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Just in Time Education: Educational Technology for Professional's Health

Monica Motta Lino* , Jean Carlos Müller Da Silva Bizarro† , Eloisa Cesa Zuanazzi† , Luiza Sheyla Evenni Porfírio Will Castro† , Felipa Rafaela Amadigi , Thaise Torres , Sophia Da Fonseca Rangel .

Interdisciplinary Laboratory of Educational Technologies in Health, Department of Nursing, Federal University of Santa Catarina, Florianópolis, Brazil

Email: *monica.lino@ufsc.br, muller.83@gmail.com, eloisacesaz@gmail.com, lsepwill@gmail.com, felipaamadigi@gmail.com, thaise_18torres@hotmail.com, sophiafonseca.r@gmail.com

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Abstract

Objective: Verify if the educational technology based on Just in Time Education is relevant to Permanent Health Education in Workers' Health. Method: This study is exploratory and descriptive qualitative research. Were performed semi-structured interviews were carried out with the worker's health team of a large company from the South of Brazil region. The collected data were carried out in 2021, between January and May, through the virtual environment, with eight participants from the Work Health Team of Eletrosul, located in Florianópolis, who agreed to participate in the research by signing the Free and Informed Consent Term, in accordance with the data saturation criterion. The research was approved by the Ethics Committee (n. 4079133) and the data were submitted to Bardin for thematic content analysis. Result: The results are presented from three categories: 1) Expansion and inclusion in Permanent Education needs; 2) Tools adopted in educational processes; 3) Just in Time Education: educational technology for workers' health. **Conclusion**: The active methodology Just in Time Education helps the processes of Permanent Education in Health, which moved from a face-to-face model to e-learning and required the knowledge renewal in the technology area to maintain efficient communication. This methodology allows quick and accurate access to information from a reliable, adequate, and up-to-date source, causing a positive impact on the qualified and problem-solving work process, in line with the needs of the employer and the company. Therefore, Just in Time Education can provide standardization, organization, and informational and operational quality necessary in this context, in addition to serving as an indicator and data generator (management tool).

^{*}Correspondence author.

[†]These authors have contributed equally to this work.

Keywords

Permanent Health Education, Educational Technology, Worker's Health, Active Methodology, Qualitative Research

1. Introduction

Discussions about the qualification of workers in general and, in particular, in the health sector have been changing throughout history. The job market demands that health professionals be prepared to deal with emerging technologies, emphasizing that traditional teaching models no longer support such needs. Society has changed and, with it, the ways of learning changed as well. Technological advances and digital immersion have transformed the way of thinking and acting of people, such as the increased velocity of processing the content and better information management [1].

Technological development and innovative expansion applied to medical devices and new therapies, especially in the hospital environment, require the strengthening of the health team, with training/qualifications in the attempt to develop their work with quality and safety [2].

From this perspective, health education actions supported by technologies are increasingly present in education, work, and social relationships. This is fundamental for the development of mechanisms and learning practices that arouse interest and meet the needs of the current generation, in line with what is perceived as innovative [3]. Thus, traditional training models are no longer compatible with the technological development of today's society, either because they demand costs, which can be minimized with intelligent solutions, or because of the need for innovation demanded by the new generation.

In Brazil, there is no formal data that economically compare the investment in health education with the iatrogenic cost to the patient, despite the fact that the damage is the irrevocable character, however, it is estimated that the wasted expenses per year in the health system, as a consequence of hospital errors/adverse events, exceed US\$ 1.26 billion [4]. Compared to the USA, the annual cost of preventable medical errors is over US\$ 17.1 billion; and most health institutions spend around US\$20,000 per nurse per year on training [5]. In this sense, adherence to medical error prevention activities, such as the use of educational tools, besides ensuring patient safety contributes to reducing medical care costs associated with avoidable errors.

For the nurse to work in the management of care and the team, it is necessary to accumulate a broad load of theoretical and practical knowledge, because these professionals have the competence to guarantee the training and qualification of the other nursing team members. But a major challenge in this formation and capacitation process occurs when nurses need to teach something they do not know or do not fully master, so is evident the importance of the easy-access to

Permanent Health Education (PHE) through technological tools, since care is interconnected with technologies, which provide scientific knowledge and its transformations quickly and dynamically [6]. Therefore, PHE is necessary to fill possible gaps in the nursing training process in order to contribute to safe and qualified care [7].

