revista interfaces
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REMOTE TEACHING AND RESEARCH PRACTICES IN THE FOOD SCIENCE FIELD DURING THE COVID-19 PANDEMIC

PRÁTICAS REMOTAS DE ENSINO E PESQUISA NA ÁREA DE CIÊNCIA DE ALIMENTOS DURANTE A PANDEMIA DE COVID-19

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ABSTRACT

Social restrictions during the COVID-19 pandemic caused a temporary closure of higher-education institutions. We accessed the impact on teaching and research practices in the food science field during 2020 through online data collection on pedagogical and research practices among 402 Brazilian instructors and/or researchers. Most faculty (60%) reported that their institution continued the academic year remotely and yet, 32.2% reported that teaching activities were suspended for up to 6 months. 52.7% of instructors reported that all courses were adjusted to an online format, while 41.2% informed that only theoretical classes were maintained. Despite the use of online platforms, most instructors used expository classes. These educators saw a need to improve the quality of virtual teaching. Those performing research during laboratory closures reported performing literature review, data analysis, and manuscript writing at home. More than 70% of researchers reported that they have stopped laboratory work for 5 months or more in 2020, a downtime that may have unprecedented consequences in research outputs. Food science educators and researchers overcame many challenges to continue their activities in 2020 and universities could benefit from the lessons learnt during remote work to improve productivity in their outcomes in the post-pandemic era.

Keywords: Teaching practice; Active learning; Emergency remote education.

RESUMO

As restrições de distanciamento social durante a pandemia de COVID-19 provocaram o fechamento temporário de instituições de ensino superior. Para avaliar o impacto da pandemia nas práticas de ensino e pesquisa na área da ciência dos alimentos durante o ano de 2020, coletamos dados por meio de um questionário online sobre as práticas pedagógicas e de pesquisa entre 402 docentes e/ou pesquisadores brasileiros. A maioria dos docentes (60%) relatou que sua instituição deu continuidade ao ano letivo de forma remota e ainda, 32,2% relataram que as atividades de ensino foram suspensas por até 6 meses. 52,7% dos docentes relataram que todas as disciplinas foram ajustadas para o formato online, enquanto 41,2% informaram que apenas as aulas teóricas foram mantidas. Apesar do uso de plataformas online, a maioria dos docentes utilizam aulas expositivas. Esses educadores relataram a necessidade de melhoraria na qualidade do ensino virtual. Aqueles que realizaram pesquisas durante o fechamento dos laboratórios relataram que as atividades continuaram em casa, principalmente por meio de revisão de literatura, análise de dados e redação de manuscritos. Mais de 70% dos pesquisadores relataram que pararam de trabalhar nos laboratórios por 5 meses ou mais em 2020, um tempo de inatividade que pode ter consequências negativas sem precedentes nos resultados de pesquisa. Educadores e pesquisadores da ciência de alimentos superaram muitos desafios para continuar suas atividades em 2020 e as universidades podem se beneficiar das lições aprendidas durante o trabalho remoto para melhorar a produtividade em seus resultados na era pós-pandemia.

Palavras-chave: Prática docente; Aprendizado ativo; Educação a distância.

revista interfaces
Artigos Originais
V. 12, N. 1 (2024) | ISSN 2317-434X

INTRODUCTION

In March 2020, the World Health Organization (WHO) declared a global pandemic caused by the new coronavirus SARS-CoV-2. With the main route of transmission being airborne, prevention measures were adopted worldwide including the use of facemasks, social distancing, partial or complete lockdowns and restrictions on gatherings, in an attempt to slow down the spread of the virus and reduce the number of cases and deaths by COVID-19 (Coronavirus Disease 2019). Educational institutions were closed, affecting students of all ages and levels (WHO, 2020; FINGER et al., 2021).

Social distancing and the use of face masks were amongst the prevention measures adopted in Brazil and many other countries around the world, with schools and universities suspending their in-person activities and adopting use of Information and Communication Technologies (ICT) in educational activities (MENEZES & MOTA, 2018; TSEGAY et al., 2022). These transformations posed new challenges for educators, students, and university staff, in which remote teaching was used as a measure to allow continuation and replacement of academic activities. However, there have been many difficulties in the development of such activities inherent to the Brazilian reality, given the non-universal access to computers and internet for a large portion of the population, as well as deficient training of teachers in using ICT (MENEZES & MOTA, 2018).

It is evident that there is a great challenge for higher education institutions and educators across many different fields to adapt teaching according to the pedagogical needs of the new generations. Aside from adapting to a period without classes and face-to-face interactions, or offering classes or activities online, it is also necessary to implement new tools and technologies that could make classes more dynamic and interactive, irrespective of pandemic times (FINGER et al., 2020).

