



FIRST EXPERIENCES IN ENGINEERING REMOTE EDUCATION: CASE STUDY OF A BRAZILIAN FEDERAL UNIVERSITY DURING THE COVID-19 PANDEMIC

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Julia Castro Mendes - jcmendes.eng@gmail.com
Universidade Federal de Ouro Preto

Ana Letícia Pilz de Castro - anacastro@ufop.edu.br
Universidade Federal de Ouro Preto

DANIELA ANTUNES LESSA - daniela.lessa@ufop.edu.br
UFOP

Edson Alves Figueira Júnior - edson.junior@ufop.edu.br
Universidade Federal de Ouro Preto

Marina de Medeiros Machado - marina.medeiros@ufop.edu.br
UFOP

Walliston dos Santos Fernandes - walliston.fernandes@ufop.edu.br
Universidade Federal de Ouro Preto

Resumo: A pandemia COVID-19 exigiu o desenvolvimento de novas estratégias educacionais em instituições públicas e privadas, em todos os níveis de conhecimento. Pegos de surpresa, os envolvidos na sala de aula tradicional tiveram que se adaptar em uma velocidade recorde às novas ferramentas de educação remota. Diante desse cenário, o presente estudo tem como objetivo avaliar a experiência e o processo de aprendizagem de alunos e professores envolvidos no primeiro semestre letivo a distância de uma instituição federal de ensino superior brasileira. O trabalho focou nos cursos de Engenharia e Arquitetura. Para tal, foram elaborados e aplicados questionários, com o objetivo de identificar os principais desafios desta nova realidade. Os principais desafios observados foram a inexperiência no ensino a distância, a falta de formação prévia (principalmente para professores), a infraestrutura precária, a dificuldade na gestão do tempo e a sensação de comunicação à distância. As opiniões sobre a qualidade geral do ensino emergencial à distância foram divididas, mas a maioria dos professores concordou que essa experiência foi importante para suas carreiras e a maioria dos alunos viu um futuro no qual o ensino à distância substituirá pelo





menos uma parte dos créditos do curso. Os autores, então, propõem práticas e políticas para universidades no Brasil e no mundo, e divulgam as lições aprendidas pelos professores envolvidos neste primeiro semestre remoto.

Palavras-chave: *Tecnologia do Ensino a Distância. Questionário. Estudo de caso*



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1 INTRODUCTION

COVID-19 was not limited to a public health problem - it generated a cascade effect in a series of human activities, due to the social distancing strategies implemented by most countries (LUIGI and SENHORAS, 2020) (SENHORAS, 2020). Education was one of the most affected activities worldwide. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), over 90% of all students in basic and higher education had their classes interrupted at some point in 2020 (UNESCO, 2020).

To minimise the impact of the interruption of face-to-face educational activities, most academic institutions replaced them with remote ones, in the form of distance learning. Distance learning allows the elimination of geographical and temporal distances by allowing students to organise their time and place of study (BATES, 2005) (HACK, 2011).

Distance education was already carried out in all parts of the world seeking to provide opportunities for students who, for various reasons, could not participate in conventional education (KING, 2012) (PIMENTA, 2017). During the COVID-19 pandemic, the vast majority of remote activities were supported by the use of Information and Communication Technologies (ICT) (PEREIRA; NARDUCHI; MIRANDA, 2020). Accordingly, the Brazilian Ministry of Education (MEC), through Ordinance No. 343, of March 17, 2020 (BRAZIL, 2020a) and Provisional Measure No. 934, of April 1, 2020 (BRAZIL, 2020b), exceptionally authorised the replacement of face-to-face activities for classes via ICT.

Brazilian universities have self-government prerogatives attributed to the didactic, scientific, administrative, and financial areas. Thus, according to the Brazilian constitution, each institution has the autonomy to choose the best way to conduct its teaching, research, and extension activities. In this sense, some universities opted to implement a remote academic term, using ICTs, during the recommended period of social isolation. In this scenario, the present work aims to analyze the first experience with distance learning of a Brazilian university during the COVID-19 pandemic.

2 METODOLOGY

2.1 Case Study

In general terms, the Brazilian higher education system encompasses four types of institutions: federal universities (110), state universities (132), municipal universities (60), and private higher education institutions (over 2,000) (INEP, 2019). The present case study was carried out in a well-established federal university. This institution has over 50 undergraduate courses, 11,000 students 900 professors. The Engineering Faculty comprises 10 courses: Architecture and Urbanism, Environmental Engineering, Civil Engineering, Geological Engineering, Control Engineering, Mechanical Engineering, Metallurgical and Materials Engineering, Mining Engineering, Production Engineering and Urban Engineering.

The COVID-19 outbreak arrived in Brazil in February 2020. In March, most face-to-face educational activities were suspended by local decrees. The institution evaluated in the present work decided, in July 2020, to begin its remote academic term by the end of August 2020. As a public university, the present institution has students from all backgrounds and social classes; and, according to the Brazilian Network Information Centre (2019), only 70%

of Brazilians have access to the internet. If split by social grades, only 48% of people on lower incomes (classes D-E) have access to the internet, 85% of them only at their smartphones (BRAZILIAN NETWORK INFORMATION CENTER, 2019).

Thus, as this first remote term would probably not be accessible to all students, it was not mandatory neither for students nor for professors. The academic term was shortened from 16 to 8 weeks, from 24/08/2020 to 21/10/2020. Consequently, modules that used to take 4h weekly were increased to 7.5h. The university administration did not provide any criteria on which modules should be taught, leaving the definition to each department.

2.2 Investigation method

To assess how professors and students at this university felt in their first experience with remote education, questionnaires were developed on the Google Forms platform. Between 04/10/2020 and 23/10/2020, the forms were sent 3 times to institutional emails of all professors and students of the engineering faculty. Two questionnaires were developed: one for professors and another for students. The form directed to professors sought information on previous training, equipment and software adopted, and teaching methodologies applied in the remote term. In turn, students were asked about the quality of internet access, and perception of communication, methodology and activities developed by professors. In both cases, the researchers included questions related to the available infrastructure, previous online educational experiences, main challenges, and their overall perception of learning.

