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Multitasking behavior in online classrooms and academic performance: case of university students in Ecuador during COVID-19 outbreak

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Abstract

Purpose – This paper aims to explore university students' multitasking behavior in online classrooms and their influence on academic performance. Also, the study examined students' opinions.

Design/methodology/approach – A total of 302 university students fulfilled an online survey. Ten questions were focused on demographic information, five items evaluated online class behavior of students, 9 items evaluated self-efficacy and four items measured academic performance.

Findings – Multitasking behavior was found to negatively influence self-efficacy of −0.332, whereas self-efficacy showed a positive influence of 0.325 on academic performance. Cronbach's alpha and average variance extracted values were 0.780 and 0.527 (multitasking behavior), 0.875 and 0.503 (self-efficacy), 0.781 and 0.601 (academic performance). Outcomes of the bootstrapping test showed that the path coefficients are significant.

Originality/value – The research findings may help university managers understand undergraduates' online and face-to-face behavior and strategies to improve the behavior to ensure the best academic outcomes. The novelty is based on using the partial least square structural equation modeling technique.

Keywords Self-efficacy, Academic performance, Multitasking behavior, Online classrooms, COVID-19, Ecuador

Paper type Research paper

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Introduction

The use of technology in educational activities has generated various educational opportunities that have facilitated university students' remote learning (Heflin *et al.*, 2017; Hamidi and Chavoshi, 2018).Students reportedly review their social media, various

e-mails and believe they are efficient in displaying multitasking behavior (Brasel and Gips, 2011; Wammes *et al.*, 2019). Previous research showed that it is more efficient to carry out each academic activity separately than all at the same time (May and Elder, 2018; Herrmann *et al.*, 2020); also, multitasking has evidenced that it generates alteration in the social interaction of students (Xu *et al.*, 2016). Specifically, it has been shown that students in face-to-face classes that use technology in an uncontrolled way will have poor academic performance (Carter *et al.*, 2017; Ravizza *et al.*, 2017; Patterson and Patterson, 2017). Despite this, multitasking behavior in virtual environments may differ from that manifested in class, facilitated by the greater use of technology as part of daily learning activity (Manwaring *et al.*, 2017).

COVID-19 and its influence on online education

Coronavirus disease 2019 (COVID-19) is an infectious disease of pandemic dimensions, with approximately 40,000,000 cases and 1.1 million deaths reported worldwide as of October 18, 2020 (WHO, 2020). One of the preventive measures established to avoid contagion was social isolation (MacIntyre, 2020; Salathé *et al.*, 2020). This situation has led universities to implement online classes to continue developing their study schedules (Bao, 2020), generating readjustments in developing the classes (Rapanta *et al.*, 2020; Farooq *et al.*, 2020), which origin that students have a different behavior about the Internet, possibly exacerbating multitasking behaviors could ultimately influence their academic performance. This aspect has increased during the COVID-19 outbreak, where virtual classes have taken a leading role in universities and are expected to be the only path for 2020 (Bao, 2020; Basilaia and Kvavadze, 2020). Given the situation, students will have to spend many hours in front of computers to be able to attend classes and have to perform new tasks that are virtual, although it has been shown that university students tend to spend a significant amount of time in non- academic activities (Hall *et al.*, 2020).

Knowing the main actions that students take during online classes in times of the COVID-19 pandemic is essential to assess the usual distraction in their classes and see how these distractions can be dealt with later by teachers. On the other hand, knowing the impact of those behaviors that are not focused on virtual classes is useful to demonstrate that more multitasking behavior would generate less self-efficacy for self-regulated learning. Finally, self-efficacy for self-regulated learning is the variable that influences academic performance, and it is critical to corroborate this influence since educational institutions offer various communication tools for students, which are added to the previous ones they already used and that they would finally generate an affectation in the academic performance. This study is the first Latin American study to be carried out in pandemic times, and that uses second-generation statistical analyzes such as the partial least square structural equation modeling for estimates.

For this reason, the present study seeks to show the impact of multitasking behavior through self-efficacy for self-regulated learning on academic performance.

Research model

Figure 1 presents the research model in which the relationship between the study variables is seen. Also, it shows that multitasking behavior can positively affect academic performance, but it seeks to prove that the complete path connecting both variables is through self-efficacy for self-regulated learning as a mediating variable.

