

Determinant Factors of Teaching Performance in COVID-19 Context

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To cite this article:

Bachir EL Murr, Genane Youness, Rola Assaf. (2024). Determinant Factors of Teaching Performance in COVID-19 Context. *Education Journal*, 13(1), 1-13. <https://doi.org/10.11648/j.edu.20241301.11>

Received: October 8, 2023; **Accepted:** October 25, 2023; **Published:** January 11, 2024

Abstract: COVID-19 pandemic still impact higher education system, stakeholders and environment all around the world. Students, teachers, academic institutions and education decision makers were shocked by an atypical new context they promptly put in face, asking drastic change in behavior and procedures at individual, familial and institutional levels. Full lockdown and closing campuses enforced students and teachers staying and sticking home, fronting unusual domestic for work atmosphere and unacquainted online learning and teaching technologies. Consequent back to classroom framework also imposes new sanitary and social distancing conditions leading to new teaching and learning habits that affected in many ways the performance of teaching. The aim of this paper is to apprehend all the challenges that may arise in similar critical situations to make convenient decisions helping to avoid the education system shutdown or to benefit from the previous experience to adapt future behaviors and perform tools and practices. For such purpose, the present paper reviews all the determinant factors of the teaching performance in both alternative online and classroom modes of dispensing courses in the COVID-19 Lebanese context, using Partial Least Squares Structural Equation Modeling approach (PLS-SEM). It appears that all manifest variables corresponding to latent variables have a reflective measurement model. After the convergence of the algorithm of Partial Least Square (PLS), the structural path significance test of both inner and outer model is verified by a bootstrap procedure with 1000 subsamples.

Keywords: COVID-19 Impact, Online and Classroom Teaching Performance, Partial Least Squares - Structural Equation Modeling, Bootstrap, Goodness of Fit

1. Introduction

Pandemics are still threatening the world population with various types and mutants; the latest variant of COVID is the XBB 1.5. COVID-19 pandemic was a shocking incident all the world urgently faced and tried to adapt. The education was one of sectors that has been mostly affected, because of the contamination risk due to mass of people daily sitting closely for hours in classrooms and living together for months in closed areas. Studies focused on the description of behavioral change of students and teachers in facing the social, education and technical consequences of the social distancing and

closures measures. Learning activities accomplished via live video and audio conferencing, with real-time feedback.

Writings around COVID-19 have the form of reports, factual studies, or surveys' findings presentations. They discussed the effect of COVID-19 on education, the prevailing challenges and acclimation capability of stakeholders, the resilience of the education sector, and the consequent technological advancement put at the services of education. Many specialized national and international organisms, governmental and nongovernmental institutions published reports displaying recommendations and information regarding the deployed efforts at individual and institutional

levels to overlap the generated difficulties by the COVID context.

The international organization UN [14] expected that COVID-19 has affected nearly 1.6 billion learners in more than 190 countries in all continents. Schools' closures have influenced 94 per cent of the world's student population, up to 99 per cent in low and lower-middle income countries. The UNESCO in 2020 [26] observed in 138 countries that 1.37 billion students were affected by school and university closures, and nearly 60.2 million teachers were no longer in the classroom. A common report published in 2021 by the UNESCO, UNICEF and World Bank [27] disclosed information on school closures and the educational response to COVID-19 in MENA countries. They estimated the potential learning loss, advanced series of recommendations for policy and programmed to ensure children's safe return to school, equitable access to remote learning, and opportunities for remedial learning.

Gallagher-Mackay *et al.* [12] administrated a survey for the International Labor Organization (ILO), and found that the impact of COVID on young people is systemic, deep and disproportionate, mainly hard on young women, younger youth and youth in lower-income countries. Schleicher A. *et al.* [22] reported for OCDE countries and mentioned that the economic consequences of COVID-19 have hit hardest the most vulnerable, notably in education. They released many inadequacies and inequities in education systems, related to the broadband and computers access needed for online education, and the supportive environments needed to focus on learning. In addition, Marinoni G. *et al.* [16], working on behalf the International Association of Universities, found that the shift from face-to-face to distance teaching relieved in the same time challenges and opportunities, the first are mainly related to access to the technical infrastructure, competences and pedagogies for distance learning, the seconds concern flexible learning possibilities, hybrid learning and the mix of synchronous with asynchronous learning.

The office for civil right in USA [15] reported that even if educators, staff, and school leaders at all educational levels have made extraordinary commitments and dedicated their talents, energy, and resources to address the needs of students, still COVID-19's consequences had fallen unevenly and shown deepening disparities in educational opportunity and achievement. Osman A. and Keevy J. [17], charged by the Commonwealth Secretariat, reviewed 11 papers aiming to explore the impact of COVID-19 on the educational opportunities afforded to the most disadvantaged and marginalized groups, on gender equity and equality in education, and on youth workers.

From its part, the Edge Foundation [6] marked that the disruption caused by the coronavirus pandemic is likely to have an impact on students' decisions relating to employment and higher education and has the potential to widen the inequalities that exist when young people leave compulsory education. Greater integration of digital techniques and delivery is needed to enrich the existing education system and increase access. Moreover, Ed Tech Hub and e-Learning

Africa [7], surveying 52 African countries, highlighted three main obstacles for learners in the midst of school shutdown: a lack of access to technology, an unsuitable home learning environment, and a lack of access to learning materials. The main obstacle for teachers was the lack of appropriate training to design and manage distance learning programs, added to a lack of infrastructure (electricity, connectivity, devices) and appropriate learning materials (books, television and internet-enabled devices). Recio S. G. and Colella C. [20] reporting to YERUN (Young European Research Universities, urged academic institutions to rapidly turn to online formats and methods, namely that many challenges face online teaching due to equity concerns, accessibility issues, work and balance worries, mental health matters, exam evaluation complications, communication and mentoring problems, and physical attendance problems for disciplines requiring physical meetings.