In addition to having to deal with online teaching and the technology involved, educators also needed to select appropriate content and teaching strategies for an effective online learning process, considering the heterogeneous group of students. Sometimes, teaching practices adopted in the classroom reflect the same traditional training that these educators had, without modernization in the lesson plan and incorporation of new teaching strategies and resources (MENEZES et al., 2019). This was confirmed in a Brazilian study which reported the common use of traditional teaching methods by university microbiology professors, who pointed to lack of time, pedagogical training, and low adhesion of students to different teaching methods as hindrances to innovations in teaching, such as active learning methods (FINGER et al., 2020).

In order to cope with the restrictions imposed by the pandemic, innovative teaching strategies as well as research protocols had to be put in place considering the temporary, but long closure of teaching and research institutions in Brazil. This study provides insights on how educators and researchers in the field of food science maintained their academic activities in 2020 due to the COVID-19 pandemic in Brazil by means of online tools and solutions.

MATERIALS AND METHODS

This research is characterized as an exploratory, cross-sectional study with a quantitative approach aiming at evaluating pedagogical and research practices in the context of the COVID-19 pandemic in Brazil.

The target audience of the research was composed of instructors (educators) in the domain of Food Science and Technology in various undergraduate and graduate courses in Brazil, offered by both public and private higher education institutions, as well as graduate students who voluntarily accepted to participate in the research.

Data collection took place between September 01st and October 07th, 2020, with anonymous voluntary participation which was carried out by the application of a questionnaire prepared on the Google® Forms platform, publicly disseminated via internet and social networks. The questionnaire comprised of 40 questions related to teaching and researching during COVID-19 pandemic and took about 15 minutes for completion. Only adults over 18 years old, as required by the Ethics Committee of the university, who research and/or teach in the food science field and reside in Brazil answered the questionnaire. The research was approved by the Research Ethics Committee of the Faculty of Pharmaceutical Sciences, University of Sao Paulo (CAAE 35496920.6.0000.0067). The voluntary participation in the research and the anonymity of the participants were guaranteed.

The questions were distributed into four categories: the first composed of queries related to the individual (sex, age, marital status, education, and academic degree), the second composed of questions related to changes in research, the third related to teaching and working regime, the fourth related to strategies and didactic resources used in teaching during the pandemic and the fifth category dealt with the challenges in teaching

and researching during social distancing measures.

Quantitative data were organized in electronic spreadsheets, using the Microsoft Office Excel 2010, and analyzed by Descriptive Statistics. Qualitative data were analyzed through the content analysis technique, which allows one to consider the data both in the textual structure as well as in the implicit subjectivity of words and their inferences in each subject's messages (FINGER et al., 2020).

RESULTS

A total of 402 individuals answered the questionnaire, covering all Brazilian regions and states (Table 1).

Table 1. Distribution of the professors/researchers who responded the survey and the number of higher education institutions by region in Brazil.

Region	Number of answers	%	Number of higher education institutions*	%
Southeast	247	61.4	1,126	44.4
Northeast	53	13.2	566	22.3
South	51	12.7	414	16.3
North	26	6.5	173	6.8
Midwest	25	6.2	258	10.2
Total	**402**	**100**	**2,537**	**100**

*Source: INEP, 2020.

About 77% of the respondents in this survey were female and 23% male (Table 2). Another observed trend was that most participants (60.2%) aged between 26 and 40 years old, while 22.6% were between 41 and 55 years old and only a minority of respondents (6.2%) were between 18 and 25 years old. This profile reflects the fact that the target audience of the research was graduate students and professors.

revista interfaces
Artigos Originais
V. 12, N. 1 (2024) | ISSN 2317-434X

Table 2. Sociodemographic characteristics of the respondents.

Category	Group	Number of answers	%
Sex	Female	308	76.6
	Male	94	23.4
Age	18 – 25 years	25	6.2
	26 – 40 years	242	60.2
	41 – 55 years	91	22.6
	56 – 70 years	41	10.2
	Over 70 years	3	0.7
Marital status	Married	172	42.8
	Single	157	39.0
	Living together	49	12.2
	Divorced	22	5.5
	Widow/widower	2	0.5
Children	No children	241	60.0
	With children	161	40.0
Responsible for family members	No	247	61.4
	Yes	155	38.6
Monthly family income	10 to 20 minimum wages	118	29.4
	04 to 10 minimum wages	104	25.9
	02 to 04 minimum wages	91	22.6
	Less than two minimum wages	55	13.7
	More than 20 minimum wages	20	5.0
	No answer	14	3.5
Professional degree	Food Engineering	117	29.1
	Nutrition	83	20.6
	Food Science and Technology	33	8.2
	Pharmacy	22	5.5
	Veterinary Medicine	18	4.5
	Biological Sciences	18	4.5
	Other professions	111	27.6
Academic background	Doctorate degree (Ph.D. degree)	136	33.8
	Academic Master	118	29.4
	Post-doctoral	68	16.9
	Undergraduate degree	38	9.5
	Specialization or MBA	29	7.2
	Professional Master	13	3.2

Source: Research data.

revista interfaces
Artigos Originais
V. 12, N. 1 (2024) | ISSN 2317-434X

Among the respondents of this survey, the majority (60.9%, 245/402) were instructors with 217 teaching in undergraduate courses, 92 in graduate courses and 45 in technical/professional courses. Additionally, 95.9% of these respondents answered that they taught only in-person classes before the beginning of the pandemic and 84.1% taught both theoretical and laboratory classes, as shown in Table 3.

