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Brazil

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- Organization and Number of Staff: 3
- Funding by: Brazilian Space Agency.
- Cooperating Organizations/Individuals: Municipal Secretary of Education of Umirim and Federal Institute of Education, Science; Technology of Ceará - Campus Umirim; Municipal Secretary of Education of Belo Horizonte; Federal University of Maranhão; Municipal Secretary of Alcântara; Federal University of Paraná; Federal Institute of Education, Science and Technology of Óbidos; State Secretary of Education of Mato Grosso; UNIVAG University Center.
- GLOBE Schools: 294
- GLOBE Protocol Areas: Atmosphere (*Clouds*), Biosphere (*Land Cover and Tree Height),* and Hydrosphere (*Mosquitoes*).

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- Number of Schools Reporting Data over the Past Year: 42
- Number of total observations from 06/01/2022 to 06/01/2023: 1,467

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Program Implementation, International Cooperation in GLOBE Network, and Activities over Past Year (categorized by GLOBE Strategic Plan 2018-2023 Goals):

- **Education**

Our efforts were dedicated to promoting enriching workshops, events, and activities tailored to inspire and educate a diverse audience, including new students, educators, volunteers, and community members. These initiatives were carefully designed to encompass the realms of Science, Arts, Mathematics, Technology, and Engineering, all with a distinct focus on nurturing environmental awareness and a connection to our planet. To address the challenges faced by some educators in integrating the GLOBE program into their curriculum, we took a proactive approach by developing comprehensive educational materials. These resources were thoughtfully aligned with the Brazilian Common Curriculum Bases, providing educators across the nation with an accessible avenue to seamlessly incorporate the GLOBE Program into their teaching activities, fostering a harmonious blend of educational objectives and global environmental consciousness.
Besides the face-to-face activities, we promoted some trains in the AEB Escola Virtual, our online platform (https://aebescolavirtual.aeb.gov.br/, mentioned in the previous Highlight).

Citizen Science GLOBE Observer Workshop
Date: July 22, 2022 – September 04, 2022
Location: Online
Number of participants: 92
Number of certificated participants: 60
Participants came from the following countries: Brazil
A brief description: The course was conducted 100% online, with theoretical classes held in the AEB Escola Virtual platform. The classes were recorded, so the students could do the course in their steps.
Protocols, theoretical introductions, videos, and other educational materials are accessible to the trained even after the end of the course.
Ninety-one Citizen Scientists participated in this workshop. The theme of the training was how to become a Citizen Scientist with the GLOBE Observer and the focus was on the protocols of Clouds, Land Cover, Trees, and Mosquito Habitat Mapper.
In this virtual course, among the participants, 16% of them were 15 years old and 24,5% were between nineteen and twenty-four years old.

2022 GLOBE Brazil Workshop - Umirim
Date: August 16, 2022 - August 18, 2022
Location: Hybrid (Online and in-person in Umirim City)
Number of participants: 41

Participants came from the following countries: Brazil
A brief description: The course was conducted in a hybrid way, with theoretical and practical classes held in the city of Umirim, State of Ceará, and educational material available through the AEB Escola Virtual platform. Forty-one Elementary and High School teachers participated in the workshop. The training focus was on the GLOBE Observer protocols (Clouds, Land Cover, Trees, and Mosquito Habitat Mapper). At the end of the course, teachers presented the research proposal that they will develop with students at the school, encouraging them to submit to IVSS in the next year. Among the presented researches proposal, we show some Questions research presented:

1) Can the garbage accumulated in the school environment proliferate the appearance of the mosquito?
2) What type of water is most favorable for the development of the Aedes mosquito?

2022 GLOBE Brazil Workshop – Belo Horizonte
Date: August 24, 2022 - August 25, 2022
Location: Hybrid (Online and in-person in Belo Horizonte)
Number of participants: 51
Participants came from the following countries: Brazil
A brief description:
The course was conducted in a hybrid way, with theoretical and practical classes held in the city of Belo Horizonte, the capital of Minas Gerais, and educational material available through the AEB Escola Virtual platform. Fifty-one Elementary, High School teachers and undergraduate students participated in the workshop. The Training focus was also on the GLOBE Observer protocols (Clouds, Land Cover, Trees, and Mosquito Habitat Mapper). At the end of the course, the participants presented the research proposal that they will develop with students at the school.
Also, we encourage this proposal to be submitted to IVSS.