Tarkar P. [24] notes that social distancing and lockdown disrupt the whole education system. Policymakers, students, teachers and parents face many problems with the change from offline to online. Mc Kinzey and Co. [5] find that students learning loss during school closures varies significantly regarding the access to remote learning, the quality of remote instruction, the home support, and the degree of engagement. Zancajo A. [31] reviews the available literature in Scopus on the impact of the COVID-19 pandemic on education, and remark that a substantial part is dedicated to analyze how the pandemic has impacted students' learning outcomes in the short-term, how this impact can increase educational inequalities or the attainment gap between social groups, how students, teachers, families, schools and universities have dealt with the unexpected situation, as well as how socioeconomic inequalities have mediated their responses. Ribeh *et al.* [21] mention that most of the research tends to focus on improving effectiveness of distance learning implementation and on students' perspectives. Harry A., Patrinos E. and Vegas R. [19], based on the available evidence and empirical findings during the first two years of the pandemic, confirm that the decline in student knowledge and skills is real and significant.

Bashir A. *et al.* [1] reveal that a majority of Aston University's Bioscience students reported positive experiences of online open-book assessments. Hybrid course delivery could offer a solution to ensure students receive hands-on laboratory experience and face-to-face contact to remain motivated and benefit from the on-campus facilities and support, and allows students some of the flexibility afforded by remote study. Yang J. *et al.* [30] also highlighted some positive impact of pandemic on education, students, teachers, researchers and nonteaching staffs of school, colleges and universities, and listed number of positive impacts of COVID-19 on online education development, environment, human life, business etc. Similarly, Chan R. Y. *et al.* [2] provide issues making the online and distance education a leveraged to facilitate student mobility, and discuss the nature and effectiveness of innovative forms of online teaching, learning, and assessment adopted during and

after the pandemic. Spunei, E. et al. [23] mention that the various digital skills acquired during online teaching activities will be useful to students in their professional work, being in line with the trend of increasing technology and adaptation to the careers of the future.

Gallagher-Mackay K., Srivastava P., Underwood K., et al. [18] note that international and local evidences suggest that school closures affect children's academic achievement and lead to significant and unequally distributed learning losses, mainly due to the duration of closures. Ejdy, J., [8] find that satisfaction, personal development and attitude toward e-learning had a significant positive impact on intention to use e-learning methods in the future to benefit from time saving and greater control over learning process. Parker et al. [18] mentioned that school closures, interruption of classes and the cancelation or postponement of assessments and examinations have all had detrimental consequences for children's academic development.

Crawford, J. and Cifuentes-Faura, J. [3] note that the rapid move toward online and digital curricula have led to declines in student and staff wellbeing. From their part, Fülöp, T. M. et al. [10] observe several discontents and personal discomfort for teachers in adapting to new technologies. Fülöp, T. M. et al. [11] link e-learning satisfaction to academic success of Romanian students who used e-learning during the pandemic. They found that external factors do not influence perceived usefulness. Accordingly, students consider that the perceived ease of use does not influence the behavior intention to use new technologies.

2. Problematic and Hypotheses

In the same alignment of the of the reviewed literature, the present paper aims to understand what happens and how was the response of teachers to the consequences of COVID-19 pandemic, by describing the change in teachers' behavior allowing to assure the sustainability of the Lebanese teaching system. It targets also to disclose the challenges facing the educators during the pandemic and the powerful factors allowing to deal flexibly to surpass the bottleneck.

For such object, the current research work commissions all

teaching behavioral and practical aspects relieved in the literature, and assesses the impact of each of online or offline mode on teaching performance, taking into consideration Lebanese educative, socioeconomic and technical background as the psychosocial environment in which teachers achieve their mission in COVID context. Teaching performance is intended here to define the state by which teachers deliver courses in the best academic, technical and psychosocial conditions allowing them to dispense full program and assure full students assimilation of delivered information.

Based on the teachers' perceptions on what they experienced at academic, technical and psychosocial level with their students during the pandemic period, the present work tries to identify determinant factors of teaching performance with both teaching modes. By screening opinions regarding teaching behavior and conditions during COVID-19 period it was possible to assess challenges and potentials suiting online and classroom modes and impacting teaching performance during such critical circumstances.

For that purpose, the study supports the following hypotheses regarding teaching performance during COVID-19 chaotic situation:

H1: Advantages of online teaching mode surpass disadvantages during COVID-19.

H2: Disadvantages of classroom teaching mode surpass advantages during COVID-19.

H3: Online teaching mode has greater impact on teaching performance than classroom mode during COVID-19.

H4: Socioeconomic and socio-psychological conditions environing COVID-19 impact teaching performance more than technical issues of online and offline teaching modes.

H5: Teachers' experience and background has a little impact on teaching performance during COVID-19.

3. Experiment Study

In order to treat this research problem, confirm or unfirms the associated hypotheses, an online survey is conducted and a model is developed according the flowchart shown in the "Figure 1".

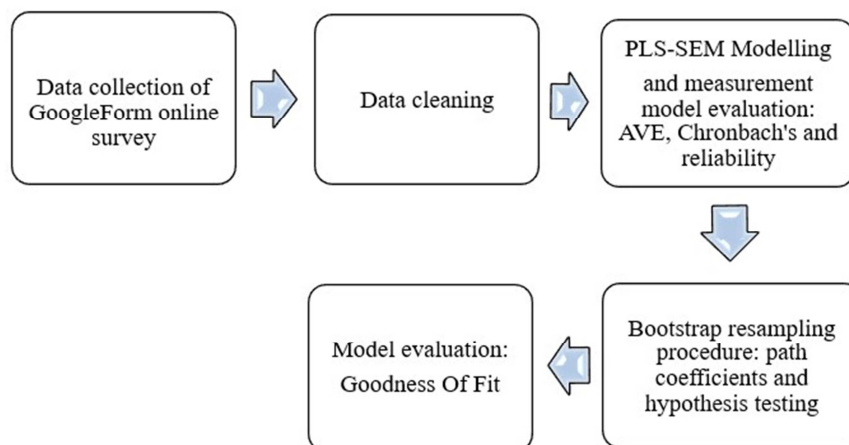


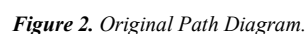
Figure 1. Flowchart of the experimental study.

