

## **Vaccines and Covid-19: an experience report about the internal qualification of an extension project**

**Vacinas e Covid-19: um relato de experiência sobre a qualificação interna de um projeto de extensão**

**Vacunas y Covid-19: un relato de experiencia sobre la calificación interna de un proyecto de extensión**

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### **Abstract**

The objective of this study is to report the experience lived by extensionists of the Immunology project in Professional Schools of Fortaleza in an internal training on Vaccines and Covid-19. This is an exploratory and descriptive study, of a qualitative and quantitative nature, carried out through the Google Meet videoconferencing application and the Google Forms survey management application. Students from undergraduate courses in health sciences and biological sciences linked to the extension project participated in the activity, as well as students and professors from postgraduate programs at the Federal University of Ceará (UFC). Among the results, distance communication technologies through the dissemination of didactic content make the teaching and learning process possible, effectively and playfully enabling the transfer of knowledge and interaction between people without the need for direct contact in the same physical environment. Through globalized communication tools, it is possible to ensure effectiveness in learning and disseminating content related to a particular theme. In conclusion, the teaching and learning activity carried out by virtual means was successful. The project public was able to expand knowledge about immunology, focusing on the constituent inputs of the vaccine against Covid-19, promoting the dissemination of knowledge during the online meeting.

**Keywords:** Teaching; Immunology; Distance education.

### **Resumo**

O objetivo deste estudo é relatar a experiência vivenciada por extensionistas do projeto Imunologia em Escolas Profissionalizantes de Fortaleza em uma capacitação interna sobre Vacinas e Covid-19. Trata-se de um estudo exploratório e descritivo, de caráter qualitativo e quantitativo realizado por meio do aplicativo de videoconferência

Google Meet e do aplicativo de gerenciamento de pesquisas Google Forms. Participaram da atividade discentes dos cursos de graduação em ciências da saúde e em ciências biológicas vinculados ao projeto de extensão, além de discentes e docentes de programas de pós-graduação da Universidade Federal do Ceará (UFC). Dentre os resultados, as tecnologias de comunicação a distância por meio da disseminação do conteúdo didático possibilitam o processo de ensino e aprendizagem, viabilizando de forma eficaz e lúdica o repasse do conhecimento e interação entre pessoas sem a necessidade de contato direto em um mesmo ambiente físico. Por meio de ferramentas globalizadas de comunicação é possível garantir a eficácia na aprendizagem e divulgação de conteúdos relacionados a uma determinada temática. Em conclusão, a atividade de ensino e aprendizagem realizada por meios virtuais ocorreu de forma exitosa. O público do projeto pôde ampliar o conhecimento sobre a imunologia, com enfoque nos insumos constituintes da vacina contra Covid-19, promovendo a divulgação de conhecimentos durante o encontro on-line.

**Palavras-chave:** Ensino; Imunologia; Educação à distância.

### Resumen

El objetivo de este estudio es relatar la experiencia vivida por extensionistas del proyecto Inmunología en Escuelas Profesionales de Fortaleza en una formación interna sobre Vacunas y Covid-19. Se trata de un estudio exploratorio y descriptivo, de carácter cualitativo y cuantitativo, realizado a través de la aplicación de videoconferencia Google Meet y la aplicación de gestión de encuestas Google Forms. Participaron de la actividad estudiantes de cursos de graduación en ciencias de la salud y ciencias biológicas vinculados al proyecto de extensión, así como estudiantes y profesores de programas de posgrado de la Universidad Federal de Ceará (UFC). Entre los resultados, las tecnologías de comunicación a distancia a través de la difusión de contenidos didácticos posibilitan el proceso de enseñanza y aprendizaje, posibilitando de manera efectiva y lúdica la transferencia de conocimientos y la interacción entre personas sin necesidad de contacto directo en un mismo ambiente físico. A través de herramientas de comunicación globalizadas, es posible garantizar la eficacia en el aprendizaje y la difusión de contenidos relacionados con un tema en particular. En conclusión, la actividad de enseñanza y aprendizaje realizada por medios virtuales fue exitosa. El público del proyecto pudo ampliar conocimientos sobre inmunología, enfocándose en los insumos constituyentes de la vacuna contra el Covid-19, promoviendo la difusión del conocimiento durante el encuentro en línea.

