Impacts of the COVID-19 pandemic on the teachers’ work from the industrial engineering course at IFMG-Bambuí

Impactos da pandemia da COVID-19 no trabalho dos professores do curso de engenharia industrial do IFMG-Bambuí

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Abstract
Sars-Cov-2 pandemic mobilized emergency and immediate actions in all sectors and societies and affected the dynamics of all citizens’ life. In Brazil, one of the first changes implemented in the educational sector was the introduction of emergency distance education, done at the touch of box. Studies carried out have shown the effects of the pandemic on the work of teachers of elementary schools and prioritize the precarity of Brazilian education. Scarcity of study of this nature was observed at the higher level. In this sense, the following research question was elected: what are the impacts of social isolation on the work of teachers of the production engineering course at IFMG-Bambui during social isolation? The objective of the study is to answer this question by developing a qualitative research, together with 32 teachers of that course. Among the results, the changes and adaptations made by the teachers to carry out the work during social isolation, as well as the effects on their physical, mental and emotional health, were found. The study generated information to deepen on the

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subjects that link to teaching work in uncertainty times and developed fully in digital and remote mode.

**Keywords:** Teaching Work. Adverse Effects. Work Conditions. Federal Institute Of Education. Industrial Engineering.

**Resumo**
A pandemia do Sars-Cov-2 mobilizou ações emergenciais e imediatas em todos os setores e sociedades e afetou a dinâmica da vida de todos os cidadãos. No Brasil, uma das primeiras mudanças implementadas no setor educacional foi a introdução do ensino emergencial a distância, feito a toque de caixa. Estudos realizados têm mostrado os efeitos da pandemia no trabalho dos professores do ensino fundamental e priorizam a precarização da educação brasileira. A escassez de estudo dessa natureza foi observada no nível superior. Nesse sentido, elegeu-se a seguinte questão de pesquisa: quais são os impactos do isolamento social no trabalho dos professores do curso de engenharia de produção do IFMG-Bambuí durante o isolamento social? O objetivo do estudo é responder a essa questão por meio do desenvolvimento de uma pesquisa qualitativa, junto a 32 professores do referido curso. Dentre os resultados, foram encontradas as mudanças e adaptações feitas pelos professores para a realização do trabalho durante o isolamento social, bem como os efeitos na sua saúde física, mental e emocional. O estudo gerou informações para aprofundamento sobre os temas que vinculam o trabalho docente em tempos de incerteza e desenvolvido integralmente na modalidade digital e a distância.


**Introduction**
Tragedies throughout human history always leave a legacy of reflection, learning, and change. It has not been different regarding the pandemic triggered in 2019 and commonly known as Covid-19, which mobilized emergency and immediate actions worldwide starting in 2020. Considered the largest pandemic of the 21st century thus far, it was caused by the widespread proliferation of the SARS-CoV-2 coronavirus on a global scale, affecting humanity worldwide, impacting countries on all continents, and influencing various sectors and segments of society, driving emergency changes, including in the field of education.
According to Diamond (2013), diseases can change human behavior on a global scale and constitute one of the three factors present throughout the development of societies, serving as accelerators of history, namely wars, revolutions, and pandemics.

In the field of education, one of the immediate changes adopted worldwide was the introduction of emergency remote teaching, which began in Brazil in March 2020. One of the immediate consequences of this measure was the increase in emotional exhaustion among teachers and students due to the impacts of abrupt changes on their working conditions and the development of the teaching-learning process.

Estimates from UNESCO (2021) indicated that in April 2020, approximately 1.7 billion students, from preschool to higher education, were affected by school closures. According to UNESCO, about 53 million Brazilian students were affected, including 8.6 million from higher education, and 90.2% of students in 191 countries were impacted by social distancing measures.

Among the changes implemented, by government decrees, to prevent a complete halt of educational activities, remote teaching was abruptly adopted. However, according to Ghisleni (2020), this was done without adequate training to effectively integrate teachers and students with the new online interaction tools, which also required new forms of interpersonal relationships. This measure, although necessary, also highlighted the precariousness of Brazilian education, reflecting the reality of teachers and students in terms of access to digital media and their forms of interaction. Significant segments of students, especially from public schools, have never had access to the internet at their homes, let alone owning computers or smartphones.

According to the PNADC - Continuous National Household Sample Survey - PNADC Brazil (2021), this number is above 40 million. For this population of students, the pandemic brought more compromising effects due to their disconnection from the circle of relationships with teachers and schoolmates.

