Digital multitasking during academic lectures: did the Covid-19 lockdown change the students' behavior?

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Abstract

This paper explores digital multitasking during lectures for university students, attending to the impact of the Covid-19 pandemic. Digital multitasking is conceptualized in this research as engaging in a digital task (T1) during academic lectures (T2). This paper has three main goals: 1. Analyze the variations in digital multitasking in three different moments – pre-pandemic (M1), during the lockdown (M2), and after the Covid-19 pandemic (M3); 2. Explore the purpose by which students engage in digital multitasking – exclusive educational (ED), exclusive non-educational (NED), and combined (COMB), combining educational and non-educational purposes; 3. Explore the digital resources – between 16 categories – used in multitasking during lectures and their relationship with the different purposes – ED, NED, and COMB. This quantitative research appeals to the survey and descriptive, comparative, and correlational analysis. Results show that multitasking during lectures is expected among university students and has changed with Covid-19 to a more educational purpose.

Keywords: Multitasking; digital resources; digital multitasking; Covid-19 pandemic; formal educative context; university students.

1. Introduction

The present article focuses on the good practices driven by the experience acquired during the Covid-19 pandemic to bring some light to educational changes. As technological development and digital resources have been the primary support during the pandemic and demanded the development of teaching and learning processes at a distance worldwide, it seems relevant to understand better how this might have changed individual habits in the formal educative context.

2. State-of-the-art

Technological integration requires a diversified collection of learning strategies supported by a learning management system (Tran & Meacheam, 2020), having multiple advantages – enhanced communication, network collaboration, quick and easy sharing, permanent access to materials, alternative types of resources, learning support, and technical skills (Legaree, 2015). Learning happens when the subjects establish connections between the information acquired from their learning networks, encompassing numerous sources and technological resources (Siemens, 2004). Without educational guidance and support during distance learning, regulating the learning process becomes essential for achieving learning goals (Kizilceca et al., 2017). Self-regulated learning skills – conscious thoughts, feelings, and behaviors regarding management and guidance to achieve personal goals (May & Elder, 2018) – are traduced by the relationship between cognitive, metacognitive, and motivational components during learning (Karlen, 2016). Systematical differences in students' efficiency are related to self-regulation strategies traduced by the understanding and application of metacognitive resources, appealing to active control over the learning process (Karlen, 2016).

With the spread of access to media, concerns have been growing about the potential negative impact of digital multitasking on students' academic performance (Alvarez-Risco et al., 2020). Multitasking involves simultaneously engaging in more than one task (Lau, 2017), and when appealing to technological devices, it's known as digital multitasking (Judd, 2013). Leysens et al. (2016) and May & Elder (2018) found negative relations between digital multitasking during lectures and academic performance. Wu (2017) found negative relationships between perceived attention problems and self-regulation strategies. During the Covid-19 lockdown, digital multitasking negatively influenced self-efficacy (Alvarez-Risco et al., 2020). In opposition, Legaree (2015) found no significant relationship between media multitasking and academic performance. Xu et al. (2016) noticed that digital multitasking could positively influence students' well-being, acting as a stress management strategy regarding the demandingness of academic responsibilities (Xu et al., 2016). The nature of the tasks encompassed might explain the divergent evidence regarding digital multitasking, the motivational factors of each student, the perceived ability to achieve goals, moderators of

attention, digital multitasking, and studying forms (May & Elder, 2018). In sum, digital multitasking relies mainly on context, individual metacognitive skills, and self-regulation abilities (May & Elder, 2018; Xu et al., 2016).

3. Methodology

This paper explores digital multitasking during lectures among university students, attending to the impact of the Covid-19 pandemic. Digital multitasking is conceptualized in this research as engaging in a digital task (T1) during academic lectures (T2).

This paper has three main goals:

1. To analyze digital multitasking between three moments – before Covid-19 (M1), during lockdown (M2), and after the pandemic (M3);
2. To explore the purpose by which students engage in digital multitasking – exclusive educational (ED), exclusive non-educational (NED), and combined (COMB), combining educational and non-educational purposes;
3. To explore the digital resources (16 categories) used in multitasking during lectures and their relationship with the different purposes – ED, NED, and COMB.

The quantitative study developed had data collected through the survey by an online questionnaire where the university students self-assess themselves in three moments, followed by descriptive, comparative, and correlational analysis regarding digital multitasking during academic lectures.

