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Article

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Citizen laboratories in the federal universities of Brazil: innovation and social contribution in the citizen science scenario

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ABSTRACT

Introduction: Citizen science favors social participation in scientific processes. This article seeks to investigate the Citizen Laboratories of the Federal Universities of Brazil from the perspective of citizen science. Objective: To map the citizen laboratories subsidized by Federal Universities of Brazil and to analyze their scope of action, in order to understand their role in terms of social innovation and how they promote the participation of citizen scientists. Methodology: It consisted of a survey of the Federal Universities of Brazil through the institutional site of the Ministry of Education, where sixty-four institutions were identified. The next step was to search the institutional site of each one of the mapped Federal Universities using pre-determined search expressions. The parameters used to frame the initiatives as citizen labs were: 1) openness for social participation; 2) possibility to explore and appropriate technologies aimed at social interests; 3) focus on learning; 4) targeting the promotion of social innovations. Results: The research enabled the identification of ten citizen labs in Brazilian Federal Universities, which are aligned with relevant social issues and generate benefits in terms of innovations that can be socially shared. Conclusion: The citizen labs analyzed enable an approximation between the University and society in general, but do not detail how the social contributions of citizen scientists are incorporated into their actions. Initiatives in this direction are still incipient in the country, but they have the potential to boost citizen participation in scientific research.

KEYWORDS

Citizen science. Citizen labs. Public participation in science. Social innovation.

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Laboratórios cidadãos em universidades federais do Brasil: inovação e participação social no cenário da ciência cidadã

RESUMO

Introdução: A ciência cidadã favorece a participação social em processos científicos. Este artigo busca investigar os Laboratórios Cidadãos das Universidades Federais do Brasil a partir da perspectiva da ciência cidadã. Objetivo: Mapear os laboratórios cidadãos subsidiados por Universidades Federais do Brasil e analisar o seu escopo de atuação, no intuito de entender o seu papel em termos de inovação social e como

promovem a participação dos cidadãos cientistas. Metodologia: Consistiu no levantamento das Universidades Federais do Brasil por meio do site institucional Ministério da Educação, onde foram identificadas sessenta e quatro instituições. A próxima etapa contemplou buscas no site institucional de cada uma das Universidades Federais mapeadas a partir de expressões de busca pré-determinadas. Os parâmetros utilizados para enquadrar as iniciativas como laboratórios cidadãos foram: 1) abertura para a participação social; 2) possibilidade de explorar e se apropriar de tecnologias voltadas para os interesses sociais; 3) foco na aprendizagem; 4) direcionamento para a promoção de inovações sociais. Resultados: A pesquisa possibilitou identificar onze laboratórios cidadãos em Universidades Federais brasileiras, que estão alinhados com temas sociais relevantes e geram benefícios em termos de inovações que podem ser socialmente partilhadas. Conclusão: Os laboratórios cidadãos analisados possibilitam uma aproximação entre a Universidade e a sociedade em geral, mas não detalham como as contribuições sociais dos cidadãos cientistas são incorporadas em suas ações. As iniciativas nesta direção ainda são incipientes no país, mas possuem potencial para impulsionar a participação cidadã na pesquisa científica.

PALAVRAS-CHAVE

Ciência cidadã. Laboratórios cidadãos. Participação pública em ciência. Inovação social.

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1 INTRODUCTION

Scientific research initiatives that rely on the collaboration of society for their development are quite old (SILVERTOWN, 2009) and have been growing, especially in recent decades, with the participation of a vast network of people (SERRANO-SANZ et al., 2014). This more expressive growth occurs in a scenario where access to the Internet and Information and Communication Technologies (ICTs) are in an accelerated democratization process, and the communication and social interaction are re-signified through the virtual environment's possibilities.

In the movement for more openness to scientific information emerges Open Science, which encourages transparency in the scientific making from research design to the use of open software (SILVA; SILVEIRA, 2019). For Albagli (2015), Open Science is an umbrella term that includes, besides the elements of free and open access to scientific publications, other open elements such as scientific data, scientific tools, hardware, scientific notebooks, open education, and citizen science.