The world is interactive and technology is increasingly present in our daily lives, especially in the health area, with the emergence of new forms of treatment and care models. Educational technologies are characterized by tools capable of mediating the teaching and learning process, used between educators (health professionals) and students (clients) in different educational methodologies, whether academic, permanent, or continuing, providing construction and reconstruction of the knowledge, contributing to an educational advance in health [8].

In this bias, Just in Time Education (JITEd), an educational instrument that facilitates the delivery of content in a timely manner promotes an increase in the quality of health care, and can be addressed to both health professionals and patients [9]. Thus, the proposed question is: How can educational technologies contribute to a better professional qualification of workers? In this context, this study aimed to understand how the expansion and inclusion of technological tools in the permanent educational process support the Worker's health based on JITEd to Permanent Education.

2. Methodology

This is an exploratory and descriptive qualitative research from the macro-project "Interactive Health: Technology that Promotes Education in Real-Time", from the Federal University of Santa Catarina. The study setting was the Occupational Health Sector of Eletrosul Power Stations S.A., located in Florianópolis, Santa Catarina, Brazil. It is a large company, which has projects in the states of Paraná, Santa Catarina, the Rio Grande do Sul, Mato Grosso do Sul, Pará, and Rondônia, being responsible for the health of one thousand five hundred employees.

The participants were the Worker's Health Team (WHT) from Eletrosul Power Stations S.A. Florianópolis headquarters: two administrative assistants, one psychologist, two doctors, one nurse, one nursing technician and one occupational safety technician. The following inclusion criteria were adopted in this research: being a WHT professional and agreeing to participate in the research. The study includes all possible participants, so there are no exclusion criteria.

The invitation letter to participate in the research was sent by e-mail and after the return with the acceptance of the WHT members, the individual appointment was made according to the availability indicated. Data collection took place virtually between January and May 2021, with eight participants from Eletrosul's WHT, who agreed to participate in the research by signing the Free and Informed Consent Term, satisfying the data saturation criterion. A semi-structured and individual interview script was used.

The meetings to carry out the interviews were performed in a reserved room

inside the work environment (Eletrosul's building), in a silent and adequate physical space for the development of the virtual dialogue. The semi-structured interviews were recorded with the support of a voice recorder and had an average of 2 hours of duration; and were done individually, according to the availability of each participant. The content was recorded and later transcribed, and all participants were invited to read and validate the transcribed material.

The participants' speeches were identified with pseudonyms throughout the study, in order to maintain the participants' confidentiality, namely: H1, H2, H3 and H4 for professionals with high-school scholarty level; U1, U2, U3 and U4 for professionals with university education. They were respected as Resolutions of the National Health Council n. 466/2012 and 510/2016. The research approved by the Ethics Committee for Research with Human Beings, under documented n. 4079133 and CAAE 31140820.5.0000.0121.

The semi-structured interview was guided by an instrument prepared from five guiding questions: 1) How and how often are educational processes carried out in the occupational health sector? 2) Do you notice the importance of expanding the educational process in your work environment? What implications/contributions could this situation add? 3) Do the currently adopted technological tools in your work environment, especially for carrying out the educational/training process, supply your needs? Could they be different? 4) What sources do you usually search to find knowledge/information when you have a doubt in your daily work? How can you ensure that this source of information is secure and/or reliable? 5) Do you believe that a low-cost educational technology solution could add value to your work environment? Have you ever heard about Just in Time Education? Can we talk more about it? Feel free to talk about what you are interested in, including questions or suggestions for the project.

The Atlas.Ti* Software was adopted for the organization and systematization of the findings in the interviews and, based on that, Bardin's thematic content analysis was carried out, which included: pre-analysis, material exploration, results treatment and interpretation/inferences through consistent updated literature, including national and international reference. The results are presented based on three categories: 1) Permanent Health Education necessity of expansion and inclusion; 2) Tools adopted in educational processes; 3) Just In Time Education: educational technology for workers' health.

3. Results

3.1. Permanent Health Education Necessity of Expansion an Inclusion

According to the interviewees, the training topics for company employees are related to Regulatory Norms, due the company be an electric power company were included first aid training, training on NR-10 which is to work at electrical hazards, work at heights, work in confined spaces were part of legal and formal training, also these issues were included in the health area.

