

EDUCATIONAL TECHNOLOGY APPLIED TO CONTINUING EDUCATION FOR HEALTHCARE PROFESSIONALS: AN ANALYSIS OF THE GOIÁS TELEMEDICINE AND TELEHEALTH CENTER (2017–2022)

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Highlights: (1) Tele-education reflects epidemiological and health training needs. (2) Online classes expand access to continuing education for health workers. (3) Tele-education strengthens continuing education and training in the SUS.

PRE-PROOF

(as accepted)

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ABSTRACT

Introduction/Objective: This study aims to analyze the tele-education initiatives developed by the Goiás Telemedicine and Telehealth Center (NUTTs) through online classes held between 2017 and 2022, focusing on the topics covered, the duration of the activities, and the alignment of the content with the needs of primary care professionals. **Method:** The methodology employed a descriptive, exploratory, and qualitative-quantitative approach. Data from 2017 to 2022 were analyzed in collaboration with NUTTs. The data analysis was structured in three stages: (1) descriptive analysis, calculating the absolute frequency of topics, broken down by year; (2) calculation of the total and average duration of the web-based classes, also broken down by year; and (3) analysis of the keywords associated with the topics of each web-based class. **Results:** The results revealed a total of 620 web-based classes covering various fields from 2017 to 2022. The fields with the highest number of web-based classes over the years were psychology (181 web-based classes offered), nutrition (121 web-based classes offered), and nursing (83 web-based classes offered). The shortest web-based classes were in medicine, biomedicine, and social work, while those in physical therapy, nursing, and dentistry were the longest. The topics most frequently covered in the web-based classes were yellow fever, general diseases, nutrition, COVID-19, childhood obesity, cancer, and nutrition for cancer patients. **Conclusion:** This study highlights the fundamental role of information and communication technology in the continuing education process for healthcare professionals.

Palavras-chave: Educational Technology. Online Classes. Distance Learning.

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INTRODUÇÃO

In recent years, there has been a rapid technological transformation, leading to new configurations in the workplace. In the field of health, these transformations are particularly evident in the development of Health Information and Communication Technologies (ICTs), which encompass resources aimed at the production, storage, and transmission of—as well as the protection and accessibility of—health data and information¹.

ICTs comprise a set of tools and systems designed to expand communication processes, strengthen social integration, promote access to information, facilitate the provision of services, and foster the circulation of knowledge^{2,3}. The COVID-19 pandemic marked a turning point in the advancement and consolidation of these technologies by driving their large-scale implementation and highlighting their strategic role in maintaining health services, managing information, and overcoming the challenges posed by physical distancing⁴.

In Brazil, this trend was also reflected in significant figures: in 2017, approximately 27% of healthcare facilities already had departments dedicated to information technology, and by 2020, telehealth services were available in 85.2% of the states. This progress was facilitated by the ongoing efforts of the Ministry of Health, whose goal is to digitize the healthcare network, with an emphasis on computerizing Primary Health Care (PHC), as well as investing in the training of professionals through continuing education programs, with the aim of improving the quality of services provided and the effectiveness of the system^{1,5}.

Continuing Health Education (CHE), established as a national policy by the Ministry of Health through Ordinances nº. 198/2004⁶ and nº. 1,996/2007⁷, aims to guide the training and continuous professional development of professionals working in public health services. Its central purpose is to promote changes in professional practices and work organization, in order to align them with the needs and challenges of the health system⁸

CHE is based on three essential principles: promoting meaningful learning, addressing everyday challenges, and training critical and transformative professionals. These principles involve valuing the prior knowledge of health workers, integrating topics of

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practical relevance, focusing on daily challenges and the search for concrete solutions, as well as encouraging continuous learning and overcoming traditional hierarchies in teaching and work processes⁹.

In this context, the CHE finds in the National Telehealth Brazil Networks Program one of the main means of implementing its guidelines. Created in 2007 by the Ministry of Health through Ordinance No. 35/2007¹⁰, and subsequently redefined and expanded by Ordinance No. 2,546/2011¹¹, the program aims to develop initiatives to support health care and CHE, particularly targeting primary care teams. These initiatives are carried out by Telehealth Centers, which are responsible for planning, executing, monitoring, and evaluating technical, scientific, and administrative activities, with an emphasis on the production and provision of teleconsultations, telediagnosics, and tele-education activities⁹.