Beyond access, the orderly movements that aim to actively include ordinary citizens as collaborators in scientific research call attention to the urgency of strengthening the links between academia and society. These two institutions are constantly affected by studies and innovations in the scientific field. However, despite an apparent dependence of society on science, more transversal communication channels can enrich scientific production and generate more effective and sustainable solutions in the social field.

Meanwhile, the proximity between science and society is fostered through expanded access to data previously restricted to the scientific environment, such as information in laboratory notebooks and preprints that will undergo peer review. In this way, Open Access principles contribute to the development of spaces that encourage the effective participation of ordinary citizens in all stages of scientific endeavor, which we call citizen science.

Citizen science is then recognized as growing through an interest in and a disruption of previously established protocols, even if intrinsically within the scientific community, and through citizens' initiative. In the latter case, mainly under the influence of available technologies and the spread of the maker culture, in addition to personal or community motivations in which citizens recognize the power of their participation in projects that aim at improving their own reality.

As citizen science expands and the possibilities for citizen participation in research multiply, scientific production takes on new configurations. The knowledge that used to be produced only in academic laboratories now goes beyond borders and takes place in other environments. Whether these environments are physical or virtual, they can be called citizen laboratories, alternative sites for research, collaboration, knowledge sharing, and knowledge production; usually linked to social movements, they are spaces of multiplicity that incorporate different experiences for developing investigative processes and problem-solving.

In citizen science, collaborative and maker spaces play a crucial role in promoting innovation and generating new knowledge. These spaces represent an enabling environment for interdisciplinary collaboration and dialogue between different sectors, allowing academics, businesses, and the local community to work together to solve complex problems and develop new ideas. In addition, they can contribute to forming individuals capable of thinking beyond traditional learning and working in teams, developing fundamental skills for professional performance. Furthermore, these spaces can be used as platforms for communication and knowledge dissemination, allowing the ideas and solutions generated to be shared with society.

In a broad sense, the spaces for collaboration and creation in the environment of Universities are suitable for the creation of an ecosystem conducive to innovation, contributing to the development of innovative solutions to complex challenges, and training individuals

capable of working in teams and thinking in a non-limiting way, challenging restrictions and established traditional molds.

Citizen labs, in the light of citizen science and its movements against political and social paradigms still present in society and in the field of scientific research, are the object of study of this article. The objective is to map the citizen labs subsidized by Federal Universities in Brazil and analyze their scope of action in order to understand their role in terms of social innovation and how they promote the participation of citizen scientists. Furthermore, it raises the debate about how citizen labs contribute to the development of research and promote the production of information and knowledge, broadening the understanding of the impacts of this initiative on society and the university community.

2 WHAT IS CITIZEN SCIENCE?

Martins and Cabral (2021) assert that practices in citizen science are not recent, but the term was only coined in the mid-1990s, with researchers Alan Irwin and Richard Bonney often being associated with the creation of the term (MARTINS; CABRAL, 2021). Citizen science involves the participation of the general public in scientific research. These are the so-called citizen scientists, people who have an interest in science and who can contribute their intellectual effort, local knowledge or resources, and tools, adding value to the scientific process while acquiring new skills and expanding their range of learning (SOCIENTIZE CONSORTIUM, 2013).

Citizen science follows scientifically valid methodologies and is often conducted in association with formal programs and professional scientists through the use of web-based and social media platforms and open-source hardware and software that act as agents of interaction for the scientific processes (UNESCO, 2022). Thus, the public dimension of science is reinvented, changing more than the relationships between amateurs and professionals, as well as the dynamics of production, validation, dissemination, and appropriation of the knowledge created (PARRA, 2015). In this sense, citizen science consists of a tool to boost the understanding of science by the general public (BONNEY, 1996).

Regarding legal implications, citizen science projects are guided by legal and ethical issues and, like any research approach, have their limitations and biases, which are considered and worked on during scientific research (EUROPEAN CITIZEN SCIENCE ASSOCIATION, 2015). Therefore, the results' quality, integrity, and trustworthiness are assured.

