



Bird of paradise – a case study on developing a didactic object

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Abstract

This research examines the didactic possibilities of the *Strelitzia reginae* plant as a case study. It is conducted as a part of the *Educ@rteNatureza* project at the University of Coimbra, Portugal, which focuses on developing a nature-centered educational model. The study focuses on examining the biological and cultural aspects of the Bird of Paradise plant in central Portugal, in order to transform this knowledge into comprehensive interdisciplinary didactic materials that can be integrated into standard curricula. The findings of the research resulted in the creation of three educational materials for students in the first cycle of basic education. These materials offer holistic exercises to be integrated with existing curriculum subjects such as mathematics and environmental studies and aim to enhance students' verbal communication skills, raise awareness of basic emotions through non-verbal communication, and facilitate the learning of geometric concepts by utilizing the distinct features of the *Strelitzia reginae* plant.

Keywords: Object-based education, natural didactic object, *strelitzia reginae*, bird of paradise, case study

Introduction

In response to the growing disconnection between humans and the natural world, there is an increasing need for nature-based education to gain popularity. This modern approach recognizes the vital role that immersive experiences in natural surrounding play in fostering environmental awareness, promoting sustainability, and nurturing a deep appreciation for the interconnectedness of ecosystems and local communities. As humanity faces pressing environmental challenges, supporting the importance of nature-based education becomes paramount in cultivating a generation of informed and environmentally conscious individuals (Esi, 2015).

The current investigation is done within the scope of the *Educ@rteNatureza* education project at the Faculty of Psychology and Education Sciences at the University of Coimbra. *Educ@rteNatureza* is a project that seeks to contribute to the design, development, implementation, and evaluation of an educational model centered around nature. Its primary objective is to grant voice and value to the surrounding spaces by employing storytelling methods. The project endeavors to establish spaces and temporal contexts for the construction of knowledge within natural environments, with a simultaneous focus on creating cultural significance for rural communities. This involves the systematic observation of nature, and identification of various elements such as objects, fauna, flora, and bodies of water. Additionally, *Educ@rteNatureza* aims to design diverse didactic materials revolving around these thematic aspects, manifested through the creation of both permanent and temporary exhibitions and interactive discussions that relate to the traditional artifacts and spaces intertwined with the memories and stories of the communities. Furthermore, the project strives to optimize the utilization of the human, material, and intangible heritage within a specific region, while harnessing the inherent natural qualities discovered on the terrain, thereby bestowing value upon the existing structure and projecting future developments and aims to promote nature objects as effective didactic materials. The present study is centered on the Bird of Paradise plant (*Strelitzia reginae*) widely spread throughout Portugal and aims to investigate its didactic potential within the existing curricular programs.

In today's fast-paced and technology-driven world, it is becoming increasingly evident that humans are losing their connection with nature. The rapid urbanization and industrialization processes have led to a

significant detachment from the natural world that once nurtured and sustained us (Martusewicz & Johnson, 2016). People are spending more time indoors, engrossed in screens and virtual realities, rather than venturing out into the open air and embracing the beauty of the natural environment. The consequences of this disconnection are reaching far. We are becoming oblivious to the delicate balance of ecosystems, neglecting the preservation of our planet's biodiversity, and compromising our well-being in the process (Saylan & Blumstein, 2011). Disconnection with nature and a consumerist approach towards natural resources led to the evident climate crisis we are all encountering now. The reality of the climate crisis is undeniable, and it is clear that it is here to stay. The Earth's climate is undergoing unprecedented changes due to human activities, and policies, culture and mindsets built around dominant and superior living approach (Martusewicz & Johnson, 2016). The impact of the climate crisis is felt worldwide, affecting ecosystems, biodiversity, and human livelihoods. Despite efforts to mitigate and adapt to these changes, the scale of the challenge is immense, and the effects will persist for generations to come (Saylan & Blumstein, 2011). The climate crisis is not a temporary issue; it is a defining challenge of our time that demands immediate attention and concerted global cooperation, including in the field of education.