Table 3. Features of participating instructors.

Category	Number of answers N= 245	%
Courses taught		
Undergraduate	217	88.6
Graduate	92	37.6
Technical / vocational course	45	18.4
Institution		
Public School	189	77.1
Private School	52	21.2
Both	4	1.6
Teaching modalities before COVID-19		
In-person instruction only	235	95.9
In person instruction and Distance-learning	8	3.3
Distance-learning only	2	0.8
Type of discipline		
Theoretical and lab classes	206	84.1
Only theoretical	35	14.3
Only lab classes	4	1.6
Teaching experience		
Less than 5 years	61	24.9
6 to 10 years	68	27.8
11 to 15 years	43	17.6
16 to 20 years	21	8.6
More than 20 years	52	21.2
Current work regime		
Exclusive dedication (full time)	172	70.2
Full time (non-exclusive)	22	9.0
Part time	15	6.1
Hourly teacher	36	14.7

Source: Research data.

Most professors that responded the questionnaire belong to public institutions with a 40-hour work regime, with full-time dedication to the university that includes teaching, research, extension, and administrative activities. Given this diversity of activities attributed to public university professors in Brazil, we also sought to identify how each educator organized their weekly work routine. For 40.8% (100) of these professionals, dedication is between 6 to 10 hours per week for teaching; 28.2% dedicate between 11 and 15 hours; 16.3% between 1 to 5 hours and 14.7% more than 16 hours. When it comes to planning teaching activities, 39.2% (96) dedicate between 6 to 10 hours, while 23.7% between 1 and 5 hours, 18.8% between 11 and 15 hours and 18.4% more than 16 hours.

Regarding the long-term continuity of academic activities during the COVID-19 pandemic after shutdowns, more than 60% of faculty reported that their institution chose to continue the academic year remotely. Of these, two-third of university administration consulted the academic community to decide the course of action. On the other hand, 38.8% decided to stop academic activities, including teaching, research, and extension with the exception for a few essential areas. However, only 26.5% of professors reported that teaching activities were

revista interfaces
Artigos Originais
V. 12, N. 1 (2024) | ISSN 2317-434X

not suspended at any time, while 32.2% reported that teaching activities were suspended between 5 to 6 months and 18.0% between 3 to 4 months. In the present study, 52.7% of the professors reported that all courses were adjusted to an online format while 41.2% answered that the institutions maintained only the theoretical classes.

When asked about the technological tools or computer programs used in pedagogical practice during the pandemic, the data indicate that most instructors (48.2%) used Google Meet®, in addition to a virtual learning environment (Moodle® / Stoa® / Solar® / Tidia®) (40.8%), Google® classroom (39.6%) and messaging apps (37.1%) to improve the students' learning outcomes (Table 4).

Table 4. Strategies and resources adopted in teaching practice during the pandemic.

Technological tools	**Number of answers**	**%**
Google Meet®	118	48.2
Virtual learning environment (Moodle®/ Stoa®/ Solar® / Tidia®)	100	40.8
Google Classroom®	97	39.6
WhatsApp® / Telegram®	91	37.1
Google Forms®	77	31.4
YouTube®	71	29.0
Google agenda®	56	22.9
Zoom®	52	21.2
Teams® (Microsoft)	46	18.8
Blackboard Collaborate Ultra®	16	6.5
Canva®	15	6.1
Others	39	15.9
Teaching strategies	**Number of answers**	**%**
Online classes (synchronous)	194	79.2
Recorded classes made available online	134	54.7
Digital content / Materials in online tool	118	48.2
Paper discussion	114	46.5
Directed Study	93	38.0
Online questionnaires	91	37.1
Group work	85	34.7
Case studies	83	33.9
Workshops	81	33.1
Discussion of questions previously answered by students	58	23.7
Project development	57	23.3
Teaching with research activity	52	21.2
Problem Based Learning (PBL)	48	19.6
Others	67	27.3
Didactic resources	**Number of answers**	**%**
Computer, notebook, tablet	219	89.4
Papers	167	68.2
Slides	139	56.7
Books	77	31.4
Smartphone/Tablet	69	28.2
DVD/movies/documentaries	39	10.6
Educational software	25	10.2
Whiteboard	15	6.1
Nothing. I do not teach online classes and do not provide online material	14	5.7
Plickers	12	4.9
Smart screen	4	1.6
Computer Lab	1	0.4

Source: Research data.