**Palabras clave:** Enseñanza; Inmunología; Educación a distancia.

## 1. Introduction

Immunology is described in the sciences as the study of the immune system of the body, seeking to highlight and disseminate the physiological functioning in order to maintain the human body through its defense mechanisms, ensuring its homeostasis (De Almeida, 2017). Cells such as leukocytes are incorporated into this system, and can be divided into phagocytes and lymphocytes, and this system is subdivided into immediate or long-term responses, such as innate and adaptive responses (Natale *et al.*, 2019; Silva *et al.*, 2018). If dealing with the innate system, this protective mechanism against invading agents as a form of first line of defense of the organism, acting as a physical barrier through the skin, saliva, tears or epithelium, as well as cells such as macrophages, neutrophils and monocytes (Silva *et al.*, 2022; Cruvinel *et al.*, 2010).

Unlike the innate, the adaptive has the possibility to generate the secretion of certain antibodies as a way to ensure the protection of the system (Mesquita-Júnior *et al.*, 2010). This protection can be disseminated by B and T lymphocytes, which act internally to the pathogen mechanism (Cruvinel *et al.*, 2010). In this sense, immunology can present highly relevant content in all fields of professional action of health sciences, allowing the discussion of issues that are important for the integral formation of the professional (Silva *et al.*, 2022; Dias *et al.*, 2021).

The implementation of new technologies as a form of teaching through the playful application on a given theme can be considered promising in terms of promoting learning (Silva *et al.*, 2018), since it promotes to the student the possibility of interest and enthusiasm (De Almeida, 2017; Evangelista *et al.*, 2021). These practical technologies can facilitate the construction of knowledge in specific subjects, such as in the teaching of immunology (Silva *et al.*, 2021), given the complex subject matter of this fundamental science (Silva *et al.*, 2022).

In the years 2020 and 2021, with the advancement of the *Covid-19* crisis, the teaching means were adapted to the virtual with the aim of reducing the infection contagion curve (Ferreira & Pena, 2020). Educational institutions used communication tools with the aim of disseminating and maintaining the transfer of knowledge on issues relevant to the

formation of society at all educational levels, demonstrating effectiveness in the communication process (Neves *et al.*, 2021). With the advancement of vaccination, these technologies have been previously reduced, being the system managed in a hybrid way in some regions, but that enables its use in an interactive and dynamic way (Leineweber & Bermudez, 2021).

Through the creativity and dedication of everyone involved in this process, the use of interactive resources such as games (Silva *et al.*, 2021), movies, and music are feasible in the construction of knowledge (Silva *et al.*, 2018). This process within an educational environment is a way to bring the teacher and student closer based on their reality, allowing those involved a greater ease in the process of educational mediation (Silva *et al.*, 2022). Tools such as video calls have become a great ally in this educational process, ensuring changes in the old methods of communication known by the society that is constantly updating (Andrade *et al.*, 2016; Duarte *et al.*, 2022).

The constant process of modification of the sciences has generated changes in the ways to adapt to the current context in which society communicates, generating new methods of learning and exchange of knowledge so that new values are generated with a focus on teaching and learning (Silva *et al.*, 2022). Many authors present in the scientific literature highlight the use of interactive resources in school environments, suggesting the need for interactivity within a classroom (Andrade *et al.*, 2016; Silva *et al.*, 2018; Silva *et al.*, 2021). Previous knowledge about the immune system in a period when society is affected by a disease of great global infection should be explored in professional training (Castioni *et al.*, 2021).

Based on this, the main purpose of this study is to report the experience of extensionists from the Immunology in Vocational Schools of Fortaleza (IMUNO ENSINA) project, linked to the Federal University of Ceará (UFC) in a virtual activity on vaccines and Covid-19.

## **2. Methodology**

### **2.1 Trial design**

Exploratory and descriptive study of qualitative and quantitative nature carried out through the *Google Meet* application and *Google Forms* in June 2021. It's worth highlighting the importance of qualitative approaches, since they have broad aspects for research in human sciences, because they constitute a scientific product peculiar to this area, present in postmodernity (Rocha *et al.*, 2021).

Moreover, qualitative investigations are formed from the subjectivity of the subject-researcher on a context that can be historical and social (Daltro & Faria, 2019). Experience reports, in turn, are inserted in the methodologies of qualitative approaches and can operationalize the idea of legitimacy of information instead of searching for their validity (Silva, 2013).

