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Examining The Impact Of Pandemic-Induced Changes On College Student Productivity: A Quantitative Analysis

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Abstract. *Objective – This research aims to reveal if there is any difference in college students' productivity during and after the COVID-19 pandemic. This research will examine the factors that influence students' productivity at those times. The factors that will be discussed are the learning environment, teaching methods, and students' expectations. Methodology – Using Smart-PLS software as a tool to examine validity and reliability, this study is quantitative in nature and 124 students in all took part in the survey for this study. The present study was conducted via an online platform, specifically Google Forms, in order to collect data from participants in an anonymous manner. Findings – The result highlights the teaching methods affect academic performance, while learning environment and students' expectations did not. Novelty – This study focuses on examining the impact of the COVID-19 pandemic on college students' productivity and the specific factors that influence this change. While there have likely been studies on the general impact of the pandemic on education, this research specifically delves into the productivity aspect and isolates learning environment, teaching methods, and student expectations as key factors. This targeted approach provides valuable insights into how the pandemic has affected students' academic performance and what factors can be attributed to these changes.*

Keywords: *Learning environment, Teaching methods, Expectations, Academic performance, COVID-19*

1. INTRODUCTION

The COVID-19 pandemic has heavily impacted people's physical and psychological stress (Citra et al., 2021). In addition, education has also been affected by adapting lockdown regulations to study activities. Sikirit (2020) also stated that the unprecedented move to remote learning has had a significant and broad impact on students, parents, and teachers. The shift has had a great effect on education and the transition in the learning method was so sudden that there was no preparation from either the teacher's or the student's side which can lead to the changing of students' academic performance (Soepriyatna & Pangaribuan, 2022).

During the COVID-19 pandemic, Sharaievska et al. (2022) found that students have reported decreases in productivity, motivation, focus, and perceived ability to learn. The report shows that the pandemic situation has negatively impacted the students' learning willingness due to the despairing situation, which can lead to a decline in students' academic performance. As of 2023, people would not have to be in fear of COVID-19 spreading anymore since President of Indonesia Joko Widodo (Jokowi) officially announced the lifting of the COVID-19 pandemic status in Indonesia (Setkab, 2023). Entering the endemical status, Indonesia is slowly returning to how they do activities before COVID-19, which is back to face-to-face activities. Even though students' academic performance is expected to increase after the pandemic, contrary to research from Zhao and Xue (2023), it has been observed that the transition from online to offline learning methods has resulted in many effects on students'

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academic performance, including the transition of learning environment, teaching methods, and students' expectations towards offline learning. This finding shows that the offline class after the COVID-19 pandemic has brought a lot of factors that decreased the overall students' academic performance.

This research aims to reveal if there is any difference in college students' productivity during and after the COVID-19 pandemic. This research will examine the factors that influence students' productivity at those times. The factors that will be discussed are the learning environment, teaching methods, and students' expectations.

2. LITERATURE REVIEW

Learning Environment, Teaching Methods, Students' Expectations, and Academic Performance

According to Koper (2014), the notion of a learning environment encompasses both physical and digital spaces, as well as the surrounding contexts and cultures, in which students engage in the process of learning. This environment can be intentionally designed or modified to foster learning that is directed toward certain goals. Additionally, modern learning environments typically adhere to constructivist learning methodologies, prioritize student-centered instruction, and foster the development of knowledge creation, collaborative work, and self-regulated learning (Closs et al., 2021).

Teaching methods include all of the tactics and procedures used to plan, organize, and carry out the educational process (Rajagopalan, 2019). Furthermore, according to Al-Rawi (2013), the term "teaching method" describes the methodical strategy used by the teacher to organize and carry out a variety of instructional resources and activities in order to achieve particular goals. According to a different study, the learning strategy and the teaching method's function as a tool to support the teaching and learning process are aspects that affect learning accomplishment (Munawaroh, 2017).

As stated by Rief et al. (2022), expectations are cognitive constructs that reflect one's ideas regarding the probability of future occurrences, and they hold significant importance in determining an individual's overall state of welfare. Expectations are also important in education for both teachers and students. The expectations held by teachers regarding student behavior and academic performance can significantly influence student academic performance (Tsiplakides & Keramida, 2010).

