

Analysis of Practical Activities Proposed in Biology Textbooks for the Lower Secondary Education in Angola

**Análise das actividades práticas propostas nos manuais de
Biologia do 1.º Ciclo do Ensino Secundário em Angola**

**Análisis de las actividades prácticas propuestas en los libros de
Biología del 1.º Ciclo de la Enseñanza Secundaria en Angola**

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ABSTRACT

Practical activities (PAs) are recognised as essential strategies in Biology teaching, however, their effectiveness depends on how they are incorporated into curriculum documents and textbooks, the main didactic resource used in the Angolan context. This study aimed to analyse the alignment between the PAs proposed in Biology textbooks for the 1st Cycle of Secondary Education and the national curriculum guidelines, identifying their structural characteristics and pedagogical limitations. A qualitative, descriptive and exploratory research was carried out, based on content analysis applied to six textbooks approved by the Ministry of Education of Angola (two per grade: 7th, 8th and 9th). The PAs were categorised according to criteria of typology (field, laboratory and experimental), didactic structure (preparation, execution and closing), illustration and feasibility. The results indicate a low number and low diversity of PAs, absence of explicit pedagogical objectives and weakness in the didactic structure, with a predominance of repetitive proposals, scarce innovation between editions and evidence of editorial stasis. A misalignment was also found between the proposed practical activities and the curriculum guidelines, which limits the development of the scientific and investigative competences foreseen for Biology teaching. The findings indicate the need for a critical revision of textbooks and improvement of editorial policies, in order to increase coherence between curriculum and didactic material and strengthen the formative potential of practical activities.

Keywords: Practical activities; Biology teaching; Textbooks; Angola.

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As actividades práticas (AP) são reconhecidas como estratégias essenciais no ensino de Biologia, mas sua eficácia depende da forma como são incorporadas aos documentos curriculares e manuais escolares, principal recurso didáctico utilizado no contexto angolano. Este estudo teve como objectivo analisar o alinhamento entre as AP propostas nos manuais escolares de Biologia do 1.º Ciclo do Ensino Secundário e as orientações curriculares nacionais, identificando suas características estruturais e limitações pedagógicas. Realizou-se uma pesquisa qualitativa, de carácter descritivo e exploratório, com base na análise de conteúdo aplicada a seis manuais aprovados pelo Ministério da Educação de Angola (dois por classe: 7.ª, 8.ª e 9.ª). As AP foram categorizadas segundo critérios de tipologia (campo, laboratorial e experimental), estrutura didáctica (preparação, realização e encerramento), ilustração e exequibilidade. Os resultados indicam número reduzido e baixa diversidade de AP, ausência de objectivos pedagógicos explícitos e fragilidade na estrutura didáctica, com predomínio de propostas repetitivas, escassa inovação entre edições e evidências de imobilismo editorial. Constatou-se ainda um desalinhamento entre as actividades práticas propostas e as orientações curriculares, o que limita o desenvolvimento das competências científicas e investigativas previstas para o ensino de Biologia. Os achados indicam a necessidade de revisão crítica dos manuais e de aperfeiçoamento das políticas editoriais, de modo a ampliar a coerência entre currículo e material didáctico e fortalecer o potencial formativo das actividades práticas.

Palavras-chave: Actividades práticas; Educação em Biologia; Manuais escolares; Angola.

Resumen

Las actividades prácticas (AP) son reconocidas como estrategias esenciales en la enseñanza de la Biología; sin embargo, su eficacia depende de cómo se incorporan a los documentos curriculares y a los libros de texto, que constituyen el principal recurso didáctico en el contexto angolano. Este estudio tuvo como objetivo analizar la alineación entre las AP propuestas en los libros de Biología del 1.º Ciclo de la Educación Secundaria y las orientaciones curriculares nacionales, identificando sus características estructurales y limitaciones pedagógicas. Se realizó una investigación cualitativa, de carácter descriptivo y exploratorio, basada en el análisis de contenido aplicado a seis manuales aprobados por el Ministerio de Educación de Angola (dos por curso: 7.º, 8.º y 9.º). Las AP fueron categorizadas según criterios de tipología (campo, laboratorio y experimental), estructura didáctica (preparación, ejecución y cierre), ilustración y viabilidad. Los resultados indican un número reducido y baja diversidad de AP, ausencia de objetivos pedagógicos explícitos y debilidades en su estructura didáctica, con predominio de propuestas repetitivas, escasa innovación entre ediciones y evidencias de estancamiento editorial. Asimismo, se constató un desalineamiento entre las actividades prácticas propuestas y las orientaciones curriculares, lo que limita el desarrollo de las competencias científicas e investigativas previstas en la enseñanza de la Biología. Los hallazgos evidencian la necesidad de una revisión crítica de los manuales y del perfeccionamiento de las políticas editoriales, con el fin de ampliar la coherencia entre currículo y material didáctico y fortalecer el potencial formativo de las actividades prácticas.

