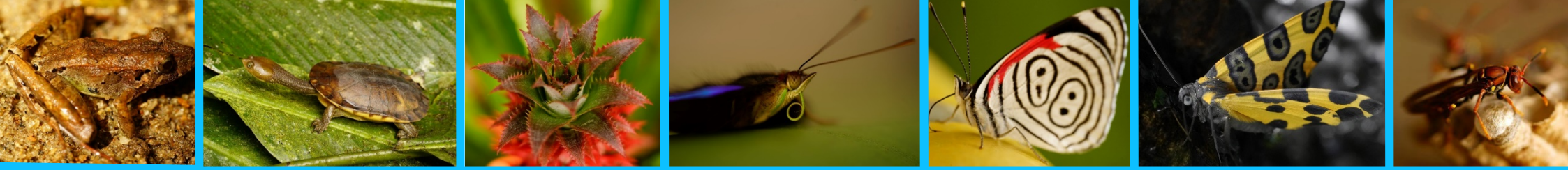

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ACTIVE LEARNING

in ecology field-based learning

TEACHER'S MANUAL

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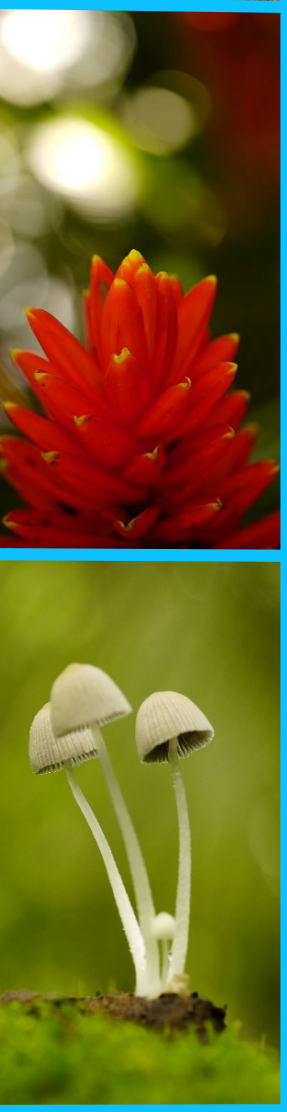

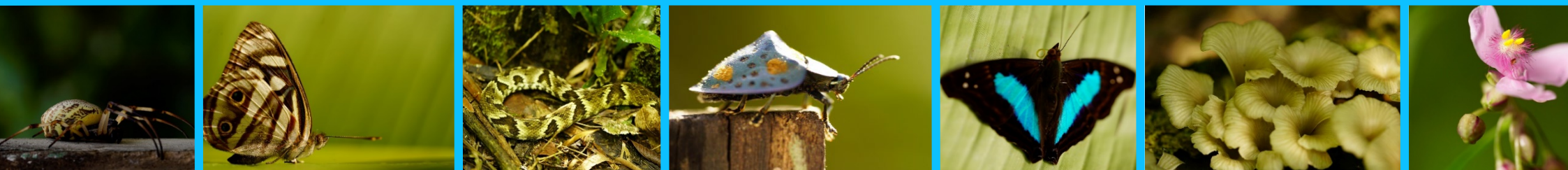

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edUNITAU
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Summary

Presentation

Dear educator,

You just obtained a field class manual. The activity here described focus on the project-based learning, a educational philosophy that aims to give students autonomy, making them more active while building their own knowledge.

The manual contains information and guidance for your field classes. However, feel free to adapt them based on the difficulties and peculiarities that might come along the way.

Have a good experience!

Introduction

For a successful learning, knowledge must be self generated, self driven and self sustained (MASSON *et al*., 2012) and this will depend on the student's role on learning – leaving from a passive to more active behaviour. For that change to happen, students need to have more responsibility on their own learning; while understanding that knowledge obtained with self effort will last longer if compared to knowledge obtained from third parties (CAMPOS, 2011).