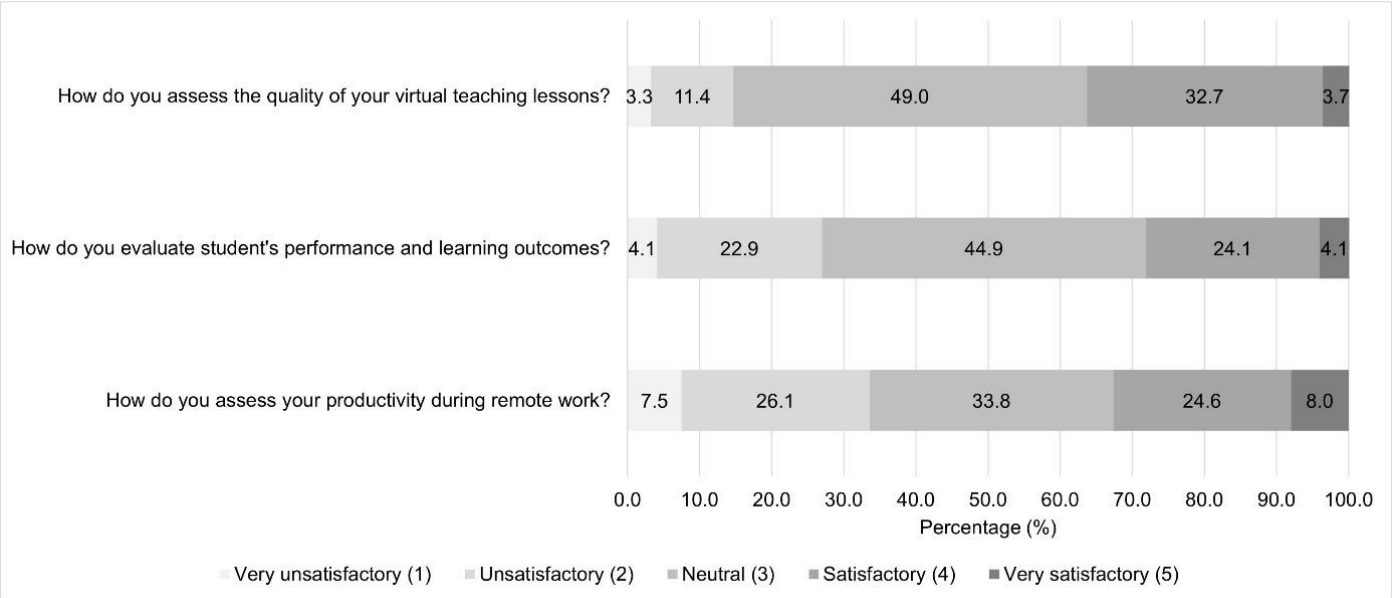
As for teaching strategies adopted during the COVID-19 pandemic, instructors stated they used mainly synchronous classes, mixed with recorded lectures made available online on students' demand, as shown in Table 4.

When evaluating the quality of virtual teaching,

revista interfaces
Artigos Originais
V. 12, N. 1 (2024) | ISSN 2317-434X

on a scale of 1 to 5, with 1 being very unsatisfactory and 5 very satisfactory, most instructors (49%) assigned 3 for online teaching and 32.7% assigned grade 4. When students' performance and learning was assessed using online teaching, 44.9% of the instructors assigned grade 3, followed by 24.1% with grade 4 (Figure 1).

Figure 1. Participants' perceptions on remote reaching and work productivity.



Source: Research data

We have also assessed research activities during the COVID-19 pandemic, and it was found that the majority of respondents (87.6%, 352) coordinate or develop research in the area of food science and technology. Of these researchers, 33.8% (120) reported that they changed the scope of their research, developing activities such as literature review, data analyses, writing and submitting manuscripts, review articles or proposals at home and only 6.8% (24) continued their in-lab research during the social distancing policies adopted during the COVID-19 pandemic. More than 30% (106) reported that they have stopped laboratory work for 6 months, an equally large number of 26.4% (93) for more than 6 months and 16.5% (58) for 5 months.

Challenges in teaching and researching during the pandemic

Educators and researchers were asked whether they participated in training courses or activities to improve their ability to work online during the pandemic. Most participants (61.7%, 248) reported that they had not participated in any training, exposing a challenge faced by instructors and researchers due to lack of available training aimed specifically at developing online activities.

We assessed whether the institution allowed time for instructors and researchers to switch to online work. The majority of respondents (56.7%, 228) replied positively, 38.3% (154) replied negatively and 5% (20) reported that they did not need this time, as they already worked online. But between training and implementation of the online practice, 34.3% (138) of the participants answered that time was not sufficient, while 31.6% (127) reported that there was training in a timely manner and 27.9% (112) stated that they had not received any training.