2022 GLOBE Brazil Workshop – Brasilia
Date: October 6, 2022 - October 7, 2022
Location: Hybrid (Online and in-person in Brasilia)
Number of participants: 39
Participants came from the following countries: Brazil
A brief description:
The course was conducted in a hybrid way, with theoretical and practical classes held in the city of Brasilia, Brazil's Capital, and educational material available through the AEB Escola Virtual platform. We had a total of 39 participants, including Elementary teachers, High School teachers, College students, and Citizen Science participating in the workshop. The training focus was on the GLOBE Observer protocols (Clouds, Land Cover, Trees, and Mosquito Habitat Mapper). At the end of the course, the teachers presented the research proposal that they will develop with students at the school.
Also, we encourage this proposal to be submitted to IVSS.

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2023 GLOBE Brazil Workshop - São Luís
Date: March 7, 2023 - March 10, 2023
Location: Hybrid (Online and in-person in São Luís)
Number of participants: 39
Participants came from the following countries: Brazil
A brief description:
The course was conducted in a hybrid way with theoretical and practical classes held in the city of São Luís, Maranhão's capital, and educational material available through the AEB Escola Virtual platform. We had a total of 39 participants, between Elementary teachers, High School teachers, and Citizen Science participating in the workshop. The training focus was also on the GLOBE Observer protocols (Clouds, Land Cover, Trees, and Mosquito Habitat Mapper). At the end of the course, the teachers presented the research proposal that they will develop with students at the school. Proposals stand out:

1) How can mapping mosquito outbreaks influence disease control and these vectors?
2) Does the spreading and accumulation of soybeans in the soil increase the incidence of mosquitoes?
3) "No garbage in my house" project. How does the garbage that was discarded come back to my house?

Also, this workshop is part of a project between AEB and Maranhão's Federal University with the objective to increase the teaching of STEAM and GLOBE in schools in the state of Maranhão.

2023 GLOBE Brazil Workshop - Curitiba
Date: April 18, 2023 - April 20, 2023
Location: Curitiba
Number of participants: 15
Participants came from the following countries: Brazil.
A brief description:
The course was conducted in a hybrid way, with theoretical and practical classes held in the city of Curitiba, the capital of Paraná. Protocols, theoretical materials, videos, and activities for the classroom were available to teachers through the AEB Escola Virtual platform. Also, they had a specific focus at the MHM because of the Zika Bus project (the project is held in Paraná), this focus aims to increase the impact of this project so they can reach new students and schools, teaching them the importance of the environment.
This event had the participation of Basic Education teachers and undergraduate students in the areas of biological sciences and exact sciences in the development of scientific research in the classroom on environmental issues and space applications of the GLOBE Program. In total, 15 teachers from 10 public schools in the metropolitan region of Curitiba and the coastal region of Paraná participated in the training. Also participating in the training were 5 students from the Federal University of Paraná who participate in the research and extension group Labmóvel. In addition to instructing

professors and university students in the GLOBE program guidelines and in the Mosquito, Tree, and Land Cover Habitat Mapping protocols, the action sought to strengthen ties with the Labmóvel group in order to develop projects in partnership. Thus, training participants can become multipliers of the GLOBE Program for other professors and students, applying the actions of GLOBE citizen scientists in the region. The training also sought to encourage teachers to participate in the Latin American and Caribbean Tree Campaign, the GLOBE 2024 International Virtual Science Symposium, and other events in the area of science education and citizen science. At the end of the training, the teachers presented a group of project proposals to be developed in the year 2023.

2023 GLOBE Brazil Workshop - Cuiabá
Date: April 25, 2023 - April 28, 2023
Location: Cuiabá
Number of participants: 32
Participants came from the following countries: Brazil.
A brief description:
The course was conducted in a hybrid way, with theoretical and practical classes held in the city of Cuiabá, the capital of Mato Grosso. Protocols, theoretical materials, videos, and activities for the classroom were available to teachers through the AEB Escola Virtual platform.
In total, 32 teachers from 29 different state public schools in Mato Grosso participated in the training. The team from the Department of Education of Mato Grosso also participated in the training. Teachers were instructed in the GLOBE program guidelines in the Mosquito Habitat Mapper, Trees, Land Cover, and Clouds protocols, which enables participants to become GLOBE Program multipliers for both other teachers and students. Applying the actions of GLOBE citizen scientists in the region, training sought to encourage teachers to participate in the Latin American and Caribbean Tree Campaign, the GLOBE 2024 International Virtual Science Symposium, and other events in the field of science education and citizen science. At the end of the training, the teachers presented a group of project proposals to be developed in the year 2023.