Three main dimensions are considered:
A. Digital resources: 16 categories of digital resources that can be appealed as parallel tasks (T1) during lectures (T2);
B. Moments: three different moments where students have assessed themselves – pre-pandemic (M1), lockout period (M2), and post-pandemic (M3);
C. Purpose: three different purposes (intentions) underlying the use of a parallel digital task during lectures – exclusive educational (ED), exclusive non-educational (NED), and combined (COMB), combining educational and non-educational purposes.

The categories of digital resources (A) encompassed were the following: (A1) store & share – store and share data; (A2) actuality – newspapers, journals, or others; (A3) commerce – buying and selling products and services; (A4) audio communication – exclusive audio communication; (A5) written communication – exclusive text communication; (A6) video communication – exclusive real-time video communication; (A7) education – online educational resources; (A8) entertainment – digital games, entertainment channels, and applications; (A9) online office tools – document creation resources; (A10) management &

organization – calendars, agendas, notes, checklists, and similar; (A11) language – online translators, dictionaries, text correctors, and similar; (A12) multimedia – photo, music, and video edition tools, programs, or applications; (A13) music – listening to music online; (A14) orientation – maps, guides, or similar; (A15) knowledge & research – browsers, wikis, and databases; (A16) social networks – personal and professional social networks.

The study hypothesizes the following:

    H.1. Students use (U) more (frequency) categories of digital resources during lectures in the Covid-19 lockdown (M2) moment than before (M1) and after (M3) this period (U: M1<M2>M3);

    H.2. Digital multitasking (T1) during lectures (T2) has a more educational purpose (ED and COMB) in the lockdown moment (M2) and after the Covid-19 pandemic (M3) than in the pre-pandemic (M1) moment (ED: M1<M2 and M1<M3; COMB: M1<M2 and M1<M3).

The quantitative data was submitted for descriptive, comparative, and explorative analysis. The analyses focused on: i) the frequency of use (U); ii) the purpose (ED, NED, and COMB) of using (U) each digital resource category (A) at each moment (M1, M2, and M3). It was also intended to verify any relationships between the categories (A) and the purposes (ED, NED, and COMB).

The population is university students. Participation criteria included: being an adult (≥18 years old); informed consent; currently a university student; having been a student since 2019/2020; having internet access since before the Covid-19 pandemic (2019); Portuguese or English language. Exclusion criteria relied on the non-observance of one of the inclusion criteria. This study collected quantitative data through the survey by appealing to an online questionnaire, ensuring participation and ethical criteria, and providing data security. The instrument encompassed five parts: informed consent; sociodemographic characterization; before Covid-19 (M1); during the lockdown (M2); and after the pandemic (M3). Participants assessed themselves regarding the use – did use (U) versus did not use (NU) – and the purpose – ED, NED, and COMB – of each of the 16 categories of digital resources at each moment – M1, M2, and M3. The data was collected between the 1st and 10th of December 2021. Data treatment appealed to SPSS from IBM and Excel from Microsoft.

4. Results

The sample of this study has 44 university students (N=44). Regarding the sociodemographic characterization of the sample: gender identification – 63.6% women, 34.1% men, and 2.3% other; age range – between 18 and 47 years old (M=23.48); nationality – most of them are Portuguese (61.4%), with (4.4%) Iranian, Brazilian and Mexican, and the rest (38.14%) not

responding; current academic level – 2.3% pre-graduation, 63.6% graduation, 25% master degree, and 9.1% doctoral degree.

In the first analysis, the frequency of engaging with a digital resource during lectures – did use (U) versus did not use (NU) in each category – was observed between the study's moments (M1, M2, and M3). Before Covid-19, 83% of university students used (U) digital resources during lectures. During lockdown (M2), digital multitasking increased by 3% (86%). After the pandemic, the use (U) decreased by 4% (82%). Interestingly, digital multitasking was frequent before the Covid-19 pandemic (M1). Digital multitasking was more frequent during the lockdown period, as expected (H.1). However, it was less frequent in M3 than in M1, only confirming part of this hypothesis. A detailed analysis regarding the frequency variation of each category (A) between the moments is presented in Figure 1.