As described in the research model, the following hypotheses are presented:

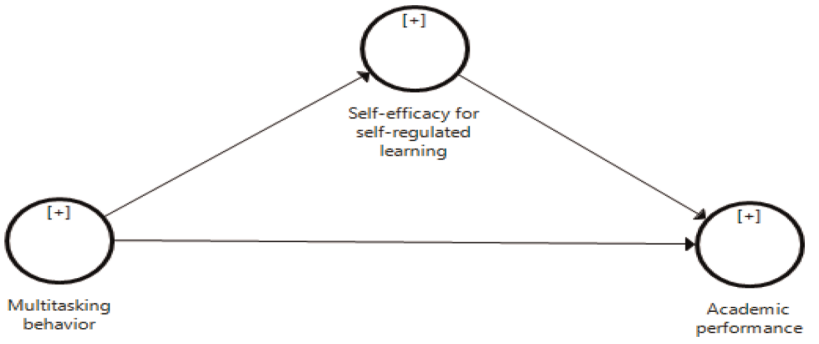

Figure 1.
Research model

H1. The multitasking behavior has a negative effect over self-efficacy for self-regulated learning.

H2. The self-efficacy for self-regulated learning has a positive effect over academic performance.

Literature review

Multitasking

The term is used to describe circumstances in which the human mind divides attention between 2 or more tasks at once. In other words, multitasking consists of a group of verbs in the way "A.ing" while "B [. . .] ing" (sendingWhatsApp message while solving academic exercises) (Aagaard, 2019).

Before the Internet's massification, multitasking in the classroom consisted of attending to the teacher's explanation while completing a task for another subject, sending written notes to other classmates, and discussing other non-academic topics. Nowadays, multitasking includes the involvement in more than one media platform (e.g. surfing Instagram, Twitter and Facebook, while listening to music on Spotify and creating diagrams with Jamboard); in addition, it has the multitasking blend that consists of performing non-media actions and media actions simultaneously as cell phoning and texting while driving (Telemaque and Madueke, 2015).

Multitasking and academic performance

Although the current world requires us to be connected to information, it has been reported that multitasking behavior tends to impact learning effectiveness (Hawi and Samaha, 2016; Reinhold *et al.*, 2020). In this way, daily and classroom use of instant messaging has been recognized as the most common simultaneous activity (Deng *et al.*, 2019), which generates a distraction and less learning. Evidence between multitasking behavior and academic performance in face-to-face contexts exists (Junco, 2012; Lau, 2017; Demirbilek and Talan, 2018; Uzun and Kilis, 2019), but there are minimal reports that compare multitasking in face to face versus online environments.

Self-efficacy for self-regulated learning

This term is defined as the confidence that a student must use different self-regulation strategies to succeeding academic activities (Bandura, 2006; Putarek and Pavlin-Bernardić, 2019). These activities include attending instruction from teachers, processing and integrating the knowledge received, rehearsing information to be remembered, and developing and maintaining positive beliefs about one's learning abilities and the expected results of actions (Schunk and Rice, 1989). Likewise, it is possible to recognize the great importance of self-regulated learning for institutions as the case reported at Mason University where the effect of a curriculum orientation program was successfully tested to increase the university retention rate and academic performance, finally showing that influencing self-regulated learning can generate better academic performance (Cambridge-Williams *et al.*, 2013).

Self-efficacy for self-regulated learning and academic performance

There are efforts to improve self-efficacy for self-regulated learning to consider the direct relationship with performance (Zhang, 2015).It is worth mentioning that online courses need more self-management than is necessary for face-to-face courses. Therefore, self-regulated behaviors and self-efficacy play a significant role in online learning environments. It has been found that there is a positive correlation between self-efficacy and academic performance at different levels and types of professional career (Agustiani *et al.*, 2016; Wilson and Narayan, 2016; Jung *et al.*, 2017; Cleary and Kitsantas, 2017; Müller and Seufert, 2018; Hayat and Shateri, 2019).

Despite the evidence presented, very few studies have compared multitasking behaviors in face-to-face classrooms and online classrooms. Also, the study's novelty is to evaluate this relationship of variables using the Partial least square structural equation modeling technique.

Research methods

Instruments

The questionnaire consisted of two sections. The first part collected socio-demographic information from university students, second with questions based on the instruments developed by Alghamdi *et al.* (2020) and Yu *et al.* (2010) to evaluate multitasking and self-efficacy for self-regulated learning and academic performance. The original items were translated and adapted linguistically. The section related to multitasking consisted of five items, self-efficacy for self-regulated learning with nine items, and academic performance with four items. All the items are assessed through a Likert-type scale of five response options (From 1 = completely disagree to 5 = completely agree). In the current study, the origin of the scales is according to Table 1.

Sample

Once the questionnaire was completed, it was established to collect the data from university students from Ecuador through a non-probabilistic sampling considering participants by online questionnaire collection between May 6 – May 28. It was considered for collect data to apply the questionnaire to university students who agreed to participate in the study by click in alternative yes/no which asked I have freely decided to participate in the study, "I understand that my participation is voluntary" and "I have received information about the objectives of the study".