Participants in the study were asked about the workload of some of the activities during the COVID-19 pandemic. In general, time spent on family care, working from home and general housework increased, while hours spent on leisure and physical activity decreased. Time allocated for sleeping and meals remained the same. In an issue related to the difficulties encountered in this new approach to remote work, most participants (60.4%, 243) indicated an increase in the workload, followed by lack of time to dedicate to learning and applying new teaching and / or research methods (41%, 165) and a lack of adequate structure (39.1%, 157). Some respondents also mentioned the lack of conviction about the effectiveness of novel teaching and / or research methods and difficulty in learning to use new tools in a short period of time.

revista interfaces
Artigos Originais
V. 12, N. 1 (2024) | ISSN 2317-434X

When assessing productivity during the COVID-19 pandemic, on a scale of 1 to 5, 1 being very unsatisfactory and 5 being very satisfactory, 33.8% (136) of the interviewees assigned a grade of 3, which corresponds to a median grade (neutral), followed by 26.1% (105) with grade 2 (unsatisfactory) and 24.6% (99) with grade 4 (satisfactory) (Figure 1). In contrast, in our study, 40% of participants who have children or are responsible for the primary care of family members pointed out an increase in productivity (grades 4 and 5) when compared to participants who do not have children (24%).

We have also asked whether participants feared being affected by the fall in productivity during the pandemic period. Most participants (60%) agreed they fear the loss in productivity because their work and/or research have been stopped and some even feared losing their job or their scholarship. The majority also reported that they are doing their best to carry out their activities. On the other hand, 38.8% of the interviewees stated that they do not fear the loss in productivity because this is acceptable considering the difficult scenario faced by everyone.

DISCUSSION

Responses were concentrated in the Southeast region of Brazil, which is also the most densely populated and industrialized region in the country, concentrating most of the higher education institutions (INEP, 2019). We also had many answers from the northeast and south regions of Brazil. It is also important to point out that these three regions have the largest numbers of higher education institutions and the largest number of undergraduate and graduate courses in the food science and technology area, according to data from the Higher Education Census (INEP, 2020) and the Coordination for the Improvement of Higher Education Personnel (CAPES), via Sucupira platform.

The greater female representation in the present study seems to be the trend in studies based on online questionnaires (BEZERRA et al., 2020; FINGER et al., 2021; GHARPURE et al., 2020; LIMA et al., 2020). This tendency may also reflect a higher interest by female instructors in taking surveys and gender participation in higher education courses in general, as observed in the census of higher education of INEP (National Institute of Educational Studies and Research). This census showed that more than 60% of students graduating from on-campus and distance-learning undergraduate courses are female (INEP, 2019). More importantly, female participation in courses in the field of food science (Food Engineering, Nutrition, Food Science, Veterinary Medicine, among others) is between 60 to 80% in Brazil.

The majority of respondents belong to the Brazilian middle-class, reflecting monthly incomes compatible with higher institution educators. Most respondents hold a doctorate degree. This result highlights the increased academic training of instructors and researchers in Brazil, which was also observed in our previous work (FINGER et al., 2020). The level of academic degree training of higher education instructors also reflects the increase in the number of graduate programs in the country since 2005, with the expansion of graduate schools across all disciplines. Despite this positive trend, graduate programs are still ill-equipped to properly provide pedagogical practice to its candidates (BRADFORTH et al., 2015; COSTA, 2010).

Among the respondent of this survey, most professors that responded the questionnaire belong to public institutions with full-time dedication to the university and they taught only in-person classes before the beginning of the pandemic. These data reinforce the need to significant adaptation in teaching that had to occur during the pandemic as well as the potential learning losses due to lack of practical training in many of the courses in the field. According to the census of higher education in Brazil, 88.2% of higher education institutions are private and only 11.8% are public (INEP, 2019). However, despite being in smaller numbers, public institutions, which provide education with no fees or tuition, are responsible for most of the Brazilian scientific research and the courses are better classified in the evaluation of higher education performed nationally and internationally (INEP, 2020).

According to the data on how each educator organized their weekly work routine, it is possible to verify that many professors spend almost half of their week with teaching related activities, but as pointed out earlier, Brazilian professors also develop many activities related to research, extension, and administrative duties. The broad scope of activities assigned to these professors requires multiple skills; however, it may impact the development of appropriate pedagogical strategies due to excessive workload. For a good performance in higher education, the instructor needs to have knowledge in the conceptual domain of the disciplines and apply appropriate methodologies to help students develop skills according to the nature of different courses/disciplines (CIRANI et al., 2015; ZABALZA, 2005). We have

previously discussed that professors of Food Microbiology and related areas in Brazil lack pedagogical training directed at developing teaching skills and this is further corroborated in the selection of new professors in which pedagogical abilities are undervalued as compared to research skills (FINGER et al., 2020).

Regarding the long-term continuity of academic activities during the COVID-19 pandemic after shutdowns, more than 50% reported that teaching activities were suspended. This period with no classes may have a long-lasting effect on learning and more studies are needed to evaluate the academic losses of this long interruption. The detrimental effects go beyond the acquisition of knowledge, as the social interactions and networking at university campuses are also crucial for professional and personal growth. As pointed out by Sohrabi et al. (2021), the current crisis will shape working and teaching patterns in the years ahead.