Considering the broad spectrum of initiatives involving citizen science, Albagli, Clinio, and Raychtock (2014) identified the set of elements below:

1. Volunteer computing: citizens make their computing resources available by increasing the processing capacity of studies;
2. Volunteer thinking: citizens donate their time to work on massive data verification research;
3. Volunteer sensing: data collection for scientific research;
4. Dialogue with society: debate by scientists that aim for more significant interaction with citizens;
5. Direct research: setting up community spaces equipped with infrastructure to boost citizen collaboration from a hacker perspective, such as citizen labs and hackerspaces.

In the same vein as the direct research topic, Silveira et al. (2021), maintain that two important labels that characterize citizen science are citizen labs and crowdsourcing, understood as the combination of volunteer efforts in an environment where each collaborator

contributes a small part towards a more significant result.

Citizen science can be divided into two parts, a) the pragmatic or instrumental part, in which citizen participation is limited to one stage of the research, usually data collection, and b) the democratic part: in which citizen scientists can act in various stages of the scientific process and in defining the directions of the research. The vision of a democratic citizen science provides a horizontal model that is more oriented to the approximation of skills around research, favoring empowerment, the expansion of social participation of citizens in issues of their interest, and the definition of public policies.

2.1 Citizen labs: spaces for collaboration and knowledge sharing

Researchers such as Parra, Fressoli, and Lafuente (2017) differentiate the traditional academic laboratory from the citizen laboratory. The first one is an environment characterized by rigid separations from the outside world; on the contrary, the latter undertakes a constant effort to open with its surroundings, striving to cross other realities. In other words, in this space-time, the experience becomes possible, and the production of knowledge is favored by the specificities involved in the process (PARRA; FRESSOLI; LAFUENTE, 2017). From this perspective, the technical procedures, such as data collection, insertion in repositories, and classification, among other research steps, are extensions that already occur in scientific laboratories. Therefore, the differential of citizen labs lies in the purpose of collaboration, democratization, and sustainability in its broadest sense.

Savazoni (2019) warns that citizen labs may have similarities with other collaborative open knowledge production labs that emerged in the early 21st century, such as living labs, fablabs, and makerspaces (SAVAZONI, 2019):

a) Living lab: Experimental environment, physical or virtual, in which stakeholders, whether they are person-public-private partnerships (called 4Ps by the authors), organizations, public agencies, or universities, contribute to elaborate, assemble prototypes, validate, and test new technologies, products, services or systems (WESTERLUND; LEMINEN, 2011; BALLON, PIERSON; DELAERE, 2005). Therefore, they are co-creation ecosystems for human-centered research and innovation (WESTERLUND; LEMINEN, 2011);

b) Maker perspective: According to Raabe and Gomes (2018), it originates from Do-It-Yourself, which from the use of technological tools such as 3D printers and laser cutters, allows learning through creation and discovery, and the spaces where its practices occur are known as makerspaces.

c) Fablab: The maker culture also gained space with the emergence of fablabs, in mid-2002, at the interdisciplinary laboratory Center for Bits and Atoms at the Massachusetts Institute of Technology (MIT) (RAABE; GOMES, 2018). Fablabs, short for "Fabrication Laboratory," are laboratories characterized as a type of workshop that offers digital fabrication made possible by available equipment and technologies.

Linked to the social movement, its main characteristic is to do the *commom*, which means to consider the needs of the collectivity (SAVAZONI, 2019). The space for more collaborative positioning and with a focus on learning, provided by citizen labs, configures a favorable place for the more significant appropriation of society, including in research stages that go beyond data collection and analysis. Thus, their actions should extend to the definition of research objects systematically, considering territoriality and proximity to problems and the need for solutions.

Fonseca (2017) states that in Brazil, the initiatives openly identified as citizen laboratories are relatively recent, and the catalyst element that consolidated the use of the term "citizen innovation laboratories" was the holding of the Ibero-American Laboratory of Citizen

Innovation (LABiCBR) in Rio de Janeiro in 2015. The event resulted from a partnership between the Iberoamerican General Secretariat (SEGIB), the Ministry of Culture of Brazil, and Medialab-Prado of Spain. Medialab-Prado is a pioneering experience at the international level. Created in 2000 by the Government of Culture and Sports of the Madrid City Hall in Spain, it functions as a meeting point for the production of open cultural projects (MEDIALAB-PRADO, 2021, online).