The survey consisted of multiple-choice questions. Options that were marked by less than 5% of the respondents were omitted from the charts. This survey was evaluated and approved by the Research Ethics Committee of the authors' institution (CAAE: 38940620.9.0000.5150). The data obtained were organized in an electronic spreadsheet and analyzed both separately and cross-referenced. A significant number of respondents added opinions to the researchers in the comment box. To facilitate the analysis, these opinions were categorized and quantified.

3 RESULTS

At the institution in which this case study was carried out, the remote educational activities were resumed on an optional basis, and in a special eight-week academic term, from 24/08/2020 to 17/10/2020. In the entire Engineering Faculty, 134 modules (subjects) from different areas of knowledge were offered, taught by 121 professors, with a total of 3,299 enrolment openings. For comparison purposes, the regular term that had started in March 2020, prior to the suspension of classroom activities, had 555 modules and 11,977 openings. Thus, in the remote term, we saw a reduction of 76% in the available modules and 72% in the vacancies that would normally be offered/opened.

At the end of the remote term, professors and students answered the questionnaires prepared by the researchers. The students' form received 813 valid responses (approximately 50% of all graduates who took remote modules), and the professors' form, 82 valid responses, (68% of the professors who participated in the remote term).

3.1 Students' answers

3.1.1. Enrollments, equipment, and infrastructure

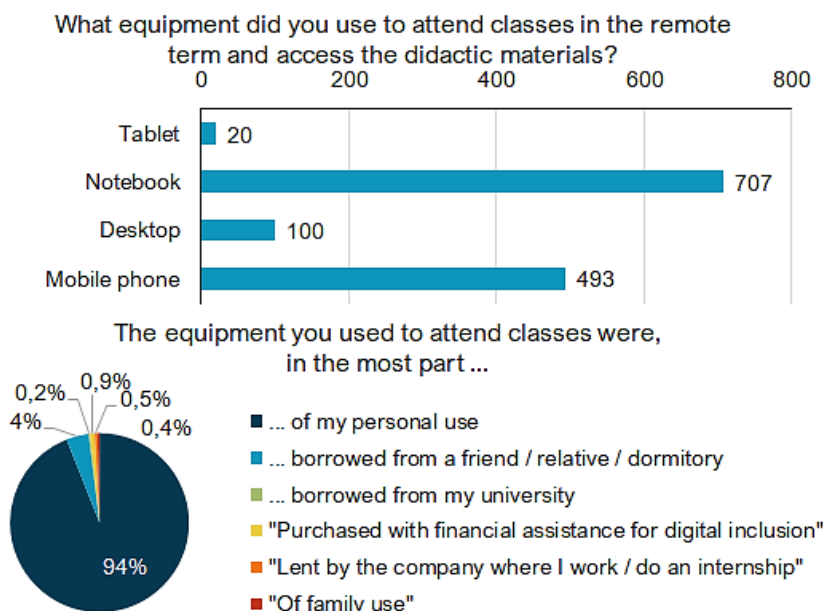
Regarding the students' enrollments, 58% chose to take two modules, in accordance with the institution's original provision, 31% took one module, and 11%, 3 or more modules (allowed by their departments in specific cases). The prudent choice of enrolling in fewer

modules in this term (1 or 2) is probably also related to the inexperience of students with online undergraduate courses - 90% declared they had no previous experience.

When asked about their technological infrastructure, the graduates mostly used notebooks and mobile phones to access classes and digital content provided by professors, most of them of personal use (94%)

Figure 1). As shown by Figure 2, for the most part, students took the subjects in their own homes (74.3%) and with broadband internet with good signal quality (74.7%). However, several students reported the need for the institution's financial assistance, as well as the loan of equipment by relatives, friends and/or by the company they work for. One of the graduates stated that his academic supervisor paid for the repair of his notebook so that he could attend classes. Additionally, more than 20% of them reported that their connection was not adequate, impairing access to classes on some occasions. These factors may have played a significant role in hindering the students' concentration and, consequently, their learning processes.

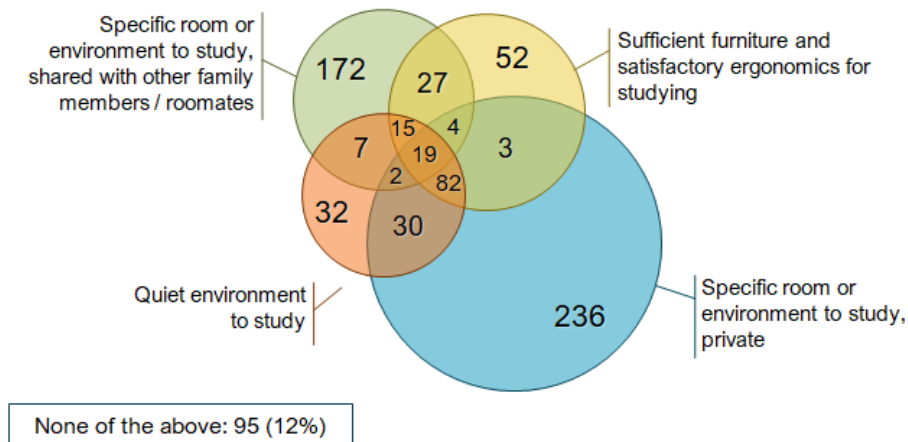
Figure 1 - Origin and type of equipment used by the students during the remote term. (Note: in the upper graph, respondents were allowed to mark more than one option).



Source: Authors' survey, 2020.

Regarding the physical space where the academic activities were performed, only 116 students (14%) stated that they had a specific room to attend online classes (individual and/or shared) that was also quiet and with suitable furniture (Figure 2). What is more disturbing, 95 graduates (12%) did not have any of the minimum conditions necessary to develop the focus and concentration necessary for quality learning.

Figure 2 - Infrastructure of the predominant study site used by the student.



Source: Authors' survey, 2020.