Active learning methodologies meet the previously mentioned needs are often suggested to be used in schools since they positively contribute to teaching and learning processes, providing students the chance to build their own knowledge as their learning autonomy. In addition, teachers will be switched from knowledge holder to knowledge mediators and facilitators in any educational setting, allowing students to question their reality as well as engaging in teamwork (DIESEL; MARCHESAN; MARTINS, 2016).

Among several educational methods, the Project Based Learning is a model that significantly contributes to the skills and competencies proposed by BNCC (BRASIL, 2017a) and LDB (BRASIL, 2017b).

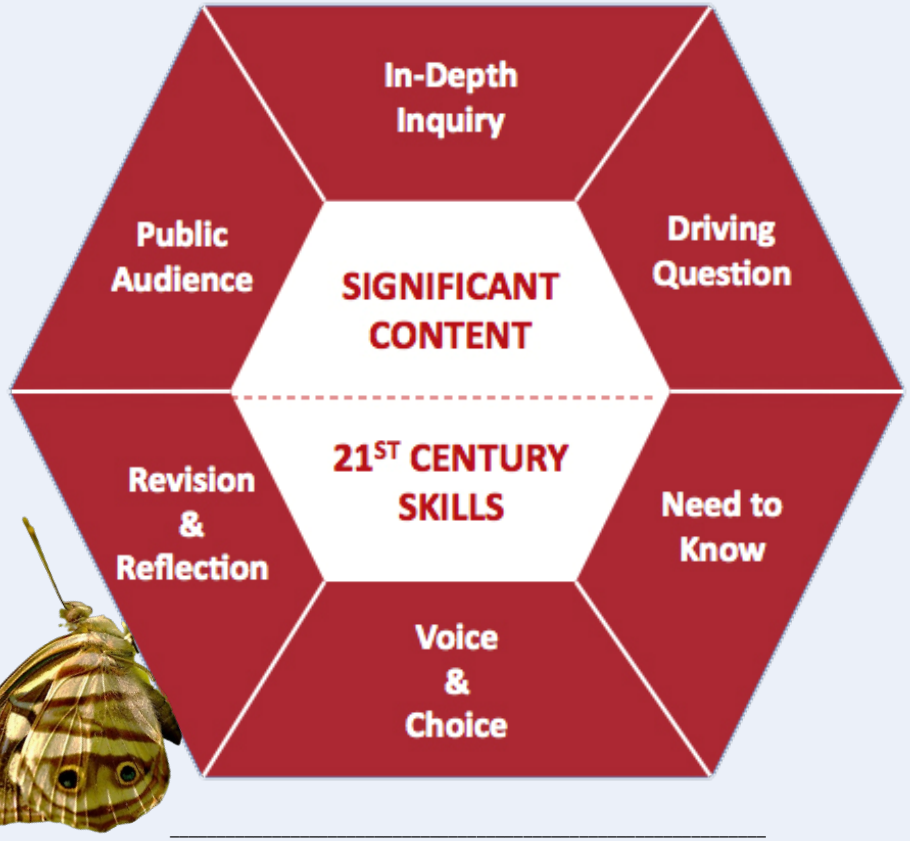
Project Based Learning

The Project Based Learning (PBL) is a teaching method created on 1960 at McMaster University, Canada (RIBEIRO, 2008) that aimed on assisting students to develop specific knowledge and essential skills. (BIE, 2008).

PBL is based in the four educational principles as well as cognitive science, both showing that learning does not happen in a passive state, but it depends on knowledge building that allows students to elaborate and redefine what is/was learned (RIBEIRO, 2008).

The PBL uses authentic and realistic projects based in a motivating and challenging tasks that teaches various subjects and disciplines. Students have a chance to tackle significant day-to-day problems in an active manner, deciding how to approach as well as seeking solutions for them (BENDER, 2014; STROBEL; VAN BARNEVELD, 2009).

PBL objetives



Source: BIE - Buck Institute for Education. Students at the Center Hub, 2021

In developing activities using this method, students have the opportunity to developing intellectual competencies as well as socio-emotional skills.