3.1. Survey

The questionnaire is decomposed in four main parts. The first part asks about information related to teachers' identity, type of delivered courses (lectures, tutorials, laboratory, on field), educational institution, teaching language, teaching mode during COVID-19, and the familiarity with digital, IT, communication and social media tools. The second part focuses on the teachers' perception regarding advantageous and challenging factors of online and classroom teaching during COVID-19. Online advantages are resumed in terms of teaching effectiveness. Online challenges concern academic, technical and psychosocial issues. Favorable factors of offline education are due to the

3.2. Material and Method

Collected responses are reviewed and cleaned. Only information from complete and coherent questionnaires are retained and treated with respect to modeling. The displayed model is based on the Partial Least Squares Path Modeling approach (PLS-SEM), that allows to model complex relationships between observed variables, known as manifests, and latent variables (Croutsche,[4]). The Smart PLS package version 4 is consequently engaged (Hair et al., [13]) to illustrate the hierarchical model and validate the results. A global Goodness-of-Fit (GoF) (Tenenhaus et al., [25]) tests the quality of the model. All manifest variables to the corresponding latent variables have a reflective measurement model. This scheme indicates the existence, rather than the direction, of the relationships among latent variables.



3.3. PLS-SEM Results and Discussion

Among numerous tentative to fix the convenient model stylizing all related considerations to teaching during COVID-19 period, only three versions of the modelling approach are here displayed, the first one represents the original model, on which two subsequent modifications are held to assure higher technical records.

As shown in “Figure 2”, the first jet of the constructed model represents separately the teachers background (TB) impact on both the online and classroom courses (OC and CR) which each, influenced also by two separated components representative of its determinants advantageous (OCA and CRA) and disadvantageous (OCD and CRD) factors, affects from its side the teaching performance. In other terms, the teaching performance is shown to be affected by the online and classroom courses (OC and CR), which each in its turn is affected by its advantageous (OCA and CRA) and disadvantageous (OCD and CRD) and the teachers background determinants factors. A list of abbreviation characteristics is presented in the Table 4 (Appendix).

After the convergence of the algorithm of PLS, the structural path significance testing of both inner and outer model is verified by a bootstrap procedure with 1000 subsamples. In order to improve the quality of the model, weakened and negligible factors are eliminated. The results

showed in “Figure 3” that the factors « Teacher’s Background (TB) », « Teacher’s experience (Texp: 0.064) » and « Online Course Quality Assurance Disadvantages (OCQAD: -0.001) » have to be removed from the model. In fact, it appears that, disregarding the effective validity of its components, teachers background (TB) represents a skinny negative influence on both of online (-0.007) and classroom (-0.001) mode of teaching. Teaching experience and familiarity with IT and communication tools seems have a negligible, even negative, impact on the online and classroom teaching processes. Teachers’ years of experience don’t constitute at all valuable added value nor notable weakness (-0.064) for the teachers’ background in the COVID-19 context of teaching. Moreover, quality assurance matters don’t have real count among online disadvantageous factors (-0.001). It seems that in such a troubled period, teachers haven’t allowed attention to issues like difficulty to meet standards of teaching, mainly because of the administrations of universities were closed during COVID19 period, the difficulty to control quality assurance requirements, to control exams and quiz cheatings, to assess the reliability of students excuses of not attending classes, to use books for course support, in addition to the lack of self-discipline to deliver the course, lack of personal computer skills for online teaching, or to the fact that online courses tend to focus on theory rather than practice.