3.1.2. Perception of the remote academic term

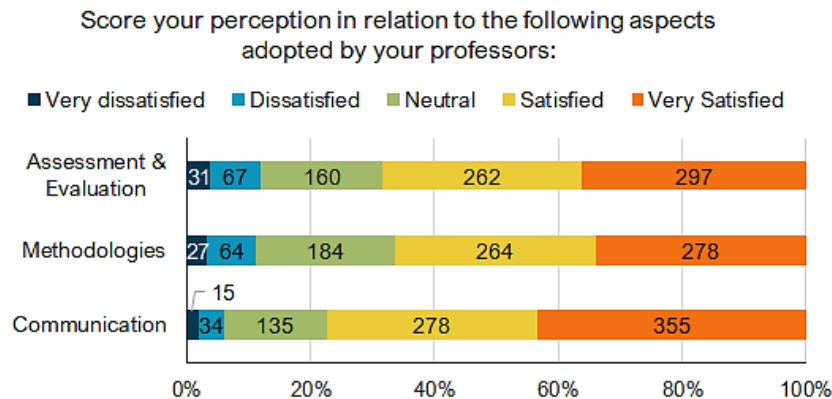
When asked about the didactic practices adopted by professors, Figure 3, most students stated that they were satisfied or very satisfied with the assessments, methodologies, and communication, especially the latter. This fact is probably related to the restructuring of the means of communication between professors and students and the professors' efforts to make remote classes more interactive.

On the other hand, the dissatisfaction observed in a fraction of graduates may be due to the discomfort that ICTs bring, when replacing the face-to-face interaction. Besides, many professors merely adapted traditional teaching models to ICT, seeking little or no innovation in teaching practices (Gomes 2013).

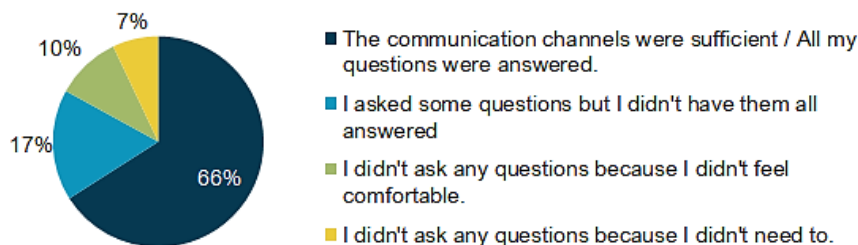
Aligned with the students' satisfaction with the professors' communication, we noticed that most of them (66%) considered the communication channels sufficient to clarify doubts. However, the number of students who felt uncomfortable asking questions is expressive (10%). It is imperative, therefore, that the professors seek artifices to minimize the effects of distance and discomfort in remote classes.

Figure 4 summarizes the students' general perception of the remote academic term. In total, 49% of graduates stated that they believe in the success of a hybrid system that reconciles remote and classroom activities. Moreover, 41% of students considered their dedication to the remote disciplines equivalent to which they would have in a regular term; another 25% stated that their dedication was higher than the normal term. Regarding the teaching platforms used, 81% of the students said they had not encountered any difficulties, while only 2% declared that they had major difficulties.

Figure 3 - Student satisfaction regarding assessments, teaching methodologies and communication with the professors; and the students' perception regarding the clarification of doubts by the professors.



Regarding the clarification of doubts over the remote term:



Source: Authors' survey, 2020.

3.1.1. Main challenges and further comments

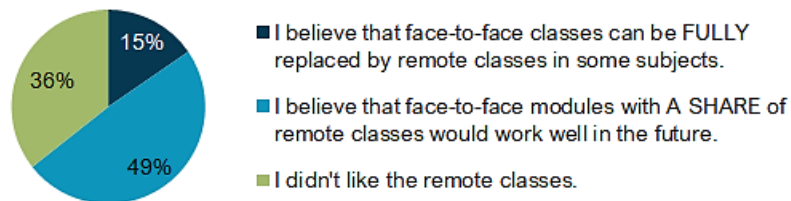
The researchers also asked about the main difficulties faced by the students, shown in Figure 5. The most important ones were: time management between personal and professional demands (72%), the sensation of insufficient or inefficient communication with the professor (30%), the inadequate infrastructure of the study location (25%); discomfort in class due to insecurity and/or shyness (24%); and the low quality of the ICT resources used - electronic equipment and internet (14%). Less than 2% of the students wrote in the "others" box: "professors lacking preparation or engagement", "to maintain focus", "my mental health", and "I had no major difficulties".

Remarkably, over 300 of the 813 respondents left their opinions and feelings in the optional comment box. The biggest complaint was related to the short duration of the academic term, 8 weeks, which led to an overload of activities (which appeared in 44 comments). The students also mentioned: the feeling of an overall inferior quality of remote activities (20 comments) and their insufficient infrastructure/equipment for study (10 times). Over 100 comments mentioned the poor organization of the modules/professors, including the lack of dedication of the professors in adapting the traditional content and assessments to ICT, the lack of feedback after assessment activities, classes that took place outside the scheduled hours, assessments that were not programmed in the Teaching Plan, assessments too concentrated at the end of the term, long classes with no breaks, and excessive classwork demands.

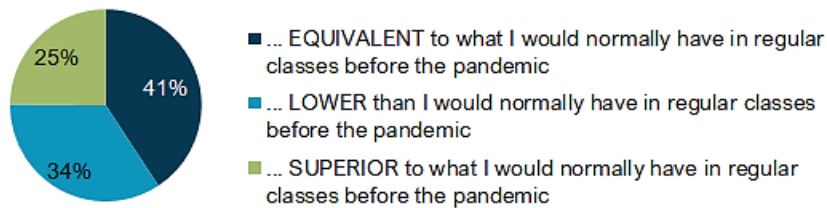
On the other hand, 76 comments showed satisfaction with the remote term, mainly due to the possibility of re-watching the recorded classes to better assimilate the contents (19 comments). Several students suggested that some modules could continue to be taught in an online format after the pandemic (27 comments). They only made reservations about the continuous use of screens and the need to improve the professors' preparation/training.

Figure 4 - Students' perception of remote education and its tools.

What did you think of the remote classes, compared to the face-to-face ones?