In Brazil, numerous public and private school institutions, in compliance with Ordinance No. 343, of March 17th, 2020 (BRASIL, 2020a) and Provisional Measure No. 934, of April 1st, 2020 (Brasil, 2020b), stablished by the Ministry of Education, were allowed to replace in-person classes with internet-based lectures in what was called Emergency Remote Education (ERE). This transition from face-to-face meetings to online education was abrupt in some universities and particularly challenging for some university professors (ASSUNÇÃO FLORES & GAGO, 2020). It is noteworthy that most of the Brazilian institutions were not prepared for long distance learning and some of them only had a couple of weeks to make the transition, as was the case in University of Sao Paulo, the largest and most prestigious university in the country (authors own experience).

Adaptations to classes remotely during the pandemic are worldwide. For example, higher education institutions in Bangalore, India, opted for online classes and the tools used by the faculty were Zoom, Google Meet, Skype, Google Classrooms, Virtual Learning Environment (LMS), YouTube, among others (SHENOY et al., 2020). The exploration of technologies and the use of new approaches can create a stimulating environment in the classroom (MASETTO, 2004). In addition, involving students in obtaining information from different sources and in building their own knowledge can contribute to achieving more significant learning objectives (FREEMAN et al., 2014). The use of technological tools demands a mediating attitude from the teacher and an active attitude from the student, as this duality provides a productive interaction. Thus, it is important to seek a platform that is viable and interesting for both parties (PALÚ et al., 2020).

In essence, even in an online platform, educators used the approach of expositive classes, featuring lectures in the traditional "teaching by telling approach" (FREEMAN et al., 2014). Therefore, Brazilian teachers continue to widely use the traditional teaching approach in the field of food science and technology, as demonstrated previously with Food Microbiology professors (FINGER et al., 2020). As argued by Palú et al. (2020) not every student can be equally successful through a single teaching scheme, so it is important to explore and adopt alternative and creative approaches. Involving students in problem solving is a modern teaching method recognized to be more motivating to students since it requires the capture of previously learned content and the application of new information received during the course (ASLAN, 2021). These beneficial problem-solving results are further enhanced when performed in a group setting and when the group has time to discuss it after the problem is announced, as reported by Schmidt (2020) in an experience with online classes. Team-based learning requires collective and collaborative construction of knowledge promoting more effective learning (PEDUZZI & AGRELI, 2018).

When evaluating the quality of virtual teaching, most educators are satisfied with online teaching adopted during the pandemic. We believe that these results reflect the successful efforts that these educators have been making to maintain the quality of teaching remotely, even with so many drawbacks. Nevertheless, the fact that the majority gave a score of 3 indicates the need to improve virtual education, which is understandable, given that many instructors did not have time to make the transition, as reported by many participants. This perception can be explained by the fact that there has been little time for professors and students to adapt to the context of remote teaching or in large by the preference for in-person experiences in the classroom and reflects the commitment of instructors to continually improve the quality of the classes under their responsibility. This result is also particularly important for higher education institutions because remote teaching may have been a temporary solution but will likely affect students' performance in many fields of study. Undoubtedly, the downtime due to the closing of research facilities is a problematic issue, since most of the research in the field of Food Science and Technology is characterized as bench work (SURYA, 2021) and many graduate students will have to delay the completion of their work due to the pandemic. For

instance, graduate students from the University of Sao Paulo could opt to extend their doctorate studies for up to 36 months more. One of the issues related to these time extensions, however, is that scholarships have not been extended due to lack of funding and student dropout rates may increase as a consequence (LASOTA et al., 2022).

Deficiency in preparation and qualification of the educators and researchers to improve their ability to work online during the pandemic can negatively impact the learning process, affecting the performance of students, teachers, and researchers (VALENTE et al., 2020). Other challenges or constraints identified by Tsegay et al. (2022) were related to lack of uninterrupted electricity/internet, teachers' ICT skills, and physical/emotional interaction. In this sense, corroborating with Monteiro & Souza (2020), we received several reports from the participants about physical and mental health concerns, with reduced creativity and losses in the quality of teaching due to the lack of experience in remote education. The results about the workload of some of the activities during the COVID-19 pandemic suggest that this new scenario involved distress and impacted the well-being of professors and students (ALVARENGA et al., 2020; FICANHA et al., 2020).

According to research of Fu & Zhou (2020) on the opportunities and challenges of online education, access to hardware equipment and a reliable wi-fi connection is unequal between students and teachers and there are issues related to the educator's technology literacy and resilience skills which may not meet the needs of online teaching. Nevertheless, some participants reported positive outcomes of online teaching such as saving commute time, the opportunity to learn new technologies, more autonomy and flexibility with schedules and the possibility of learning new didactic and research strategies, similar to the benefits pointed by professors in the study of Tsegay et al. (2022). One could argue that there are several benefits of online work, and universities should consider flexible work schedules, taking into consideration that commuting time may be diverted to work time and the use of new technologies may bring improvements in productivity.