Thus, citizen labs are spaces open to community participation and represent potential spaces for social transformation through collective collaboration and sharing of local experiences and knowledge. In turn, the social impact caused by the realities in which they are inserted is an explicitly underlined factor.

2.2 Citizen Labs and social innovation: a possible dialogue

Eskelinen et al. (2015) assert that citizen labs move research and development from scientific laboratories to the real-world environment. This occurs through the engagement of stakeholders, participants who collaboratively work towards the creation of new products and services, promoting social innovation (ESKELINEN et al., 2015). According to Schiavo et al. (2013), by strengthening innovation, citizen labs help reduce social inequalities and various asymmetries. Innovation is only essential when it generates value for users and society in general, which occurs through the interaction of different actors in the phenomenon called co-creation of value (SILVA, 2012).

The social innovation modality is distinct from the technological one, whose central aspect does not fit into the logic of market competition or prioritizing customers' will (ROLLIN; VICENT, 2007; SILVA, 2012). While technological innovation prioritizes value appropriation, social innovation is based on value creation (SILVA, 2012). In other terms, it is differentiated mainly by the aspects of purpose, strategy, locus, and process of development and dissemination of knowledge (SILVA, 2012).

Chiarini and Vieira (2012) point out that Higher Education Institutions play a crucial role in the formation of human resources and in the creation of knowledge aimed at socioeconomic development. They constitute fundamental actors for engendering new knowledge and technologies through basic and applied research. Consequently, the University is a central actor that contributes to the emergence and the process of open innovation itself through resources, which, according to Vieira et al. (2015, p. 22), are: "physical structure, credibility transfer, offering specialized labor and, also, through the qualification of professionals and researchers (in most cases, fellows from funding agencies or professors)."

Due to the above, the University is considered an appropriate space for the development of citizen laboratories as strategies to enhance participation in science, the exchange of knowledge between different sectors of the University itself and other institutions, as well as fostering local development.

3 METHODOLOGY

This study has a qualitative approach and a fundamental nature. Regarding the procedures, it is characterized as bibliographic and documental research, which seeks support in the literature of the area in order to obtain subsidies to study the proposed theme and survey the cases of citizen laboratories. As for the objectives, it is an exploratory research that, besides reviewing the literature, analyzes the citizen labs in the context of citizen science.

In order to explore the initiatives of citizen laboratories developed in Brazilian Federal Universities, it was carried out the mapping of these on the website of the Ministério da Educação (MEC) of Brazil, which provided a total of sixty-four institutions. The next step of

the research was to verify the existence of citizen laboratories on the websites of these universities through the search field of each one. The expression "citizen laboratory" was used, and when no return was obtained, the strategy of searching for other terms was adopted: "laboratory," "center," and "observatory." The identification of citizen labs based on the literature in the area used the following parameters: 1) openness for social participation; 2) possibility of exploring and appropriating technologies focused on social interests; 3) focus on learning; 4) targeting the promotion of social innovations.

The search was conducted between November 1 and November 4, 2022. It is noteworthy that some institutions develop ventures that resemble citizen labs, such as fablabs, makerspaces, among others. After collecting and investigating the information on the websites of the 64 institutions, 27 initiatives were found, of which, according to the categorization adopted in this study, eleven can be considered citizen labs. Notably, one of them is part of a network composed of three citizen labs, which increases the total number to thirteen. The results are presented in a table in the next section of the paper for better visualization.

4 RESULTS

The information gathered in the research process is shown in Table 1, which is subdivided into three columns: the institution of origin, the city, and the approach worked by the citizen lab. The presentation follows an alphabetical order by the name of the institution.