Improvement in the area of occupational health and other activities of the company were foreseen in the Regulatory Norms, as well as a course of updating equipment, use of PPE. There are improvement study groups in the health area, which includes information technology, control, occupational health and occupational diseases. Pre-hospital first aid course, including electric shock, cardiac arrest, with a focus on preparing these professionals in an equivalent way to first responders who work on the roads that have a traffic accident, this course is given when the employees enter into the company and every two years as recycling; also have rescue at height course.

The biggest obstacle to employee job training right now is that there is no systematic program of continuing education or recycling. Another obstacle was related to the pandemic, because some activities were released from being carried out, to avoid exposing the employee to the virus. Even the state and municipal decrees limited the educational issue, training, capacitations were restricted, now we are gradually resuming, but it certainly influenced a lot, practically stagnated, only strictly legal training, for example, employees who had to enter a risk area and needed training because it was an essential activity, then they were allowed to do it, there were emergency situations, but routine like that, it stagnated.

The employees do many online courses, as they can plan their time to take online courses, including paid courses (the institution may even pay the costs depending on the type of course, if it is interesting for the area), this makes it possible to carry out courses in any place in the world. So in general the employees prefer online learning.

The employees prefer training due to the exchange of knowledge, not only of the course that they are doing, but also the interaction with professionals from other areas of activity, which enriches the learning process even more. So, the expansion of the education process is necessary and would add quality to the work process, contributing not only to WHT, but also to all employees.

I have no doubt that we need [more educational processes] and that this would considerably increase our quality in the work process. The day-to-day work in the area of occupational health is extremely dynamic and has a very strong legal basis. Clarifying the fact and the day-to-day work itself is essential, this avoids making mistakes due to lack of updating (S2).

The expansion would improve, participating in some lectures would be great. I think that information is never too much, even more for us—that work here in the health area, we are obliged to know about several things (M1).

They indicate that the company's counterpart, as an incentive, would be of great importance for workers to be more motivated to participate—and should be offered to all employees more training.

The company should encourage more, because it has personal motivation: our team [WHT] really likes to study, learn and update itself, but it is a very personal motivation. There should be more encouragement from the company (S1).

Some company professionals informed that despite work together with the

WHT, they do not participate in the PHE events held, due they be outsourced and not direct employees of the company. This shows that no outsourced employees are included in formal educational processes.

We never participated in training. We always learn from the people here [WHT]. Since I joined, eight years ago, I have never had any kind of training, as it is outsourced employee. And the outsourced company that hires us never offered training (M2).

It was highlighted by all interviewed participants that there is no formal agenda of educational processes for the company employees. The forming programs happened by demand of workers, on an eventual character; or by employer initiative, on a descending and mandatory character without considering the real needs of these workers.

We systematically do not have [educational processes], despite the company having a Corporate Education sector. It is not systematic, it is on demand: this activity appears and these people who are included in this activity are trained (M3).

3.2. Tools Adopted in Educational Processes

The formal educational processes reported by WHT members are mostly instructional and in lecture format. Many professionals discuss subjects that are required by law and developed with expository tools and methods.

Normally [without pandemic] we do lectures and instructional activities (S3). Most [of the courses] are really expository (M3).

Although the educational processes still be hegemonically traditional—in the sense of transmitting knowledge, the interviewees refer that the company has supported a more dialogic process in the context of training. This was highlighted when the preparation of the so-called "educational employees" was mentioned, that a can be observed when employees from various sectors and also from WHT are responsible for promoting the other workers's PHE, within the organization itself.

[The company] is closely linked to liberating pedagogical concepts, so they use Paulo Freire as a reference and teach the educator employees to deliver their training in a more dialogic way, more of information sharing, within a perspective that valorizes the knowledge exchange. Well, we are all workers at the same company, so we all know a little bit about it. So, the best way for us to learn in the work process is by sharing and exchanging information (S2).

In activities with young apprentices, I bring up general topics, for example. mental disorder or harassment. Finally, we work on various topics together with the young apprentices, which are fundamental to awaken reflection (S1).

Unlike an external instructor—who often doesn't even know the company's reality and may be spread a information that is not the reality, then that is lost because the training does not become attractive and whoever is there on the other side does not see ownership in whom is talking—the educator employee is

a huge insight, very intelligent (M3).

With the ongoing Covid-19 pandemic, these courses converged to the remote format, using video and image resources on the online platform. To maintain the safety of workers, the practical activities that some courses previously offered were canceled. Before the pandemic, however, these activities included realistic clinical simulation, with actors, for some training courses, such as first aid.