The previous considerations raise questions related to the repercussions of the Covid-19 pandemic on teaching work, whether related to variables that account for adverse effects or related to the specificities of each context and educational level. In this line, the research sought knowledge focusing on the impact of the Covid-19 pandemic in different school environments, levels of education, infrastructure, working conditions, levels of teacher quality of life, among other variables that can characterize the reality of teaching work in the pandemic scenario. It is within this framework that the present study was proposed, specifically to generate information about the work of teachers in the undergraduate course of...
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Production Engineering at the Federal Institute of Education, Science, and Technology of Minas Gerais, Bambuí campus. The study also aims to contribute to existing research and encourage new research in the field. Therefore, the study was guided by the following research question: What are the impacts of the pandemic on the work of teachers in the Production Engineering course at IFMG-Bambuí during the period of social isolation?

The article is structured as follows: an introduction; a literature review on teaching during the pandemic and its adverse effects on teaching work. It also includes information on the methodological procedures of the study, presentation and analysis of the data collected through a standardized questionnaire, results, and final considerations.

1.1 Remote Teaching During Social Isolation

Remote teaching adopted in the context of the Covid-19 pandemic was made mandatory by Decree No. 343 of 2020, directed at higher education institutions within the federal education system. Subsequently, based on Law No. 14,040 of 2020, new decrees and ordinances were issued to ensure the operationalization of remote teaching, in an exceptional manner, through the use of digital educational resources to fulfill the workload of pedagogical activities. This situation prevailed until the end of the decree to return to in-person classes at the end of 2021 and its consolidation in 2022.

Despite this scenario, PNADC Brazil (2021) demonstrated that the proportion of Brazilian households with internet access experienced an increase from 79.1% to 82.7% in 2019. However, it is crucial to consider other variables when examining the impact of social inequality in this domain, as the country harbors a population of 40 million individuals who remain disconnected from the digital network. It is important to highlight that although approximately 72% of Brazilian households possess internet connectivity, this figure does not necessarily translate into satisfactory conditions to support remote teaching across all educational levels. Additionally, PNADC Brazil (2021) revealed a substantial presence of low-income university students who have temporarily transitioned to remote learning, both within public and private institutions.

Another group directly affected by the emergency measures implemented during the pandemic period was that of teachers. The study conducted by Valente et al. (2020) revealed a significant increase in the pressure imposed on teachers to rapidly assimilate the new technologies of remote teaching, which greatly impacted their workload. Additionally, teachers faced unsatisfactory conditions in their improvised home infrastructures to carry out
their work, as well as the new dynamics of familial coexistence within the confines of the lockdown. These circumstances were further compounded by the emotional distress resulting from the loss of relatives and friends, as well as the profound feelings of uncertainty and insecurity regarding the future of their profession and employment.

Santos (2020), in addressing the pedagogy and teaching forced upon by COVID-19, affirms that every pedagogical act holds the potential to either humanize or dehumanize, underscoring the profound importance and relevance of reflecting upon the human life within this context.

1.2 Adverse Effects of the Pandemic on Teaching Work

Research conducted within the context of the COVID-19 pandemic has revealed the consequences of increased and ongoing quantitative and qualitative demands placed upon teachers, leading to the emergence of chronic exhaustion and emotional depletion. These outcomes represent key indicators of the precariousness inherent in teaching work. Amongst these studies, Baeriswyl, Bratoljic, and Krause (2021) assert the necessity of investigating the factors that contribute to teacher stress. Dolghan and Owen (2021) have identified specific variables, such as teaching experience, professional development, and instructional support, as influential factors that correlate with teachers’ perceptions of self-efficacy during the transition to online teaching amidst a pandemic.

In a study published in Social Education (2020) in the United States, some teachers reported missing the sense of being together in a special space, such as school, learning and supporting each other. One participant in the study expressed this sentiment by stating, "I think our true sense of community comes from our shared academic experiences" (p.150). The authors believe that this is what is missing in the remote teaching environment.

Chronic exhaustion is characterized by the repetitive and continuous experience of fatigue, physical and mental tiredness that teachers face in their teaching practice, particularly during the period of social isolation. It is closely related to emotional exhaustion resulting from the prolonged working hours and the absence of social contact. Consequently, this reality gives rise to various uncertainties regarding the future of the profession, increased turnover in the workforce, absences, replacements, separations, and a lack of prospects, among other actions that will impact the desired outcomes in educational activities, potentially compromising both individual and organizational goals.
At the same time, these studies aim to expand knowledge about the processes that lead to emotional exhaustion and seek to demonstrate how the effects of prolonged remote work hours, lack of social contact, uncertainties about the future, among other factors that have emerged or been reinforced in the context of COVID-19, contribute to its increase. Moreover, it is strongly related to organizational outcomes such as turnover (ALARCON, 2011), performance (TARIS, 2006), psychological reactions, and physiological stress (LEE & ASHFORTH, 1990). All of this has important implications for promoting workplace health (BAERISWYL; BRATOLJIC; KRAUSE, 2021).