As inclusion criteria, students from universities in Ecuador and studying business-related careers were considered. Students in general studies cycles (cycle one and cycle two) were considered exclusion criteria.

Variable	Item	Reference
Multitasking	*Participation in 100% online classes*	Alghamdi *et al.* (2020)
	When I am in online classes, I communicate through social networks	
	When I am in online classes, I watch TV or videos	
	When I am in online classes, I see non-academic topics on the Internet	
	When I am in online classes, I play video games	
	When I am in online classes, I chat with friends	
Self-efficacy for self-regulated learning	I can concentrate on university subjects	Zimmerman *et al.* (1992)
	I can take class notes of class	
	I can use the library to get information for class assignments	
	I can plan my university work	
	I can organize my university work	
	I can remember information presented in class and textbooks	
	I can arrange a place to study without distractions	
	I can motivate myself to do university work	
	I can participate in class discussions	
Academic performance	I am confident about the adequacy of my academic skills and abilities.	Yu *et al.* (2010)
	I feel competent conducting my course assignments.	
	I have learned how to successfully perform my coursework in an efficient manner.	
	I have performed academically as well as I anticipated I would	

Table 1.
Variables indicators

The data collected were tabulated and analyzed using the statistical programs SPSS version 26 and SmartPLS version 3.3.2. The data quality would be monitored, ensuring the originality of the source, and discarding incomplete questionnaires. The sample consisted of 302participants, 197 men (65.2%), and 105 women (34.8%), ranging between 18 and 29 years. The average age was 22.53, with a standard deviation of 8.74 years.

Analysis of data

The analysis of the data was carried out in two stages. In the first stage, each subscale's internal consistency was evaluated using Cronbach's alpha reliability coefficient. This coefficient indicates the degree of internal consistency between the items when their values are higher than 0.707.Also, the instrument's construct validity was established through the factorial analysis of principal components with varimax rotation. In the second stage, the questionnaire was validated using structural equations of variance with partial least squares (SEM-PLS). The SmartPLS statistical package version 3.3.2 (Ringle *et al.*, 2015) was used to determine to construct and discriminant validity and internal consistency through composite reliability.

When a PLS model is used, the indicators' reliability is assessed by examining each indicator's loads and their dimension, accepting as reliable those loads that were higher than 0.50. Another measure used to analyze the fit of the model is the average extracted variance that provides the variance that a construct (dimension) obtains from its indicators about the error variance. A good fit requires values higher than 50%. Finally, the questionnaire's discriminant validity was established applying the Fornell–Larcker criterion (Fornell and Larcker, 1981). This criterion indicates that the square root of variance extracted must be greater than the correlations presented with the rest of the subscales.

Results

Validity and reliability

Before determining the instrument's validity and reliability, a descriptive analysis of the items and scales was carried out through the mean, standard deviation, asymmetry, and kurtosis (see Table 2). Likewise, the absence of collinearity was corroborated with the variance inflation factors values, which are less than 5.

Reliability

The scales of multitasking behavior, self-efficacy for self-regulated learning, and academic performance presented reliability coefficients (Cronbach's alpha) higher than the expected minimum of (0.5) in the exploratory analysis (see Table 3).

Validation with SEM-PLS

To verify the validity of the instrument with the technique of structural equations of variance with partial least squares, the procedure named the measurement model was used, which includes the reliability analysis of each indicator, the internal consistency of each dimension (composite reliability), the analysis of the average variance extracted and the discriminant validity.

Items – scales	Mean	SD	VIF	Asymmetry	Kurtosis
P1	2.394	1.207	1.465	0.636	−0.374
P2	1.384	0.634	1.489	1.813	4.099
P3	1.656	0.910	1.363	1.531	2.177
P4	1.162	0.549	1.305	4.652	25.647
P5	2.139	1.026	1.548	0.789	0.247
P6	3.149	0.672	1.712	−0.252	−0.545
P7	3.291	0.710	1.499	−0.768	0.337
P8	2.656	0.884	1.386	−0.162	−0.689
P9	2.993	0.690	2.535	−0.355	0.155
P10	3.113	0.681	3.145	−0.461	0.299
P11	2.950	0.710	1.892	−0.319	−0.011
P12	2.891	0.837	1.806	−0.337	−0.516
P13	3.053	0.717	2.057	−0.350	−0.204
P14	2.808	0.828	1.472	−0.227	−0.547
P15	3.752	1.014	1.347	−0.924	0.597
P16	3.957	0.911	2.151	−1.157	1.547
P17	3.921	0.810	2.230	−1.244	2.771
P18	3.940	0.778	1.337	−0.912	1.863