Telessaúde Brasil Redes, through its centers and the services it offers—including Teleducação—serves as a strategic tool for the professional development of healthcare professionals within the the CHE framework. By supporting primary care teams in coordinating care pathways, providing remote clinical support, implementing matrix-based support, and resolving day-to-day problems, the program reaffirms its role in improving clinical practices and strengthening the Unified Health System (SUS)^{12,13}

The CHE activities promoted by the National Telehealth Brazil Networks Program aim to enhance workforce education, with a focus on improving the quality of care, expanding the scope of action of multidisciplinary primary care teams, transforming care practices, organizing work processes, and strengthening primary care as the organizing element of services within Brazil's Unified Health System¹⁴

This study, while focused on the state of Goiás, has implications that go beyond the local context, since the international literature points to distance education as a key strategy for addressing the shortage of qualified professionals and reducing inequalities in access to knowledge across different health care systems^{15,16}.

The Brazilian experience, particularly within the context of the SUS, can be considered a replicable model for other universal public health systems or for low- and middle-income regions seeking scalable and cost-effective training solutions. The findings

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align with the global goals of the 2030 Agenda¹⁷, particularly ODS 3 (Good Health and Well-being)¹⁸ and ODS 4 (Quality Education)¹⁹, reinforcing the importance of distance learning as a strategic tool for training professionals and improving the response to emerging challenges, such as pandemics and the rise in chronic noncommunicable diseases.

Thus, this study aims to analyze the distance education initiatives developed by the Goiás Telemedicine and Telehealth Center (NUTTs) through the online classes held between 2017 and 2022, focusing on the topics covered, the duration of the activities, and the alignment of the content with the needs of primary care professionals.

METHODOLOGY

Study Design

This is a descriptive, exploratory study with a quantitative approach using secondary data provided by NUTTs. Measures were taken to ensure the confidentiality, privacy, and protection of participants, preventing any possibility of individual identification without consent or appropriate ethical justification. Access to the data complied with the guidelines of the General Data Protection Law (Law No. 13,709/2018)²⁰, ensuring the privacy and anonymization of sensitive personal information, as well as the ethical standards established by Resolution No. 466/2012 of the National Health Council²¹.

Data processing took place in a secure environment, with access restricted to the information essential for the analysis, in accordance with best practices in governance and information protection. All stages of the process were conducted transparently, in compliance with legal and ethical requirements, and in a manner that allows other researchers to replicate the study without compromising the privacy of the individuals involved.

The data, covering the period from October 2015 to December 2022, were classified, organized, and tabulated using Microsoft Excel® 2020. This time frame corresponds to the phase of expansion, restructuring, and consolidation of the distance education initiatives promoted by the program.

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The variables analyzed included: field, year, duration, and topic of the web lectures available on the official NUTTs YouTube channel (@Telessaudegoiasoficial). For the purposes of this study, “field” was defined as the professional area related to the web lecture, identified based on the presentation’s title and the speaker’s academic background (undergraduate degree). The “topic” corresponds to the content covered in the lecture, while “duration” was expressed in minutes, representing the total length of each video.

Data Analysis

The data analysis was conducted in three sequential stages: (i) descriptive analysis, (ii) calculation of the cumulative and average duration of the online classes, and (iii) analysis of keywords related to the topics covered.

We used Microsoft Excel 2020 and the R software package (version 4.2.1), with support from the *dplyr*, *ggplot2*, *plotly*, *openxlsx*, *stringr*, *magrittr*, *patchwork*, *reshape2*, and *tm* libraries.

In the first stage (descriptive analysis), the online classes were grouped by topic and year, allowing us to calculate the absolute frequencies by area of knowledge for the period from 2017 to 2022. The results were presented using bar charts, enabling the identification of thematic and temporal trends.

In the second stage, indicators of the cumulative course load for the web classes in each year and the average duration per class were calculated, stratified by time period. These indicators were represented in line charts, providing a quantitative view of the evolution of the course load.