Now, in times of a pandemic, we [WHT] are not doing the practical part, but we usually do the practical part. We have a defibrillator of training, mannequins. We have the whole simulation part. We [WHT] do a test with them [workers] at the end of the training, a practical test in a simulated context—and all this gives people a sense of truth, which is very positive (S2).

Participants indicate that self-instructional courses are also offered, in which, through access to the virtual platform, it is possible to autonomously carry out the entire course, including self-assessment. These courses have naturally expanded since the Covid-19 pandemic.

We have self-instructional courses, with self-assessment, to do for self-knowledge. There, practically everything is online, with an online platform (S4).

Another feature pointed out by WHT refers to the use of institutional emails to keep company workers informed. However, WHT is concerned about the effectiveness of this and other initiatives. For this reason, WHT has pointed out the need to expand and renew the tools adopted, according to the records of the evidence.

We ended up always using the same tools, like sending our content by email, sending the link. The worker receives in his work area, many look out, others not look. And sometimes we [WHT] can not reach the extension that we would like (S2).

Last year [2020, pandemic on the rise] was very stopped, no courses, no training. Lately I have not taken any courses (S1).

I think that new technological education tools would help a lot in our work process today [WHT]. We arrived at a point where we can not expand more than that, so new ideas, new possibilities would be welcome today (S2).

3.3. *Just in Time Education*: Educational Technology for Worker's Health

After introducing the JITEd active methodology to WHT members, there was positive feedback about the methodology adherence. The participants were confident and interested in this perspective for the processes of Permanent Education in Health.

It will add a lot here for us, in the occupational health sector, but it will also help all other employees (M1).

I'm completely in favor of these new ideas, it's something new and interesting (S3).

Today we are in the time of education and quick information, so the Just in

Time fits like a glove: everyone wants information very quickly in hand, no one wishes to waste two days looking for information. For us [WHT] it would be very significant, with a big impact on our work process, it would really qualify a lot, it would be decisive to have faster information. It's lovely to think that we can have this possibility—quick access, for example, to an updated Regulatory Normative (S2).

The WHT highlighted the interest in the method able to strengthen know-ledge from an audiovisual perspective, fast and updated in real time. Indicate that it is in line with the needs of the company. Also, it highlighted the fact that JITEd offers fast and safe content, suited to the needs of the person/company.

Visual and auditory are stronger than text. So, this has to be valued, because these generations use this side more than those long texts that we were used to, which were pages and pages of books. People learn differently nowadays (S4).

It would be nice if this idea and this practice were common. Because it's a modern thing but at the same time it is not a complex thing. It is a technology that someone thought of using for the benefit of health, and health education, so it is interesting (S1).

There are some work routines, even, that are not very trivial and that are not done every day. So arrives in a time that emerges the question "how is it done?" and sometimes these are basic functions that you do not do every day, so you have to look for it, you have to remember (M3).

There is a special concern reported by WHT about the sources of consultation in doubt situations, in the sense that these sources be reliable.

When you have a doubt, it depends a lot on the professional's curiosity, proactivity, and have the ability to find the right sources. Because it is not helpful use the Google to looking for any crap. I try to solve my doubts with more experienced professionals in the area, we have certain paths, but nothing formal. This tool [JITEd] could be an opportunity for safe knowledge, to obtain an orientation faster, in a source of consultation in case of doubts (S1).

If it is not an internal question, it is on the internet, a supplier, some other company that may have the answer. (...) It is usually like this, we go hunting for information, because there is nothing parameterized, nothing is easy to find, everything is assembled and we find the knowledge to try to understand the process that was generated (M4).

The importance of standardizing certain processes that JITEd can provide in the organization was highlighted, as well as the quality standards that can emerge from this context.

When you standardize, having a database that everyone has access to the same database, standardizes. Whenever any process is standardized, you get a quality from that personal objective activity. (...) If I have a service routine in which everyone has the same attendance, if I give a simple information in a standardized way like everyone else does, we fall back on an objective quality, this means that everyone will have a standard of care attendance. (...) So everything

that is standardized is better. If you don't have a standard of care, well-defined protocols, anyone who comes here to replace me will be "lost". It is not always possible, but we [WHT] try to standardize protocols, POP, routines that we have. And, in this sense, the method can contribute a lot, especially in a computerized context (M3).