They are fundamental for person-to-person interaction and task performing, like gaining scientific knowledge, critical and creative thinking; communication, ownership, empathy, cooperation and debate.

All part of the Brazilian National Basic Curriculum (BNBC) indicated in the following figure (BRASIL, 2017).

In order to become autonomous learners, educators must stimulate students on discovering new knowledge, instigate discussions, facilitate group dynamics and evaluate students from a cognitive-behaviour standpoint. In summary, the educator needs to act as an knowledge and social-interaction manager (MASSON *et al*., 2012).

10 Skills for the Brazilian National Basic Curriculum (BNBC)

1. Knowledge: Appreciate and use the knowledge historically built on the physical, social, cultural, and digital world to understand and explain reality, to build a democratic and inclusive society.

2. Scientific, Critical and Creative Thinking: Exercise intellectual curiosity including research, reflection, critical analysis, imagination, and creativity, to investigate causes, develop and test hypotheses, formulate and solve problems and create solutions (including technological ones)

3. Cultural Awareness: Appreciate, acknowledge and enjoy the diverse artistic and cultural manifestations, from local to global, and participating in diverse artistic-cultural productions.

4. Communication: Use different languages: verbal (oral or visual-motor, such as Libras, and written), body, visual, sound, and digital. Obtain and express knowledge of artistic, mathematical, and scientific languages, to express and share information and produce ways to mutual understanding.

5. Digital Culture: Understand, use and create digital information and communication technologies in a critical, meaningful, and ethical way in the various social practices (including school) to communicate, solve problems and exercise protagonism in personal and collective life.

6. Work and Life Project: Appreciate the diversity of knowledge and cultural experiences and obtaining knowledge and experiences that enable you to understand the relationships inherent in the work-life and make choices aligned with the exercise of citizenship and your life projects, with freedom, autonomy, critical awareness, and responsibility.