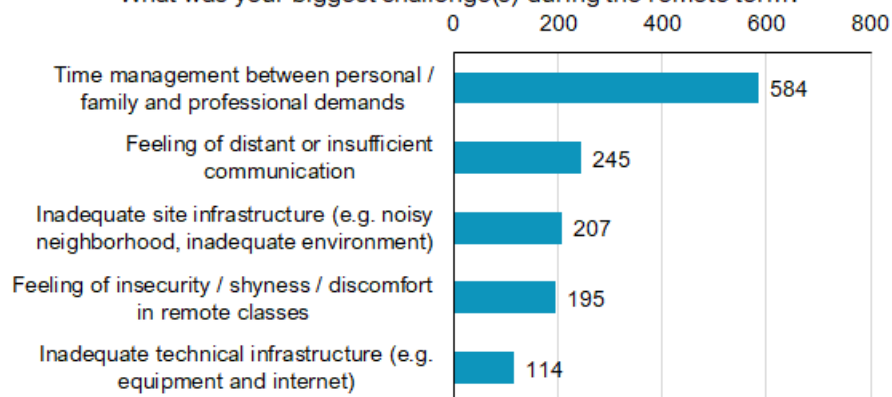
In your perception, your dedication to the modules in the remote term was ...



Source: Authors' survey, 2020.

Figure 5 - Students' opinion about the biggest challenges faced in the remote period (Note. respondents were allowed to mark up to 3 options).

What was your biggest challenge(s) during the remote term?



Source: Authors' survey, 2020.

3.2 Professors' answers

3.2.1. Modules taught, equipment, and infrastructure

Among the 82 professors who participated in the survey, 85% said they had no previous experience in online educational activities. These professors mostly taught only 1 subject (67%) and individually (84%). Since most of the professors were inexperienced in remote education, they had to study the teaching-learning methodologies adopted for this format.

59% of respondents participated the institution's specific course for the remote term, and 32% took other courses and watched the tutorials for using the Moodle platform. Next, respondents stated that they watched webinars (57%) and read about the topic (30%). Some did not carry out any type of training (11%). Six professors (7%) wrote in the "others" box that they asked advice to their colleagues and 4 (5%) claimed they already had experience with

online teaching (not pictured in the chart). Even though most of the professors sought some form of preparation for the remote term, 48% of them considered that this training did not provide in-depth and practical information, with 16% of them stating they felt insecure at the start of their module.

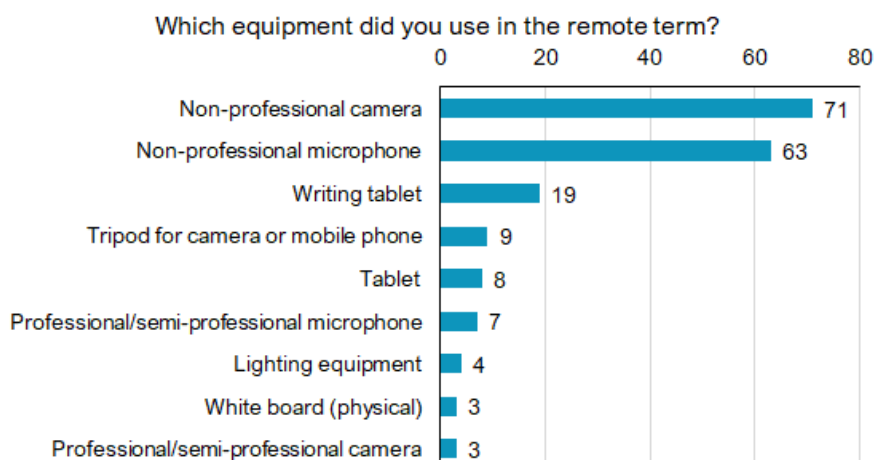
Castaman and Rodrigues (2020) reported that there has been little incentive for digital literacy among professors over the past few years, given that most of the pedagogical practices of higher education institutions are face-to-face. In this sense, the training for the application of ICT in teaching activities needs to be an ongoing process and should not end when the pandemic is over.

Regarding infrastructure for the classes, most professors used non-professional cameras and microphones (Figure 6). A few have used more specific devices such as a writing tablet, professional camera and/or microphone, lighting equipment. Only 3 professors adopted traditional (physical) white boards to teach (not shown in the graph). When asked about the origin of these devices, 99% of the respondents stated that they used their own personal equipment to carry out the remote term.

Most professors used the Moodle platform (87%) as their learning management system since it was recommended by the institution (Figure 7). Among the most adopted teaching software, apps, and platforms, the professors mentioned online meeting platforms (90%), to teach synchronous or asynchronous classes. The fact that slide-making software (61%) was used much more than video editing software (34%), forms platforms (29%), and quizzes platforms (5%), indicates that classes in the remote term were predominantly based on slides, as in the regular classroom teaching. This result corroborates the students' complaints about some professors not making an effort to update their modules to remote education, rather merely adapting the face-to-face classes to online meetings.

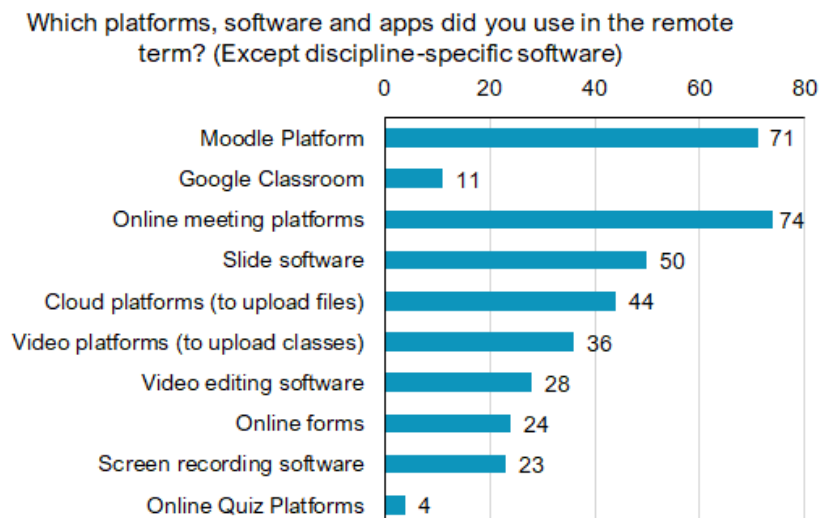
Even so, the professors undeniably made investments to improve the quality of remote education. Approximately 68% of them used part of their salary to increase the internet package; to purchase headphones, cameras, microphone, writing tablet, and computers/notebooks; or to subscribe to teaching platforms and software. Only 5% of the professors declared that they prepared and taught their modules from the university campus. Following the OMS recommendations for social distancing, 95% of them said they worked from their residence or at the residence of a family member.