Table 2. Descriptive statistics: Mean, standard deviation, asymmetry and kurtosis of the items and scales

Scales	N° of items	Cronbach's Alpha	Range of relations item – scale
Multitasking behavior	5	0.721	0.612 – 0.778
Self-efficacy for self-regulated learning	9	0.875	0.590 – 0.823
Academic performance	4	0.781	0.631 – 0.855

Table 3. Reliability of scales: Analysis of internal consistency

Compound reliability

An acceptable level of composite reliability must be greater than 0.707. The coefficients of reliability composed of the different sub-scales of the instrument oscillate between 0.816 and 0.900 (see Table 4). Overall, the values obtained in the three sub-scales confirm the reliability of the questionnaire.

Discriminant validity using SEM-PLS

Fornell-Larcker criterion (Fornell and Larcker, 1981) was used to establish the sub-scales' discriminant validity. This criterion showed that the variance extracted square root must be greater than the correlations presented by one sub-scale with the rest of the sub-scales. Table 5 shows compliance with this criterion in all subscales (diagonals between parentheses), demonstrating the discriminant validity of the instrument analyzed.

Bootstrapping

Finally, the Bootstrapping Technique (5,000 times) is a non-parametric procedure that was applied to test if the path coefficients (beta) are significant (Streukens and Leroi-Werelds, 2016). According to Table 6, all values are significant ($p < 0.01$).

Also, through the calculation of the size of the effect (F^2) (Table 7), it was established that the Multitasking behavior has an inverse effect on academic performance ($F^2 = -0.073$), multitasking behavior has a significant inverse effect on self-efficacy for self-regulated learning

Table 4.
Construct validity of the items of the scales by means of structural equations of variance using partial least squares

Scale – Items	Factorial weight	Composite reliability	Extracted variance
Multitasking			
When I am in online classes, I communicate through social networks	0.612		
When I am in online classes, I watch TV or videos	0.702		
When I am in online classes, I see non-academic topics on the Internet	0.718		
When I am in online classes, I play video games	0.612		
When I am in online classes, I chat with friends	0.778	0.816	0.509
Self-efficacy for self-regulated learning			
I can you concentrate on university subjects	0.640		
I can you take class notes of class	0.577		
I can you use the library to get information for class assignments	0.766		
I can you plan my university work	0.823		
I can you organize my university work	0.717		
I can you remember information presented in class and textbooks	0.721		
I can you arrange a place to study without distractions	0.777		
I can you motivate myself to do university work	0.590		
I can you participate in class discussions	0.726	0.900	0.502
Academic performance			
I am confident about the adequacy of my academic skills and abilities	0.631		
I feel competent conducting my course assignments	0.827		
I have learned how to successfully perform my coursework in an efficient manner	0.855		
I have performed academically as well as I anticipated I would	0.770	0.856	0.601

($F^2 = -0.211$), and self-efficacy for self-regulated learning has a significant direct effect on academic performance ($F^2 = 0.347$).

Figure 2 shows the research model tested. As previously reported, it has been confirmed that multitasking behavior has a negative effect on self-efficacy for self-regulated learning. At the same time, it was shown that self-efficacy for self-regulated learning has an effect on the academic performance of students.

Test of hypothesis

H1 (*H1*): The multitasking behavior has a negative effect over self-efficacy for self-regulated learning.

The multitasking behavior has a negative effect of −0.186 over self-efficacy for self-regulated learning. The multitasking behavior explains 3.5% of self-efficacy for self-regulated learning.

H2 (*H2*): The self-efficacy for self-regulated learning has a positive effect over academic performance.

Table 5. Discriminant validity of Sub-scales using the Fornell-Larcker criterion

Scales	Academic performance	Multitasking behavior	Self-efficacy for self-regulated learning
Academic performance	*(0.775)*		
Multitasking behavior	−0.109	*(0.687)*	
Self-efficacy for self-regulated learning	0.330	−0.186	0.709

Table 6. Significance of trajectory coefficients (beta)

Scales	Original sample	Mean sample	SD	*t*-statistic	P
Multitasking behavior → Self-efficacy for self-regulated learning	−0.186	−0.211	0.056	3.345	0.001
Self-efficacy for self-regulated learning → Academic performance	0.330	0.347	0.059	5.599	0.000

Notes: Bootstrapping technique (5,000 times) using SmartPLS. p value < 0.01
Source: 302 questionnaires to university students

Table 7. Effect size of the coefficients (beta)