Chart 1. Survey of citizen laboratories in Federal Universities in Brazil

Institution	Name	Scope
Universidade Federal de Goiás	Ideias, Prototipagem e Empreendedorismo (IPELab)	Entrepreneurship and innovation
Universidade Federal de Goiás, Universidade Federal do Sul e do Sudeste do Pará e Universidade de Brasília	Rede Media Lab Brasil	Research and innovation in multi-user environments
Universidade Federal de Pelotas	Rede de Laboratórios da UFPEL (REDELAB)	COVID 19 prevention and health preservation
Universidade Federal de São Paulo	Laboratório do Comum Campos Elíseos	Research and creation of knowledge and social practices around social, political, cultural, and economic axes
Universidade Federal de Uberlândia	Laboratório de ecologia e comportamento de abelhas (LECA)	Ecology and sharing knowledge with the community
	Centro de incubação de empreendimentos populares e solidários (CIEPS)	Popular Economy
Universidade Federal do Acre	Laboratório de Interculturalidade (LabIntercult)	Support for research conducted by indigenous people
Universidade Federal do Paraná	Observatório do Espaço Público (OEP)	Socially relevant issues
Universidade Federal do Piauí	Fab Lab THE Laboratório de Fabricação Digital e Prototipagem	Prototyping and digital fabrication
Universidade Federal do Rio de Janeiro	MediaLab UFRJ	Development of research around the axes of techno-politics, subjectivities, and visibilities

Universidade Federal do Rio Grande do Sul	Centro de Tecnologia Acadêmica do Instituto de Física da UFRGS	Uses open and free hardware, promoting projects and research in several areas

Source: Survey data, 2022.

The citizen labs examined show diversified initiatives in different knowledge themes, such as ecology, entrepreneurship, innovation, technology, politics, health, and society. Among the main characteristics of the analyzed experiences are:

1) IPELab: Its laboratories are present in five units of the Federal University of Goiás, and the project IPELab Volante, one of the initiatives of the network, develops actions in the environment of state public schools in the interior of the State of Goiás in conjunction with the State Department of Education of the State of Goiás (SEDUC GOIÁS), understanding that the approximation of the university with schools can be positive to instigate students and teachers in the search for knowledge at other levels;

2) The Rede Media Lab Brasil is formed by three universities: UFG, UnB, and UNIFESSPA, being Media Lab/UFG the central laboratory of the network, which is focused on research, development and innovation in interactive media, acting in the cultural, social and artistic segments, with the purpose of impacting human and scientific development. The network operates in partnership with the Graduate Programs of the universities that integrate it, as well as having international partnerships with foreign universities. In addition to this, it is able to sign agreements and sponsorships with the private sector to operationalize the promotion of scientific and artistic projects;

3) REDELAB: Acts in the fight against the Coronavirus - Covid19 through a program of integrated actions directed to fight the disease and preserve health. In all, 17 laboratories and collectives from the Faculdade de Arquitetura e Urbanismo (FAUrb), the Centro de Artes (CEARTE) and the Centro de Desenvolvimento Tecnológico (CDTEC) are mobilized, with each one performing actions according to their area of expertise, besides the production of personal protection equipment and informative documents. The project "Designing Resilient Communities to support the health and well-being of Venezuelan Refugees in Brazil and Colombia - LabCom/ UFPel" stands out;

4) *Laboratório do Comum Campos Elíseos: This is a social innovation laboratory that operates under the perspective of experimentation. Aligned to the expression of citizen science, it directs its actions to the understanding and collective creation of knowledge and social practices around social, political, cultural, and economic axes;*

5) LECA: Develops research focused on the management and conservation of natural areas and reproduction, as well as ecological studies with an emphasis on nesting habits and agricultural systems focused on the pollination behavior of stingless bees. LECA has as one of its assumptions to disseminate scientific knowledge to the community in general through teaching and extension projects;

6) CIEPS: Advises popular collectives that generate income from the principles of a popular solidarity economy based on actions associated with teaching and academic research. It works with the principle of incubation of Productive Solidarity Organizations (OPS), which refers to the elaboration and implementation of a program

of transdisciplinary actions, articulated and engendered with all those affected in the process of creation and delivery of value to society;

7) LabIntercult: Developed by the Universidade Federal do Acre (UFAC), it provides support for research by indigenous masters, aiming at the dialogue with the academic world from the perspective of "interculturality";

8) OEP: Acts on three fronts, which are research, exhibitions, and extension. The members, while traveling through the Brazilian public spaces, observed their conflicts, mismatches and peculiarities, and consequently felt the need to create a structure to develop the project's activities and, at the same time, be a platform for interaction with society in general. It configures, since 2016, an auxiliary body of the Department of Architecture and Urbanism of the Universidade Federal do Paraná;