Figure 6 - Equipment used for classes and their origin (Note: in the upper graph, respondents were allowed to mark more than one option).



Source: Authors' survey, 2020.

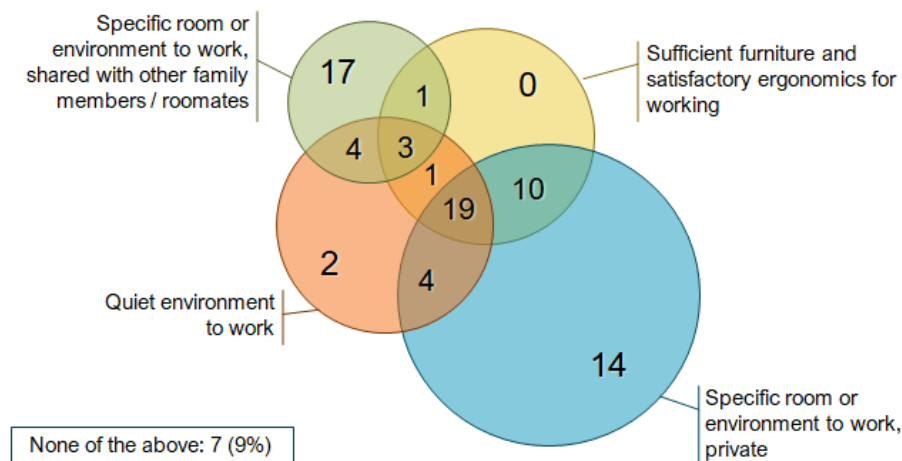
Figure 7 - Computational tools adopted in class (Respondents were allowed to mark more than one option).



Source: Authors' survey, 2020.

For the most part, the professors' homes did not combine a dedicated workplace, adequate furniture, and a quiet environment (Figure 8). Of the respondents, 33 (40%) had only one of these three items, while 7 (9%) had none, which could impair the focus required for the development of teaching activities. On the other hand, 27% of the professors marked that they had adequate working conditions, in contrast to only 14% of students.

Figure 8 - Infrastructure of the predominant workplace used by the professors.

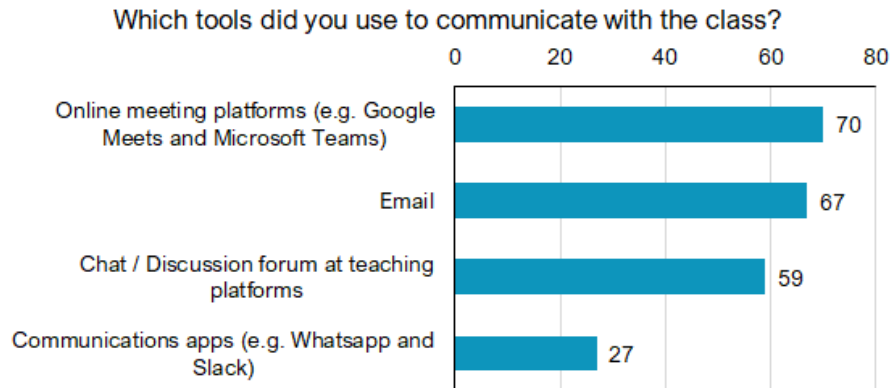


Source: Authors' survey, 2020.

3.2.2. Perception of the remote academic term and adopted methodologies

As shown in Figure 9, the professors were concerned with communication with the class since 60% used at least three different communication tools/channels to minimize the distance with students and facilitate learning. Among these tools, the online meeting platforms used for classes and email were the most cited.

Figure 9 - Tools employed for communication (respondents were allowed to mark more than one option)



Source: Authors' survey, 2020.

The professors also adopted, on average, five to six different methods to facilitate the teaching-learning process, such as synchronous meetings, development of didactic material, recommendation of reading material, slide-based video lectures, discussion forums, and recommendation of Youtube videos (Figure 10). Some pointed out innovations, such as using a writing tablet and recording of podcasts. In addition, 30% of professors adopted seven different types or more.

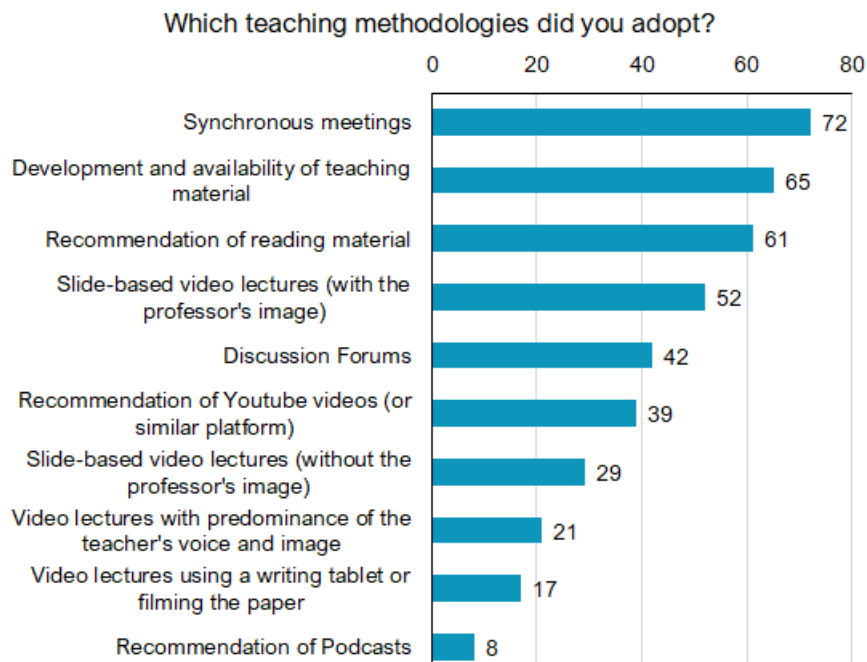
As shown in Figure 11, the evaluation models adopted were, mainly, asynchronous tests, seminars, forms, or projects. Some responses indicated that some professors gave synchronous evaluation activities, such as oral examination or activities with a connected camera, although the university guidelines had prohibited them. This is especially worrying given that almost a quarter of the graduates did not have access to good quality internet, as well as adequate infrastructure for carrying out the remote activities, and may have been harmed by this situation.