- **Science**

Between 2022 and 2023, the Brazilian GLOBE Coordination actively motivated teachers and students to engage in research, while the Brazilian Space Agency (AEB) launched a significant project in Maranhão. This project aims to educators with comprehensive guidance on developing research projects using scientific methodologies and seamlessly integrating the GLOBE program into their teaching. This collaborative effort involves scientists, undergraduates, citizen scientists, and STEAM professionals, forming a support network for knowledge exchange. The initiative's overarching goal is to enrich research experiences for educators and

students alike, fostering empowerment through scientific protocols and global environmental awareness. The Maranhão project contribute to both science and a deeper connection of the school community to the world around them. Additionally, we formed a collaborative group aimed at offering guidance and fostering interaction among teachers throughout the country. This platform serves as a valuable resource for educators to share insights, seek advice, and collectively enhance their teaching methodologies. By creating this supportive network, we are strengthening the collective educational landscape and promoting a culture of continuous improvement in pedagogical practices.

Project GLOBE and permanent STEAM
Date: January 2, 2023
Location: Hybrid
Number of participants: 1000+
Participants came from the following countries: Brazil
A brief description:
The aim of this project is to popularize and encourage the development of pedagogical projects that use scientific research in STEAM (Science, Technology, Engineering, Arts, and Mathematics), with a focus on technologies related to the environment (GLOBE) and space, continuously in the state of Maranhão, starting in Alcântara.
The specific objectives include promoting cooperation among Maranhão's Federal university, technical institutions, the Municipal Education Department, the Brazilian Space Agency, the Alcântara Launch Center, and local communities, to disseminate science and construct scientific knowledge about the environment and space. It also aims to empower young university students and students from technical courses to produce scientific knowledge and engage in their communities by offering scientific development workshops for children and young people in the municipal public school system.
Other goals include training teams in GLOBE protocols and STEAM methodology in ten cities of Maranhao State, stimulating the development of research methodologies by children in secondary schools and high school, with priority participation of UFMA's graduating students and IFMA's high school/technical students at these communities, focusing on actions related to the environment and space.
Consequently, the project aims to spread participants' work at scientific events and encourage the submission of articles and technical papers to specialized journals.
The objectives include planning actions in nearby schools, training teams in GLOBE protocols and STEAM methodology, monitoring and supporting scientific development projects, and promoting participants' participation in in-person and online scientific dissemination events.
The project also aims to host the 1st Scientific Exhibition of works carried out by students in secondary and high schools, as a means of promoting and valuing their scientific research.

The first step was a workshop held in Sao Luis, capital of Maranhão State, on May 08 through 10, 2023. Thirty-nine UFMA's teachers and students were trained on the GLOBE Observer Protocols. The project continues with the follow-up and dissemination of protocols to students by trained teachers who are accompanied and assisted by university professors.

"ZikaBus"
Date: Since March 2020
Location: Paraná
Number of participants: +500
Participants came from the following countries: Brazil.
A brief description:
It is an initiative between the Federal University of Paraná (UFPR) and the Brazilian Space Agency. A university team goes in an adapted bus to public schools around Paraná's coast and teaches the students about mosquito protocol, and how the Aedes Aegypti lives, procreates, and spreads diseases. Their focus is Public Schools and their wish is to have at least two teachers per school that can collect data and do research with students. During their activities, they collect and analyze mosquitoes' eggs and larvae, using GLOBE's scientific kits, so the participants can observe the samples with a magnifier attached to a mobile phone. Therefore, the students can learn how to classify mosquito larvae and how to trap them.

- **Community**

For the community, we are seeking a more organic path, exposing GLOBE's projects at events, science days, and social media like Instagram, Facebook, and our website. In addition, we are encouraging our teachers, trainers, and students to involve their city's community in projects and research about GLOBE. The action idea is involving more scientific citizens in a dynamic way. The interest in science and space has been raised over the past years, and many events are being created on that and we are exposing GLOBE on these events. Therefore, we can create a better link between the program and the community.

International Virtual Science Symposium's Support Course
Date: January 2, 2023
Location: Online
Number of participants: 2
Participants came from the following countries: Brazil
A brief description:
To facilitate the engagement of teachers, researchers, and citizen scientists in the IVSS (International Virtual Science Symposium), the Brazilian Space Agency organized a Support Workshop, which is now accessible on our virtual platform, "AEB Escola Virtual." This comprehensive workshop offers a range of resources, including

video classes, documents, books, and a detailed "how-to" guide for participating in IVSS.
Moreover, participants can explore various research ideas and learn how to integrate the GLOBE program into their school curriculum effectively.
As a result of this support course, two teachers successfully participated and had their projects approved for the IVSS. The titles of their projects are as follows:

- "Is mosquito Aedes Aegypti humankind's new pet?"
- "Understanding the history of Óbidos through the study of Land Cover."