Palabras clave: Actividades prácticas; Enseñanza de la Biología; Libros de texto; Angola.

Introduction

Biology teaching in Lower Secondary Education in Angola should promote the development of scientific, investigative and ethical competences (Law No. 32/20, 2020; INIDE/MED, 2019). These competences aim at understanding biological phenomena, applying scientific knowledge in practical life and developing attitudes of respect for life and the environment, contributing to the construction of critical and responsible citizenship.

From this perspective, Biology occupies a strategic position by addressing living beings and their interactions with the environment, stimulating scientific thinking, curiosity and ethical reflection, especially in countries with high biodiversity, such as Angola (Figueiredo & Smith, 2008). Practical activities (PAs) constitute one of the main means to achieve these purposes, favouring observation, experimentation and investigation, are essential dimensions for active learning (Pires, 2017; Bizerra & Ursi, 2014; Krasilchik, 2019).

However, the implementation of PAs faces limitations of an organisational, material and formative nature (Dourado, 2006), aggravated in Angola by the scarcity of didactic resources (Huntley, 2023). In this context, textbooks assume a central function as a pedagogical support, often the only one available, which gives them a determining role in the selection of contents and teaching methodologies.

The relevance of these materials is reinforced by the Law on the Foundations of the Education and Teaching System (Law No. 32/20), which establishes their compulsory use up to Secondary Education, and by the "Educar Angola 2030" Plan, which recognises them as essential instruments for equitable, inclusive and quality education (Ministério da Educação, 2016).

However, historically, textbooks have privileged theoretical and transmissive approaches, with little stimulus to investigation and contextualisation of contents (Krasilchik, 2019). As they act as mediators between the prescribed curriculum and the practised one, they constitute strategic sources for curricular analysis and evaluation of current educational policies.

Research carried out in different contexts (Figueiroa, 2001; Costa, 2006; Chiappetta & Fillman, 2007; Azevedo, 2020; Marques & Rosa, 2015; Rosa, 2018; Rosa & Artuso, 2019; Rosa et al., 2020; Oliveira & Pires, 2021; Vanderley & Pereira, 2023; Vieira, 2024) demonstrates that Science and Biology textbooks directly influence teaching practices and the way science is presented in the classroom. These studies show that PAs express specific conceptions of science and teaching, often poorly articulated with curriculum guidelines.

In Angola, research on textbooks is still scarce and, in general, limited to content or analogy analysis (Manuel, 2019). Studies that specifically address PAs and their alignment with national curriculum guidelines are lacking. This gap is significant, as the textbook often constitutes the main didactic resource used by teachers and students (Capitango, 2025), reinforcing the importance of investigating the alignment between PAs and official curriculum guidelines. Despite the recognised importance of practical activities, it remains unclear to what extent these are adequately structured and aligned with curriculum guidelines in the textbooks used in the Angolan context. This concern, however, is not recent. As early as the 1980s, Leite (1988) warned of the need to analyse not only the content of textbooks but also the nature and pedagogical intentionality of PAs, lest reproductive practices be perpetuated. Years later, Leite (2006) reaffirms this criticism by demonstrating that, although the experimental dimension appears in teacher training processes, it is rarely translated into consistent proposals in textbooks. Given this scenario, this study aimed to analyse the alignment between the PAs proposed in Biology textbooks for the 1st Cycle of Secondary Education and the national curriculum guidelines, evaluating their coherence and formative potential for the development of the scientific, investigative and ethical competences foreseen in official documents.

Methodology

This study analysed to what extent the practical activities (PAs) proposed in Biology textbooks for the 1st Cycle of Secondary Education in Angola are aligned with the guidelines of official documents, focusing on their didactic structure and formative potential.

This is a qualitative, descriptive and exploratory research, guided by an interpretative perspective, centred on the coherence between the prescribed curriculum and the didactic material used in schools.

Study Corpus

The corpus consisted of six Biology textbooks for the lower Secondary Education, corresponding to the 7th, 8th and 9th grades (regular age range 11 to 14 years), officially approved by the National Institute for Research and Educational Development (INIDE).

The selection followed three criteria: (i) Representativeness (official adoption by the Angolan educational system); (ii) Recurrence of use – verified during the Supervised Pedagogical Internship (2017–2024), in public and private schools; (iii) Availability – presence in the national book market, guaranteeing effective access for teachers and students. Two textbooks per grade were analysed, totalling six works published between 2003 and 2018 (Table 1). For organisational purposes, each copy received a code: A1 and A2 (7th grade), B1 and B2 (8th grade) and C1 and C2 (9th grade), with the number “1” assigned to the oldest edition.