Most professors opted to carry out several assessments during the remote term, almost weekly (51%). Only 15% of professors applied up to 2 assessments, while 34% applied 3-5 assessments. This number of assessments applied during the remote term resonate with the comments of the students, who claimed they were overloaded with work in some modules. Among the evaluations, they were mostly individual (50%), or evenly split between individual and group evaluations (32%). Only 18% of the professors gave group assessments only.

Combining the efforts to develop and adapt their teaching methodologies and multiple assessment activities, 56% of the professors declared that they had dedicated themselves more to the remote modules than they would to regular modules. Additionally, 35% said they had had an equivalent dedication and only 9% said that their workload was lower than in traditional face-to-face academic terms.

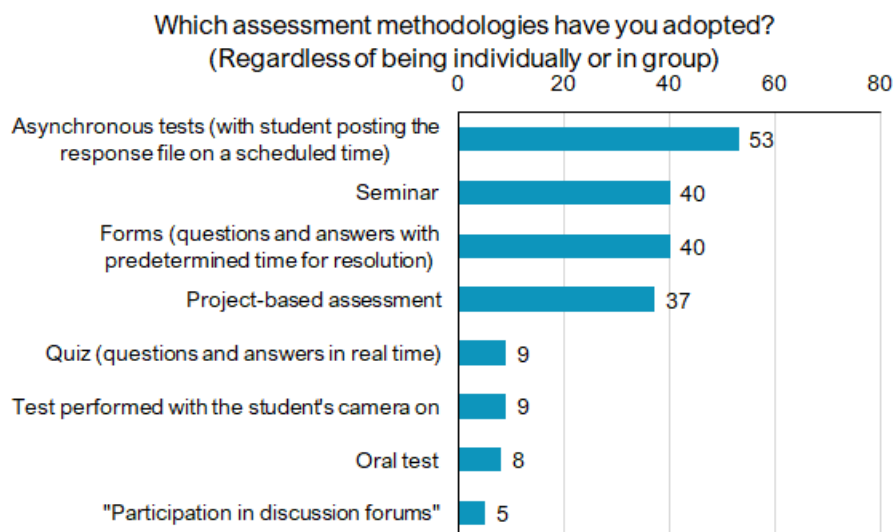
Agreeing with this fact, in a survey carried out by Brown; Lewin and Shikongo (2014), professors who work in distance education at the University of Namibia estimated that they dedicate 39% more time to prepare activities in remote education compared to face-to-face classroom. However, professors' results contrast with those of the students, in which only 25% stated that they dedicated themselves more to remote classes than to conventional ones, while 34% reported lower dedication. Finally, the professors also reported that the remote term contributed significantly to their professional growth (57%), making them safer and more confident to teach future remote modules (56%).

Figure 10 - Most adopted teaching methodologies (respondents were allowed to mark more than one option).



Source: Authors' survey, 2020.

Figure 11 - Adopted evaluation/assessment methodologies (respondents were allowed to mark more than one option).



Source: Authors' survey, 2020.

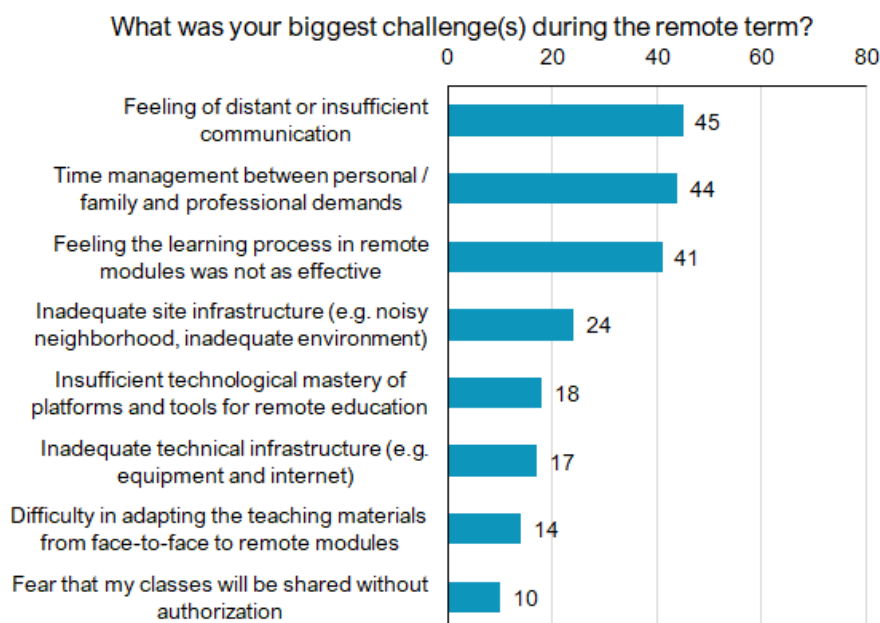
3.2.3. Main challenges and further comments

The main challenges cited by the professors were the feeling of distant communication (55%), the struggle in time management (54%), and the sensation of deficiencies in the students' learning process in the remote format (50%) (Figure 12). More than 20% of professors pointed out problems with the infrastructure of their workplace, concerning both the physical space and the technological elements. Finally, 18% also reported difficulties in adapting their teaching material and assessments to the remote mode, which can be considered a consequence of the superficiality of the training provided by the university.

In comparison, time management was the main challenge reported by the graduates (71%), distantly followed by the feeling of insufficient communication (20%). However, these two challenges were the most cited by the two groups, highlighting the lack of preparation and experience of remote education by both students and professors.