Referring to Mappadang et al. (2022), the term "academic performance" refers to the degree to which students excel in their studies in a variety of disciplines. Masud et al. (2019)

revealed that one of the many aspects that go into being successful in school is having good academic achievement. Furthermore, Shahjahan et al. (2021) stated that academic performance is believed to be a complex student behavior that is inspired by a number of talents such as memory, previous knowledge, or aptitude, as well as psychological aspects. In addition, Lamas (2015) found that several researchers concur that learning, which is initiated by the teaching activity of the instructor and produced by the student, determines academic performance. The performance of students is governed by their openness to change, their flexibility, their capacity to make difficult decisions, their ability to learn from their failures, their ability to change controlling beliefs, and the choices they make (Feldman et al., 2016). With the transition from online classes to offline classes, there are many factors that influence students' academic performance. Therefore, the subsequent section examines the association between different independent variables and dependent variables (see Figure 1).

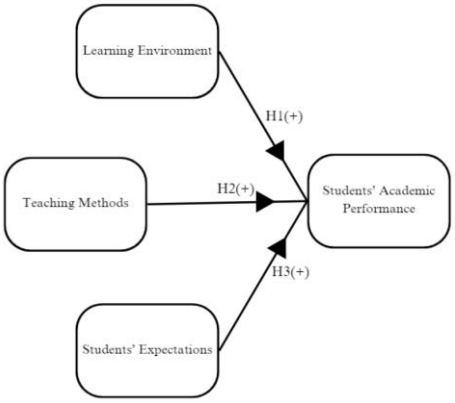

Figure 1. Proposed Conceptual Model

Learning Environment and Students' Academic Performance

As stated by Rusticus et al. (2022), a learning environment refers to the whole context in which learning takes place, encompassing the psychological, social, cultural, and physical aspects that impact students' learning experiences and academic performance. Therefore, the learning environment that students encounter in traditional classrooms is a major factor in determining their academic achievement. The statement is also supported by the finding that says students' academic performance is influenced by the level of comfort provided by the facilities and physical components contained within the classroom (Adewale et al., 2021). However, according to a study by Mohamed et al. (2018), there is no meaningful correlation

between academic achievement and classroom atmosphere, implying that the association between academic achievement and classroom atmosphere may be mediated by other factors. Therefore, hypothesis one of this study is:

H1: Learning environment positively influences students' academic performance

Teaching Methods and Students' Academic Performance

Teaching methods encompass the overarching strategies employed to facilitate students in attaining desired learning outcomes, whilst activities refer to the many means by which these approaches are put into practice (Schildkamp et al., 2020). Therefore, Students' academic achievement is also impacted by the teaching methods that are used. Research by Ganyaupfu (2013) discovered that the consistent underachievement of most students is substantially connected to the utilization of inadequate teaching methods by educators. Hafeez (2021) also stated that the effectiveness of teacher training and teaching methods on students' academic performance and interests is substantial, with the demonstration teaching approach being the most efficacious. Hence, the transition from online to face-to-face learning needs to be done correctly in terms of teaching methods so that the students can maintain their academic performance. Therefore, hypothesis two of this study is:

H2: Teaching methods positively influence students' academic performance

Students' Expectations and Students' Academic Performance

Students' expectations towards offline classes can be impactful on their academic performance. Panitz et al. (2021) stated that expectations are probabilistic beliefs about the future that have an impact on our perception, emotions, thoughts, and actions in many situations. Hence, it is crucial to align the expectations of students and the implementation of offline classes. According to Pinquart and Ebeling (2020), it is possible to accurately estimate the future academic success of students by taking into account their educational expectations. With the transition from online to offline learning, students must have their own expectations towards the new face-to-face learning, which can affect their academic performance. Therefore, hypothesis three of this study is:

H3: Students' expectations positively influence students' academic performance

3. METHODOLOGY

Measurement Scale

The respondents will find themselves answering the questionnaire with multiple choices based on their opinions or experiences related to offline learning. The learning environment as a variable was measured with five survey items, teaching methods with five items, student expectation with four items, and academic performance with four items. The survey items the respondents need to answer were adapted from previous research.