Furthermore, according to Baeriswyl, Bratoljic, and Krause (2021), the prolonged work hours facilitated by quick access to digital means should be seen as an early warning sign for school managers, indicating the need to closely monitor teachers in order to help them reduce the risk of emotional exhaustion and its adverse consequences for teachers, students, and the school itself. It is crucial to develop actions that promote physical, mental, and emotional health, as well as social well-being for all involved.

The study conducted by Silva et al. (2020) found that in the context of the pandemic, issues known as productivity and teacher work overload persist and worsen. The authors observed that teachers worked more than usual, maintained high levels of academic output, adapted their homes to workspaces, continued remote activities even without proper preparation and conditions, and experienced illness.

**Methodology and Methodological Procedures**

This study adopts a qualitative and descriptive research approach, following the definition provided by Kauark, Manhães, and Medeiros (2010, p. 26). It is characterized by a subject-object relationship between the researcher and the real world, devoid of statistical methods and techniques, and focuses on the collection of data from the natural environment. The primary aim is to provide a comprehensive description of the phenomena under investigation.

Regarding its objective, this study is characterized as descriptive research, as defined by Rampazzo (2005, p. 53), which involves observing, recording, analyzing, relating, and studying facts from the physical environment without the researcher's subjective opinion. Data collection was conducted through a structured questionnaire designed to investigate the life and work dynamics of teachers during the period of social isolation, encompassing the suspension of face-to-face work. The questionnaire addresses aspects related to time
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utilization and allocation, engagement in professional development activities, professional and social relationships, changes and adaptations in work routines, among others. The questionnaire was distributed to the 32 teachers enrolled in the course via email in June 2022, utilizing the Google Forms tool. Within the specified timeframe, 18 questionnaires were returned, representing approximately 56% of the total number of teachers affiliated with the mentioned course.

IFMG Campus Bambuí offers 7 technical level courses, 10 undergraduate courses, 3 postgraduate courses (Lato Sensu), and 1 (Stricto Sensu). Established in 2010, the Production Engineering program achieved the maximum rating in the MEC course evaluation in 2015 and has consistently received a four-star rating in the Guia do Estudante published by Editora Abril since 2016. Therefore, it is recognized as one of the top Production Engineering courses in the country.

Presentation and Analysis Of Results

The findings reveal that 55% of the faculty members are male, while 45% are female. Among them, 61% fall within the age bracket of 37 to 54, with a mean age of 43 years. The vast majority (94%) hold advanced degrees at the master's or doctoral level, and 88% are tenured faculty, while the remaining 12% are employed on a temporary basis as substitute instructors. Approximately 61% of the participants have accumulated over a decade of experience in the academic program, whereas 16% have a tenure of 2 to 5 years, and merely 23% have been engaged for 1 to 2 years. With respect to departmental affiliation, it was observed that 44% belong to the DEC (Department of Engineering and Computing), 44% are associated with the DCGH (Department of Managerial and Human Sciences), and 12% are affiliated with the DCL (Department of Sciences and Languages).

When asked whether they were currently enrolled in any type of course or training, 61% of the participants stated that they were not, while 39% indicated that they were. Among those who were pursuing further education, 33% were enrolled in a stricto sensu graduate program at the doctoral level, and 6% were pursuing a master's degree. Regarding their professional roles, 78% of the teachers reported working in technical and higher education courses, while 11% were involved in teaching solely technical, higher education, and postgraduate courses. Another 11% were exclusively teaching higher education courses.

Regarding the use and distribution of time during the period of social isolation, it was observed that 72.2% of the teachers experienced an increase in the time dedicated to their
regular academic tasks. Among them, approximately 18% reported an increase of up to two hours per day, while the majority (82%) reported an average increase of up to six hours per day. This data is considered alarming by Baeriswyl, Bratoljic, and Krause (2021), as it is a practice that can lead to what they refer to as the risk of emotional exhaustion, with adverse consequences for the physical, mental, and emotional health of teachers.