The results show that some people feel that their productivity was affected during remote work. A study by Staniscuaski et al. (2021) with the academic population also points out that graduate productivity is being affected during the pandemic. The authors observed that this effect is related to gender, race, and parenting, with women with children having the most affected productivity, unlike white men without kids. These findings highlight the need to implement actions and policies to support working women including flexible deadlines, planning meeting times and other actions (STANISCUASKI et al., 2021). In contrast, in our study, 40% of participants who have children or are responsible for the primary care of family members pointed out an increase in productivity when compared to participants who do not have children. Despite the increase in the workload, some people may be more capable to coordinate working time, even with an increase in activities related to family care and general domestic tasks.

CONCLUSION

Due to adaptations to perform remote activities during the worst period of the COVID-19 pandemic in 2020, educators and researchers had to overcome many challenges and the Brazilian academic community made a joint effort to adapt and innovate in a timely manner. This scenario led to changes in teaching practices and in the development of research in the field of food science.

The in-person interactions were replaced by virtual interfaces; the insertion of technological tools in pedagogical mediation was necessary, and a wide variety of didactic resources have been observed. However, it was also possible to detect issues related to unpreparedness, work overload, mental health concerns and increased educational and social inequality.

Educators and researchers are now facing a special moment in history where there is a constant need to keep up with new and evolving technologies that can be incorporated in the classroom and improve teaching as well as research outcomes. Educators, particularly, need to adapt to the new virtual reality through the improvement and inclusion of digital practices in their classes in order to expand the teaching and learning processes. Universities must also provide mechanisms to help educators and students to take advantage of the experience of remote education in order to develop pedagogical actions in the post-pandemic future that facilitates learning and professional development. Furthermore, it is also necessary to consider the multiple Brazilian socioeconomic realities, so that, given the digital divide that still persists among students, it does not imply in the expansion of social and educational inequalities in the country.

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REFERENCES

ALVARENGA, R. et al. (2020). Percepção da qualidade de vida de professores das redes públicas e privadas frente à pandemia do covid-19. *Revista CPAQV–Centro de Pesquisas Avançadas em Qualidade de Vida*, *12*(3), 2. https://doi.org/10.36692/cpaqv-v12n3-1

ASLAN, A. (2021). Problem-based learning in live online classes: Learning achievement, problem-solving skill, communication skill, and interaction. *Computers & Education*, *171*, 104237. https://doi.org/10.1016/j.compedu.2021.104237

ASSUNÇÃO FLORES, M., & GAGO, M. (2020). Teacher education in times of COVID-19 pandemic in Portugal: national, institutional and pedagogical responses. *Journal of Education for Teaching*, *46*(4), 507-516. https://doi.org/10.1080/02607476.2020.1799709

BEZERRA, A. C. V., SILVA, C. E. M. D., SOARES, F. R. G., & SILVA, J. A. M. D. (2020). Fatores associados ao comportamento da população durante o isolamento social na pandemia de COVID-19. *Ciência & Saúde Coletiva*, *25*, 2411-2421. https://doi.org/10.1590/1413-81232020256.1.10792020

BRADFORTH, S. E. et al. (2015). University learning: Improve undergraduate science education. *Nature*, *523*(7560), 282-284. https://doi.org/10.1038/523282a

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 da pandemia do Novo Coronavírus–COVID-19. *Diário Oficial [da] República Federativa do Brasil*, Brasília, 2020, 39.

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 nº 13.979, de 6 de fevereiro de 2020. *Diário Oficial [da] República Federativa do Brasil*, Brasília, n. 63-A, 2020, 1.

CIRANI, C. B. S., CAMPANARIO, M. D. A., & SILVA, H. H. M. D. (2015). A evolução do ensino da pós-graduação senso estrito no Brasil: análise exploratória e proposições para pesquisa. *Avaliação: Revista da Avaliação da Educação Superior (Campinas)*, *20*, 163-187. https://doi.org/10.590/S1414-40772015000500011

COSTA, N. M. D. S. C. (2010). Pedagogical training of medicine professors. *Revista Latino-americana de Enfermagem*, *18*, 102-108. https://doi.org/10.1590/S0104-11692010000100016

FICANHA, E. E. et al. (2020). Aspectos biopsicossociais relacionados ao isolamento social durante a pandemia de Covid-19: uma revisão integrativa. *Research, Society and Development*, *9*(8), e709986410-e709986410. https://doi.org/10.33448/rsd-v9i8.6410

FINGER, J. A. F. F. et al. (2020). Challenges of teaching food microbiology in Brazil. *Brazilian Journal of Microbiology*, *51*, 279-288. https://doi.org/10.1007/s42770-019-00107-0

FINGER, J. A. F. F. et al. (2021). Adherence to food hygiene and personal protection recommendations for prevention of COVID-19. *Trends in Food Science & Technology*,*112*, 847-852. https://doi.org/10.1016/j.tifs.2021.03.016

FREEMAN, S. et al. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of The National Academy of Sciences*, *111*(23), 8410-8415. https://doi.org/10.1073/pnas.1319030111

FU, W., & ZHOU, H. (2020). Challenges brought by 2019-nCoV epidemic to online education in China and coping strategies. *Journal of Hebei Normal University (Educational Science)*, *22*(2), 14-18.