In this research, the researcher provided a five-point Likert scale with five options: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, and (5) strongly agree. The respondents must express their level of agreement or disagreement towards each statement on a scale, contributing to a more comprehensive understanding of their viewpoints. This study uses the 5-point Likert scale in surveys and questionnaires due to its ease of use, interpretability, and ability to create quantifiable data, making it particularly helpful for measuring attitudes, opinions, and beliefs. The scale's wide range of response options, ranging from strongly disagree to agree strongly, provides for a more nuanced assessment of attitudes. At the same time, its versatility allows researchers to compare views across groups and observe changes over time. The use of a 5-point Likert scale is also compatible with validity and other calculations using Smart-PLS that are used in this research, which makes it easier for the researcher to examine the data gathered.

The questionnaire itself is based on four variables to examine the impact of offline classes on students' academic performance. The first variable, the learning environment, was assessed using five survey items adapted from previous research by Adewale et al. (2021) to analyze respondent's opinions regarding the impact of the learning environment on academic performance in offline classes. (e.g., Lighting technique affects your academic performance). This variable also uses survey items adapted from Hoi (2022) for "Students as supportive to one another." The second variable, teaching methods, adapting survey items from Peng and Liu (2021), "This course has improved my thinking ability," to observe the teaching methods influence student academic performance in offline classes.

The variable students' expectation was observed with four survey items adapted from Gopal et al. (2021) and Peng and Liu (2021) with adjusted items, "The instructor used good examples to explain statistical concepts" and "I reached my expected goal for this course." These items were used to investigate the relationship between students' expectations and academic performance during offline classes. Lastly, the variable academic performance as a

dependent variable uses four survey items adapted from Gopal et al. (2021), "Offline classes really try to get the best out of all its students."

Sampling Method

In order to carry out this study, the researchers employed a quantitative approach, utilizing a questionnaire survey as a means to investigate and evaluate the impact of offline learning on students' academic performance after the COVID-19 pandemic. The present study was conducted via an online platform, specifically Google Forms, in order to collect data from participants in an anonymous manner.

The sampling approach employed in this study is based on Green's (1991) procedure. The rationale behind employing Green's procedure stems from its straightforward and user-friendly sampling technique, which enables the generation of a statistically representative sample from a given population. Green's methodology is additionally effective and can be employed to produce a sample of a specified magnitude, even when dealing with a population of limited size. In addition, Green's (1991) methodology exhibits versatility since it enables sampling from diverse populations, encompassing those that are stratified or clustered.

Table 1. Profile of the Respondents

Demographic Characteristics	Item	Percentage	Frequency
Age	<18	4.83%	6
	18-25	91.93%	114
	>25	3.24%	4
Gender	Male	20.20%	25
	Female	79.80%	99
University	Public	51.61%	64
	Private	48.39%	60
Year	1	8.87%	11
	2	16.13%	20
	3	41.13%	51
	4	22.58%	28
	>4	11.29%	14
Faculty	Socio-Politics	16.13%	20
	Business	23.39%	29
	Science	11.29%	14
	Medical	10.48%	13
	Engineering	8.87%	11
	Education	8.06%	10
	Law	7.26%	9
	Others	14.52%	18
Online Learning Experience	Yes	97.58%	121
	No	2.42%	3
Online Learning Experience (Time)	<1 Year	29.03%	36
	1	34.68%	43
	2	29.03%	36
	3	7.26%	9
	>3	0	0
	Never	0	0

4. RESULTS AND DISCUSSION

Profile of the Respondents

The first section of the questionnaire gathered the demographic of the respondents, such as age, gender, academic level, and their experience with online learning (see Table 1). The survey collected demographic information on the respondents. The majority of the participants (91.9%) were between the ages of 18 and 25, with 4.8% under the age of 18 and 3.2% above the age of 25. The study had a feminine bias, with 79.8% of respondents being female and 20.2% being male. 51.61% of respondents were linked with public institutions, while 48.39% were affiliated with private universities. The study years fluctuated, with 8.87% in their first year, 16.13% in their second year, and 41.13% in their third year, followed by 22.58% in their fourth year, and 11.29% with more than four years remaining in their studies.

