offers a distinct advantage in fostering the importance of process-oriented learning. This approach emphasizes the balanced development of skills over time and leverages technology

while relying on students' self-regulation capabilities, which are inherent in each student.

IV. METHODOLOGY

The study design involved 148 students from a university/college in Varanasi Uttar Pradesh. Information on demographics, digital tools, sleeping patterns, social interactions, academic performance, psychological condition, and a scale for measuring anxiety and sadness was gathered using an online questionnaire. The primary analysis requires the use of descriptive statistics, chi-square, Analysis of Variance (ANOVA), and linear regression, $\alpha = 0.05$.

A Chi-Square test for independence investigates the association between two variables presented in a table. Its primary purpose is to assess whether The categorical variable distributions are distinct from each other. A low Chi-Square test statistic indicates that the observed data align well with the expected data, indicating a strong association. Conversely, a high Chi-Square test statistic suggests little to no association between the data. The significance of the results is determined by the p-value. The degree of freedom in this context is calculated as the number of categories minus 1. The significance level, denoted as alpha (α), is typically set at 0.05 (equivalent to 5%), although it can also take other values such as 0.01 or 0.10. If the calculated statistic is greater than or equal to the critical value: This indicates a significant result, leading to the rejection of the null hypothesis (H_0), suggesting a dependent relationship between the variables.. If the calculated statistic is less than the critical value: This signifies a lack of statistical significance, leading to the failure to reject the null hypothesis (H_0), suggesting an independent relationship between the variables.

For this analysis, the hypotheses are as follows:

H_0 : The features of digital tools and academic performance are independent.

H_1 : Digital tools and academic performance are not independent.

One-way ANOVA tests are employed to ascertain whether there are differences in the means of a numeric variable across various levels of a single categorical variable. In essence, it addresses the question: do any of the groups mean exhibit significant differences from one another? ANOVA entails more complex calculations compared to the t-test, but the procedure follows a similar pattern: calculate the F-statistic value and subsequently compare the test statistic to a critical value derived from a probability distribution.

V. EXPERIMENTAL DESIGN, MATERIAL, AND METHODS

In this section, we delve into the experimental outcomes of the suggested framework. The primary results are divided into descriptive statistics and graphical representations. These results are showcased through tables and figures to provide a more comprehensible visual perspective.

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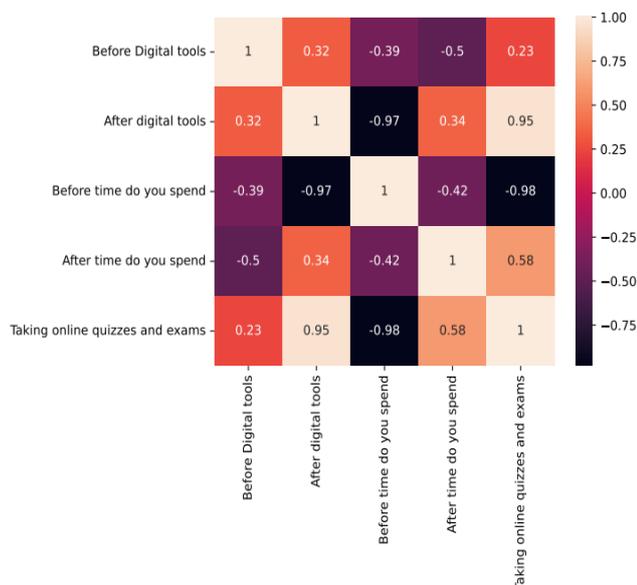


Figure 1: Heat Maps are Commonly Utilized to Visualize Correlation Matrices.

Figure 1 displays a correlation matrix featuring correlation coefficients between various variables. Each cell in this table presents the correlation between two specific variables. A correlation matrix serves the purpose of illustrating linear relationships between variables and summarizing data. The diagonal line of 1's running from the top-left to the bottom-right represents the main diagonal, signifying that each variable perfectly correlates with itself. This matrix is symmetrical and reveals correlations between digital tools, sleep variables, and their relevance to online quizzes and exams. Notably, the pattern observed in the table indicates that most variables exhibit relatively low correlations with each other, except for those related to the use of digital tools and engagement in online quizzes and exams.

Table- I: Summary of the Chi-squared test and p-value

Features	Ch ² - Statistics	p-value
Before: Digital Tools	24.8516	.001
After: digital tools	10.6412	.030
Before: the time you spend using digital tools.	16.3536	.002
After: the time you spend using digital tools	10.09	.038

Compare the significance level or goodness of fit value with Taking online quizzes and online exams. Table 1 shows that attributes are associated so we take the null hypothesis that there is no association in the attributes or other words attributes are independent if Ch² is less than the table at a certain level of significance. So from the table, we conclude that certain rows Table 1 shows the results of the Chi-squared test for the selected features and the target column "Taking quizzes and exams online". In Table 1, for the feature, "Before time do you spend using digital tools", the Significance value is below 0.05. Therefore, the use of digital tools is statistically significant for online education.