We are thrilled to witness such impactful projects emerge from our Support Workshop, and we look forward to fostering more collaborations and innovative research in the future. Our commitment to supporting the education community remains steadfast, and we are already planning additional workshops and initiatives to further empower educators and researchers in their scientific endeavors.

- Technology

The GLOBE Brazil team played a significant role in assisting Dr. Russanne Low, a Senior Earth Scientist from the Institute for Global Environmental Strategies (IGES), during her research project on citizen science in Brazil. Dr. Low, the recipient of a Fullbright U.S. Scholar Award, conducted her research in Brazil for a six-month period. Her initial three months were spent in Curitiba, where she collaborated with the Federal University of Paraná to develop projects.
For the latter part of her research, Dr. Low moved to Brasilia, the capital of Brazil, where she focused on building a scientific study for the Amazon and Obidos, a city in the state of Pará. In September, together with AEB Analyst Erick Silva, she visited the Tapajós National Forest, situated within the Amazon Rainforest near Belterra, Para. A detailed report of this visit is available here: https://observer.globe.gov/de/news-events-and-people/news/-/obsnewsdetail/19589576/globe-goes-to-the-amazon
Subsequent to their visit to the forest, the team traveled to Obidos to implement a learning methodology that involved utilizing the GLOBE Observer app and Collect Earth Online software at the Federal Institute of Pará. The activity aimed to introduce the GLOBE Program and the GO app, provide instruction on the science behind the Land Cover protocol, emphasize the significance of satellites and Remote Sensing, collect Land Cover data through the GO app at 37 designated points on the 9 km^2 map of the city, and analyze the same points using NASA satellite imagery.

An impressive total of 40 students actively participated in this activity, and they subsequently compiled a report for IVSS 2023. The report received three badges for their exceptional efforts ("Be a Collaborator," "Be a Data Scientist," and "Make an Impact") and is available for viewing via the following link:

https://www.globe.gov/documents/10157/0/10754848/069d5fcf-b50a-53c7-e177-bbd5c5d89bad
The collaboration between Dr. Russanne Low, the GLOBE Brazil team, and the enthusiastic students has yielded valuable insights and contributions to citizen science and environmental research. Such initiatives underscore the importance of engaging young minds in scientific endeavors and contribute to fostering a better understanding of our natural world.

- **Communications**

To foster community engagement, we are actively promoting a series of events and webinars through various channels, including our social media platforms. One of our approach involves collaborating with technical specialists and inviting experts who can speak on topics relevant to GLOBE's participants. By utilizing these avenues, we aim to create meaningful interactions and provide valuable insights that resonate with our community, enhancing their connection and involvement with the GLOBE Program.

Earth Day
Date: April 1, 2023 - April 24, 2023
Location: Online
Number of participants: 30
Participants came from the following countries: Brazil.
A brief description:
To celebrate its 28th anniversary and Earth Day, the activity ‘Campanha de Aniversário do GLOBE – Dia da Terra’ ('GLOBE Anniversary Campaign - Earth Day', in English) was conceived with the aim of encouraging participation in data collection with GLOBE and promoting these collections on the official AEB Instagram, generating engagement, and disseminating the program's knowledge to the general public.
To participate in the campaign, each participant had to fill out a form about the collected data, attaching a photograph of the chosen location. It was also necessary to agree to the release of the photographs on social media, at the discretion of AEB, giving proper credit. For participants under 18, a Consent Form filled and signed by the responsible adult was required.
On the last day of the campaign (24/04) at 5 pm, a webinar was held via Zoom, featuring Silvana Cristina, a Fisheries Engineer and collaborator of the Chico Mendes Institute for Biodiversity Conservation (ICMBIO). She presented the importance of data collection and environmental data acquisition protocols. At the end of the webinar, a video with all submitted images was shown, thanking everyone for their participation. Dr. Aline Veloso, the national coordinator of the GLOBE Program and Director at Brazilian Space Agency (AEB), commented on the upcoming program activities for the year 2023.

The Earth Day campaign received 32 image submissions, with 5 participants under 18 from across the country. The webinar had 35 live participants, who engaged by asking questions during the event.
After the conclusion of the GLOBE Anniversary Campaign - Earth Day, it was observed that the initial objectives were achieved, with citizen scientists of various ages participating in the image submissions and the lecture by ICMBIO collaborator Silvana Cristina. The event also generated engagement on social media, with the final video of image submissions being replayed 3,600 times on Instagram as of the present moment.