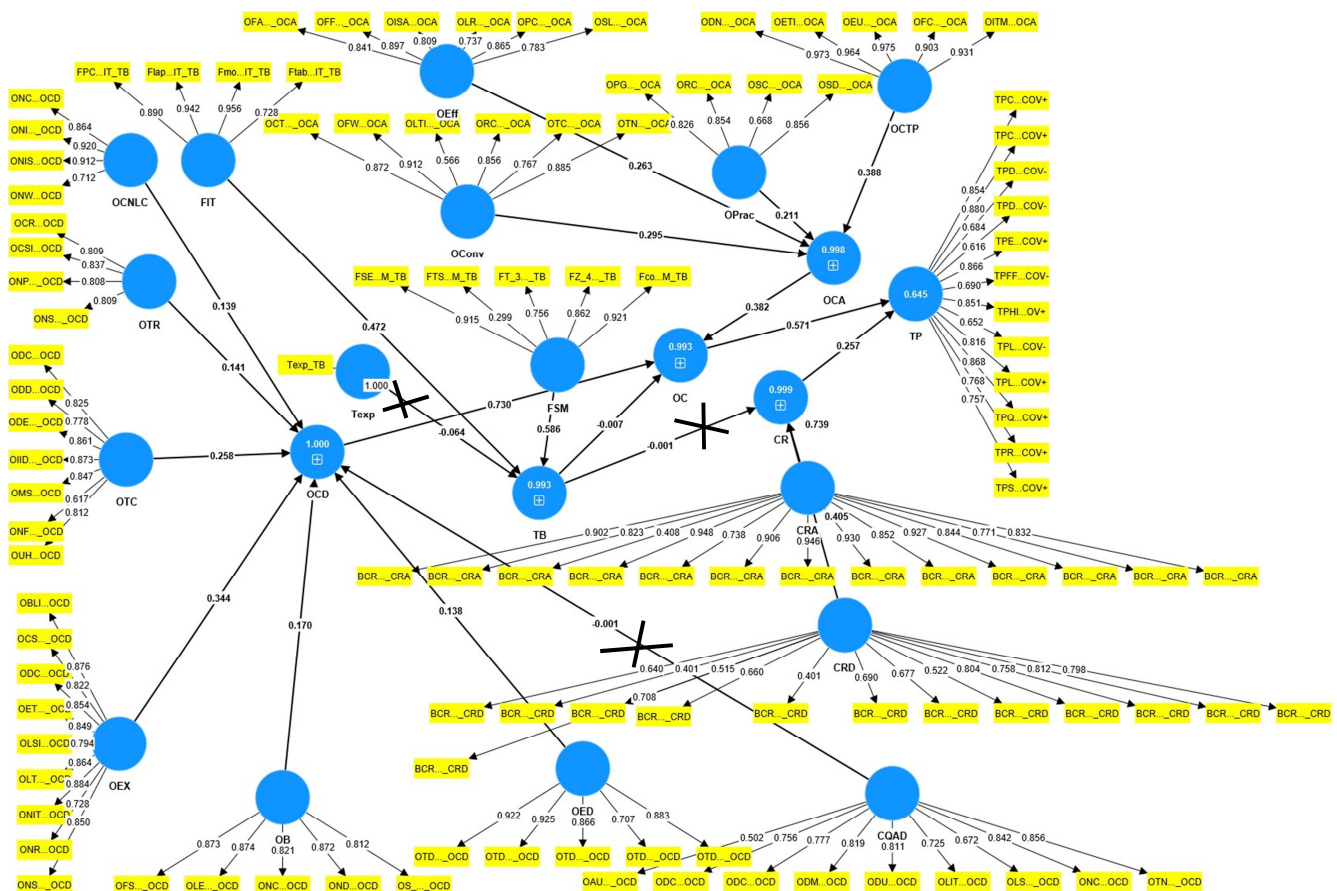


Figure 3. Path Diagram with bootstrap procedure.

After applying these modifications and using the algorithm PLS-SEM by SmartPLS software [version 4.0.8.7], the final model may be dressed as follows as shown in “Figure 4”:

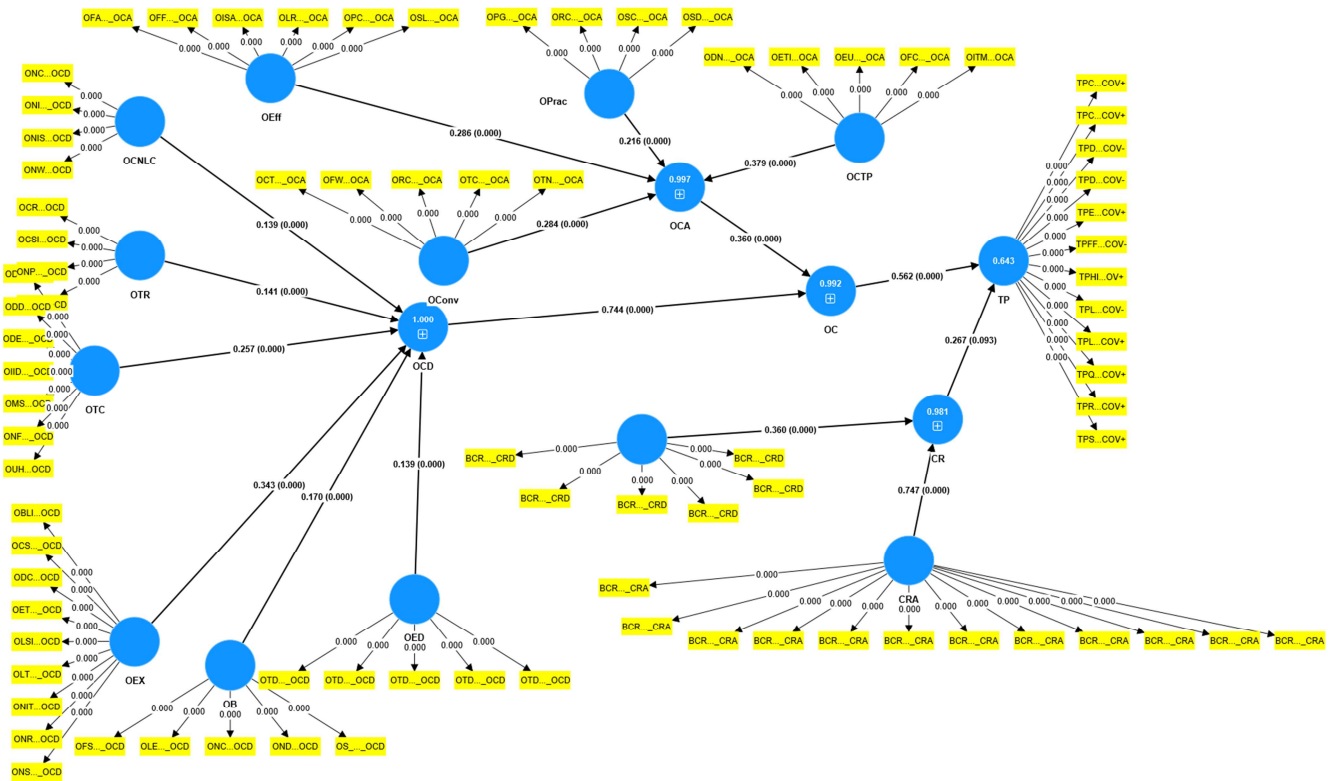


Figure 4. Final Path Diagram.

The composite reliability and Cronbach's alpha, represented in Table 1, are greater than 0.7 for all latent variables (Fornell & Larcker, [9]) The AVE is either borderline or slightly above the threshold, except for OC. The coefficient of determination (R²) of the endogenous constructs is here 0.643, significantly

higher than 0.24 (Vinzi et al., [28]), letting say that online and classroom teaching explain 64% of the variance of teaching performance. The GoF of the model (Tenenhaus et al., [25]) is equal to 0.671, which is significantly above the good quality model threshold of 0.36 (Wetzels et al., [29]).

Table 1. Quality measures for PLS-SEM model.