A. Regression analysis interpretation

- Predictors: (Constant), the features of digital tools, and academic performance.
- Dependent Variable: Digital tools and academic performance.

Table 2 provides the R and R² values. The R-value represents the simple correlation and is 0.974 (the "R"

Column), which indicates a high degree of correlation. The R² value (the "R Square" column) indicates how much of the total variation in the dependent variable, Digital tools and academic performance, can be explained by the independent variables i.e., The features of digital tools and academic performance. In this case, 93.1% of the dependent variable can be explained by the independent variables.

- Predictors: (Constant), the features of digital tools, and academic performance.
- Dependent Variable: Digital tools and academic performance.

From Table 3, the Significance value is 0.005 (i.e. p = .005), which is below 0.05 and, therefore, there is a statistical significance of the technology for online education.

Table 4 provides the result of a separate t-test for each pair of groups and the statistics and p-value. The statistics value shows the t-test statistic and the p-value indicates the significance level. The p-value for each pairwise t-test suggests that the mean of "Strongly Agree" is likely similar with some other groups but not for all the groups as the p-values for most of the t-tests involving the "Strongly Agree" group are more than .05.

Table 5 presents the responses of the participants regarding the utilization of smart tools before and after the onset of COVID-19. The table examines whether prolonged use of digital tools for academic purposes results in distraction. The data indicates that 31.76% were already using digital devices for an extended duration, but this percentage increased to 52.03% after the commencement of the COVID-19 pandemic. Figure 2 shows the percentage of using smart appliances by the participants. The graph shows participants are used digital tools before and after the pandemic also with the use of smart tools in e-learning they distracted.

Table 6 displays the distribution of students' sleeping habits about their daily usage of digital tools. The table indicates that the sleep patterns of 50.68% of the participants have been influenced during the COVID-19 period because of their extensive use of digital devices. Figure 3 Describes the percentage of the students' sleeping habits responses in the context of specified times for wake-up and bedtime, the use of smart tools affected before and after COVID.

Table 7 provides an overview of the participants' responses regarding their social behavior and the impact of lockdowns, curfews, and the use of e-learning tools on their daily activities. Additionally, this table highlights the psychological challenges experienced by students during the COVID-19 pandemic, including stress, frustration, tension, and depression. The final section of the table explores how these social and psychological effects have influenced the academic performance of the students. Figure 4 displays the percentage of social interaction, academic performance, distance learning, and mental state of students. There are several questionnaires given in Table 7 which is shown by the bar graphs.

Table- II: Summary of the R-Value and R Square Value with the Std. Error

Model	R	(R ²) R Square	Adjusted R square	Std. Error of the Estimate	Model
1	0.974066347 ^a	0.948805249	0.931740332	5.017386328	

Table- III: Summary of the ANOVA test

Model	Sum of Square.	df	Mean Square	F	Significance value
Regression	1399.677503	1	1399.677503	55.59976	0.004993818
Residual	75.52249669	3	25.17416556		
Total	1475.2	4			

Table- IV: Conduct a T-test on Each Pair

Col1	Col2	t-statistics	p-value
Strongly Agree	Disagree	-2.042069	.11068
Strongly Agree	Neutral	-1.739416	.15695
Strongly Agree	Agree	-0.979127	.38296
Strongly Agree	Strongly Disagree	-4.046832	0.01552
Disagree	Neutral	2.390457	.07513
Disagree	Agree	4.466558	.0111
Disagree	Strongly Agree	2.042069	.11068
Neutral	Agree	3.188225	.03327
Neutral	Strongly Disagree	-3.987342	.0163
Agree	Strongly Disagree	-12.452441	.00024

Table- V: The Responses of Participants using Smart Appliances (Smartphones, Laptops, and Tablets).

	pandemic	Agree		Disagree		Strongly Agree		Strongly Disagree		Neutral	
		N	%	N	%	N	%	N	%	N	%
		I always use digital tools in studying	Before	47	31.76	31	20.95	23	15.54	8	5.40
	After	42	28.38	11	7.43	77	52.03	5	3.38	13	8.78
When I use smart tools in e-learning I am distracted	Before	42	28.38	26	17.57	39	26.35	6	4.05	35	23.65
	After	36	24.32	23	15.54	54	36.49	8	5.4	27	18.25