With the escalating environmental challenges we face, there is an ever-growing need for informed environmental decisions and responsible stewardship toward nature (Esi, 2015). Informed environmental decisions require a deep understanding of the complex systems that govern our environment, as well as the potential consequences of our choices. This knowledge empowers individuals, communities, and scholars to make sound judgments that prioritize sustainability and the preservation of natural resources. Responsible stewardship entails recognizing our role as caretakers of the Earth, and understanding that our actions today have far-reaching implications for future generations (Saylan & Blumstein, 2011).

Despite growing awareness of the importance of environmental responsibility, it is troubling to observe that many humans are still being schooled to perceive themselves as superior beings, driven by self-interest, and inclined to exploit nature and its resources (Martusewicz & Johnson, 2016). Such a perspective disregards the intrinsic value of nature and fails to recognize the interconnectedness within the environment. It perpetuates a pattern of resource extraction, deforestation, pollution, and overconsumption, all driven by short-term gains and a narrow understanding of progress. To truly address the pressing environmental challenges, this paradigm must be challenged and transformed. It is essential to promote a shift towards an ecocentric worldview that embraces humility, respect, and sustainable coexistence with nature. This requires reevaluating of educational systems, fostering a deep sense of ecological literacy, and nurturing a sense of responsibility toward the natural world (Esi, 2015).

Nature-based education is a potentially powerful response to the harmful path that humanity has taken. Although existing in a variety of forms, nature-based, environmental, ecological, and/or outdoor education needs the permanent effort of awareness and support to be fully integrated into regular curriculums to change the human-nature approach to become enriching, respectful, enchanting, cooperative, and equal (Martusewicz & Johnson, 2016). Nature-based education is a guaranteed approach to developing healthy, confident, enterprising, and responsible citizens (Education Scotland, 2010). It helps regain psychological well-being, reduce stress and mental fatigue, and renew attention focus (Sprague, Sachs, & Ekenga, 2022), as well as increase self-confidence, help build positive relationships within communities, and improve self-awareness and understanding of others (Education Scotland, 2010). Frequent interaction with nature is also known to positively influence the individual sense of purpose, belonging, and general enjoyment of life (Flack, 2022), additionally increasing the feeling of safety and higher quality of life (Sprague, Sachs, & Ekenga, 2022).

Pedagogies of nature-based education encompass a range of instructional approaches that emphasize learning and engagement with the natural world. While acknowledging the absence of a standardized approach to nature-based education and the various financial and policy constraints that educators encounter when integrating this form of education into their curricula (Martusewicz & Johnson, 2016), there are still inspiring examples of K-12 outdoor education programs. For example, Canadian public schools emphasize holistic and integrated learning mixed with hands-on experiences. Such a pedagogical

approach aims to connect theoretical knowledge with students' everyday life, as well as blend different curricular subjects, for example, history, biology, and physical education (Asfeldt, Purc-Stephenson, & Zimmerman, 2022). This is achieved through a variety of activities, like outdoor living skills development, sports and recreation activities, games, art and crafts, environmental reflections, and more.

Another prominent example is given by the Ministry of Education of Scotland, which stresses that there are opportunities for nature-based outdoor learning “*within and across all curriculum areas*” (Education Scotland, 2010). One of the pedagogical approaches that they offer is a place-based education, which emphasizes the connection between learners and their local environment and encourages students to explore and investigate their surroundings, fostering a sense of stewardship, environmental responsibility, and interconnectedness within the local community (Education Scotland, 2010). By prioritizing the needs of all stakeholders and participants, outdoor education prioritizes the significance of cultural and social diversity and inclusivity in the planning of curricular activities.

Nature-based education holds great potential within Montessori pedagogy, aligning harmoniously with its principles and practices (Flack, 2022). Montessori education relies on the interconnectedness of all beings, collaborative relationships within the Universe, and maintaining order and harmony with nature, which corresponds with the principles of nature-based education. The pedagogy of Montessori also emphasizes hands-on, experiential learning, and the natural world provides an ideal setting for students to explore, discover, and connect with their environment. Incorporating nature-based activities and experiences into the Montessori curriculum can enhance students' sensorial development, ignite their curiosity, and foster a deep appreciation for the unification of all living things (Flack, 2022). Nature-based education within the Montessori approach encourages ecological literacy, empathy towards the natural world, and a lifelong commitment to environmental stewardship. It nurtures the holistic development of the individual, fostering a harmonious relationship between the individual, the community, and the planet.