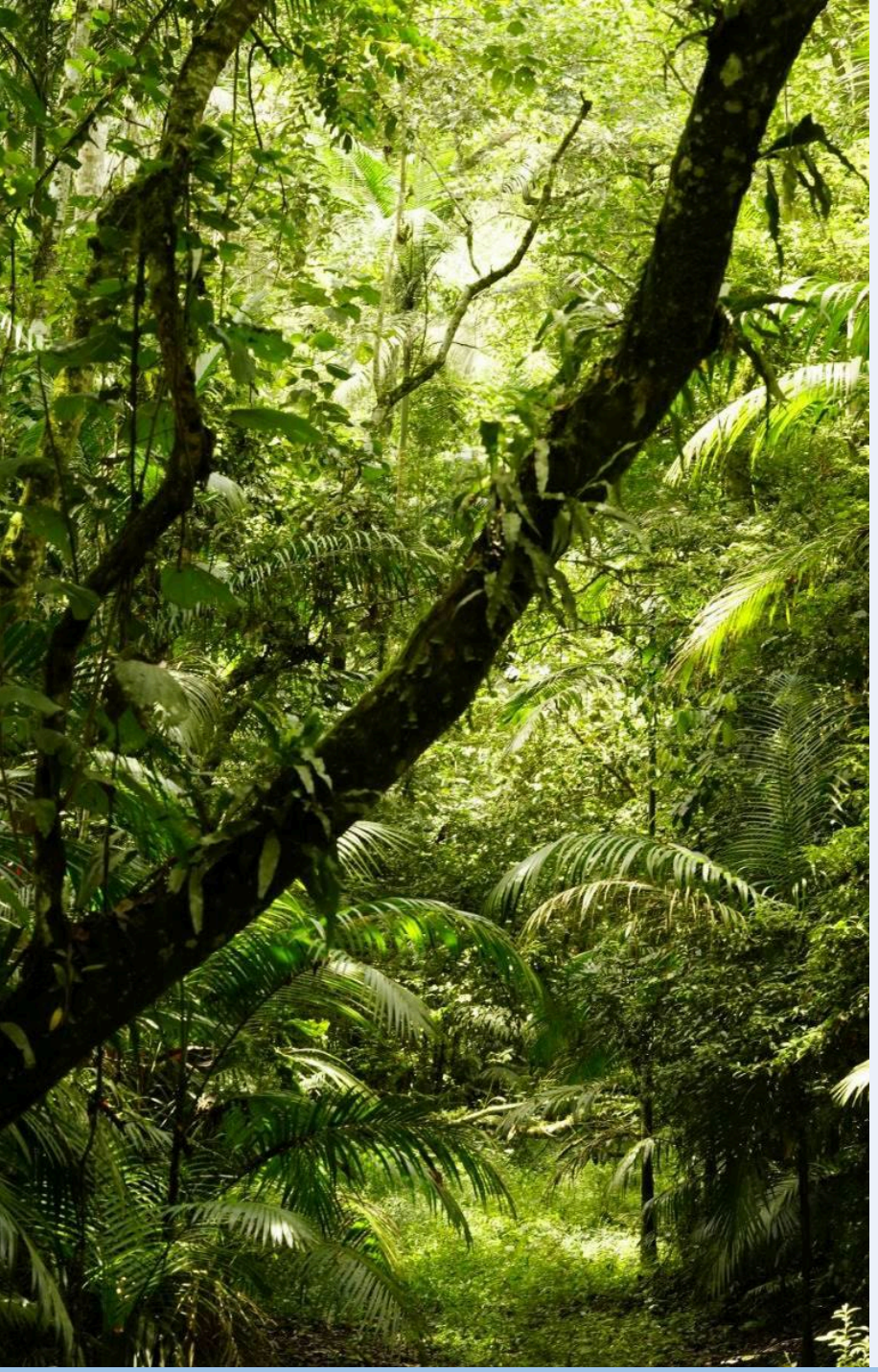
7. Reasoning: Discuss based on reliable facts, data, and information, to formulate, negotiate and defend common ideas, points of view, and decisions that respect and promote human rights, social and environmental awareness, and responsible consumption at the local, regional and global level, with ethical positioning in relation to the care of oneself, others and the planet.

8. Self-knowledge and self-care: Knowing yourself, appreciating yourself while taking care of your physical and emotional health, understanding yourself in human diversity, as well as recognizing your emotions and those of others, with self-criticism including the ability to deal with them.

9. Empathy and Cooperation: Exercise empathy, dialogue, conflict resolution, and cooperation, ensuring respect and promoting respect for others and human rights, with acceptance and appreciation of the diversity of individuals and social groups, their knowledge, identities, cultures, and potentialities, without prejudice of any kind.

10. Responsibility and Citizenship: Act personally and collectively with autonomy, responsibility, flexibility, resilience, and determination, making decisions based on ethical, democratic, inclusive, sustainable, and solidary principles.

Source: INEP. Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira, 2021 (translated by authors).



Biology teaching in natural environments

The goal of biology education is to bring a deep comprehension to students on biological processes and concepts, allowing them to recognize the importance of science in modern life, developing the interest for all life while contributing for their citizenship formation, being ethical and responsible to the Earth (KRASILCHIK, 2011).

However, biology can be one of the most insignificant disciplines to students, depending on how it is taught. This often happens due to the lack of teacher-student interactivity, where educators spend most of their time lecturing while using technical vocabulary (KRASILCHIK, 2011).

In order to captivate students attention, teachers need to use different learning techniques, changing teaching methods, because every learning situation is unique and needs a tailored solution (KRASILCHIK, 2011). Besides regular lectures, it is possible to tackle subjects with discussions, show and tell, laboratories classes and field activity (VIVEIRO; DINIZ, 2009).

Field activity in sciences is defined as any activity that moves students from the classroom to a different area, natural or not, allowing the study the relationship of the local life, including humans as well as natural, social, historical, cultural aspects, among others. The spaces used can be parks, squares, industries, museums, preservation areas, among others (VIVEIRO; DINIZ, 2009; FERNANDES, 2007).