**Working on weekends** was a reality for 77.8% of the teaching staff, and these dynamics elicited varied responses. The positive aspect was highlighted in terms of the flexibility and autonomy it provided, allowing for dedicated work engagement and a sense of productivity during the period of social isolation, thereby aiding in coping with the challenges brought about by the disease context. Conversely, the negative side was associated with an increased workload under a climate of pressure. Considering the interplay between **task demands and time constraints**, only 5.5% of the educators reported insufficient time availability, as they had to assume additional responsibilities pertaining to their family life. Moreover, 16.7% deemed the allocated time to be unsatisfactory due to a decrease in productivity. The data indicate that 83.3% of the respondents felt pressured to meet targets and deadlines, highlighting the potential negative impact of such circumstances. A study conducted by Santos (2020) revealed that the pedagogical and work approaches imposed by certain educational institutions on their teaching staff can be dehumanizing.

The study refers to measures such as the use of technological tools without proper training or preparation, the precarious quality of internet connectivity, computer equipment, and the physical environment to support teaching work. It also highlights the lack of interaction with peers and the insensitivity of school administrators who attempted to replicate the school environment within teachers’ homes, thereby minimizing the diverse realities and domestic and health-related challenges they faced, among other reasons. These findings align with those reported in the study by Silva et al. (2020) regarding the effects of productivity variables and workload burden on teachers, indicating an excessive increase in working hours, with over 80% of respondents working at least 5 additional hours. This increase is justified by the need to maintain high levels of academic output, while teachers also feel pressured to meet goals and deadlines.

When queried about their inclination towards **undertaking professional and personal development activities** during the period of social isolation, it was revealed that the majority (94%) embarked upon various forms of educational pursuits, encompassing both knowledge updating and specialized training. Courses focusing on pedagogical aspects and topics such as virtual learning environments, active technologies, and audiovisual resources
were particularly prominent. Additionally, a notable number of individuals also commenced master's and doctoral programs, showcasing a commitment to advanced scholarly endeavors amidst the circumstances of isolation.

Furthermore, it was observed that approximately 77% of teachers sought information electronically through attending live events, lectures, and reading scientific articles in their field. Among the communication channels utilized, only 5.5% of teachers resorted to print media.

Regarding changes in the quality of professional and social relationships during the isolation period, occurrences of both improvement and deterioration were noted. Overall, the responses from teachers indicated changes, for various reasons, in their relationships with colleagues (50%), course coordinators and neighbors (27%), and friends (44%). It was found that 67% of the teachers' responses indicated that the relationship with students was the most affected aspect, followed by the relationship with fellow teachers. Instances of improvement in relationships were mentioned by 33% of respondents, particularly within the context of family life, involving spouses, parents, and children.

Among the main changes most frequently reported during the period of isolation, the following were observed: a transformation in the way work is performed (89% of responses), highlighting the intensification of the use of remote technologies and an increase in working hours, as well as the unfamiliarity of working without interactions with colleagues, which impacted idea exchanges and decision-making. The distancing from students was also emphasized as a significant change. Changes in personal care routines were observed in 61% of responses, whether due to alterations in dietary habits or an increase in hygiene measures. Additionally, there was a demonstrated interest among teachers in establishing connections with sources of learning, as previously mentioned. There was also an expressed interest in pursuing new income opportunities (18% of responses) and facing financial difficulties (39%) arising from family members' illness in the context of the pandemic.

When asked if there were any tasks or professional activities that could not be fully carried out during the period of social isolation, it was found that 16% of the responses mentioned the development of practical classes. Additionally, 22% indicated the continuity of research and extension projects, while 55% stated that they did not interrupt any activities during this period. Regarding the distribution of workload among teaching, research, and extension activities, it was found that 83% of the respondents allocated at least 70% of their workload to remote teaching activities, 67% dedicated at least 20% to ongoing research, and 72% allocated at least 30% of their workload to extension activities. When asked which of the
three activities was most affected, 38% pointed to teaching activities, 44% to research activities, and 50% to extension activities.

Regarding the adaptations made to carry out teaching work during the period of social isolation, it was found that adaptations were made to accommodate the students' conditions (89% of the responses), to the family/household routine (72%), the need to acquire technological equipment (mentioned by 67% of the respondents), and the acquisition of new internet services/packages (55%). The need for investments in technology and technological resources to adapt the working conditions of teachers confirms the precariousness of remote work conditions in Brazilian households, as mentioned in the study by Brazil (2021) and IBGE (2018). These results differ from those found in Silva et al. (2020), where approximately 70% of the teachers reported having technological conditions to carry out their activities, demonstrating how the impacts can vary in different realities.