Another remarkable approach in nature-based education is the pedagogy of responsibility and care ethics, proposed within the EcoJustice education (Martusewicz & Johnson, 2016). This methodology focuses on fostering environmental and social justice through education. It recognizes the interdependence of ecological and social systems and aims to address environmental issues within a broader framework of social equity and fairness. EcoJustice education seeks to empower students to become agents of positive change by examining and challenging the root causes of environmental problems, such as social inequities, economic disparities, and cultural biases (Martusewicz R. A., 2018). This pedagogical approach encourages critical thinking, reflection, and action by exploring the intersections between environmental sustainability, social justice, and human rights. Through collaborative projects, field studies, and community engagement, students develop a deep understanding of the complex environmental challenges facing their communities and the world.

Important to state that nature-based education pedagogies recognize the value of incorporating digital and technological instruments into the learning process. While emphasizing the importance of hands-on experiences and direct engagement with nature, they also acknowledge the potential of digital tools to enhance learning and connect students to broader educational concepts. Technology can be employed to document observations, conduct research, and explore virtual simulations that complement and deepen the understanding of natural phenomena (Education Scotland, 2010). Additionally, digital resources can serve as tools for environmental advocacy and foster connections between learners and global environmental issues. By striking a balance between nature-based experiences and the judicious use of digital and technological instruments, nature-based education can embrace the advantages of both realms, nurturing a comprehensive and holistic educational experience for students.

Method

In this study, a case study research method is employed to develop didactic materials centered around a specific nature object. Given the geographical context of central Portugal and individual preferences of the

researchers, the chosen object for investigation is the Bird of Paradise (*Strelitzia reginae*). The utilization of the case study method in this research entailed a thorough and detailed examination of a particular educational phenomenon associated with the plant, resulting in a comprehensive understanding of the contextual factors, processes, and outcomes involved (Cohen, Manion, & Morrison, 2007). By applying this method to the development of didactic materials, the researchers were able to investigate the effectiveness of these materials in supporting teaching and learning, while also fostering principles and values aligned with nature-based education.

The current study adopted a descriptive case study methodology, following the framework proposed by Robert Yin (2017), to address the research question that evolved from a broad inquiry focused on the didactic possibilities of local natural objects to a specific investigation into the didactic options associated with *Strelitzia reginae*. The research methodology encompassed theoretical exploration of the plant's origins, botanical characteristics, cultural significance, and symbolic meanings, in addition to examining theories related to nature-based pedagogies and the current landscape of nature-based education.

This research employed field observation (Yin, 2017) as a primary method to gather data on the Bird of Paradise species, with the ultimate aim of developing didactic materials. The field observation allowed for a comprehensive understanding of the plant's habitat, and unique characteristics in its natural environment. By immersing themselves in the field, researchers were able to witness firsthand the vibrant colors, elaborate courtship displays, and ecological interactions of *Strelitzia reginae*. Through careful analysis of these observations, including notes and photographs, a dataset was compiled to support the creation of didactic materials. The case study approach facilitated the exploration of how the captivating features of the Bird of Paradise could be effectively translated into educational materials, aligning with the principles of nature-based education and fostering a deeper appreciation for the natural world.

The various stages of research, encompassing observations, analysis of theoretical references, and the development of didactic materials, underwent a group peer review process involving colleagues and researchers within the *Educ@rteNatureza* project. The inclusion of multiple perspectives and opinions, as advocated by Cohen, Manion, and Morrison (2007), facilitated triangulation in the research process. This approach expanded the scope of the study, enabling a comprehensive exploration of the topic. By considering diverse viewpoints, the researchers were able to identify potential weaknesses and contradictions in the data, leading to a more thorough analysis. Triangulation of opinions also bolstered the credibility of the study's findings, as it provided a well-rounded perspective and reduced the risk of bias or limited interpretation. Ultimately, this integration of multiple opinions through triangulation enhanced the validity and robustness of the research outcomes (Cohen, Manion, & Morrison, 2007).