Latent Variables	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)	R-square	Communality	Redundancy
CR	0.941	0.963	0.944	0.423	0.981	0.423	0.414963
OC	0.975	0.978	0.976	0.396	0.992	0.396	0.392832
OCA	0.956	0.964	0.960	0.522	0.997	0.522	0.520434
OCD	0.967	0.969	0.969	0.484	1.000	0.484	0.484
TP	0.940	0.943	0.949	0.609	0.643	0.609	0.410234
CRA	0.971	0.973	0.974	0.760	0.9226	0.49	Avg
CRD	0.896	0.918	0.924	0.678		0.671	GoF
OB	0.904	0.908	0.929	0.724			
OCNLC	0.874	0.881	0.916	0.733			
OCTP	0.973	0.973	0.979	0.902			
OConv	0.917	0.920	0.939	0.757			
OED	0.914	0.923	0.936	0.747			
OEX	0.946	0.947	0.954	0.700			
OEff	0.905	0.914	0.927	0.679			
OPrac	0.817	0.836	0.879	0.648			
OTC	0.908	0.911	0.928	0.649			
OTR	0.832	0.833	0.888	0.665			

The correlations between the latent variables are given in Table 2, where an important correlation between «OR», «OC»,

«OCD» and «TP» is shown.

Table 2. Correlations between endogenous latent variables.

Correlation	CR	OC	OCA	OCD	TP
CR	1				
OC	0.853	1			
OCA	0.661	0.789	1		
OCD	0.823	0.952	0.576	1	
TP	0.746	0.790	0.659	0.724	1

Bootstrap with resampling of 1000 repeated subsamples is also carried out as part of the scrutiny process in Table 3. Only the relation between classroom teaching CR was a weak significant predictor of on teaching performance (TP) during the pandemic (tvalue = 1.679; p-value = 0.093). However, all other construct had a strong effect and relationship, their p-values were below 0.005 threshold.

Table 3. Summary of hypothesis testing.

Hypothesis	Original sample	mean (M)	Standard deviation	T test	P values
CR -> TP	0.267	0.248	0.159	1.679	0.093
CRA -> CR	0.747	0.747	0.042	17.902	0.000
CRD -> CR	0.360	0.358	0.032	11.323	0.000
OB -> OCD	0.170	0.169	0.011	15.303	0.000
OC -> TP	0.562	0.585	0.157	3.580	0.000
OCA -> OC	0.360	0.359	0.035	10.350	0.000
OCD -> OC	0.744	0.743	0.040	18.420	0.000
OCNLC -> OCD	0.139	0.138	0.011	12.969	0.000
OCTP -> OCA	0.379	0.379	0.025	15.161	0.000
OConv -> OCA	0.284	0.283	0.019	14.808	0.000
OED -> OCD	0.139	0.137	0.018	7.655	0.000
OEX -> OCD	0.343	0.343	0.017	19.777	0.000
OEff -> OCA	0.286	0.285	0.029	10.006	0.000
OPrac -> OCA	0.216	0.217	0.015	14.263	0.000
OTC -> OCD	0.257	0.257	0.018	14.465	0.000
OTR -> OCD	0.141	0.141	0.009	16.303	0.000

*Note: p-value was considered significant at the 0.05 level.

Consequently, this study supported all hypotheses with significant t-tests at a 10% risk.

Accordingly, the main equations sorted out by the model are presented as follows:

$$OC = 0.744_{(0.000)}OCD + 0.36_{(0.000)}OCA \quad (1)$$

$$CR = 0.36_{(0.000)}CRD + 0.747_{(0.000)}CRA \quad (2)$$

$$OCD = 0.139_{(0.000)}OCNLC + 0.141_{(0.000)}OTR + 0.257_{(0.000)}OCT + 0.343_{(0.000)}OEX + 0.17_{(0.000)}OB + 0.139_{(0.000)}OED \quad (3)$$

$$OCA = 0.216_{(0.000)}OPrac + 0.379_{(0.000)}OCTP + 0.284_{(0.000)}OConv + 0.286_{(0.000)}OEff \quad (4)$$

The causality scheme (figure 4) shoes that teaching performance is explained by two latent variables, OC and CR, with a risk of 10%, as expressed in the following equation:

$$TP = 0.562_{(0.000)}OC + 0.267_{(0.093)}CR \quad (5)$$

Thus, the inner model suggests that, in COVID-19 circumstances, online course OC (0.562) has the strongest effect on teaching performance (TP), followed by classroom teaching CR (0.267). It appears that online teaching turned out to be such an important factor for teaching performance than the classroom. Moreover, while online courses are greater affected by disadvantageous (OCD: 0.744) than advantageous (OCA: 0.36) factors, classroom mode of teaching in COVID-19 context is more influenced by advantageous (CRD: 0.747) than disadvantageous (CRD: 0.36) factors. Disadvantageous factors of online courses have similar impact

of advantageous factors of classroom mode of education (OCD: 0.744, CRA: 0.747), and vis-versa (OCA: 0.36, CRD: 0.36). Finally, it seems that even if online (0.562) has greater effect than classroom mode (0.267), both of two teaching modes have moderate positive effect on teaching performance in COVID-19 context. The important positive effect of disadvantageous factors on online courses (OCD: 0.744) is due to the slight impact of its negative components, showing that teachers surpassed the difficulties of online teaching. It seems that teachers were easily adapted to their promptly changing environment. They adopted controlled behavior and auto fitted themselves to new strict rules they fixed for themselves in order to reduce distracting circumstances of working at home (OED: 0.139), like social media, texting, visitors and family members, phone calls, wifi disconnections. They succeeded also to acclimatize with online prevailing boring context (OB: 0.170) due to the narrative nature of courses, the lack of on-board presentation, lack of enthusiasm and motivation to make online classes, the stressful conditions of being bounded in houseroom, with no space for distraction topics and issues, and addressing fictive students behind screens. Teachers overpassed as well comprehensively technical challenges of online courses (OTC: 0.257) due to the absence of faculty structure and support, and to logistics and technological issues of online teaching mode, like the big deal to choose right technology and apps, the difficulty to draw graphics on the spot, to support long screen-time, to face course interruption by internet disconnection and electricity shortage, and to the fact that online courses are totally unsuitable for hands-on-fields. Moreover, it appears that teachers assumed very well the