Despite the time interval between editions, thematic and structural standardisation was found, covering contents of ecology, human physiology, cytology, botany and zoology, which allowed consistent comparisons between the textbooks.

Table 1.
Textbooks analysed by grade, title, author, publisher and edition

TEXTBOOK	TITLE	AUTHOR(S)	PUBLISHER	EDITION
A1	Biologia 7ª Classe	(Agostinho, 2003)	INIDE	
A2	Biologia 7ª Classe	(Agostinho, 2018)	Texto Editores	1ª Edição
B1	Biologia 8ª Classe	(Miguel, 2014)	Editora das Letras	1ª Edição
B2	Biologia 8ª Classe	(Miguel, 2015)	Texto Editores	2ª Edição
C1	Biologia 9ª Classe	(Agostinho & Miguel, 2014)	Editora das Letras	1ª Edição
C2	Biologia 9ª Classe	(Agostinho & Miguel, 2018)	Texto Editores	2ª Edição

Source: Own elaboration based on textbook data.

Note: The unit of analysis corresponded to the practical activities identified in the textbooks that make up the study corpus.

In the Angolan context, the absence of regular mechanisms for monitoring and evaluating textbook use makes the representativeness of the corpus dependent on their effective circulation and adoption in the classroom, observed in supervised internships and field records.

The Teacher's Guides published by Texto Editores (2006; 2007) were not included in the analysis, as they only reproduce the content of the student textbooks, without adding significant pedagogical or methodological guidelines (Marques & Rosa, 2015).

Analysis Technique: Content Analysis

The research followed the classic procedures of Content Analysis (Bardin, 2020), due to its suitability for the decomposition, categorisation and interpretation of textual and visual elements. The process was structured in three stages:

- Pre-analysis:** complete reading of the textbooks and curriculum programmes, with identification of all passages containing PA proposals
- Exploration of the material:** categorisation of PAs according to: typology (field, laboratory, experimental), didactic structure (preparation, execution, closing) and components (objectives, materials, procedures, expected results, questions and visual resources).
- Treatment and interpretation of data:** organisation into descriptive tables and qualitative analysis based on the frameworks of Costa (2006), Marques and Rosa (2015), Figueiroa (2001) and Krasilchik (2019), considering frequency, structuring and alignment with official curriculum programmes (INIDE/MED, 2019).

Data coding was carried out by double independent reading, followed by consensual review of divergences, which reduced possible interpretative biases and reinforced the reliability of the analysis. The information was recorded in analysis grids adapted from Costa (2006), Figueiroa (2001) and Pires (2017).

Results and Discussion

1 - Distribution and typology of practical activities in textbooks

The analysis of practical activities (PAs) in Biology textbooks for the Lower Secondary Education (7th, 8th and 9th grades) revealed scarcity, low typological diversity and repetition of proposals between editions, with slight advances in the 9th grade. These results suggest the existence of pedagogical and editorial limitations, aggravated by the absence of a robust regulatory framework for textbook production and evaluation.

1.1. 7th Grade Textbooks (A1 - 2003 and A2 - 2018)

Seven PAs were identified in each textbook, all concentrated on the theme "Structure and functioning of ecosystems", especially in the sub-themes diversity of ecosystems, plants and animals. There is no proposal in the theme "Environmental factors", nor in the sub-theme "Classification of living beings". Field activities (five) and experimental activities (two) predominate, with no records of laboratory proposals.

Although two textbooks were analysed (A1 - 2003 and A2 - 2018), both present exactly the same set of seven PAs, without variations in type, content or distribution. For this reason, Table 2 presents the consolidated total, without duplication of data.

Table 2.
Consolidated practical activity (PA) in 7th Grade textbooks (A1 – 2003 and A2 – 2018)

CONTENTS	TOTAL NO. OF PAS	FIELD	LABORATORY	EXPERIMENT
Diversity of ecosystems	2	2	0	0
Diversity of plants	1	0	0	1
Diversity of animals	4	3	0	1
Classification of living beings	0	0	0	0
Environmental factors	0	0	0	0
Total	7	5	0	2

Source: Own elaboration based on 7th grade Biology textbooks.

Note: The data represent the consolidated total, as both textbooks present the same set of practical activities.

The absence of PAs in central themes contradicts the programme guidelines, which recommend activities such as field classes for classification of living beings and observation of ecological relationships:

“Plan a field class; verify the adaptation of living beings in their ecosystems, identify the characteristics that allow them to live in a given environment and group them according to their similarities [...]” (INIDE/MED, 2013, p. 14).

“Conduct a field class to observe ecological relationships such as mutualism, predation and food chains, as well as examples with local fauna” (INIDE/MED, 2013, pp. 16 and 17).