In this sense, legitimacy enables the advancement in the theoretical conception about a theme that focuses on studying the unprecedented understanding of the formation of meaning of ideas without forgetting the completeness of the information. For this reason, it's necessary to grant the real value to the experience reports as investigations that express honest and powerful narratives, whose focus is to establish a space for discussions, in addition to allowing the deepening of a knowledge in themes of interest (González-rey, 2002; Lefèvre, 1992).

### **2.2 Approaching the target audience and collecting data from the literature**

The educational process was carried out through prior organization of the students and teachers on current issues related to health in a multidisciplinary way, with the guidance of the project coordinator. As for the meetings, the practices occur three times a week with a total workload of up to 2 hours, being computed 3 weekly meetings. In addition, the activity allows the student to know and participate in several activities related to patient health promotion, as well as disease prevention and health rehabilitation, according to the needs of the population and individuals, with the resoluteness capacity of these health services.

Initially, in order to guide the work, a literature search on studies related to the theme was carried out in order to include them in the educational material to be prepared. The studies should relate to immunology, vaccines, and *Covid-19*. The target audience of the health education action was the undergraduate and graduate students linked to the project. All quantitative and qualitative data obtained through *Google Forms* and consulted literature were tabulated using *Microsoft Excel* version 2021, and the percentages of each subgroup were highlighted in Tables 1 and 2 and Graph 1, as discussed below.

### **3. Results**

#### **3.1 Activity proposal and distribution of forms**

The literature highlights that the extension project, like one of the constituent pillars linked to higher education, enables those involved to improve on a particular theme through theoretical and practical moments previously organized by the creators (Brêtas & Pereira, 2007). In this context, during the meetings previously formulated based on the calendar of activities in the year 2021, it was proposed to students and teachers of the extension project, the research, preparation and presentation of topics related to immunology. Each student of the project could present a theme previously passed on by the team organizing the schedule of activities.

In the first moment, taking into account the context of the health crisis present in society, the theme of choice was vaccines and *Covid-19*, focusing on studies that addressed the hypersensitivity and/or allergy to the constituent containers in the formulation of vaccines against *Sars-CoV-2*, the virus that causes *Covid-19*. Thus, an interactive online presentation on the topic was prepared, and two electronic forms were applied to verify the students' knowledge on the implemented topic.

Eleven students participated in the activity through *Google Meet* synchronously. The pre-test and post-test questionnaire was composed of 5 questions related to the theme addressed during the presentation, and based on primary studies in the scientific literature in order to verify the knowledge of the students of the project on the subject. The questionnaire was distributed through *Google Forms* via a link fixed in the chat of the meeting after it ended. The questions had only the options true or false and were distributed in moments before the presentation and after the presentation.

#### **3.2 Tabulation of the quantitative data obtained**

All data collected were tabulated using *Microsoft Excel*, version 2021. Table 1 highlights the main information idealized and the study outcomes in this first pre-activity moment. The questionnaires were extracted and adapted based on the study by Cabanillas and Novak (2021).

**Table 1 - Pre-test questionnaire.**

Question	Template	True (%)	False (%)
1. Antigens from the vaccine's infectious agent can also trigger allergic reactions, but to a lesser degree.	True	100%	-
2. The mechanisms of allergic reactions to polyethylene glycol (PEG), polysorbates, tromethamine/tromethamol can be IgE mediated, but also non-IgE mediated.	True	77,8%	22,2%
3. Health researchers have warned that any individual with a prior history of allergy to drugs or any component of vaccines should not be vaccinated.	True	33,3%	66,7%
4. The BNT162b2 and mRNA-1273 mRNA vaccines are based on the same mRNA technology that encodes the viral spike glycoprotein (S) of SARS-CoV-2.	True	33,3%	66,7%
5. Hypersensitivity to Polyethylene glycols as part of medications sometimes easy to diagnose due to the widespread knowledge among physicians of this excipient as a potential allergic sensitizer.	False	33,3%	66,7%

Source: Authors (2023), based on data obtained by Cabanillas and Novak (2021).

In Table 1, it was observed that in the first formulated question of the activity, all participants got the question right (100%). This percentage was also positive in the second item evaluated, so, in question 2, the vast majority of students (77.8%) answered the statement correctly. However, in the two subsequent items it was observed a pattern of incorrect results in large percentages, with the vast majority of students not answering correctly the guiding question (66.7%).