These activities also contribute to learning specific topics in biology, allowing a confrontation between theory an hands-on. In addition, it allows student involvement and interaction with real-world situations, stimulating student's curiosity on what is being learned and decreasing the relationship gap between students and educators, building a better relationship through the pleasant interactions between them (VIVEIRO; DINIZ, 2009).

Furthermore, when the activity is developed in a active way, not limited to environmental observation only, it allows students to be the protagonists of their own learning, favoring complex hypothesis formulation about the studied phenomena (VIVEIRO; DINIZ, 2009), thus allowing the development of important skills, like autonomy, cooperation, creativity, etc.

Educational activities in natural environment can contribute to student's emotional-cognitive development (KAPLAN, 1995), because it allows a more integrated view of the studied phenomena in a multi-cognitive way, like sensations (environmental temperature, sounds and colours) and emotions (tranquillity, freedom, comfort). These are not commonly expressed in a classroom environment (SENICIATO; CAVASSAN, 2004).

Developing the activity

EDUCATOR,

Start by introducing the theme, aiming to spark student's curiosity. Talk about the responsibilities in each phase of the activity and their duration. State that students will have to submit a report at the end of the project. The report should contain a description of the activities from all phases and it will be worth marks for the subject.

The Project's main theme is the **Atlantic forest**, taught on the 2nd bimester on Grade 1 from São Paulo schools (SÃO PAULO, 2011).

This activity is divided in 5 phases

WHAT TO BRING TO THE FIELD TRIP

Long pants, long sleeve t-shirt, closed toe shoes, bug spray, sunscreen, allergy medication, notebook, pencil, ruler, backpack, small backpack, water bottle, etc.

1st Teams

1. Create teams of 5. Ask them to have 1 notebook for their project.
2. Ask teams to do research on the Atlantic forest and to note the highlights of their research on their project notebook.
3. If needed, create a WhatsApp group with one representative from each team. This way educators can answer questions and provide further guidance about the next steps.

2nd Visiting the forest

1. Find a location for the activity. It is recommended a mature forest with secondary vegetation as shown on figures 1 and 2.
2. Liaise with the school administration on determining the best date for the field trip.
3. Send the proper forms to get consent from parents (Appendix A)
4. Inform students about the activity, the dress code, the location, what to bring, etc.

Figure 1 – Mature forest from Parque Natural Municipal Trabiju, Pindamonhangaba.

Figure 2 – Secondary vegetation from Parque Natural Municipal Trabiju, Pindamonhangaba.

MATURE FOREST:
It has high biodiversity and good preservation state.

SECONDARY VEGETATION:
Forest that is regenerating, like post extraction secondary forests or “capoeiras”

The activities Will happen in 2 stages

Stage 1 - Forest observation

1. Guide teams through the secondary vegetation area.
2. Ensure the teams are 10 meters apart while walking and ask them to take notes of everything They notice in this secondary vegetation (sounds, smells, species seen, sensations, among others – examples on Picture 3).
3. Instruct Education assistants to not Interact with students during their observations.
4. Continue to the area with more preserved vegetation following the same instructions as item #2 and 3.

FOLLOW THE SCIENTIFIC METHOD:
Observation, hypothesis, experimentation, result analyse and presenting

Figure 3 – Students observing the secondary vegetation.

Figure 4 – Students observing the mature forest.

Data collection

1. After observations are done, gather the teams to presented their findings and notes.
2. Encourage the teams on thinking about the possible questions that can be asked based on their observations and what would be the next steps to answer them.
3. In order to assist students, presented some tools for data collection (i.e. metric or measuring tape, strings and cords, canopy meter, ruler, etc.).
4. Assist students on understanding data collection good practices allowing them to express their opinions.
5. Finally, guide the teams on using the correct scientific methods for data collection in each project.
6. Ask the teams to keep their notes to present at their school, on the next phase of this project.