Scales	F^2 Original sample	F^2 Mean sample	SD	*t*-statistic	P
Multitasking behavior → Academic performance	−0.062	−0.073	0.023	2.683	0.007
Multitasking behavior → Self-efficacy for self-regulated learning	−0.186	−0.211	0.056	3.345	0.001
Self-efficacy for self-regulated learning → Academic performance	0.330	0.347	0.059	5.599	0.000

Notes: Bootstrapping technique (5 000 times) using Smart PLS. p value < 0.01
Source: 302 questionnaires to university students

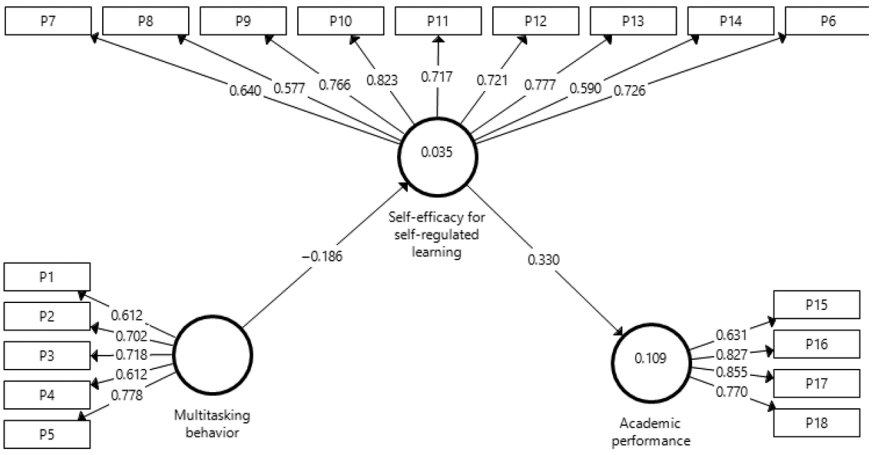

Figure 2.
Research model tested

The self-efficacy for self-regulated learning has a positive effect of 0.330 on academic performance. The self-efficacy for self-regulated learning explains 10.9% of academic performance.

Discussion

The present study's objective was to test the model of multitasking, self-efficacy for self-regulated learning, and academic performance among university students in Ecuador. Discriminant validity and reliability (internal consistency – Cronbach's alpha coefficient and composite reliability) were verified. The results obtained show that the questionnaire results are valid, reliable, and statistically relevant in the application. As verified in previous studies, the scales that make up the questionnaire showed reliability and validity.

It has been possible to verify what Deng (2020) describes as the influence that the use of laptops and mobile phones has had on self-study time. The distracting factors found in the development and use of the online classes in this study are similar to those previously reported: social media (Guinness *et al.*, 2018; Uzun and Kilis, 2019; Law and Stock, 2019; Wammes *et al.*, 2019; Rodriguez-Triana *et al.*, 2020) and smartphone usage (Guinness *et al.*, 2018; Hayashi and Nenstiel, 2019; Kim *et al.*, 2019; Rojas-Osorio and Alvarez-Risco, 2019; Larkin and Hein, 2018).The results are also similar regarding the effect of multitasking on academic performance (Lepp *et al.*, 2015; Frimpong *et al.*, 2016; Le Roux and Parry, 2017; Uzun and Kilis, 2019; Karim *et al.*, 2019; Glass and Kang, 2019; Rodriguez-Triana *et al.*, 2020).

This topic is very relevant because social isolation is officially a preventive measure against COVID-19. The schools and universities have changed their face-to-face classes to virtual classes. This change is significant that this has meant for both teachers and students. In this context, the students' behavior was transformed and the use of the Internet as an informal utilizing synchronous connection of 2–3 hours for each subject and then obtain information and develop activities on educational platforms. However, the multitasking report during face-to-face classes has been reported in the literature with a negative relationship with students' self-regulation capacity to adapt to learning, and self-regulation capacity for learning has had a positive relationship with academic performance. The online classes report has evidenced a similar relationship between the study variables; however, these reports were made in students who have had some online classes alternated with face-to-face classes. The current circumstance has led

many students to receive 100% of their classes online, so it is an entirely new situation and generates a series of student behavior changes.

Connection times are now longer and are shared between conversations of academic assignments and personal conversations, so there is a much greater connection time for students, affecting the self-regulation capacity of learning. Considering the change in the time of use of the Internet by students, it is necessary to show that the relationship between multitasking and self-regulation continues to be negative. In other words, being connected to virtual classes and at the same time communicating through social networks, watch videos, see non-academic topics on the Internet, play video games and chat with friends hurts students in their ability to fulfill their academic tasks and, therefore, in their academic performance. The more significant Internet connection time, due to online classes, could generate a greater chance of being distracted; however, there may also be cases where students reduce communication time in non-academic subjects to prioritize their university tasks.