increased responsibility associated to online courses (OTR: 0.141) and related to safety, security and privacy, mainly for sharing publicly teachers and students' names, and eventually critical information, and due to courses recording. Teachers seem also having maintained comprehensive relationship with students through online platforms (OCNLC: 0.139), in contrast with what was argued in the literature that generally in online courses teacher doesn't lead the class, because of there is no possibility to control students' attention, interaction and assiduity, due to the absence of interaction with students, the absence of interaction in group lessons, in addition to the lack of the warmth of face-to-face interaction. However, teachers felt somehow exhausted by online courses delivery (OEX: 0.343) because of not having a rest time in class, lack of interaction time space with students, continuously speaking all along the class period, difficulty to keep classes for longer duration, impossibility to observe face to face students feedback, lack of interest and involvement the students show during online classes, which require also a bigger load of information to fill the class time, a larger time to prepare comprehensive courses, then a need for extra time self-investment. In the same time, online courses are slightly impacted by advantageous factors (OCA: 0.36) because of the lack effect of their components. In fact, teachers haven't remarked great online effectiveness (OEFF: 0.286) allowing students to learn more and faster, and assure decreased retention rates, or faster and frequent feedback and assessments. They didn't see also in the online courses a way to increase search of methods and activities to engage students or to enhance administrative control of punctuality and courses content because of the possibility to review registered course sessions. They didn't observe in the online course great convenience (OCONV: 0.284) since it reduces contact and contagious risk, requires lesser time investment, lesser transportation and displacement costs, and allows teachers flexibility to work whenever and wherever with more control over schedule since they are not bounded by geography. Teachers haven't noted a great practicality in online course (OPRAC: 0.216) for it permits generally to create parallel discussion group by class to share information and documents with students, save displacement time to university, save courses' preparation time, and requires continuous adaptation and readiness. Technical Platforms constitutes the best advantage the teachers benefit in performing online classes (OCTP: 0.379), because of online classes help teachers to use innovative teaching methods, enhance teachers' IT knowledge, allow discovering newest communication apps. Technology use allows also teachers to focus on their core tasks, save time and resources, and have easy use of documents downloaded online. On the other side, classroom advantages were highly scored (CRA: 0.747). They favorized students to be more engaged and accountable, and authorized better assessment of their assiduity and attention. Moreover, classroom enhances teaching responsibility, good relationship and direct support to students, easy access to libraries and research materials, freedom and liberty of expression because of no need for courses recording, and promotes collaborative teaching and

knowledge transfer, extra-curricular activities. Classroom teaching also allows teachers addressing non awakened students. Face to face enhances as well interaction with all students, mainly with those majors that couldn't be taught online. However, back to classroom teaching has been assigned some disadvantages by teachers (BCRD: 0.360) mainly related to the difficulty to follow COVID-19 safety protocols, to teach with mask on face, to the absence of sufficient space to respect social distancing norms, to support mask on face all classroom time. With classroom teaching, administration increases control and pressure, and teachers loose class organization and time saving technology tools, familiarity with social media, easiness of contact with students, automatic attendance registering, saving courses through recording app, flexibility in scheduling classes, and tools of online chat, discussion forums and online meetings.

4. Conclusion

The paper aimed to assess the impact of COVID-19 on the teaching performance in Lebanese public and private universities. In addition to personal and teaching issues, attention is allowed to the socioeconomic and psychosocial environment associated to the COVID-19 context. Determinant factors of teaching performance with both teaching modes were founded by screening opinions regarding teaching behavior and conditions during COVID-19 pandemic. Modeling approach is used to elaborate comprehensive relationships among the explained teaching performance variable and multiple explanatory variables associated to challenges and potentials governing online and classroom modes.

It appears that while both of teaching modes have positive impact on teaching performance (H1 validated, H2 infirmed), online teaching mode has greater impact than classroom mode (H3 confirmed). At the same time, technical issues of online and offline teaching modes have had higher impact on teaching performance than socioeconomic and sociopsychological conditions environing COVID-19 (H4 infirmed). However, teachers' experience and background have a tiny impact on teaching performance during the pandemic (H5 validated). Moreover, while disadvantageous factors have greater effect on online courses than advantageous factors, they have lesser effect on classroom teaching mode. Teachers retained generally positive thinking regarding both of the two teaching modes, because they succeeded to acclimate their own personal and work life to the prevailing pandemic environment, surpassing the difficulties of online and offline teaching modes and benefiting in the same time from their experience with such a challenging period of COVID-19. During online teaching mode, they adopted controlled behavior to reduce distracting circumstances of working at home, avoided boring context, overpassed technical challenges of online courses, assumed very well the increased responsibility associated to online courses, and maintained comprehensive relationship with students through online platforms, even they felt somehow

exhausted by online courses delivery, reinforced by some advantageous factors increasing online effectiveness, convenience, practicality assured by technological platforms. During classroom attending period, teachers employed their experience and accustomed knowhow to grasp students' attention, engagement, assiduity and accountability, by maintaining good relationship and direct support to students and enhancing as well interaction with and within groups of students, and by avoiding universities pressure on their paid hours and inconvenience related to some online tools and COVID-19 safety and social distancing protocols.

Now, the hardest of the pandemic period, in which the whole education system was inclined to turn towards full online teaching, has passed away, but not without consequent great change in teaching behaviors. Homework experience is yet generalized, and not limited to a restricted number of individuals and institutions in some specific domains. However, in the education, fears of COVID-19 being moderate with time, allowed a bold comeback to classroom. Hence, shall the education sector reject easily all the benefits of the online generalized experience taking over the education system all along the previous period?