The qualitative data derived from observations and the analysis of relevant theoretical references were utilized to determine the visual, botanical, and cultural characteristics of the *Strelitzia reginae* plant. These characteristics along with outstanding patterns of the plant's appearance were applied to the curricular requirements of basic education in Portugal (Decreto-Lei n.º 176/2014, 2014) and led to the creation of the three didactic materials within the curricular subjects of mathematics and environmental education for the students of the 1st cycle (Decreto-Lei n.º 176/2014, 2014).

Findings and Results

The *Strelitzia reginae* plant belongs to the *Strelitzia* genus, which encompasses five different plant species. It is commonly known as the Bird of Paradise due to the resemblance of its petals to the flying exotic bird. Native to South Africa, the *Strelitzia reginae* is commonly found growing along the banks of rivers in its natural habitat. The plant exhibits distinct botanic parameters that contribute to its unique characteristics. This flower can reach a height of approximately 2 meters, making it a tall and visually striking addition to

any landscape. The long leaves of *Strelitzia reginae* measure between 25 to 70 cm in length and are broad in shape, providing an impressive foliage display (Walt, 2000). One of the most captivating features of this plant is its flowers, which consist of three orange petals and three blue or white petals. These petals come together to form an arrow-like nectary, creating a perch for sunbirds, the primary pollinators of the flowers. When the sunbirds perch on the nectary to drink the nectar, the third petal opens, releasing the anther and covering the birds' feet in pollen, which ensures effective cross-pollination. *Strelitzia reginae* is characterized by its evergreen leaves, indicating that it retains its lush foliage throughout the year. It thrives in warm and sunny climates, where it can flourish alongside other tropical plants. In terms of botanical relationships, *Strelitzia reginae* is related to both the banana tree and the palm tree, sharing common ancestry and evolutionary traits (Walt, 2000).

Bird of Paradise or *Estrelícia* in Portuguese, holds significant symbolism and importance in Portugal. Its prevalence in the country can be observed in various gardens, parks, and public spaces, where it adds a vibrant touch to the surroundings. *Strelitzia reginae* also plays a role in Portugal's botanical heritage, contributing to the country's rich and diverse plant life.

The Bird of Paradise plant's specifications were applied to the principles of object-based pedagogy to create appropriate didactic materials. Object-based learning is an educational approach that uses tangible objects and artifacts as primary resources for teaching and learning. In this approach, students observe, analyze, and interpret objects, drawing connections to the concepts being studied. They explore physical properties, examine historical and cultural contexts, consider symbolism, and make interdisciplinary connections. This hands-on approach promotes active learning, sensory engagement, critical thinking, and observation skills (Chatterjee & Hannan, 2017).

The didactic materials developed around the Bird of Paradise as a natural object are composed of three educational exercises. One of them called “*Once upon a time...*” aims to enhance students’ verbal communication skills, enabling them to effectively articulate their thoughts and ideas, and promote imaginative thinking and cooperation with nature. The “*Draw me how you feel*” activity serves as a platform for raising awareness of basic emotions and experience closeness and positive attachment toward objects in the natural world. The didactic material “*Lines and Angles*” leverages the unique characteristics of the *Strelitzia reginae* plant to explain the connection between natural objects and geometrical concepts. By incorporating the distinct features of the Bird of Paradise, students can explore geometric principles in an engaging and visually stimulating manner, promoting a deeper understanding and appreciation of mathematical concepts within the natural world.

Activity 1 – “Once upon a time...”

Context: Environmental studies; curricular.

Audience: Students of the 1st cycle, ages 6-9.

General objective 1: To learn about the *Strelitzia reginae* plant.

Specific objectives:

1. To identify new words related to the plant;
2. To search for the meaning of new words;
3. To relate the new words with the different parts of a plant.

General objective 2: To improve children's verbal communication.

Specific objectives:

1. To actively listen to others during the storytelling activity;
2. To create phrases that contribute to the storyline.

General objective 3: To develop narrative creativity.

Specific objectives:

1. To identify and describe the main elements of the story;
2. To explore the relationships and interactions between the different narrative elements.

Resources: Depiction of the *Strelitzia reginae* plant.

Methodology:

Students aim to create a story or a fairy tale featuring the Bird of Paradise flower as either the main or a side character. Each student will contribute a phrase to continue the narrative, building on the previous student's contribution. For example, N. starts the story by saying:

"Once upon a time, there was a Princess who loved the Bird of Paradise flower most of all".