Conclusions and futures studies

The current study's main contribution is to understand the impact of multitasking behavior, which is usually promoted to be an efficient student. Another contribution is related to having a questionnaire validated that can be adapted and used in other students in different countries by education centers to measure the influence of multitasking behavior and guide their students to optimize the use of the Internet. The importance of the methodology used since, due to the social isolation in Ecuador, the research had to be carried out precisely by online surveys, which may generate a variation in the respondents' responses. Another aspect that also affected work is that many people were at home studying remotely due to isolation. It can be understood that multitasking skills are valuable and promoted to carry out many activities simultaneously, but that changes when learning processes are involved. These results must be taken by universities to develop strategies that allow the most efficient use of the Internet by their students to achieve better academic performance. More studies in other countries are required to show if similar results are presented and can be taken as a reference for implementing specific plans to optimize academic performance.

References

Aagaard, J. (2019), "Multitasking as distraction: a conceptual analysis of media multitasking research", *Theory and Psychology*, Vol. 29 No. 1, pp. 87-99.

Agustiani, H., Cahyad, S. and Musa, M. (2016), "Self-efficacy and self-regulated learning as predictors of students academic performance", *The Open Psychology Journal*, Vol. 9 No. 1.

Alghamdi, A., Karpinski, A.C., Lepp, A. and Barkley, J. (2020), "Online and face-to-face classroom multitasking and academic performance: moderated mediation with self-efficacy for self-regulated learning and gender", *Computers in Human Behavior*, Vol. 102, pp. 214-222.

Bandura, A. (2006), "Guide for constructing self-efficacy scales", *Self-Efficacy Beliefs of Adolescents*, Vol. 5 No. 1, pp. 307-337.

Bao, W. (2020), "COVID - 19 and online teaching in higher education: a case study of Peking university", *Human Behavior and Emerging Technologies*, Vol. 2 No. 2, pp. 113-115.

Basilaia, G. and Kvavadze, D. (2020), "Transition to online education in schools during a SARS-CoV-2 coronavirus (COVID-19) pandemic in Georgia", *Pedagogical Research*, Vol. 5 No. 4, pp. 1-9.

Brasel, S.A. and Gips, J. (2011), "Media multitasking behavior: concurrent television and computer usage", *Cyberpsychology, Behavior, and Social Networking*, Vol. 14 No. 9, pp. 527-534.

Cambridge-Williams, T., Winsler, A., Kitsantas, A. and Bernard, E. (2013), "University 100 orientation courses and living-learning communities boost academic retention and graduation via enhanced

self-efficacy and self-regulated learning", *Journal of College Student Retention: Research, Theory and Practice*, Vol. 15 No. 2, pp. 243-268.

Carter, S.P., Greenberg, K. and Walker, M.S. (2017), "The impact of computer usage on academic performance: evidence from a randomized trial at the United States military academy", *Economics of Education Review*, Vol. 56, pp. 118-132.

Cleary, T.J. and Kitsantas, A. (2017), "Motivation and self-regulated learning influences on middle school mathematics achievement", *School Psychology Review*, Vol. 46 No. 1, pp. 88-107.

Demirbilek, M. and Talan, T. (2018), "The effect of social media multitasking on classroom performance", *Active Learning in Higher Education*, Vol. 19 No. 2, pp. 117-129.

Deng, L. (2020), "Laptops and mobile phones at self-study time: examining the mechanism behind interruption and multitasking", *Australasian Journal of Educational Technology*, Vol. 36 No. 1, pp. 55-67.

Deng, L., Ku, K.Y.L. and Kong, Q. (2019), "Examining predictive factors and effects of in-class multitasking with mobile phones", *Interactive Technology and Smart Education*, Vol. 16 No. 1.

Farooq, A., Laato, S. and Islam, A.N. (2020), "Impact of online information on self-isolation intention during the COVID-19 pandemic: cross-sectional study", *Journal of Medical Internet Research*, Vol. 22 No. 5, p. e19128.

Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.

Frimpong, K.O., Asare, S. and Otoo-Arthur, D. (2016), "The effects of mobile phone usage on the academic performance of Ghanaian students, a case of Presbyterian University College Asante-Akyem campus", *International Journal of Innovative Research and Advanced Studies*, Vol. 3 No. 11.

Glass, A.L. and Kang, M. (2019), "Dividing attention in the classroom reduces exam performance", *Educational Psychology*, Vol. 39 No. 3, pp. 395-408.

Guinness, K.E., Beaulieu, L. and MacDonald, J.M. (2018), "Effects of technology breaks on media multitasking with college students", *Behavioral Interventions*, Vol. 33 No. 4, pp. 427-439.