The present paper's results showed positive impact of both

education modes on teaching performance, with greater impact of online teaching mode, marked by a notable influence of online and offline' technical issues on teaching performance. These outcomes let to think that education system's practices should be revisited to move progressively towards a combined mode of education in order to benefit from the technical advancements in communication and educational tools in terms of flexibility for all education stakeholders.

In these regards, future work will tackle herewith highlighted limitations of online and offline courses, in a tentative manner to make corrective measures allowing to establish a comprehensive combined system management to assure a fully integrated and homogeneous learning whatever is the teaching mode.

In such perspective, coming work will open the way for more worldwide-developed studies to enlighten the academic deciders to the determinant factors of teaching performance in both educational modes, in a way to consider them in choosing the convenient education system either to enhance performance in future normal circumstances or to avoid total paralysis in case of pandemics or any other kind of crisis.

Appendix

Table 4. List of all variables and abbreviations.

Construct	Item	Description
Teacher background – TB		
Teaching experience	Texp	Teaching experience (years' number)
Familiarity with IT – FIT		Familiarity with electronics, digital and IT tools
	Flap_1FIT	Familiarity with laptop
	FPC_2FIT	Familiarity with personal computer
	Fmob_3FIT	Familiarity with mobile phone
	Ftab_4FIT	Familiarity with I-pad / tablet
Familiarity with social media – FSM		Familiarity with technology and social media
	FTSM_1FSM	Easiness
	FSE_2FSM	Search engines (Google, altavista,...)
	FT_3FSM	Teams
	FZ_4FSM	Zoom
	Fcom_5FSM	WhatsApp / Viber / Emo / messenger,...
	Ffac_6FSM	Facebook
Online Classes Advantage – OCA		
Online Effectiveness – OEFF		Online classes are more effective than classroom teaching mode
	OSLMF_1OEff	Students learn more and faster
	OLRR_2OEff	Retention rates are lesser
	OFAss_3OEff	Allow frequent assessments
	OFFF_4OEff	Feedback is faster and frequent
	OISAE_5OEff	Increase search of methods and activities to engage students
	OPCCC_6OEff	Enhance administrative control of punctuality and courses content
Online Convenience – OC		
	OLTI_1OConv	Require lesser time investment]
	OTCS_2OConv	Teachers have more control over schedule
	OTNBG_3OConv	Teachers are not bound by geography
	ORCCR_4OConv	Reduce contact and contagious risk
	OFWWW_5OConv	Flexibility to work whenever and wherever
	OCT_6OConv	Costless in transportation
Online practicality – OPRAC		
	OPGSI_1OPrac	Create parallel discussion group by class to share information and documents with students
	OSDTU_2OPrac	Online classes save displacement time to university
	OSCPT_3OPrac	Online classes save courses' preparation time

Construct	Item	Description
Online Platform – Oplat	ORCAR_4OPrac	Online courses require continuous adaptation and readiness
	OPUT_Oplat	Online teaching platform and facilities are mainly controlled by university or afforded by teachers
Online classes technical platform – OCTP	OITM_1OCTP	Online classes help teachers to use innovative teaching methods
	OEUDD_2OCTP	Easy use of documents downloaded online
	OETIT_3OCTP	Online courses enhance teachers IT knowledge
	ODNCApp_4OCTP	Online courses allow discovering newest communication apps
	OFCT_5OCTP	Technology use allows teachers to focus on their core tasks
	OSTR_6OCTP	Technology use allows save time and resources
Online classes disadvantages due to COVID – OCD In online courses teacher doesn't lead the class – OCNLC	ONCIA_1OCNLC	No possibility to control students' attention, interaction and assiduity
	ONIS_2OCNLC	No interaction with students
	ONIGL_3OCNLC	No Interaction in group lessons
	ONWFtF_4OCNLC	Lacks the warmth of face to face Interaction
Online courses increase teachers' responsibility – OTR	ONSSM_1OTR	Online classes are not safe and secure method
	ONP_2OTR	Sharing publicly teachers and students' names is passing on privacy
	OCSI_3OTR	Teachers should be careful of what to share of information with students
	OCR_4OTR	Recording courses arise teachers' responsibility
Technical challenges of online courses – OTC	ONFSS_1OTC	No faculty structure and support
	ODDG_2OTC	Difficulty to draw graphics on the spot
	OMST_3OTC	Online teaching means more screen-time
	OUHS_4OTC	Unsuitable for hands-on-fields
	ODCT_5OTC	Big deal to choose right technology and apps
	OIID_6OTC	Online courses are interrupted by internet disconnection
	ODES_7OTC	Online courses can't be performed with electricity shortage
Online courses are exhausting because – OEX	ONRTC_1OEX	No way to permit rest time in class
	ONITSS_2OEX	Lack of interaction time space with students
	OCSCP_3OEX	Continuously speaking all along the class period
	ODCLP_4OEX	Difficult to keep classes for longer duration
	ONSF_5OEX	No way to observe face to face students feedback
	OLSH_6OEX	Students show lack of interest and involvement during online classes
	OBLI_7OEX	Require a bigger load of information to fill the class time
	OLTCP_8OEX	Require larger time to prepare comprehensive courses
	OETSI_9OEX	Need extra time self investment
Online classes are boring – OB	ONC_1OB	Courses are narrative and lack of on-board presentation
	OLEM_2OB	Feel lack of enthusiasm and motivation to make online classes
	OS_3OB	Bounded in houseroom is stressful
	ONDSTI_4OB	No space for distraction topics and issues
	OFSBS_5OB	Addressing fictive students behind screens
Teachers get easily distracted during online classes by – OED	OTDSM_1OED	Social media
	OTDT_2OED	Texting
	OTDFV_3OED	Family and visitors
	OTDPC_4OED	Phone calls
	OTDTI_5OED	Technical issues disrupt the flow and pace of online classes
Online classrooms quality assurance disadvantages – OCQAD	ODMST_1OCQAD	Difficulty to meet standards of teaching
	ONCQAR_2OCQAD	No possibility to control quality assurance requirements
	OTNP_3OCQAD	Online courses tend to focus on theory rather than practice
	OLITDT_4OCQAD	Lack of personal computer skills cause difficulties in online teaching
	ODUB_5OCQAD	Difficulty to use books for course support
	OLSD_6OCQAD	Lack of self-discipline to deliver the course
	ODCES_7OCQAD	Difficulty to control exams and quiz cheatings
	ODCAC_8OCQAD	Difficulty to assess the reliability of students excuses of not attending classes
	OAUC_9OCQAD	The administration of the university is closed during COVID19 period
Classroom Advantages – CRA		
Back to classroom teaching advantages in COVID period – BCRA		