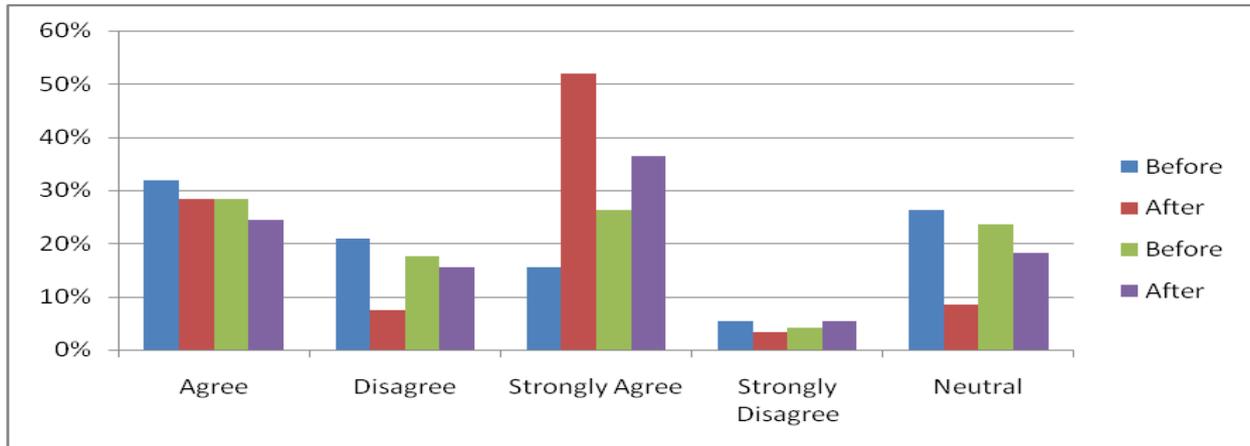


Figure 2: Percentage of the Response of Participants Using Smart Appliances

Table- VI: The Student's Responses Regarding Sleeping Habits.

	pandemic	Agree		Disagree		Strongly Agree		Strongly Disagree		Neutral	
		60	40.54	18	12.16	44	29.76	3	2.03	23	15.54
		I have specified times for wake-up and bedtime	Before	36	24.32	44	29.73	20	13.52	19	12.86
	After	42	28.38	34	22.97	32	21.62	6	4.05	34	22.97
Long use of smart tools affected my sleeping habits	Before	43	29.05	12	8.11	75	50.68	4	2.7	14	9.46
	After	60	40.54	18	12.16	44	29.76	3	2.03	23	15.54

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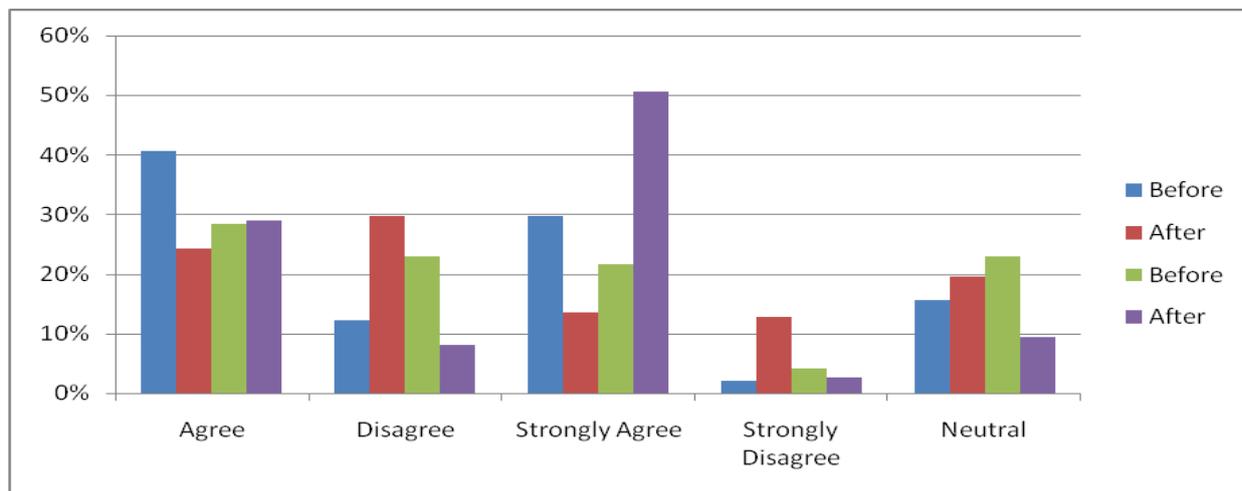


Figure 3: Percentage of the Student's Responses Regarding Sleeping Habits.

Table- VII: Student Social Interaction, Mental State, Academic Performance, and Distance Learning.