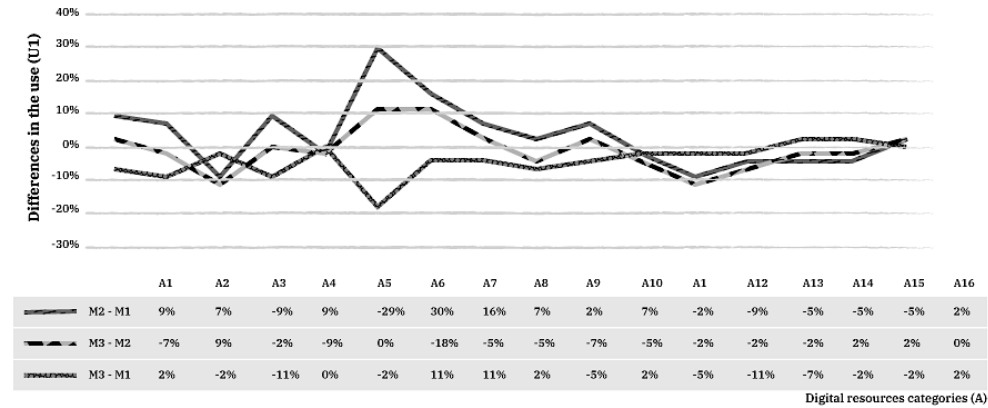|	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A1	A12	A13	A14	A15	A16
M2 - M1	9%	7%	-9%	9%	-29%	30%	16%	7%	2%	7%	-2%	-9%	-5%	-5%	-5%	2%
M3 - M2	-7%	9%	-2%	-9%	0%	-18%	-5%	-5%	-7%	-5%	-2%	-2%	-2%	2%	2%	0%
M3 - M1	2%	-2%	-11%	0%	-2%	11%	11%	2%	-5%	2%	-5%	-11%	-7%	-2%	-2%	2%

Digital resources categories (A)

Figure 1: Graphical (line chart) and descriptive (table) analysis of the percentual differences in the use (U) of each category of digital resources (A) between the three moments – before Covid-19 (M1), during lockdown (M2), and after the pandemic (M3).

When comparing the frequency of digital resources' use in multitasking behavior during lectures, higher variations occurred between the moments in written communication (A5), video communications (A6), store & share (A1), commerce (A3), education (A7), and office tools (A9). In a second analysis, we have focused on the purpose by which university students engage in digital multitasking during lectures (Figure 2).
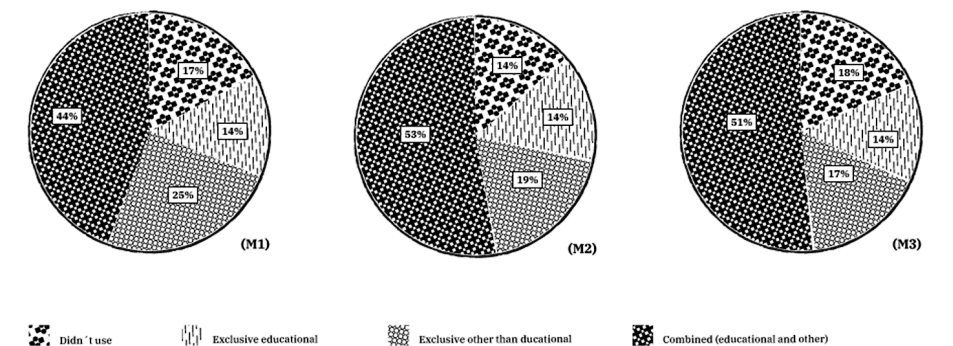
	NU	ED	NED	COMB
M1	121	96	167	304
M2	98	100	127	363
M3	128	97	114	349

Figure 2: Percentual distribution (circular graphics) and absolute frequencies (table) of the purpose – exclusive educational (ED), exclusive non-educational (NED), and combined (COMB) – regarding digital multitasking during lectures, within the different moments – before Covid-19 (M1), during lockdown (M2), and after the pandemic (M3).

The frequency of university students using (U) digital multitasking during lectures has increased between M1 and M2 – with a lower percentage of "did not use" condition (NU) in M2. This percentage is altered again between M2 and M3, with M3 showing a higher frequency of not using (NU) digital multitasking during lectures. Educational purpose (ED) frequencies of digital multitasking during lectures remained constant during the three moments (M1, M2, and M3). The non-educational purpose was higher in digital multitasking during lectures before Covid-19 (M1=25%) than during lockdown (M2=19%) or after the pandemic (M3=17%). Combined purpose has an increased frequency in M2 (53%) when compared to M1 (44%), which seems to remain in M3 (51%). These results confirm the second hypothesis (H.2) only partially – although exclusive educational purpose (ED) didn't seem to variate over time, the combined purpose (COMB) has increased during the pandemic, and exclusive non-educational purpose (NED) has decreased, with that trend being maintained after the pandemic (M3). It was also intended to test if the variance observed was significant. To see which categories (A) contribute to the different purposes, correlations between them and the purposes (ED, NED, and COMB) were conducted (Table 1).