Plans and Ideas for Next Year:

Citizen Science GLOBE Observer Workshop – 2nd Class
Date: August to October of 2023
Location: Online
Expected number of participants: 100
Participants came from the following countries: Brazil
A brief description: The course is conduct 100% online, with theoretical classes hold in the AEB Escola Virtual platform. The classes were recorded, so the students could do the course in their steps.
Protocols, theoretical introductions, videos, and other educational materials are accessible to the trained even after the end of the course. The theme of the training will be how to become a Citizen Scientist with the GLOBE Observer and the focus was on the protocols of Clouds, Land Cover, Trees, and Mosquito Habitat Mapper.

GLOBE Brazil Data Collection Campaign
Date: August to November of 2023
Location: Online
Expected number of participants: 100
Participants came from the following countries: Brazil.
A brief description:
From August to November, the Brazilian Space Agency (AEB) will conduct four data collection campaigns, each focusing on a specific protocol. The primary objectives of these campaigns are to promote environmental education and space technologies, engage citizen scientists across Brazil, and foster scientific understanding at the local level. Participants will be encouraged to collect data using the GLOBE Observer app's protocols, which include Clouds, Mosquito Habitat Mapper, Land Cover, and Trees. They are also encouraged to share photos of the registered locations along with the collection codes.
At the end of each month, a Zoom webinar will be organized, featuring lectures by renowned scientists and educators from the GLOBE program. These webinars will

cover the scientific aspects of the protocols and their practical application in basic education. The ultimate goal is to disseminate knowledge about the GLOBE program, interact with participants, and enhance understanding of environmental and space technologies among all involved.

Participation is open to citizen scientists of all ages who are GLOBE program participants and have an interest in presenting images of specific locations through data collection using the GLOBE Observer app. To participate, individuals will need to fill out a form with their email, age, responsibility for the image, and agreement to share image rights with AEB. Additionally, participants will provide their full name, Instagram handle, collection site details, and date and time of data collection.

The submitted photos will be featured on AEB's institutional Instagram page, and a video containing all submitted photos will be presented during each month's webinar. In case of participants under 18, a consent form for minors must be submitted along with the photograph.

The webinars will take place monthly during the four-month campaign, allowing participants to celebrate the photos submitted for each protocol while delving into the scientific background of the protocols. Educators will also share their experiences and insights regarding the application of the protocols in basic education, adding value and relevance to the webinars. The aim is to create a meaningful and engaging experience for all involved, contributing to the overall success of the GLOBE program in Brazil.

Citizen Science Trough the GLOBE Program CNPq Project

Date: October 2023 to August 2025

Location: Brazil

Expected number of participants: 1000+

Participants came from the following countries: Brazil.

A brief description:

The proposed project is categorized as a science and technology dissemination and popularization initiative within the context of CNPq (National Council for Scientific and Technological Development). Its main objective is to spread environmental and space scientific knowledge among students and teachers from Elementary, Secondary e High Education, utilizing the GLOBE Program. Additionally, the project aims to provide specific support, training, and encouragement to teachers and students, fostering their engagement in scientific research and promoting Citizen Science, all in accordance with the guidelines set by the GLOBE program.

The project's actions encompass several key areas: Firstly, it involves adapting the international content of the GLOBE Program to align with the national curriculum and cater to the Brazilian context and culture. Secondly, the project will produce educational and scientific dissemination materials and content that adheres to the standards outlined by AEB (Brazilian Space Agency). Furthermore, workshops will be conducted to equip teachers with the necessary skills and knowledge for effective implementation of the GLOBE Program in their classrooms.

The project also aims to provide ongoing support to both teachers and students throughout their scientific research endeavors within schools. This includes facilitating

and guiding their research efforts to ensure successful outcomes. Lastly, the project will actively participate in and promote both physical and online scientific dissemination events, thereby reaching a wider audience and enhancing the impact of the project's objectives.

GLOBE and Permanent STEAM Project
Date: August to November of 2023
Location: Online
Expected number of participants: 100
Participants came from the following countries: Brazil.
A brief description:
We are planning to organize a Student Scientific Exhibition projects to promote and recognize their scientific research efforts. Furthermore, we are actively encouraging students also to apply their works for academic papers, IVSS and other relevant symposiums. By this engagement, we aim to instill a sense of value in their scientific contributions and inspire them to pursue further exploration and dissemination of their research findings.
The core aim of this project is to seamlessly integrate GLOBE and STEAM projects into the regular curriculum, making them a natural and integral part of students' educational journey.