Regarding the field of study, the respondents covered a wide range of disciplines, with 16.13% studying social and politics, 23.39% business, 11.29% science, 10.48% medicine, 8.87% engineering, 8.06% education, 7.26% law, and 14.52% other subjects. Furthermore, 96.1% of respondents had participated in online learning throughout the COVID-19 epidemic, with only 3.9% claiming no participation. The duration of online learning varied, with 28.3% having less than a year of experience, 33.9% having one year of experience, another 28.3% having two years of experience, 7.1% having three years of experience, and 0.8% having more than three years of experience, leaving 1.6% without any online learning experience.

Table 2 Validity and Reliability

Construct	Item	Loadings	CA	CR	AVE
Learning Environment	LE1	0.953	0.753	0.836	0.508
	LE2	0.600			
	LE3	0.787			
	LE4	0.755			
	LE5	0.801			
Teaching Methods	TM6	0.704	0.843	0.887	0.613
	TM7	0.799			
	TM8	0.755			
	TM9	0.869			
	TM10	0.758			
Students' Expectation	SE11	0.873	0.864	0.906	0.707
	SE12	0.838			
	SE13	0.803			
	SE14	0.849			
Academic Performance	AP15	0.887	0.915	0.940	0.797
	AP16	0.891			
	AP17	0.904			
	AP18	0.887			

Before collecting the main survey data, a pretest of 30 participants was undertaken to assess the questionnaire's validity and reliability. The results of the pretest survey suggested that the questionnaire had acceptable levels of validity and reliability. The questionnaire eventually contained a total of 18 items. The data collection method was carried out using an online survey platform, which resulted in a thorough dataset consisting of 124 persons who successfully completed the survey. The research model was examined utilizing Smart-PLS software.

Based on the data presented in Table 2, it is apparent that most of the indicators for the research variables exhibited loading factor values that reached or exceeded 0.6. According to Yana et al. (2015), All indicators that acquire a value of 0.6 or higher can be stated to be valid indicators. Therefore, the data in Table 2 shows that most of the indicators are valid. However, item LE 1 show that the achieved value is only 0.593, which is lower than 0.6. To support this indicator, Sarstedt et al. (2021) stated that it is recommended that the reflecting indication be removed if the outer loadings are less than 0.4. Based on this statement, the researcher decided that the LE 1 item's value is tolerable since 0.593 is higher than 0.4 and kept it as the main survey item to examine.

Furthermore, Table 2 shows the total dependability value findings from the Smart-PLS output. According to Fornell and Larcker (1981), the composite reliability of each construct must be greater than 0.70, and the average variance extracted (AVE) for each construct must be greater than 0.50. Both the composite reliability and average variance extracted (AVE) values in this research clearly exceed the minimum values of 0.70 and 0.50. As for the Cronbach's alpha value, Ghozali (2013) stated that it is necessary for the Cronbach's alpha to be higher than 0.7. Hence, the indicators that can be found in this research can be considered reliable since all of the Cronbach's alpha is higher than 0.7. This finding implies that the constructs are very reliable and meet the bare minimum for acceptable levels of reliability. As a result, the data's reliability was found to be excellent, and the measuring scale demonstrated robust consistency, proving its validity and reliability.

Table 2 presents the results of the examination conducted to assess the validity and reliability of the indicators used in this study, including Cronbach's Alpha, rho_A, Composite Reliability, and Average Variance Extracted (AVE). These measures have been shown to demonstrate the validity and reliability of their respective indicators in the present research. Furthermore, the findings of this study will illustrate the interrelationships among the variables within the outer model displayed in Figure 2.