The questions were directly related to the containers that make up the *Covid-19* vaccines and their formulation technologies. In the last alternative related to hypersensitivity, the results showed a greater knowledge of the students on the subject, with satisfactory results.

In view of these results, a second test was implemented post presentation, highlighting questions with a similar theme to the pre-test and that were addressed in the discussion of the study by Cabanillas and Novak (2021). The post-test consisted, like the first, of 5 questions related to vaccines and Covid-19, focusing on immunology and its importance to society. Table 2 highlights quantitative information related to the percentage of correct and incorrect answers obtained in the activity.

**Table 2 - Questionnaire post-test.**

Question	Template	True (%)	False (%)
1. Adverse events are classified as any occurrence that affects an individual's health after vaccination. In this process, there is not necessarily a relationship with vaccine use.	<b>True</b>	60%	40%
2. In order to be registered and released for use, through the responsible agencies National Health Surveillance Agency (ANVISA) or Food and Drug Administration (FDA), vaccines need to follow rigorous steps that can prove their effectiveness.	<b>True</b>	100%	-
3. Due to the low reported rates, one should not consider such adverse events in vaccines due to the unusual fact that a large majority of the world's population will undergo Covid-19 vaccination.	<b>False</b>	-	100%
4. BNT162b2 and AZD1222 are BioNTech, Pfizer and Oxford Vaccine, AstraZeneca, respectively.	<b>True</b>	100%	-
5. Allergy to specific excipients in drugs and vaccines is misdiagnosed due to the absence of suspicion for specific excipients as allergenic triggers or due to inaccurate labeling or nomenclature.	<b>True</b>	100%	-

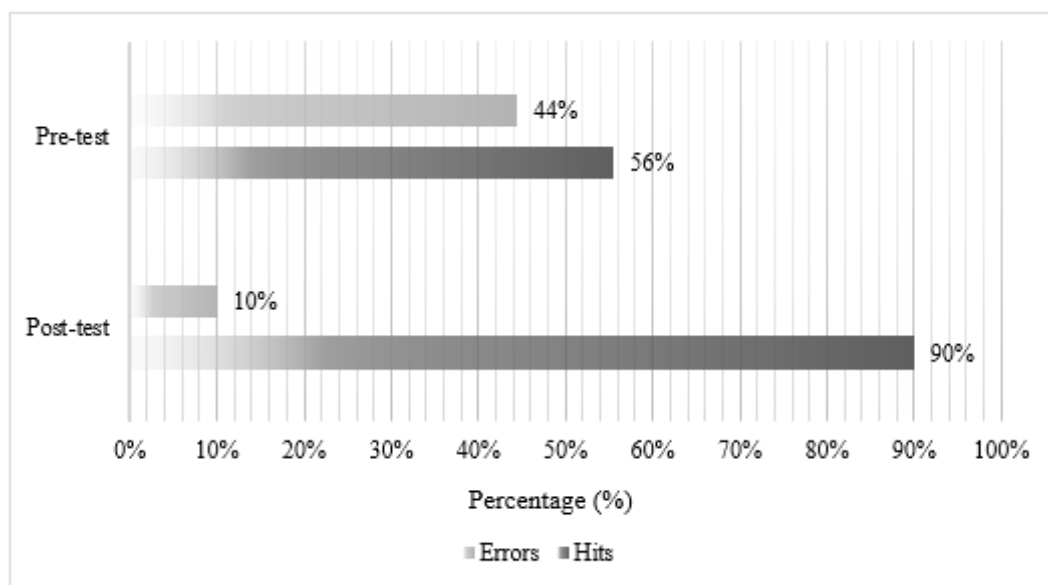
Source: Authors (2023), based on data obtained by Cabanillas and Novak (2021).

According to the data obtained, a higher hit rate is observed in 4 of the 5 idealized questions, with a discrepancy only in the first item formulated. The questions were formulated based on two main themes: adverse events and allergies, with a focus also on the formulation of two vaccines approved for emergency use against the *Covid-19* virus.

### 3.3 Evaluation of the average number of correct answers between the tests

Using the *Microsoft Excel 2021* tool, the data from the pre-test and post-test were compared regarding their average number of correct answers and errors on the five questionnaires addressed before and after the presentation. Based on the evaluation, it can be seen that after the presentation of the theme, the data showed a higher percentage of correct answers to the questions that make up the questionnaire, reducing the error curve when compared to the pre-test (Graph 1).