GHARPURE, R. et al. (2020). Knowledge and practices regarding safe household cleaning and disinfection for COVID-19 prevention—United States, May 2020. *American Journal of Transplantation*, *20*(10), 2946-2950. https://doi.org/10.1111/ajt.16300

INEP. (2019). Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. Ministério da Educação. Sinopse Estatística da Educação Superior, 2018. [online]. Brasília: INEP, 2019.

INEP. (2020). Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. Ministério da Educação.

Enade 2019. [online]. Brasília: INEP, 2020.

LASOTA, R. R. et al. (2022). The effects of losing postsecondary student grant aid: Results from a systematic review. *Educational Researcher*, *51*(2), 160-168. https://doi.org/10.3102/0013189X211056868

LIMA, D. L. F. et al. (2020). COVID-19 no estado do Ceará, Brasil: comportamentos e crenças na chegada da pandemia. *Ciência & Saúde Coletiva*, *25*(5), 1575-1586. https://doi.org/10.1590/1413-81232020255.07192020

MASETTO, M. (2004). Inovação na educação superior. *Interface - Comunicação, Saúde, Educação*, *8*, 197-202.

MENEZES, J. B. F., & MOTA, F. D. L. (2018). O uso das tecnologias educacionais durante o exercício da monitoria acadêmica em um curso de ciências biológicas. *Revista Brasileira de Iniciação Científica*, *6*(1), 96-108.

MENEZES, J. B. F., MOURA, F. N. S., & SOUSA, S. D. A. (2019). Utilização das tecnologias digitais por docentes vinculados à cursos de licenciatura ofertados no município de Crateús-CE. *Ciência & Desenvolvimento-Revista Eletrônica da FAINOR*, *12*(1), 111-128. https://doi.org/10.11602/1984-4271.2019.12.1.7

MONTEIRO, B. M. M., & SOUZA, J. C. (2020). Mental health and university teaching working conditions in the COVID 19 pandemic. *Research, Society and Development*, *9*(9), e468997660.

PALÚ, J., SCHÜTZ, J. A., & MAYER, L. (2020). Desafios da educação em tempos de pandemia. *Cruz Alta: Ilustração*, *324*.

PEDUZZI, M., & AGRELI, H. F. (2018). Trabalho em equipe e prática colaborativa na Atenção Primária à Saúde. *Interface - Comunicação, Saúde, Educação*, *22*, 1525-1534. https://doi.org/10.1590/1807-57622017.0827

SCHMIDT, S. J. (2020). Teaching AND reaching our students from a distance. *Journal of Food Science Education*, *19*(4), 234-237. https://doi.org/10.1111/1541-4329.12210

SHENOY, V., MAHENDRA, S., & VIJAY, N. (2020). COVID 19 lockdown technology adaption, teaching, learning, students engagement and faculty experience. *Mukt Shabd Journal*, *9*(4), 698-702.

SOHRABI, C. et al. (2021). Impact of the coronavirus (COVID-19) pandemic on scientific research and implications for clinical academic training–a review. *International Journal of Surgery*, *86*, 57-63. https://doi.org/10.1016/j.ijsu.2020.12.008

STANISCUASKI, F. et al. (2021). Gender, race and parenthood impact academic productivity during the COVID-19 pandemic: from survey to action. *Frontiers in Psychology*, *12*, 1-14, 663252. https://doi.org/10.3389/fpsyg.2021.663252

SURYA, R. (2021). Research at home: Being creative in running an undergraduate final research project in Food Science amidst the COVID-19 crisis. *Journal of Food Science Education*, *20*(1), 63-68. https://doi.org/10.1111/1541-4329.12213

TSEGAY, S. M., ASHRAF, M. A., PERVEEN, S., & ZEGERGISH, M. Z. (2022). Online teaching during COVID-19 pandemic: Teachers' experiences from a Chinese university. *Sustainability*, *14*(1), 568. https://doi.org/10.3390/su14010568

VALENTE, G. S. C., DE MORAES, É. B., SANCHEZ, M. C. O., DE SOUZA, D. F., & PACHECO, M. C. M. D. (2020). O ensino remoto frente às exigências do contexto de pandemia: Reflexões sobre a prática docente. *Research, Society and Development*, *9*(9), e843998153-e843998153. https://doi.org/10.33448/rsd-v9i9.8153

WHO. (2020). World Health Organization. COVID-19 and food safety: guidance for food businesses. Interim Guidance, 7 April 2020. https://www.who.int/publications-detail/covid-19-and-food-safety-guidance-for-food-businesses

ZABALZA, M. A. (2004). *O ensino universitário: seu cenário e seus protagonistas.* Porto Alegre: Artmed. Brasil, 2004. p. 238.