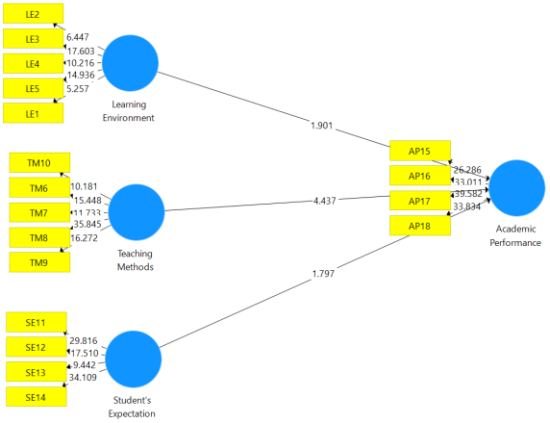

Figure 2 Bootstrap Calculation Results

By running the bootstrap calculation on the indicators, the researcher gets each variable's significance level. Furthermore, the relation between variables needs to be examined through the collinearity test. According to Shrestha (2020), Multicollinearity arises in multiple linear regression analysis when there is a substantial correlation between numerous independent variables and their correlation with the dependent variable. The collinearity test is shown in Table 3.

According to Einax et al. (2010), VIFs can be utilized as a generic diagnostic metric of collinearity and are a far superior way to studying simple correlation values. Shrestha (2020) stated that the value of VIF = 1 indicates that the independent variables are not correlated. Moreover, if the value of VIF is higher than one but still lower than five, there is a moderate correlation between variables (Akinwande et al., 2015). The data in Table 4 shows that each construct has a moderate level of correlation, which can be seen from the number of each construct to the Academic performance variable. Learning Environment is 2,450, Teaching Methods is 2,338, and Students' Expectation is 2,669.

Table 3 Collinearity Test

Construct	Item	VIF
Learning Environment	LE1	1.433
	LE2	1.350
	LE3	1.873
	LE4	2.071
	LE5	1.785
Teaching Methods	TM6	2.032
	TM7	1.852
	TM8	2.753
	TM10	1.926
Students' Expectation	SE11	2.507
	SE12	2.239
	SE13	1.932
	SE14	1.817
Academic Performance	AP15	2.904
	AP16	2.928
	AP17	3.080
	AP18	2.849

To determine whether the constructs or factors they have defined in their measurement model are distinct and ensure that their measurement instruments can accurately capture unique variance in each construct, the researcher uses a Discriminant Validity (Fornell-Larcker Criterion).

The assessment of discriminant validity involves the comparison of the square root of the average variance extracted (AVE), as presented in Table 3 for each construct, with its association with all other constructs within the model. In order to show discriminant validity, it is necessary for the square root of the average variance extracted (AVE) to exceed the correlation with any other concept (Fornell & Larcker, 1981). The discriminant validity analysis in Table 4 shows how well the measurement instruments capture the unique variability of each construct.

Table 4 Discriminant Validity (Fornell-Larcker Criterion)

Construct	Square Root of AVE	AP	LE	SE	TM
Academic Performance	0.892				
Learning Environment	0.713	0.678			
Students' Expectation	0.841	0.689	0.734		
Teaching Methods	0.783	0.724	0.688	0.719	

It is evident that the square root of the average variance extracted (AVE) for each construct surpasses its correlation with all other constructs. This finding suggests that the four constructs exhibit clear differentiation and possess discriminant validity. In conjunction with the Fornell-Larcker criterion, one alternative approach for evaluating discriminant validity involves the examination of the cross-loadings of each item in relation to its loading on its respective construct. Cross-loading refers to the degree of association between an item and a construct that is distinct from the construct it is designed to assess. Discriminant validity is seen to be present when the loading of an item on its corresponding construct surpasses its cross-loadings on all alternative constructions. Nevertheless, the cross-loading method is not as frequently employed as the Fornell-Larcker criterion due to its relatively more intricate interpretational challenges. The Fornell-Larcker criterion supports the discriminant validity of the four constructs presented in Table 4.

According to Ijomah (2019), the coefficient of determination, often known as R-squared, is extensively used to measure the degree of fit for regression models. Therefore, the R^2 can help determine the proportion of the dependent variable's variability that the predictors in the model can explain. The coefficient of determination might take on values ranging from negative infinity to one (Chicco et al., 2021). The R^2 value fits the criteria whereas 0.606 is

between -∞ and 1. Furthermore, Hair et al. (2021) mentioned that a coefficient of determination of 0.5 to 0.7 is considered moderate. The coefficient of determination has a value of 0.606, which indicates that the R^2 is at a moderate level.