Check the next page for an Project example that was done with students from a public school from Taubaté, São Paulo.

Check the PEC website for Other data collection examples (in Portuguese)
www.pec8.com.br

Data collection example

1. After the observations from phase 1, students gathered to discuss their notes and observed that the secondary vegetation area had higher temperatures than the mature forest.
2. The initial hypothesis was that the temperature is influenced by the local fauna, meaning, the larger the canopy and the trunk circumference, the temperature would be cooler.
3. The teams analyzed the trails every 10 meters, going 5 meters in the vegetation for data collection (figure 5).
4. By using a canopy meter (figure 6), students observed the canopy coverage, attributing the value 1 for full coverage (leaves in the X) and 0 for no coverage (no leaves in the x). Then, the teams selected 3 trees that were closest to them and measured they trunk circumference (same heigh of 1.5 m – figure 7).

Figure 5 – Teams positioned on the trail for data collection.

Figure 6 – Canopy meter (10cm PCV pipe)

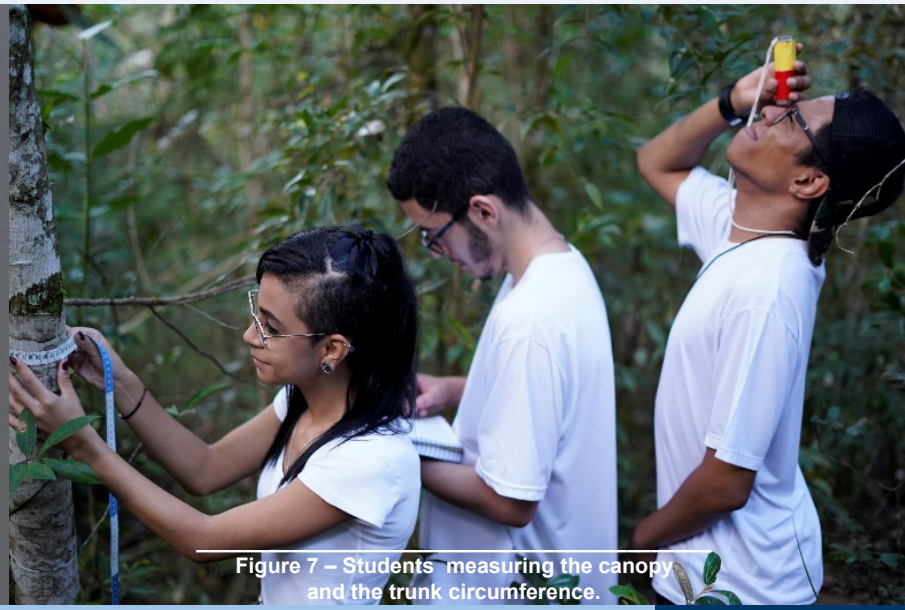


Figure 7 – Students measuring the canopy and the trunk circumference.

3rd Analysis and discussion

1. Back in the school, assemble the teams for data analysis.
2. Ask the teams to share their results among themselves. Have them create spreadsheets, calculate averages of the values collected and plot column charts for better data comprehension.
3. Finally, discuss the results, linking them to the hypothesis previously stabilised.

4th Scientific report

1. Assemble the teams and explain the components of scientific report – title, authors, introduction, objective, methods, results (with column chart), references and the correct text norms.
2. Allow students to use research used on phase 1 to assist on the scientific report.
3. Stablish a deadline based on the teams needs.

5th Final product

1. After submitting the reports, the teams should create a final product for a presentation at the school.
2. The product should be related to the research made at the forest, pointing the main discoveries and conclusions made.
3. The students Will have the power to decide how this final product Will be and how to presented it to classmates.
4. Determine the deadline of the Project with the school administration.

PRO TIP

The final product can be posters, plays, a mock-up, PowerPoint presentations, among others. The point here is to give students the autonomy do to what They want.