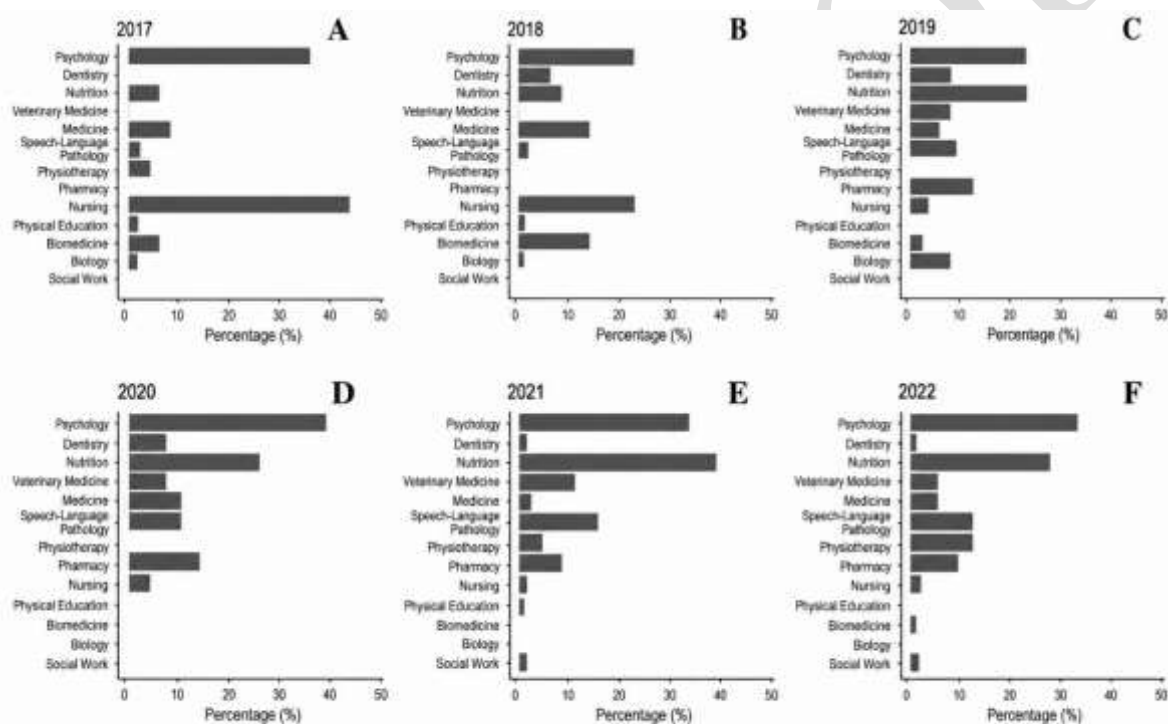
In the third stage, an exploratory analysis of textual content was conducted using the word cloud technique. To this end, the titles of the web-based classes were processed, including standardization of keywords, removal of irrelevant terms, and correction of linguistic variations. This procedure reduced noise in the analysis and made it possible to identify and quantify the recurrence of similar terms between 2017 and 2022.

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RESULTS

From 2017 to 2022, a total of 620 online classes covering various fields were made available by NUTTs and posted on its official YouTube channel. Figure 1 shows the fields that have had the highest number of web-based classes over the years: psychology (n = 181), nutrition (n = 121), and nursing (n = 83).

Figure 1. Number of online classes offered by NUTTs per year (2017–2022).



Source: NUTTS, 2023.

The field that offered the most online courses during the 2017–2022 period was psychology, as shown in Figures 1A, 1B, 1C, 1D, 1E, and 1F. The field of nutrition also offered online classes, with a significant increase in 2020 and 2021, as shown in Figures 1D and 1E. The field of nursing had the highest number of online classes in 2017 and 2018, as evident in Figures 1A and 1B, but saw a decline in subsequent years.

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When calculating the duration of web-based classes by field, it can be observed that the web-based classes with the highest cumulative number of hours (sum per field) are in nursing, psychology, and nutrition, as shown in Figure 1A. This finding is related to the greater number of classes offered in these fields over the years.

Regarding the average duration (in minutes) of the classes, Figure 1B shows that the shortest web-based classes were in medicine, biomedicine, and social work. Conversely, the longest classes were in physical therapy, nursing, and dentistry.