Hypothesis Testing

Table 5 displays the outcomes of a hypothesis test examining the associations between three distinct independent variables, namely LE, TM, and SE, and a dependent variable denoted as AP. The findings of the study indicated a statistically significant and positive correlation between TM and AP (P = 0.000). However, no statistically significant correlations were observed between LE and AP (P = 0.058) or SE and AP (P = 0.073).

Table 5 Hypothesis Testing Result

Variable	beta	T Statistics	P Value	Result
LE → AP	0.237	1.901	0.058	Rejected
TM → AP	0.396	4.437	0.000	Accepted
SE → AP	0.231	1.797	0.073	Rejected

The findings indicate that there is no statistically significant and positive correlation between learning environment and academic performance. The research result is similar to the research conducted by Mohamed et al. (2018), which says there was no significant association between classroom climate and academic performance of the students. The previous study supported the statement that students' academic performance is unaffected by their learning environment.

The results of the study suggest that there exists a statistically significant and favourable association between teaching methods and academic performance. This suggests that kids who are exposed to more effective teaching approaches are more likely to attain higher levels of academic achievement. This discovery aligns with the scholarly investigation conducted by Hafeez (2021), which posited that effective instructional approaches enhance students' academic achievement. Previous research has provided evidence to substantiate the assertion that students' academic performance is influenced by the instructional approaches employed by their educators.

The influence of student expectations on academic performance is generally expected to be favorable, although it is worth noting that high expectations can also have a potentially harmful impact. Moreover, the study conducted by Kumar et al. (2021) revealed that the presence of expectations can have a detrimental effect on performance due to the induction of demotivation. The aforementioned data suggest that students' expectations have the potential to exert both positive and negative effects on their academic achievement. The respondent

demography reflects the hypothesis in that the majority of respondents (79.8%) were young adults (18-25 years old) and female. These demographic considerations could have made students more responsive to successful teaching methods. Younger individuals, for example, may be more open to new and innovative teaching methods, whereas females may prefer more collaborative and participatory teaching approaches.

Another possible explanation for the finding that teaching methods have a significant impact on academic performance is that the majority of the respondents were students at public universities (51.6%) and were studying in the fields of business (23.39%) and science (11.29%). Public universities are often more likely to have a wider range of teaching methods available to students, and students in the fields of business and science may be more likely to be motivated by learning methods that are relevant to their future careers.

It is also worth noting that the majority of the respondents had a positive online learning experience (97.58%). This suggests that the students were generally open to different teaching methods and that they may have been more receptive to effective teaching methods, regardless of whether they were delivered in an online or face-to-face setting.

5. CONCLUSION

The study found that there is no statistically significant correlation between Learning Environment and Academic Performance. However, there is a statistically significant correlation between Teaching Methods and Academic Performance. This suggests that effective teaching methods have a positive impact on student achievement. The influence of student expectations on academic performance is generally expected to be favorable, but high expectations can also have a negative impact.

Managerial Implication

The strategies used in the classroom have a substantial impact on student academic performance. Educators should prioritize the use of effective teaching methods, such as active learning tactics, hands-on learning opportunities, and differentiated instruction. Schools and educational institutions should engage in ongoing professional development programs to give instructors the skills and knowledge they need to apply these effective teaching strategies. Regular assessments of teaching efficacy, including classroom observations, student feedback, and data analysis, are required to ensure that these strategies are having the desired effect on student learning.

Limitation and Future Research

One of the key disadvantages of research limited to university students is the findings' limited generalizability. University students' unique features and experiences may not adequately represent the broader population of learners, particularly those at younger age levels. Furthermore, when compared to younger students, university students frequently have a better level of self-motivation, independent learning skills, and access to resources, which may influence their academic performance in offline settings. Given the return to offline courses as a result of the COVID-19 pandemic, it is critical to research effective teaching approaches that can optimize student learning and academic success in this new environment. We may obtain a complete grasp of effective teaching methods for offline classrooms in the post-pandemic period by exploring the best teaching methods, empowering educators to promote a thriving learning environment and maximise student academic performance.

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