S. continues the story with their phrase:

"But an evil witch cast a spell and transformed the Princess herself into the flower..."

The students take turns adding phrases, with the teacher facilitating the process and emphasizing the importance of active listening and developing the main storyline. The activity continues until the story reaches a satisfying conclusion, with students actively participating in the creative process.

Once the story is composed, the teacher guides a discussion to analyze the narrative elements of the fairy tale using the Actancial Model developed by A.J. Greimas (Hébert, 2006). Students are encouraged to identify and discuss the roles of the subject, object, sender, receiver, helper, and opponent within the story they have collectively created. This analysis aims to enhance their comprehension of the story's structure and the interplay between the natural elements involved in the activity.

For example, the teacher may ask the following questions:

Who will be the protagonist (hero/heroine) of our tale? – Princess (SUBJECT).

What did the Princess have that brought joy and beauty to people's lives? – The Bird of Paradise (OBJECT).

What allowed the flower to always be beautiful? – Light, water, love of the Princess (SENDER).

Who benefited from the presence of the flower? – All people (RECIPIENT).

Who interfered turning Princess into flower? – Evil witch (OPPONENT).

Who helped the Princess recover back to herself? – Her friends (HELPER).

Activity 2 – “Draw me how you feel”

Context: Environmental studies; curricular.

Audience: Students of 1st cycle, ages 6-9.

General objective: To create positive attachment to natural object – *Strelitzia reginae* plant.

Specific objectives:

1. To learn about the *Strelitzia reginae* plant;
2. To learn about 6 basic emotions;
3. To learn to identify emotions;
4. To learn to depict emotions with the help of drawings;
5. To express caring feelings about the plant.

Resources: Depiction of *Strelitzia reginae* plant; facial expression images; contextual examples of 6 basic emotions; emotion cards to distribute to students (Image 1).

Methodology:

The facilitator explains the concept of 6 universal emotions (happiness/joy, sadness, surprise, fear, disgust, and anger) based on the theory of American psychologist Paul Ekman (2003). Using facial images and contextual examples, the facilitator engages students in reflecting on the emotions, their causes, and manifestations. Children reflect on each emotion with the help of questions:

What do you think causes happiness? / When are you happy?

When do you feel fear?

What color do you think is disgust?

Following the discussion on human emotions, the facilitator introduces the question of whether natural objects, such as plants and animals, experience emotions. This prompts students to consider the emotional world of plants and animals and discuss possible triggers. The facilitator may ask the following questions:

Do you think plants have emotions? And animals?

What do you think can make a plant sad?

What can surprise an animal?

To engage students in expressing emotions through art and promoting non-verbal communication, the teacher distributes emotion cards randomly among students. Each student then creates a drawing of a Bird of Paradise flower that represents the assigned emotion from their card with the help of details, and context. The facilitator guides and assists students in explaining their chosen emotion and provides ideas for the drawings.

After the drawings are completed, the facilitator presents each drawing to the class, and students identify the emotions depicted. This allows for further discussion and understanding of the conveyed emotions and their interpretations. The teacher may ask the following questions:

What do you think is the emotion of the drawing?

What makes you understand this emotion?

To conclude the activity, the facilitator leads a group reflection on the emotional world of both humans and representatives of nature, including animals and plants. This discussion fosters empathy and a deeper appreciation for the emotional aspects of the natural world.

HAPPY	HAPPY
SAD	SAD
ANGRY	ANGRY
FEAR	FEAR
DISGUST	DISGUST
SURPRISE	SURPRISE

Image 1 – Emotion cards to be distributed between students for the activity “Draw me how you feel”

Activity 3 – “Lines and Angles”

Context: Mathematics; curricular.

Audience: Students of 1st cycle, ages 6-9.

General objective: To understand the connection of natural world and geometrical concepts.

Specific objectives:

1. To learn about the *Strelitzia reginae* plant;
2. To understand the concept of main geometrical shapes;
3. To identify main geometrical shapes on an object.

Resources: Picture of *Strelitzia reginae* plant; ruler; pencil.

Methodology:

Facilitator explains the concept of lines, starting with a dot and extending to another point. Using the blackboard, the teacher draws examples of straight and curved lines. The teacher demonstrates the concepts by giving examples with a ruler, pencil, and other objects.