Figure 2. Class duration for NUTTs online classes from 2017 to 2022

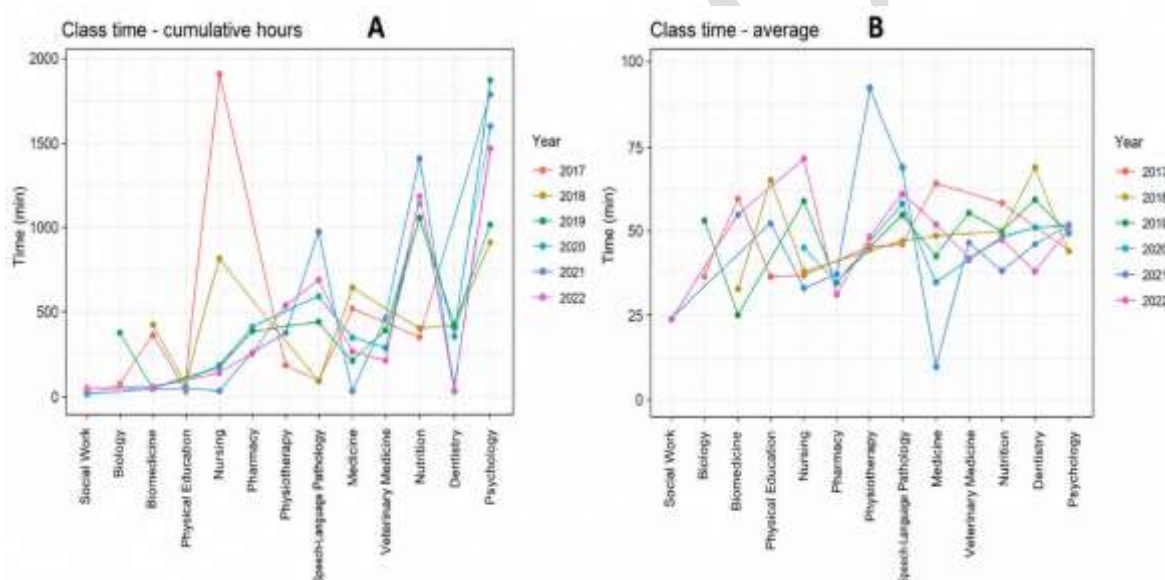


Figure 2A shows “Class Time—Cumulative Hours,” while Figure 2B shows “Class Time—Average.”

Source: NUTTS, 2023.

When analyzing the word cloud, as shown in Figure 3, with the aim of identifying the main topics of the online classes, it is observed that the most prominent word across all years is “health.” This is because the majority of the online classes are related to the field of health.

In 2020, the focus was on COVID-19. In 2021, childhood obesity took center stage, as did nutrition—specifically healthy eating and its importance for immunity. In 2022, the topic of cancer was extensively covered, along with nutrition during cancer treatment.

Figura 3. Word cloud of the online courses offered by NUTTs from 2017 to 2022



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DISCUSSION

The results indicated a higher volume of educational content in the field of psychology, highlighting the availability of training programs geared toward mental health professionals. This finding reflects recurring challenges in mental health care, such as a shortage of resources, inadequate professional care, violations of patients' rights, and difficulty accessing professional training programs. The complexity of mental health care requires multifaceted approaches, including long-term therapeutic and psychological support²².

It was found that the fields of nursing, psychology, and nutrition accounted for the highest number of class hours. The predominance of these areas suggests an educational focus on topics such as obesity, nutrition, and patient care. The significant increase in obesity and overweight globally is alarming, and its consequences extend beyond the physical realm, being associated with psychological disorders such as anxiety, depression, and eating disorders²³.

In 2017, Brazil faced the largest wild yellow fever epidemic in recent decades, a fact reflected in the presence of the term “fever” in the analyses. In 2019, the topics “medications” and “pharmaceuticals” gained prominence, suggesting an increase in discussion about pharmaceutical practice and its relationship to the safety and effectiveness of treatment. The COVID-19 pandemic, beginning in 2020, had a significant impact on the search for educational resources, driving content on mental health, nutrition, and lifestyle habits^{24,25}. In 2021, childhood obesity was widely discussed, while in 2022, discussions focused on cancer and nutrition for cancer patients²³.

Childhood obesity, defined as the excessive accumulation of body fat, has been recognized as a public health problem of global proportions²⁶, with its prevalence tripling over the past three decades, as noted in a report by the United Nations Children's Fund (UNICEF)²⁷. This significant increase is associated with factors such as changes in dietary patterns, rapid urbanization, and an increasingly sedentary lifestyle²⁶.

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The importance of a multidisciplinary approach to obesity is widely recognized in the literature, as this condition is associated with biological, psychological, and social factors, requiring integrated care strategies²⁶. In addition to physiological and metabolic consequences, childhood obesity is directly linked to psychological, social, and economic impacts. Obese children often face stigma and discrimination, which affect their self-esteem and social integration²⁸. Furthermore, the costs associated with treating obesity and its complications represent a significant burden on health care systems, underscoring the need for effective intervention starting in childhood²⁷. Thus, a multidisciplinary approach—involving nutritionists, psychologists, physicians, and physical educators—as well as family involvement is essential to ensure comprehensive and effective treatment that goes beyond weight loss and promotes sustainable changes in children's eating behaviors and lifestyles^{26,28,29}.