Construct	Item	Description
Classroom Disadvantages – CRD Back to classroom teaching disadvantages in COVID period – BCRD	BCRSEA_1BCRA	Students are more engaged and accountable
	BCRBAA_2BCRA	Better assessment of students' assiduity and attention
	BCRER_3BCRA	Classroom enhances teaching responsibility
	BCREDSS_4BCRA	Classroom enhance direct support to students
	BCRGRS_5BCRA	Classroom allows good relationship with students
	BCREIS_6BCRA	Face to face enhances interaction with students
	BCRCT_7BCRA	Classroom promotes collaborative teaching and knowledge transfer
	BCRNAMO_8BCRA	Not all majors can be taught online
	BCREAL_9BCRA	Easy access to libraries and research materials
	BCRECA_10BCRA	Classroom promotes extra-curricular activities
	BCRNRF_11BCRA	Stop recording courses allow freedom and liberty of expression
	BCRANAS_12BCRA	Classroom teaching allows teachers addressing non awakened students
	BCRBP_13BCRA	Classroom teaching hours are paid better than online hours
With back to classroom teaching	BCRSP_1BCRD	Difficult to follow COVID-19 safety protocols
	BCRMP_2BCRD	Difficult to teach with mask on face
	BCRNSD_3BCRD	No sufficient space to respect social distancing norms
	BCRMF_4BCRD	Difficult to support mask on face all classroom time
	BCRACP_5BCRD	Administration control and pressure increase with classroom teaching
Teaching performance in COVID context – TPCOV Teaching performance in COVID context (Positive) – TPCOV+	BCRLT_6BCRD	Teachers loose technology tools
	BCRLFSM_7BCRD	Teachers loose familiarity with social media
	BCRLECS_8BCRD	Teachers loose easiness of contact with students
	BCRLCOT_9BCRD	Teachers loose class organization tools
	BCRLAAR_10BCRD	Teachers loose automatic attendance registering
	BCRLSCR_11BCRD	Teachers loose saving courses through recording app
	BCRLTST_12BCRD	Teachers loose time saving technology tools
	BCRLFSC_13BCRD	Teachers loose flexibility in scheduling classes
Teaching performance in COVID context (Negative) – TPCOV-	BCRLOM_14BCRD	Teachers loose tools of online chat, discussion forums, online meetings
	TPRETA_1TPCOV+	Recording courses arise teachers' awerness
	TPHITM_2TPCOV+	Online classes help teachers to use innovative teaching methods
	TPECTSW_3TPCOV+	Online classes enhance consciousness about teachers' skills and weaknesses
	TPLP_4TPCOV+	Online classes allow larger productivity in teaching period
	TPSDT_5TPCOV+	Online courses save distraction time of normal classes
	TPCF_6TPCOV+	Online courses require continuous formation to formator sessions
	TPQOTM_7TPCOV+	Online courses require quitting oldest teaching methods
OC/CR performance, personal opinion, PO	TPCCR_8TPCOV+	Online courses require continuous courses content refreshment
	TPDDSLTS_1TPCOV-	Difficulty to deliver same length of teaching session
	TPLGA_2TPCOV-	Low grades achievements because of COVID19 online learning
	TPDLRLAP_3TPCOV-	Digital learning tools are responsible for low academic performance
Impact on teaching performance (personal opinion) – ITPPO	TPFFBAA_4TPCOV-	Face-to-face interaction contributes to boost students' academic achievement
	OCTP_1PO	In your opinion, during COVID19 period, have online courses improved or decreased teaching performance?
	OCC RTP_1PO	In your opinion, do online or classroom courses have better impact on teaching performance?
	FOCCRCOV_1PO	After your experience, are you in favor of online or classroom teaching, during COVID19 period?
		In your opinion, who is mainly responsible of the improvement of online teaching performance?
Conditions to improve online classrooms teaching Performance – COCTP	ME_1ITPPO	Ministry of education
	AI_2ITPPO	Academic institutions
	T_3ITPPO	Teachers
	S_4ITPPO	Students
	HTC_5ITPPO	High-tech companies
	RCC_1COCTP	In your opinion, what should be made to improve online teaching performance?
		Redesign curriculum's content

Construct	Item	Description
Preference to teaching modes during COVID19 period – PTMDCOV	NTM_2COCTP	Introduce new teaching methodology
	FSHT_3COCTP	Do formation sessions to familiarize with high-Tech
	HFWC_4COCTP	Assure high and for free wifi connection
	TOCT_5COCTP	Add more teaching options to communication tools
	CTF_6COCTP	Render communication tools more friendly
	IOCCSE_7COCTP	Innovative options in communication tools to assure control on students' engagement and conduct
Preference to teaching modes after COVID19 period – PTMACOV	OC_1PTMDCOV	Express your preference to each of the teaching modes during COVID19 period.
	CR_2PTMDCOV	Online courses
	C_3PTMDCOV	Classroom courses
		Combination of online and classroom
	OC_1PTMACOV	Would you prefer to continue with online, classroom or a combination mode after COVID19 period?
	CR_2PTMACOV	Online courses
	C_3PTMACOV	Classroom courses
		Combination of online and classroom

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