The more operational JITEd, more likely it is to be applicable, with activities that need quick guidance. To guide the operational worker, it is better to make a video. What we [WHT] have been doing is not explaining the whole process, but only the demand that comes. The worker asks "how do I do such thing" and we just explain what is questinated—because the huge amount of explanation worse the comprehension. It's hard to find something that be specific, usually it is just the general. And it is complex to set up training, because we do not know exactly if what we are teaching is really what they [workers] need to know. Understanding demand is difficult, it can end up replicating a difficulty. JITEd can be useful in this sense, able to focus, make available quick orientation, standardization and operational (M4).

In addition, besides the customized or personalized learning that JITEd can provide to workers, was highlighted the relevance of the resource in the context of management, since each access to the published content by the tool generates a statistic, internally, to the organization, through a corporate panel. Thus, it becomes viable to realize statistical inferences and predictive analyzes from graphs of the proposed educational technological resource use.

The idea is brilliant, because contribute with the pontual doubts issues, as well as cath the goal that you aim, in a dynamic and quick way, the method can be used as a management tool (M3).

4. Discussion

To reduce the impact of the Covid-19 pandemic on people's lives, several countries around the world have adopted systematic surveillance processes to contain the transmission of the virus, such as controlling borders between states and countries, closing schools, imposing distancing among other actions, in order to mitigate the damage caused by the virus. In this context, a fundamental strategy to ensure the continuity of the provision of health services referred to the training/qualification of health workers to perform work based on the new scenario that was socially imposed [10].

Health institutions have learned some lessons from the pandemic: 1) pandemics can be prolonged; 2) high-quality non-pandemic health care is still a priority; and 3) disruption of various functions within organizational sectors can be reduced through technology [10].

In this context, PHE promotes the maintenance of the team's clinical skills and knowledge, maintains performance and boosts a positive patient outcomes. They are therefore crucial in enabling Workers' Health Teams to continue providing high-quality care to patients, equipping them to handle ongoing

non-Covid-19 cases and ready to face an ever-increasing number of clinical needs that were not attended—which are being postponed—to balance the system during the intervening crisis [10] [11] [12].

Work's Health and Safety is made up of people who are on the front line, even within factories and institutions, and it is important not ignore the importance of continuous professional qualification. Just as several companies are innovating with methods of working at home, it is necessary that companies and industries know and consider the use of new educational technologies beyond updating in a new technological arrangement, advance with innovation to continuous health training in the face of adversity that are socially imposed [10].

The continuing education of healthcare workers has been significantly impacted by the Covid-19 pandemic. Clinical training days have been canceled; annual review of corrected skill progression requirements; reduced or reworked out-of-program opportunities; and clinical routines were reconfigured to prioritize frontline emergency response, while in the meantime combating disinformation was necessary [11] [12].

However, in between hese challenges, many positive learning experiences and new ways to access PHE opportunities have emerged [13] [14] [15]. In the UK, access to online education emerged with the use of Microsoft Teams* and Zoom* (Zoom Video Communications). For those not on the front lines, the ability to participate in activities over the phone, helplines and follow-up to workers with suspected or confirmed Covid-19, provided valuable training opportunities [11].

While traditional face-to-face teaching methods may have been canceled or postponed, virtual learning and online webinars have emerged, providing WHTs ongoing opportunities to learn—both as participants and as lecturers. A recent review showed that online learning has been the most used method to mitigate the adverse effects of the pandemic on continuing education for all workers [13] [14] [15]. These initiatives can be implemented reasonably quickly, as demonstrated by the experiences of one institution in Singapore [11].

Online sessions offer some advantages such as easy accessibility, allowing online training from outside the institution itself, encouraging the learning system from shared experiences between different specialties and hospitals in large geographic regions. Furthermore, even in live online teaching sessions, the evolution of these platforms allows both direct interaction (such as chat available for questions to be asked in real time), and promotes an involvement of online teaching in a similar manner when compared to personal (face-to-face) teaching [11] [13] [14] [15].

In this bias, guidelines were produced for WHT's educators/teachers informing how to effectively prepare and maximize the usefulness of online teaching sessions addressed to companies and organizations workers, in the face of the pandemic. It should be noted that WHT clinical meetings were held in an online format, allowing easier access to decision-making shared by experts. In general, virtual meetings performed by WHT offer a standard of service equivalent to

face-to-face meetings [11].