When asked about occurrences related to changes in habits and personal health, a wide variety of responses with high frequency rates were observed. Thus, 88% of them pointed to daily fatigue; 83% indicated anxiety, changes in sleep patterns, personal demotivation, and complete social isolation. Furthermore, 78% reported changes in eating habits; 72% referred to a sudden drop in productivity for no apparent reason; 66% expressed anguish and disbelief. However, the occurrence that highlights the extent of the consequences of social isolation on the physical, mental, and emotional health of teachers was the indication that 94% of the responses mentioned the need to consult doctors and therapists during the social isolation period. These results align with those of the study by Baeriswyl, Bratoljic, and Krause (2021), where 51% of teachers in a situation of social isolation with increased workload experienced anxiety, demotivation, and sleep disturbances, and 43% experienced a sudden drop in productivity and persistent fatigue when they started working from home due to social isolation.

The general educators were also asked about the measures or behaviors they resorted to in order to cope with social isolation. The majority of their responses (88%) revolved around maintaining a work and study routine, followed by maintaining a self-care routine (66% of the responses) and engaging in physical activity (61%). According to Baeriswyl, Bratoljic, and Krause (2021), this indicates that the items assessing workload and extended work hours should not be interpreted as indicators of a single construct, as they encompass other activities and distinct reactions based on individual realities of the educators.

When asked about their concerns regarding the resumption of in-person activities, 77% of the responses focused on adopting and maintaining satisfactory sanitary conditions,
while 72% pointed out the risk of contamination. Only 10% highlighted the recovery of students' learning process. These results confirm that, in addition to health and sanitary concerns, according to Fior and Martins (2020), educators' commitment to recovering the content and experiences that were not developed due to remote teaching is one of the priorities after the return to in-person activities.

When questioned about their self-evaluation of their work during the period of isolation, the predominant frequency of responses (55%) indicated satisfaction, 22% of them expressed neutrality (neither satisfactory nor unsatisfactory), 17% reported dissatisfaction, and a mere 6% reported high satisfaction. These findings exhibited similarity to the study conducted by Silva et al. (2020) at the State University of Rio de Janeiro, where a similar pattern was observed, with 43.6% reporting satisfaction, 23.5% expressing neutrality (neither satisfactory nor unsatisfactory), 17.4% reporting dissatisfaction, and only 12.6% reporting high satisfaction. Thus, the results demonstrate a consistent trend among the studied populations.

Conclusions

It can be observed that the majority of the teaching staff in the study course consists of tenured professors, with almost all of them holding master's or doctoral degrees. They form a young group, with an average age of 43, and the majority are male.

Among the obtained results, there were some reconfigurations of the working conditions, such as an increase in the time dedicated to academic tasks, up to 6 hours per day, which altered the routine of most professors. Although a portion of the teachers reported that working on weekends had a positive aspect, as it allowed for more flexibility and autonomy, there were also complaints regarding the pressure experienced, which contributed to the emergence of physical, mental, and emotional health issues among the faculty. These issues were partially associated with work overload to meet deadlines and goals.

To cope with the emptiness brought by social isolation and make the most of their teaching life and time, the teachers pursued training and updating courses and embarked on master's and doctoral programs using technological tools. These initiatives demonstrated their commitment to their careers and profession, as they recognized the need for continuous development and a closer bond with digital technologies in their fields of expertise. It was also observed that, in order to sustain their teaching work from home, some teachers had to incur financial expenses to adapt equipment and digital technologies.
Among the different relationships that teachers establish in their daily lives, professional relationships were the most affected, with the majority reporting a negative impact on their interaction and connection with students and fellow teachers – a gap that technology was unable to fully compensate for. On the other hand, the prolonged presence of teachers within their families brought them closer to the daily lives and routines of their loved ones, strengthening emotional bonds with their spouses, children, and parents.

The intensification of staying within the family environment also brought about changes in personal care routines, dietary habits, and overall health. This manifested positively through increased attention and time dedicated to physical activities, adequate sleep, among others. However, it also had negative effects such as weight gain, the emergence and exacerbation of discomfort, symptoms, pain, and illness, which can be attributed to emotional causes and stress stemming from pressure to meet deadlines and goals.

In this context, in addition to the abrupt decline in productivity, the emergence of feelings of anguish, stress, and uncertainties regarding the future of work and the profession, as well as the consequences of the pandemic in the educational field where teachers are involved, were observed. This reflects the insecurity regarding the changes in the practice of teaching in the face of these challenges.

The study provided information that allows for a more in-depth analysis of issues related to teaching work in times of uncertainty and precariousness. In this sense, one aspect that deserves greater attention is the impact of unexpected events, such as a pandemic, on the work carried out in the field of education. The Covid-19 pandemic has driven the use of technology as a means to partially fill the gap left by face-to-face teaching. However, it has also highlighted the value of the affective interaction provided by human contact among the different agents involved in this process.

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