	Agree		Disagree		Strongly Agree		Strongly Disagree		Neutral	
	N	%	N	%	N	%	N	%	N	%
Long use of digital tools causes students isolation.	48	28.38	9	5.41	73	51.35	3	2.70	15	12.16
Staying home for long periods of time leads to laziness.	35	23.65	6	4.05	88	59.46	3	1.35	16	11.49
Prolonged use of e-learning tools often leads to bedroom, nervousness, and tension.	48	29.06	7	4.05	76	52.70	2	1.35	15	12.84
Some students cannot afford to buy all the necessary digital tools, which is embarrassing and frustrating.	38	24.32	2	4.73	96	59.46	1	1.35	11	10.14
I do not recommend continuing with the online learning model because it is mentally and socially unhealthy.	34	22.97	13	8.11	68	48.65	5	2.70	28	17.57
The measure of a pandemic caused stress, frustration, and depression.	41	25.68	8	6.08	78	52.03	2	2.70	19	13.51
Online quizzes and exams made students nervous and uncomfortable.	34	21.62	18	12.84	60	43.24	10	5.41	26	16.89
Long use of digital tools leads to low academic performance.	39	26.35	10	6.76	75	47.97	3	2.03	21	16.89
Face-to-face learning increases student's academic achievement.	43	29.05	3	2.03	85	57.43	1	0.68	16	10.81

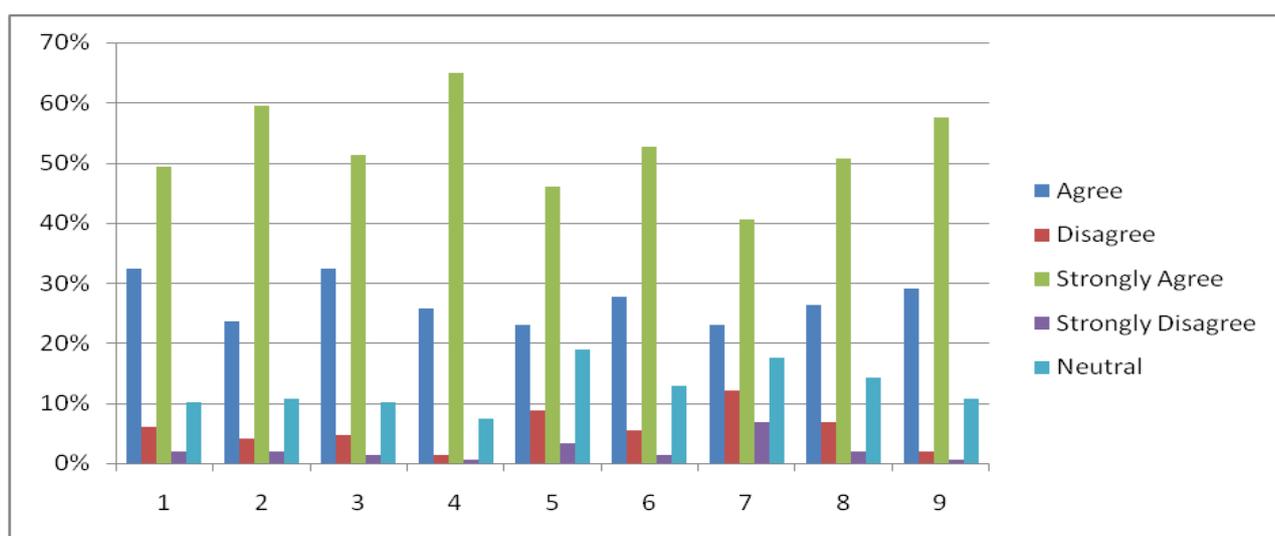


Figure 4: Percentage of Students' Social Interaction, Mental State, Academic Performance, and Distance Learning.

VI. CONCLUSION

Despite any difficulties that may disturb and negatively impact our technical online learning during the pandemic, the findings of this experimental investigation show that online learning is beneficial and practical, and student interaction is positive. However, most students agreed that it could not replace the traditional method of learning due to some issues in terms of currently available infrastructure, engagement techniques, and the need for enhanced knowledge management. Moreover, there is a positive relationship between the use of digital tools for online education and academic performance during the COVID-19 pandemic. The pandemic will also be a new stage for online learning and it will make people more confident in the online learning system. Besides, there is a critical need to investigate the effectiveness of virtual education and students' fears and tensions amidst such pandemics.

DECLARATION STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Conflicts of Interest/ Competing Interests	No conflicts of interest to the best of our knowledge.
Ethical Approval and Consent to Participate	No, the article does not require ethical approval and consent to participate with evidence.
Availability of Data and Material/ Data Access Statement	Yes, It is relevant. Availability of Data and data are collected before the pandemic and after the pandemic. the source of data is based on a survey of Jagatpur P.G. College Varanasi India students.
Authors Contributions	All authors have equal participation in this article. The article consists of group efforts that are easily voiced in detail.

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