The findings regarding the high demand for training in the field of mental health are consistent with studies pointing to the growing need for psychological and therapeutic support, due to the shortage of professionals and the complexity of psychiatric disorders²². The impact of the pandemic on mental health has been widely documented, highlighting increased anxiety, stress, and depression among the general population and healthcare professionals, corroborating the findings of the present study³⁰. In addition, changes in eating behavior and physical activity during social isolation contributed to increased consumption of ultra-processed foods and a more sedentary lifestyle³¹.

The COVID-19 pandemic has accelerated the need for emergency training of healthcare professionals, making Continuing Health Education (CHE) a fundamental strategy. Faced with an uncertain situation, it was essential to rapidly train teams in infection control, clinical management, and adapting services to the new public health guidelines³².

Primary Health Care (PHC) played a central role in addressing the pandemic, working on epidemiological tracking, case monitoring, and mitigating psychosocial impacts, such as mental health disorders and domestic violence³³. The CHE facilitated the dissemination of updated protocols and training on the correct use of Personal Protective Equipment (PPE) and preventive measures. However, challenges such as institutional

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resistance and a lack of investment hinder its implementation across various services³³. In addition to these challenges, which were addressed through tele-education, it was observed that CHE strengthened the Psychosocial Care Network, promoting integration between Primary Health Care and specialized services, such as the Psychosocial Care Centers and Expanded Family Health Units, to ensure adequate support for the growing demand for mental health care³³.

The rapid spread of EPS during the pandemic thus reflects its importance in helping professionals adapt to new care guidelines, ensuring greater safety in patient care and improving the health services' response to the health crisis³².

The emphasis placed on Pharmaceutical Care in 2019 is also supported by studies that highlight the importance of pharmacists in health education, medication dispensing, and pharmacotherapeutic monitoring, promoting safety and treatment adherence. Melo and Pauferro (2020) emphasize that the pharmacist's role goes beyond simply dispensing medications; it involves educational activities aimed at guiding patients on the rational use of medications, identifying and preventing potential drug interactions, and promoting treatment adherence, thereby contributing to patient safety and therapeutic efficacy.³⁴ The relevance of nutrition in the context of cancer, highlighted in 2022, is supported by the literature, which identifies diet as one of the main modifiable environmental factors in the prevention and control of the disease³⁵. The findings of this study underscore the importance of distance learning as a strategic tool for expanding the training of healthcare professionals. Distance learning enables continuous access to up-to-date content, allowing professionals to acquire knowledge that enhances their skills and competencies in patient care.

In addition, an analysis of the topics covered in the online courses over the years provides insight into the priorities of professional training in health care, reflecting emerging needs and epidemiological events that have impacted society.

Another relevant point is the flexibility provided by the web-based classes available on NUTTs' YouTube channel, allowing professionals to watch the content at their convenience, review the topics at their own pace, and reduce travel costs. The possibility of

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asynchronous access to the content reinforces the democratization of knowledge and the optimization of time for professional training³⁶.

Thus, this study contributes to the understanding of the evolution of demands for health training and reinforces the importance of distance education as an essential tool for professional development and the dissemination of knowledge based on scientific evidence.

FINAL CONSIDERATIONS

This study highlighted the importance of continuing professional development through the online courses offered by NUTTs. Thus, the research underscores the fundamental role of information and communication technology in the dissemination of knowledge through distance education, providing a diverse range of learning opportunities for those interested in these fields. The accessibility and flexibility offered by these online resources promote the continuous development and expansion of knowledge on the topics covered.

The fields with the highest number of web-based courses were psychology, nursing, and nutrition. The main topics covered were yellow fever, general diseases, nutrition, COVID-19, childhood obesity, cancer, and nutrition for cancer patients.

Given this context, it is clear that the importance of continuing education for healthcare professionals is indisputable. The healthcare landscape is constantly evolving, with technological advances, scientific discoveries, and changes in clinical practices. Continuing education allows healthcare professionals to stay up to date, improve their skills, and acquire new knowledge to provide quality care.

The emphasis on continuing education not only benefits individual professionals but also positively impacts the quality of health services provided to the community. Therefore, investing in continuing education programs for health professionals is essential to ensuring excellence in care and promoting the health and wellness of the population.

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