Table 1: Non-parametric correlations between the categories of digital resources (A) and the purpose of engaging in digital multitasking during lectures – exclusive educational (ED), exclusive non-educational (NED), and combined (COMB).

Categories (A)	ED		NED		COMB	
1 Store & share	np=-.028	p=.819	np=-.198	p=.103	np=.244	p=.041[*]
2 Actuality	np=-.273	p=.024[*]	np=-.175	p=.145	np=.340	p=.004[**]
3 Commerce	np=-.089	p=.459	np=-.327	p=.006[**]	np=.263	p=.025[*]
4 Audio communication	np=-.253	p=.051	np=-.196	p=.101	np=.399	p<.001[***]
5 Written communication	np=-.184	p=.140	np=-.161	p=.193	np=.332	p=.006[*]
6 Video communication	np=-.050	p=.679	np=-.084	p=.487	np=.287	p=.015[*]
7 Education	np=.089	p= .483	np=-.221	p=.079	np=.219	p=.076
8 Entertainment	np=.029	p=.812	np=-.278	p=.021[*]	np=.323	p=.006[**]
9 Office tools	np=.006	p=.965	np=-.376	p=.003[**]	np=.342	p=.006[**]
10 Organization	np=-.078	p=.517	np=-.287	p=.017[*]	np=.302	p=.011[*]
11 Language	np=.003	p=.980	np=-.246	p=.046[*]	np=.418	p<.001[***]
12 Multimedia	np=-.192	p=.144	np=-.174	p=.148	np=.482	p<.001[***]
13 Music	np=-.083	p=.494	np=-.277	p=.023[*]	np=.384	p=.001[**]
14 Orientation	np=-.069	p=.566	np=-.252	p=.034[*]	np=.397	p<.001[***]
15 Research & Knowledge	np=-.156	p=.211	np=-.297	p=.017[*]	np=.441	p<.001[***]
16 Social Networks	np=-.128	p=.290	np=-.342	p=.005[**]	np=.437	p<.001[***]

Note: [*] (p<.050), [**] (p<.010), [***] (p<.001).

These results are evidence regarding the educative use of digital resources during lectures (H.2) because they show that most of the categories have an inverted relation with the non-educational purpose (NED), meaning that the increase in the use (U) of those digital resources during lectures determines the reduction of non-educational purpose (NED) in a significant way. Besides, significant positive correlations were found between all categories (except for educational resources) and combined purpose (COMB).

5. Discussion

No study seems to have previously attended to the purpose of digital multitasking behavior during lectures among university students. It was verified that digital multitasking is a common trend and that research in this field is relevant as the learning processes are changing to a more demanding, versatile, and continuous search for information in our daily lives (Siemens, 2004). Besides, digital multitasking has been related to poorer academic performance in some studies (Alvarez-Risco et al., 2020; Leysens et al., 2016) and seems to have changed since the Covid-19 pandemic, supporting the need for more research in this field. During lectures, university students seem to use that behavior not only as a distraction factor, as suggested by Leysens et al. (2016), but also with a more educational purpose, although combined, as we have observed. However, it is important to notice that digital multitasking might only be productive if the demands are not competing for the same cognitive resources to respond to both tasks in parallel, with digital multitasking requiring

individual self-regulation abilities and high executive processes to be effective (Karlen, 2016; May & Elder, 2018).

6. Conclusion

This study provides exciting results. Although university students seem to resort more to digital multitasking during the lockdown, this behavior has decreased to inferior levels to the pre-pandemic moment more recently. The categories of digital resources that contribute to reducing the non-educational purpose of digital multitasking during lectures might be the ones that contribute to a more educational purpose, including commerce, entertainment, office tools, organization, language, music, orientation, research & knowledge, and social networks. The main limitations of this study were the small sample size (N=44) driven by the high dropout rate (78%), mainly related to its length, and the method of data collection – a self-assessment measure requiring the appeal to memory. Further research should introduce self-management assessment measures and analyze digital multitasking between learning contexts.

Acknowledgments

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