In the optional comments section, 49 out of the 83 respondents left the authors a message. Several professors stressed the importance of the remote term as the main way to maintain social distance during the COVID-19 pandemic. At least 10 comments (12% of respondents) demonstrated approval for remote and hybrid education, highlighted their professional growth during the academic term, and pointed out that the success of remote education must consider the commitment of both students and professors.

Figure 12 - Professors' opinion about the biggest challenges faced in the remote period (respondents were allowed to mark up to 3 options).



Source: Authors' survey, 2020.

On the other hand, in general, the main complaints in the comments box were: heavy workload in adapting the contents (especially due to the short preparation time and the short duration of the academic term); the fact that there were clear signs of plagiarized exercises, and the lack of interaction with the class when the students' cameras were off.

3.3 Results discussion

To start this discussion, it is noteworthy that most professors and students stated that they prefer face-to-face activities but understand the importance of remote education during the pandemic. The authors believe that the lack of adequate infrastructure (equipment, stable internet connection and workspace), for both groups, is one of the major factors why face-to-face activities are preferred. This scenario is also an obstacle to the technological evolution of education in Brazil and other developing countries, and, thus, should be tackled by policymakers in all governmental and institutional levels with urgency.

In general terms, this experience in remote education has emphasized the economic inequalities in Brazil, which was also noted by Oliveira et al. (2020) and Castaman e Rodrigues (2020). A portion of the population has quality internet access, multiple gadgets,

personal notebook, and an adequate location to study. Meanwhile, another portion needs to reconcile their scarce financial resources with concerns that go beyond the experience of online education, but which, in a certain way, have a strong influence on teaching and learning, such as housing and food. One of the professors commented that he stopped asking the students to turn on their cameras during classes since some of them were clearly uncomfortable with the conditions of their homes. This reality shows the need for mutual understanding, and that synchronous evaluations must be avoided, if possible.

Regarding the overall learning experience, the students' major criticism was the excessive workload of activities. This situation was especially exacerbated because most graduates accumulate out-of-class activities, such as junior research, social projects, part-time work, and internship. Additionally, during the pandemic, many students stated that they needed to perform domestic activities or care for relatives. This result agrees with Agdas et al. (2014), who noticed that the balance of personal, work, and academic life is one of the greatest challenges of distant learners, resulting in the logistics of a course being the factor that most impacts the overall satisfaction of students.

Students also stated that they had difficulty concentrating, especially in slide-based classes, which were deemed "tiring" and "boring". The authors note that this complaint already preceded the COVID-19 pandemic but must have been aggravated by the lack of the professors' authority figure in the room, and the many notifications that pop out in the computer or mobile phone in which the students were watching the classes. Correspondingly, Betts and Heaston (2014) pointed out that, despite the greater reach and flexibility of remote classes, the personal motivation necessary to conduct and attend classes through ICTs is greater.

This scenario shows that professors need motivation, planning and training to effectively migrate their content to active and interactive teaching methodologies. Furthermore, simply changing the position that classes are taught - from standing in the classroom to sitting at the computer - is not an effective strategy.

There were no practical instructions on the different teaching methodologies aimed specifically at remote teaching. Finally, most of these initiatives took place in the week from 17 to 21/08/2020, with the remote term starting on 24/08/2020. There was also no prior training or introduction lecture for the students. Moreover, no financial or technical assistance was provided for the purchase of equipment by the professors.

Among the advantages of remote education mentioned by professors and students in the comments, we highlight: the possibility of pausing video lessons, rewatching the class, and watching the lecture from anywhere and on any device. Additionally, the interviewees reported satisfaction with the decrease in travel time to the university and the possibility of researching content on the internet in parallel with the class. Almost two-thirds of the students stated that they see a future in which remote education replaces at least a fraction of the course credits.

In accordance with the authors' observations, Saunders, Brooks and Dawson (2020) saw remote teaching as an opportunity to adopt new pedagogical approaches and learn new technologies. They also emphasized the benefits of distance learning for the institution, such as increased reach, reputation, and income (for private institutions), and, on the students' side, more flexibility and increased access to courses.

4 CONCLUSION

Based on interviews with students and professors from the Engineering Faculty of a renowned Brazilian university, the present work exposed and discussed the perceptions and challenges faced during its first remote academic term. The first lesson learned was that,

instead of just adapting face-to-face classes to ICT tools, professors should seek to completely update their teaching and assessment methodologies to remote learning strategies. Synchronous assessments should be avoided, as the technological infrastructure of a significant part of the students is not reliable.

Distant or insufficient communication between students and professors was in the top 3 challenges for both groups. Thus, the professors must search for ways to make students more comfortable asking questions and encourage participation by audio during synchronous classes. Also, as the communication channels are usually asynchronous and indirect, the professors must organize the schedule of classes and their teaching platforms thoroughly.

Regarding evaluations, professors should decrease the length of assessments so as not to overwhelm students. Despite most graduates having remained at home, the university's demand remains high, in addition to the increase in the household, work and family care activities reported by several students. This scenario, combined with social distancing measures, can lead to the degradation of mental health for both graduates and professors.

Several students and professors stated that their learning quality was superior to conventional academic terms, others defended the opposite. The authors believe that the precarious infrastructure and the difficulty in adapting the class content and assessments to distance learning in such short notice may have influenced this response.

From this research, the authors can predict, as short-term consequences of this remote academic term: promoting a 'psychological rescue' (preventing demotivation) of students and increasing the sense of belonging to the institution and the course; reducing dropout; and reducing enrolment bottlenecks when face-to-face classes return. In the near future, the remote term will encourage the technological development of professors and students, promoting adaptation to modern tools of digital communication and cloud technology, and leading to the modernization of the modules. Finally, in the long-term, the authors believe that these emergency actions will lay the roots for hybrid education, demystify the low quality of distance education, and democratize higher education for people in remote locations.