**Graph 1** - Average of hits and misses between Table 1 and 2.



Source: Authors (2023), using the Microsoft Excel 2021 tool.

## 4. Discussion

This study had as its main focus to describe, through an extension experience report, the process of teaching immunology through virtual media with a focus on vaccines and Covid-19 for students at the university level through an internal training. Based on the experience applied, it was observed that distance communication technologies through the dissemination of educational content promote the teaching and learning process, enabling effective and playful transfer of knowledge and interaction between people, without the need for direct contact in the same physical environment.

The globalized communication tools ensure the efficiency in learning and passing on of content related to a particular subject previously stipulated (Da Silva Junior *et al.*, 2021). In this study, higher education students participated in the activity as a way to internally train the content and ensure the applicability and updating on the theme so that it can later be disseminated to middle level students in the capital of Ceará. Based on the quantitative data obtained, a difference can be noticed in terms of percentage as to the pre-test and post-test applied, ensuring that prior knowledge about a particular subject may contribute to better results in its applicability.

For Theodoro *et al.* (2016), when the didactic and pedagogical basis is not explored in depth by the faculty with a focus on professional achievement, as a result, there may be failures in the education of the graduate of a given undergraduate course. In this context, there is a great valorization of the cognitive domain, and the development of individual abilities that are

possible to generate the desired competence of that particular professional is not observed. In this sense, teaching intermediated by the use of technologies are sharing resources that complement the formation of this professional (Da Silva Junior *et al.*, 2021). In a contextualized way, communication platforms such as *Zoom*, *Google Meet* and *WhatsApp* were used randomly in times before the *Covid-19* pandemic, but with the arrival of the virus worldwide they became a priority in these educational environments, enabling the interaction between all involved in the process interactively (Rodrigues-Neto, 2021; Wang *et al.*, 2020).

These globalized mass communication tools have allowed for the continuation in the teaching of health science courses across the country (Kabelitz *et al.*, 2012). This process of education passed on for decades presents modifications in its form of obtaining knowledge, especially in immunology, with the student being the main protagonist of their training, being characterized as the active methodology. With the arrival of the *Covid-19* pandemic, the construction of knowledge was proceeded of adaptations (Wilkinson *et al.*, 2021; Wang *et al.*, 2020), being that most of the time it is not considered simplified (Kabelitz *et al.*, 2012). Thus, these teaching and learning tools by virtual means help in the construction of this knowledge, gaining prominence in today's society (Rodrigues-Neto, 2021)

The implementation of tools such as gamification in these platforms is advocated by several authors in the scientific literature, as it allows the learner the opportunity to learn about a given context based on real and interactive simulations (Cohen, 2017; Da Silva Junior *et al.*, 2021). In this experience report, it was observed based on the perception of students and teachers that the activity of discussion of studies by virtual means can be considered fruitful in its applicability, generating satisfactory results regarding the consolidation of knowledge. These technologies allow learning to continue even away from a physical educational environment through strategies that allow the absorption of content in a fun way (Theodoro *et al.*, 2016).

This study enabled us to reflect on the constant need for updates in the health field, especially in the basic sciences, through the implementation of techniques relevant to professional training. Despite the sample size being considered low (n=11), the tools used were useful in obtaining data that will enable the formation of future studies related to the theme, thus ensuring the effectiveness of the applicability of playful and interactive forms of communication in the individual's training process, so that he/she can contribute to society. Thus, the implementation of immunology teaching strategies with current issues and interactive way among those involved in the process can ensure a greater ability to absorb what is being passed on (Rodrigues-Neto, 2021).

## 5. Final Considerations

The teaching and learning activity carried out through virtual media occurred successfully, and the interactive content was disseminated smoothly. The project audience was able to broaden their knowledge about immunology, with a focus on the process of *Covid-19* vaccine inputs, promoting knowledge during the meeting. Among the limitations in the present study, the need for internet connection in adequate signal means is emphasized, since this factor can be a variable that depends on the connection signal of each of those involved in the process, which may later generate communication failures or prolong the stipulated activity time. It is hoped that this study will contribute to the scientific literature with a focus mainly on the elaboration and development of new interactive tools in the teaching of basic immunology, especially for middle and high school students, thus enabling the dissemination of important issues in the process of society's constitution.

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