EDUCATOR,

At the end of the project, you could give students and exam with the purpose of evaluating the knowledge retention (Appendix B).

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Appendix A

Parents Authorization Term

I_____ ID#. _____, resident at the address _____ City _____ responsible for the student _____ Student ID# _____, authorize a visit to _____, on _____, with the scheduled departure from _____ from School _____ and expected arrival at school at _____.

The visit will be accompanied by the teacher _____, ID# _____, along with other teachers and educational assistants or the school coordinator.

I am aware and agree that THIS AUTHORIZATION MUST BE SUBMITTED SIGNED AT THE TIME OF BOARDING ON THE BUS AND OTHERWISE, THE STUDENT SHALL NOT BE ABLE TO BOARD.

Note: The student must be wearing long pants, closed-toes shoes, a long-sleeved t-shirt, cap or hat (if possible) and must bring bug spray, a bottle of water and a snack.

Date: _____

_____

Signature of the parent

Appendix B

1) What does the term "Biome" mean?
a) Geographic space with specific characteristics defined by the climate, aspect of vegetation, soil and altitude.
b) Geographical space, with a tropical climate, characterized by a single plant and animal species.
c) Set of communities that live in a given location and interact with each other and with the environment.

2) Originally, the proportion of the Brazilian territory occupied by the Atlantic Forest was, approximately:
a) 25% b) 15% c) 08%

3) Currently, the Atlantic Forest is reduced to what proportion of its original extension?
a) 13% b) 7% c) 3%

4) How many Brazilian states are in the Atlantic Forest area?
a) 17 b) 12 c) 04

5) What other biomes border the Atlantic Forest?
a) Caatinga, Pantanal and Amazon Forest
b) Amazon Forest and Cerrado
c) Caatinga, Cerrado and Pampa

6) Which of the species below are endemic (typical) of the Atlantic Forest?
a) Jaguar, Golden lion tamarin, Bromelia and Palm tree
b) Puma, Coral Snake, Cactus and Eucalyptus
c) Bem-te-vi (great kiskadee), crab eating fox, Araucaria pine, and Ipê

7) What are the main characteristics of the Atlantic Forest Biome?
a) It is a Tropical Forest, which occurs in the coastal region of Brazil, in plains and mountains. Its average annual temperature is 21°C and presents a set of very diverse forest formations (Dense Ombrophilous Forest, Mixed Ombrophilous Forest, Open Ombrophilous Forest, Seasonal Semi-deciduous Forest and Seasonal Deciduous Forest)
b) It is the second largest Brazilian biome, with locations with well-defined climatic seasons (a very rainy season and a dry one), soil with a sandy composition and low in nutrients and tortuous, small trees with deep roots. It is characteristic of having wildfire seasons.
c) It occupies an extensive plain, suffers flooding during periods of rain. It has a hot and humid climate and in the dry season, when the average temperature is 21°C, it hardly rains. In the dry season, the waters go down and, in the lands recently flooded with waters rich in nutrients, lush vegetation appears.

8) What is the main reason for the exploitation of the Atlantic Forest?
a) Floods b) Natural fires c) Deforestation

9) Relate the two types of forest with the characteristics below?
1. Mature forest 2. Secondary forest
( ) Low trees and thin stems
( ) Tall trees and thick stems
( ) Low temperature
( ) Lower illumination
( ) High temperature
( ) Greater illumination
a) 1,2,2,1,2,1 b) 2,1,2,1,1,2 c) 1,2,1,1,2,2

10) To carry out a research project in the Atlantic Forest, what steps must be taken?
a) Observation, experimentation, analysis of results, hypothesis and presentation
b) Experimentation, observation, hypothesis, analysis of results and presentation
c) Observation, hypothesis, experimentation, analysis of results and presentation

Answers: 1 – a, 2 – b, 3 – b, 4 – a, 5 – c, 6 – a, 7 – a, 8 – c, 9 – c, 10 - c

Notes

Active methodology
in ecology field-based learning

Teacher's manual

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