5 REFERENCES

- AGDAS, Duzgun et al. Analysis of distance learner value assessment of distance education in engineering. **Journal of Professional Issues in Engineering Education and Practice**, v. 140, n. 1, p. 04013001, 2014.
- BATES, A. W.; BATES, T. **Technology, e-learning and distance education**. Psychology Press, 2005.
- BETTS, Kristen; HEASTON, Amy. Build it but will they teach?: Strategies for increasing faculty participation & retention in online & blended education. **Online Journal of Distance Learning Administration**, v. 17, n. 2, p. n2, 2014.
- BRASIL. 2020a. **Portaria No. 343, de 17 de março de 2020**. Dispõe sobre a substituição das aulas presenciais por aulas em meios digitais enquanto durar a situação de pandemia do Novo Coronavírus. COVID-19. D.O.U 18/03/2020. Disponível em: <<http://www.in.gov.br/en/web/dou/-/portaria-n-343-de-17-de-marco-de-2020-248564376>>. Acesso em: 03 mai. 2020
- BRASIL. 2020b. **Medida Provisória No 934, de 1º de abril de 2020**. Estabelece normas excepcionais sobre o ano letivo da educação básica e do ensino superior decorrentes das medidas para enfrentamento da situação de emergência de saúde pública de que trata a Lei nº13.979, de 6 de fevereiro de 2020.
- BRAZILIAN NETWORK INFORMATION CENTER. 2019. **Survey on the Use of Information and Communication Technologies in Brazilian Households**. São Paulo, Brasil: CGI-BR (Brazilian Internet Manager Committee).
- BROWN, Anthony; LEWIN, A.; SHIKONGO, Regina M. University of Namibia academics' perceptions of face-to-face learning and open and distance learning (ODL). **International Journal of Humanities Social Science and Education**, v. 1, n. 8, p. 101-108, 2014.

CASTAMAN, Ana Sara; RODRIGUES, Ricardo Antonio. Educação a Distância na crise COVID-19: um relato de experiência. **Research, Society and Development**, v. 9, n. 6, p. e180963699-e180963699, 2020.

<https://doi.org/10.1590/S1414-40772013000100002>.

HACK, Josias Ricardo. Introdução à educação a distância. **Florianópolis: UFSC**, v. 126, 2011.

LUIGI, Ricardo; SENHORAS, Elói Martins. O novo coronavírus e a importância das Organizações Internacionais. **Nexo Jornal [17/03/2020]**. Disponível em: <https://www.nexojornal.com.br/ensaio/2020/O-novo-coronav%C3%ADrus-e-a-import%C3%A2ncia-das-organiza%C3%A7%C3%B5es-internacionais>. Acesso em 20/12/2020, v. 14, n. 05, 2020.

OLIVEIRA, Eleilde et al. A educação a distância (EaD) e os novos caminhos da educação após a pandemia ocasionada pela Covid-19. **Brazilian Journal of Development**, v. 6, n. 7, p. 52860-52867, 2020.

<https://doi.org/10.34117/bjdv6n7-799>.

PEREIRA, Alexandre; NARDUCHI, Fábio; DE MIRANDA, Maria Geralda. Biopolítica e Educação: os impactos da pandemia do covid-19 nas escolas públicas. **Revista Augustus**, v. 25, n. 51, p. 219-236, 2020.

<https://doi.org/10.15202/1981896.2020v25n51p219>.

PIMENTA, Alexandre Marinho. A EaD como renovação do mercado educacional brasileiro do nível superior. **Revista Internacional de Educação Superior**, v. 3, n. 2, p. 308-321, 2017.

SENHORAS, Eloi Martins. Coronavírus e educação: análise dos impactos assimétricos. **Boletim de Conjuntura (BOCA)**, v. 2, n. 5, p. 128-136, 2020.

UNESCO. **A Comissão Futuros da Educação da Unesco apela ao planejamento antecipado contra o aumento das desigualdades após a COVID-19**. Paris, France: United Nations Educational, Scientific and Cultural Organization, 2020. Disponível em: <https://pt.unesco.org/news/comissao-futuros-da-educacao-da-unesco-apela-ao-planejamento-antecipado-o-aumento-das>. Acessado 21/10/2020.

VERGARA, Sylvia Constant. Estreitando relacionamentos na educação a distância. **Cadernos EBAPE. br**, v. 5, n. SPE, p. 01-08, 2007.

SAUNDERS, Fiona C.; BROOKS, James; DAWSON, Mark. Exploring staff attitudes to distance learning—what are the opportunities, challenges and impacts on engineering academics and instructional designers. **European Journal of Engineering Education**, v. 45, n. 5, p. 675-690, 2020.

<https://doi.org/10.1080/03043797.2019.1677562>.

PRIMEIRAS EXPERIÊNCIAS EM ENSINO REMOTO NA ENGENHARIA: ESTUDO DE CASO DE UMA UNIVERSIDADE FEDERAL DURANTE A PANDEMIA DA COVID-19

Resumo: *Introdução: A pandemia COVID-19 exigiu o desenvolvimento de novas estratégias educacionais em instituições públicas e privadas, em todos os níveis de conhecimento. Pegos de surpresa, os envolvidos na sala de aula tradicional tiveram que se adaptar em uma velocidade recorde às novas ferramentas de educação remota. Diante desse cenário, o presente estudo tem como objetivo avaliar a experiência e o processo de aprendizagem de alunos e professores envolvidos no primeiro semestre letivo a distância de uma instituição federal de ensino superior brasileira. Métodos: O trabalho focou nos cursos de Engenharia e Arquitetura. Para tal, foram elaborados e aplicados questionários, com o objetivo de identificar os principais desafios desta nova realidade. Resultados: Os principais desafios observados foram a inexperiência no ensino a distância, a falta de formação prévia (principalmente para professores), a infraestrutura precária, a dificuldade na gestão do tempo e a sensação de comunicação à distância. Conclusão: As opiniões sobre a qualidade geral do ensino emergencial à distância foram divididas, mas a maioria dos professores concordou que essa experiência foi importante para suas carreiras e a maioria dos alunos viu um futuro no qual o ensino à distância substituirá pelo menos uma parte dos créditos do curso. Os autores, então, propõem práticas e políticas para universidades no Brasil e no mundo, e divulgam as lições aprendidas pelos professores envolvidos neste primeiro semestre remoto.*

Palavras-chave: Tecnologia do Ensino a Distância. Questionário. Estudo de caso.