Hall, A.C., Lineweaver, T.T., Hogan, E.E. and O'Brien, S.W. (2020), "On or off task: the negative influence of laptops on neighboring students' learning depends on how they are used", *Computers and Education*, p. 103901.

Hamidi, H. and Chavoshi, A. (2018), "Analysis of the essential factors for the adoption of mobile learning in higher education: a case study of students of the university of technology", *Telematics and Informatics*, Vol. 35 No. 4, pp. 1053-1070.

Hawi, N.S. and Samaha, M. (2016), "To excel or not to excel: strong evidence on the adverse effect of smartphone addiction on academic performance", *Computers and Education*, Vol. 98, pp. 81-89.

Hayashi, Y. and Nenstiel, J.N. (2019), "Media multitasking in the classroom: problematic mobile phone use and impulse control as predictors of texting in the classroom", *Current Psychology*, pp. 1-7.

Hayat, A.A. and Shateri, K. (2019), "The role of academic self-efficacy in improving students' metacognitive learning strategies", *Journal of Advances in Medical Education and Professionalism*, Vol. 7 No. 4, p. 205.

Heflin, H., Shewmaker, J. and Nguyen, J. (2017), "Impact of mobile technology on student attitudes, engagement, and learning", *Computers and Education*, Vol. 107, pp. 91-99.

Herrmann, K.J., Lindvig, K. and Aagaard, J. (2020), "Curating the use of digital media in higher education: a case study", *Journal of Further and Higher Education*, pp. 1-12.

Junco, R. (2012), "In-class multitasking and academic performance", *Computers in Human Behavior*, Vol. 28 No. 6, pp. 2236-2243.

Jung, K.R., Zhou, A.Q. and Lee, R.M. (2017), "Self-efficacy, self-discipline and academic performance: testing a context-specific mediation model", *Learning and Individual Differences*, Vol. 60, pp. 33-39.

Karim, S., He, H., Mallah, G.A., Laghari, A.A., Madiha, H. and Larik, R.S.A. (2019), "The impact of using Facebook on the academic performance of university students", *International Conference on Artificial Intelligence and Security*, Springer, Cham, pp. 405-418.

Kim, I., Kim, R., Kim, H., Kim, D., Han, K., Lee, P.H., Mark, G. and Lee, U. (2019), "Understanding smartphone usage in college classrooms: a long-term measurement study", *Computers and Education*, Vol. 141, p. 103611.

Larkin, T.L. and Hein, B.R. (2018), "24/7 Connectedness and its potential impact on today's physics students: technology use, multitasking, and GenMe", *International Journal of Engineering Pedagogy (IJEP))*, Vol. 8 No. 2, pp. 72-87.

Lau, W.W. (2017), "Effects of social media usage and social media multitasking on the academic performance of university students", *Computers in Human Behavior*, Vol. 68, pp. 286-291.

Law, A.S. and Stock, R. (2019), "Learning approach and its relationship to type of media use and frequency of media-multitasking", *Active Learning in Higher Education*, Vol. 20 No. 2, pp. 127-138.

Le Roux, D.B. and Parry, D.A. (2017), "In-lecture media use and academic performance: does subject area matter?", *Computers in Human Behavior*, Vol. 77, pp. 86-94.

Lepp, A., Barkley, J.E. and Karpinski, A.C. (2015), "The relationship between cell phone use and academic performance in a sample of US college students", *Sage Open*, Vol. 5 No. 1, p. 2158244015573169.

MacIntyre, C.R. (2020), "Case isolation, contact tracing, and physical distancing are pillars of COVID-19 pandemic control, not optional choices", *The Lancet Infectious Diseases*, Vol. 20 No. 10.

Manwaring, K.C., Larsen, R., Graham, C.R., Henrie, C.R. and Halverson, L.R. (2017), "Investigating student engagement in blended learning settings using experience sampling and structural equation modeling", *The Internet and Higher Education*, Vol. 35, pp. 21-33.

May, K.E. and Elder, A.D. (2018), "Efficient, helpful, or distracting? A literature review of media multitasking in relation to academic performance", *International Journal of Educational Technology in Higher Education*, Vol. 15 No. 1, p. 13.

Müller, N.M. and Seufert, T. (2018), "Effects of self-regulation prompts in hypermedia learning on learning performance and self-efficacy", *Learning and Instruction*, Vol. 58, pp. 1-11.

Patterson, R.W. and Patterson, R.M. (2017), "Computers and productivity: evidence from laptop use in the college classroom", *Economics of Education Review*, Vol. 57, pp. 66-79.