Students are provided with a picture of the *Strelitzia reginae* plant to work with. They need to identify the straight lines created by the plant's stem, leaves, and petals and mark them on the picture (Image 2).

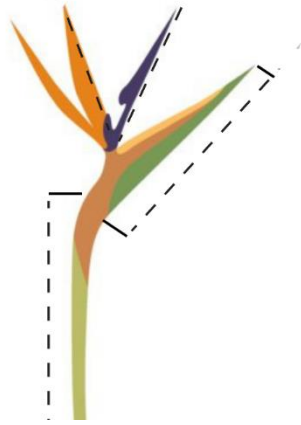


Image 2 – Example of the straight lines marked on *Strelitzia reginae* plant.
Original image retrieved from www.canva.com

The teacher explains the concept of angles, where two lines originate from the same dot and form an angle. Using the blackboard, the teacher draws examples of angles and shapes that form angles (e.g., triangles and rectangles). The teacher differentiates between acute angles and obtuse angles and provides examples. Students need to identify the angles formed by the plant's petals and describe their type: *acute* or *obtuse*. (Image 3).

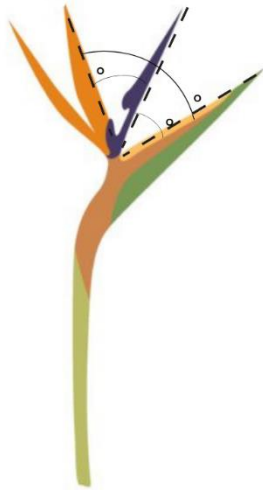


Image 3 – Example of angles identified on *Strelitzia reginae* plant.
Original image retrieved from www.canva.com

The teacher explains the concept of the right angle and provides examples. Students try to find the right angle formed by the plant's petals (Image 4).

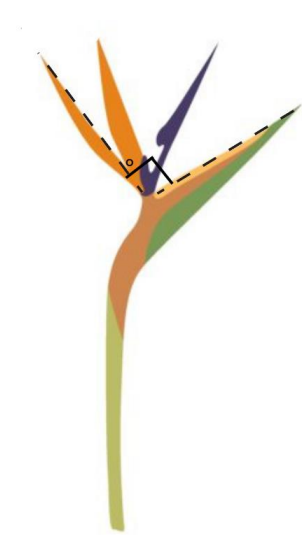


Image 4 - Example of a right angle identified on *Strelitzia reginae* plant.
Original image retrieved from www.canva.com

The teacher summarizes the activity, emphasizing the connection between geometry and nature. Students are encouraged to find their own examples of different shapes and angles in objects found in nature.

Conclusion and Recommendations

As part of the *Educ@rteNatureza* educational project, the current study has significantly contributed to the exploration of central Portugal's local natural heritage and the promotion of nature-based education and its pedagogies. It extensively examined the existing practices and pedagogies in nature-based education, identifying areas for improvement and further development. Additionally, the study found the *Strelitzia reginae* plant to be a remarkable didactic resource suitable for various curricular subjects and age groups.

The study has received highly positive evaluations through peer reviews and is currently being considered for further development and promotion. It is recommended that the didactic activities developed in this study undergo authentic assessments in real-life educational settings, involving the participation of 1st cycle students and teachers. This assessment will evaluate the activities' suitability for the target age group, measure satisfaction with the materials, and assess their effectiveness in facilitating positive learning experiences.

To disseminate the findings, the didactic activities are recommended to be organized in the form of educational booklets and digital learning materials. This will provide valuable resources for educators and curriculum designers to enhance nature-based education approaches and foster a deeper understanding and appreciation of the local natural heritage within the standard curriculum.

Moreover, the study's findings can lay the groundwork for future research endeavors and facilitate the progression of nature-based educational approaches in both formal and informal learning settings. One promising area for further development involves the formulation of a methodology that transforms natural objects into effective didactic materials. This methodology should harness the inherent educational potential of nature, allowing educators to creatively integrate natural elements into their teaching practices. By establishing a systematic framework for utilizing natural objects as educational resources, the study paves the way for enhanced engagement, experiential learning, and a deeper connection between learners and the natural world.

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