9) Fab Lab THE: Started in 2016 as an integrated space between teaching, research and extension, whose goal was to create a link between the Federal University of Piauí and the community, favoring the access of society in general to the production of scientific and cultural nature. Its purpose is to generate knowledge for society, enabling national and international partnerships, thus raising the state's research potential. It is interconnected to the international Fab Lab network, an open and creative community formed by amateurs and professionals spread over more than 100 countries;

10) MediaLab UFRJ, created in 2012 at the Escola de Comunicação da Universidade Federal do Rio de Janeiro (UFRJ), has its research directed towards the intersections between three elements: techno-politics, subjectivities and visibilities, exploring digital methods of analysis, and data visualization in the field of humanities;

11) The Centro de Tecnologia Acadêmica do Instituto de Física of UFRGS (CTA-IF/UFRGS) develops and applies free and open knowledge methods through free software and making information about its projects available in a public repository.

The listed projects reveal a diversity of actions, covering current themes and socially relevant issues. Regarding the innovations, considering the products delivered by the citizen labs to society, and the possibilities of action for citizen scientists, table 2 summarizes the results. The order of presentation follows the same sequence as Table 1:

Chart 2. Innovation and social participation in citizen laboratories

Name	Innovation	Social Participation
Ideias, Prototipagem e Empreendedorismo (IPELab)	It adopts a maker perspective, providing equipment such as 3D printers, laser cutters, and printed circuit prototyping machines.	Users interested in developing their ideas should request the services of the labs through the website
Rede Media Lab Brasil	Creation of important projects such as, for example, a) "Game Lab", focused on the development of games; b) methodologies for collaborative work over the Internet; c) technological products for people with disabilities; d) literary and artistic languages; e) Tainacan, which is free software for the	It integrates research and innovation in interactive media in multi-user environments and with multidisciplinary teams.

	creation of repositories of digital collections in WordPress.	
Rede de Laboratórios da UFPEL (REDELAB)	Prototyping of face protectors for health professionals and other actions to face the pandemic of COVID-19. Development of GIS platform based on the software "ArcGis Online", integrating information to local and national decision making.	Community participation in the interviews and observations carried out by the researchers.
Laboratório do Comum Campos Elíseos	Creating spaces based on a policy of care and reproduction of life, for research and development of prototypes related to the ecosystem of social technologies and sociotechnical arrangements for democratic socio-environmental innovation.	Participation of several actors involved in territorial issues for the collective development of actions for the promotion and defense of vulnerable populations in downtown São Paulo.
Laboratório de ecologia e comportamento de abelhas (LECA)	Shares scientific knowledge with society through research and extension projects. Conducted the construction of gardens composed of bees and plants, in partnership with the school community of the region.	The gardens serve as a didactic resource for school activities and allow the implementation of citizen science actions involving teachers and students.
Centro de incubação de empreendimentos populares e solidários (CIEPS)	It advises popular collectives and contributes to the generation of work and income through the principles of popular economy.	Permanent extension forum to dialogue with society in a propositional and creative way, aiming at meeting its demands.
Laboratório de Interculturalidade (LabIntercult)	In the context of the pandemic, "Recommendations for the community to fight COVID-19" are presented by indigenous masters, in addition to workshops, seminars, and projects, such as the Research Lab.	The Lab fosters a support program for indigenous teachers, but not restricted to them. It promotes a vision of teaching as an open "movement".
Observatório do Espaço Público (OEP)	Its focus is the public space and the urban landscape. Developed the "Guia Paisagístico dos Espaços Públicos de Curitiba" (Landscape Guide to Curitiba's Public Spaces) as an invitation for society to experience the city's public spaces with a new look, based on the premise that the public belongs to everyone.	Through academic extension, it carries out the "Landscape for All" project in public schools, in which students and teachers participate.
Fab Lab THE Laboratório de Fabricação Digital e Prototipagem	Based on the principles of maker education and entrepreneurship, it is based on promoting knowledge sharing and the do-it-yourself concept.	It boosts the community's contact with digital fabrication and prototyping technologies.
MediaLab UFRJ	It used as methodology the Cartography of Controversies, inspired by the actor-network theory. The cartographies carried out are available on the website	It is a laboratory open to transversal partnerships and has the collaboration of several artistic collectives and activists to