Putarek, V. and Pavlin-Bernardić, N. (2019), "The role of self-efficacy for self-regulated learning, achievement goals, and engagement in academic cheating", *European Journal of Psychology of Education*, pp. 1-25.

Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L. and Koole, M. (2020), "Online university teaching during and after the Covid-19 crisis: refocusing teacher presence and learning activity", *Postdigital Science and Education*, pp. 1-23.

Ravizza, S.M., Uitvlugt, M.G. and Fenn, K.M. (2017), "Logged in and zoned out: how laptop internet use relates to classroom learning", *Psychological Science*, Vol. 28 No. 2, pp. 171-180.

Reinhold, F., Hoch, S., Werner, B., Richter-Gebert, J. and Reiss, K. (2020), "Learning fractions with and without educational technology: what matters for high-achieving and low-achieving students?", *Learning and Instruction*, Vol. 65, p. 101264.

Ringle, C.M. Wende, S. and Becker, J.M. (2015), "SmartPLS 3', Boenningstedt: SmartPLS GmbH", available at: www.smartpls.com

Rodriguez-Triana, M.J. Prieto, L. Holzer, A. and Gillet, D. (2020), "Instruction, student engagement and learning outcomes: a case study using anonymous social media in a face-to-face classroom. IEEE transactions on learning technologies".

Rojas-Osorio, M. and Alvarez-Risco, A. (2019), "Intention to use smartphones among Peruvian university students", *International Journal of Interactive Mobile Technologies (Ijim)*, Vol. 13 No. 3, pp. 40-52, doi: 10.3991/ijim.v13i03.9356.

Salathé, M., Althaus, C.L., Neher, R., Stringhini, S., Hodcroft, E., Fellay, J., and Eckerle, I. (2020), "COVID-19 epidemic in Switzerland: on the importance of testing, contact tracing and isolation", *Swiss Medical Weekly*, Vol. 150 Nos 11/12, p. w20225.

Schunk, D.H. and Rice, J.M. (1989), "Learning goals and children's reading comprehension", *Journal of Reading Behavior*, Vol. 21 No. 3, pp. 279-293.

Streukens, S. and Leroi-Werelds, S. (2016), "Bootstrapping and PLS-SEM: a step-by-step guide to get more out of your bootstrap results", *European Management Journal*, Vol. 34 No. 6, pp. 618-632.

Telemaque, J.H.R. and Madueke, C.D.Z. (2015), "Cell phoning and texting while driving: multitasking ourselves to death", *SAGE Open*, Vol. 5 No. 3, p. 2158244015595089.

Uzun, A.M. and Kilis, S. (2019), "Does persistent involvement in media and technology lead to lower academic performance? Evaluating media and technology use in relation to multitasking, self-regulation and academic performance", *Computers in Human Behavior*, Vol. 90, pp. 196-203.

Wammes, J.D., Ralph, B.C., Mills, C., Bosch, N., Duncan, T.L. and Smilek, D. (2019), "Disengagement during lectures: media multitasking and mind wandering in university classrooms", *Computers and Education*, Vol. 132, pp. 76-89.

WHO (2020), "Coronavirus disease (COVID-19)", available at: www.who.int/docs/default-source/coronaviruse/situation-reports/20200928-weekly-epi-update.pdf?sfvrsn=9e354665_6

Wilson, K. and Narayan, A. (2016), "Relationships among individual task self-efficacy, self-regulated learning strategy use and academic performance in a computer-supported collaborative learning environment", *Educational Psychology*, Vol. 36 No. 2, pp. 236-253.

Xu, S., Wang, Z.J. and David, P. (2016), "Media multitasking and well-being of university students", *Computers in Human Behavior*, Vol. 55, pp. 242-250.

Yu, A.Y., Tian, S.W., Vogel, D. and Kwok, R.C.-W. (2010), "Can learning be virtually boosted? An investigation of online social networking impacts", *Computers and Education*, Vol. 55 No. 4, pp. 1494-1503, doi: 10.1016/j.compedu.2010.06.015.

Zhang, W. (2015), "Learning variables, in-class laptop multitasking and academic performance: a path analysis", *Computers and Education*, Vol. 81, pp. 82-88.

Zimmerman, B.J., Bandura, A. and Martinez-Pons, M. (1992), "Self-motivation for academic attainment: the role of self-efficacy beliefs and personal goal setting", *American Educational Research Journal*, Vol. 29 No. 3, pp. 663-676.

Further reading

Judd, T. and Kennedy, G. (2011), "Measurement and evidence of computer-based task switching and multitasking by'net generation' students", *Computers and Education*, Vol. 56 No. 3, pp. 625-631.

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