Technological and social media platforms have facilitated continuous learning during the pandemic. Many WhatsApp groups with Covid-19 themes were formed among WHT, in order to provide opportunities for sharing resources, guidelines, pertinent research articles and clinical experiences. Likewise, Twitter provided a dynamic forum to highlight the world's Covid-19 resources and share knowledge. WhatsApp groups among WHT members also provided an important support network for interns and workers (patients) to be assisted. Various digital platforms promoted by the UK's National Health Service—e.g. Headspace (Headspace), Daylight (Big Health) and Sleepio (Big Health)—have been helpful in providing additional wellness support and complementing face-to-face reports and psychological care for students who get involved inside the companies issues, as well as support the WHT's communication with other assisted workers [11].

Thus, the implementation of mixed reality technologies in the clinical environment has also been used to maximize educational opportunities [13] [14] [15]. For example, one study demonstrated the value of headset adherence by healthcare professionals, when it revealed the importance of real-time interactions perceiving due to two-way communication with remotely located colleagues. This strategy favored students who were not at the bedside bed to participate in clinical consultations and observe procedures, minimizing their potential exposure to Covid-19 and facilitating continuous learning in a safe way. Such technology also reduced the average time spent on visits to the nursery, which improved the efficiency of the workday for doctors [11]. Many educational opportunities have emerged and evolved due to innovations and reconfigurations in patient care pathways during the pandemic. Most of them could continue to be implemented in the future, maximizing the use of technology and facilitating the involvement of WHT in new ways to continue clinical practice, as well as mitigating the challenges that the pandemic poses to the care of workers in companies and organizations. It is vital that these benefits be recognized, so new educational technologies are created in the scope of worker health [11] [13] [14] [15].

Notably, the amount of information produced and available is immense, on the other hand, never in history the ignorance has been so propagated and disseminated. The dissemination of false information, called fake news, by articulated groups generates distrust and fear. Therefore, the role of Nursing and other health professionals, as health educators, is fundamental to oppose and eradicate this type of information. For this, professionals need to dialogue in an accessible and contextualized way with the objective of promoting health, preventing diseases and injuries, as well as combating misinformation [12].

Therefore, the active methodology JITEd, an approach that facilitates the provision of education based on time and work, can have practical application in the quality of life and in the impacts on the mental health of health professionals

by allowing access to reliable information in a fast manner, ensuring efficiency, safety, and quality in the provision of health services, as reported by [13] in their study. These characteristics are reinforced and highlighted in [14] and [15] studies that obtained improvement in the cognitive knowledge of professionals using the JITEd methodology.

In this context, [9] in their study demonstrated the efficiency of a JITEd program in a large private hospital, allowing educators and managers to balance clinical education theory without losing the fidelity of the teaching method, keeping nurses in the clinical environment, at the same time while providing authentic learning experiences for nurses. In this study, the importance of this type of education and the subsequent results were highlighted, to guide hospital administrators who take into account the requirements of the Standards of the National Health Safety and Quality Service.

In the same way, studies point to the numerous benefits generated by the role of the student as responsible for their own education, from their reflections and inquiries that arise practical solutions to real or even potential problems [16] [17] [18]. It can not be denied the direct impact on professional performance due to the paths taken and the knowledge acquired during the training process. Thus, preparing students for praxis is a necessity that needs to be better discussed and, mainly, implemented in conjunction with emerging technologies.

5. Conclusion

PHE transitioned from a face-to-face and classic model to e-learning, revolutionizing the health professional's need to renew their knowledge in the area of technology in order to remain updated and qualified. In this way, the active JITEd methodology can help the processes of Permanent Health Education, by allowing quick and accurate access to a range of reliable, appropriate, and up-to-date information, contributing positively to a qualified and resolute work process. Therefore, considering the quality of life and the impacts on workers' mental health, it is necessary to insert consistent and significant educational policies and coping mechanisms. In this scenario, JITEd can provide standardization, organization, and informational and operational quality necessary in this context, in addition, can be used as an indicator and data generator, serving as a management tool. This interview had a limited participant number. So, it is suggested that new research be carried out with a greater number of participants in the attempt to compare these results with the findings of this research.

Authors' Contribution

Monica M. Lino: Conceptualization, methodology, investigation, data curation, writing-original draft, project administration, supervision, validation; Jean C. M. S. Bizarro: writing-original draft, visualization; Eloisa C. Zuanazzi: data curation, writing-original draft; Luiza S. E. P. W. Castro: writing-original draft, visualization, writing review & editing; Felipa Rafaela Amadigi: conceptualization, writ-

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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