	and on the platform "Controversy Mapping Archive", an initiative of Science Po (Paris), which gathers cartographies of partner universities.	carry out activities open to the public.
Centro de Tecnologia Acadêmica do Instituto de Física da UFRGS	It promotes free digital culture, using and developing free and open knowledge and technologies, as in the case of a) the "João-de-barro PCI Milling Machine" and b) the "Modular Weather Stations".	Open community participation: making low-cost electronic equipment and building weather stations for climate and environmental monitoring, with data collection by citizens (crowdsourcing).

Source: Survey data, 2022

The analyzed cases show that citizen labs promote community participation and represent spaces for social transformation through collective collaboration and sharing of experiences and local knowledge. However, they do not provide detailed information about citizen participation in their projects. It would be essential to determine whether they are oriented towards a more pragmatic or democratic strand of citizen science.

The main lines of action of the investigated spaces reveal a consonance with current and comprehensive spectrum themes of social interest, which are: a) entrepreneurship and innovation; b) crowdsourcing; c) integrated actions in prevention and health preservation in the context of Covid-19; d) territorial dynamics and social practices e) ecology and environmental preservation; f) popular economy; g) interculturality; h) approach to public space considering the relations of people with the environment; i) digital fabrication and prototyping; j) social cartography; l) free and open technologies.

It can be noticed that, regarding the analyzed citizen labs, the integration of the pillars that form the University, which are teaching, research, and extension, is present, which increases the dialogue, the exchange of knowledge, and the formation of partnerships with society in general. These include citizens interested in science and in the co-creation of solutions for local problems; collectives of people gathered around a common goal of interest; public schools; other Universities from Brazil and abroad, and even other laboratories.

Consequently, they make it possible to fulfill the social function of the University, facilitating its approach to the community in which it is inserted, primarily through extension actions. In this way, it enables different social actors to develop their ideas and projects in partnership with researchers, students, amateurs and professionals, with the help of Information Technology and appropriate equipment. The strengthening of academic research and teaching are other essential points of the laboratories, which reverts into benefits for society. Causing a social impact on the reality in which they are inserted is a factor explicitly underlined by the citizen labs.

CONCLUSION

With the expansion of the concept of citizen science beyond the walls of university institutions, the possibilities of citizen participation in social innovation gain new contours, even allowing the decentralization of research previously carried out only in the academic sphere. The so-called citizen labs, generally associated with social movements, aim to meet the new needs of production, use and sharing of knowledge; following the example of international initiatives, Federal Universities in Brazil have created and maintained such spaces.

The citizen labs identified inside these institutions presuppose the community's access to its participation in the projects and researches that will be developed, covering the real needs

of the society and proposing sustainable solutions to specific populations. However, they do not provide detailed information about how effective citizen participation occurs. Nevertheless, it is evident that through collaborative approaches, these laboratories have developed research and extension projects for the preservation of the environment and the appreciation of cultural diversity; actions for urban development through the mapping of public spaces all over the country; alternatives for income generation through the principles of the popular economy; prototyping and creation of innovative products, besides collective movements for the preservation of people's health.

In this sense, the citizen labs analyzed are oriented to social and open innovation because they advocate the opening to the outside environment, beyond the spaces of the University, and are not premised on profit and market competition. It is inferred that the projects and innovations resulting from the work of citizen labs are oriented towards the search for social transformation, which contributes to the development of the regions where they are located.

In this scenario, we can observe that the principles of citizen science occur widely in the citizen labs linked to the Federal Universities in Brazil. However, the practice is still incipient in the country and the websites of the federal universities make their information available in a dispersed way, making it difficult to search for citizen laboratories.

Therefore, further research is suggested to verify how the participation of citizens in these projects occurs in order to draw a panorama of the functioning of citizen laboratories in federal universities, as well as to list the necessary requirements to boost the multiplication of these initiatives in other institutions of the same character.

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