These results suggest that the absence of PAs in structuring contents may limit conceptual consolidation, reduce opportunities for observation and scientific analysis, and compromise the appreciation of biodiversity and the environment, objectives foreseen in official documents (INIDE/MED, 2019; Law No. 32/20, 2020).

The repetition between editions, even after the educational reform (Law No. 17/16, 2016), reinforces evidence of low editorial innovation (Silva, 2019) and distance from contemporary approaches to experimental teaching. These results differ from those observed by Chiappetta and Fillman (2007), Costa (2006) and Figueiroa (2001), who identified greater diversity and evolution of practical proposals in successive editions. In Angolan textbooks, such evolution did not occur, with the absence of practices related to the classification of living beings and environmental factors persisting.

1.2. 8th Grade Textbooks (B1 - 2014 and B2 - 2015)

Regarding the 8th grade, each textbook presented six PAs, distributed across five of the eight themes foreseen in the programme. The proposals concentrate on human physiology contents, with absence of PAs on “Food and maintenance of life”, “Hormonal coordination” and “Reproductive function” (Table 3). Experimental activities predominate (five) and only one laboratory practice. As the two analysed textbooks present the same set of activities, the data are presented in a consolidated manner.

Table 3.
Distribution of practical activities (PAs) in 8th Grade textbooks (B1 – 2014 and B2 – 2015)

CONTENTS/THEMES	TOTAL NO. OF PAS	FIELD	LABORATORY	EXPERIMENT
Food and maintenance of life	0	0	0	0
Digestive function	1	0	0	1
Circulatory function	1	0	0	1
Respiratory function	1	0	0	1
Urinary function	1	0	0	1
Hormonal coordination	0	0	0	0
Nervous coordination	2	0	1	1
Reproductive function	0	0	0	0
Total	6	0	1	5

Source: Own elaboration based on 8th grade Biology textbooks.

Note: The data represent the consolidated total of practical activities, as both textbooks present the same set of proposals.

The absence of PAs in central themes reduces the formative potential and transfers to the teacher the responsibility of creating alternatives, in a context marked by the scarcity of complementary materials (Huntley, 2023). Scientific and investigative competences are treated repetitively, and ethical objectives related to health and prevention are not explored (INIDE/MED, 2019; Law No. 32/20, 2020).

As Costa (2006) and Figueiroa (2001) point out, the lack of practical diversity restricts active learning opportunities. Marques and Rosa (2015) reinforce that when PAs are not available in the textbook, their execution depends exclusively on teacher initiative, which compromises equitable access to investigative experiences.

1.3. 9th Grade Textbooks (C1 - 2014 and C2 - 2018)

Compared to the previous grades, the 9th grade textbooks reveal a slight advance in the diversity and quantity of PAs, although structural and methodological limitations persist. A total of nine PAs were identified, unevenly distributed between the two editions analysed. Textbook C1 (2014) presents three PAs, all related to the theme cell, while C2 (2018) includes six activities, concentrated on the themes “Cell” and “Organisation of plants”.

No proposals were identified regarding the theme “Organisation of animals”. Experimental activities predominate, with five in textbook C2 and one in C1. Two laboratory activities are also observed in C1 and one in C2, all focused on observing cellular structures (Table 4).

Table 4.
Distribution of practical activities (PAs) in 9th Grade textbooks (C1 – 2014 and C2 – 2018)

CONTENTS	C1 (2014)			C2 (2018)		
	Field	Lab.	Exp.	Field	Lab.	Exp.
Cell (structure/function)	0	2	1	0	1	3
Organisation of plants	0	0	0	0	0	2
Organisation of animals	0	0	0	0	0	0
Total	0	2	1	0	1	5

Source: Own elaboration based on 9th grade Biology textbooks.

Although C2 represents a small advance over previous editions, as it presents a greater number of activities and introduces the theme “Organisation of plants”, the absence of field practical activities and the strong thematic concentration on cellular contents remain. The proposals remain restricted to descriptive and observational practices, without stimulus to investigation in natural contexts, as recommended by official guidelines:

“Conduct a field class where students can observe the structure of each organ of the plant under study” (INIDE/MED, 2013, p. 52).

Despite the quantitative increase observed, scientific competences remain restricted to cellular study, without investigative expansion or articulation with ethical and environmental dimensions.

In general, the six textbooks analysed show low compliance with goals related to practical diversity, with a predominance of repetitive experiences and a centralised authorial structure. The recurrence of similar proposals reinforces Leite’s (1988) critique, according to which the didactic organisation of textbooks is conditioned by traditional models, which restricts teacher autonomy and limits the use of complementary materials.

As Costa (2006) and Marques and Rosa (2015) highlight, textbooks, as they constitute one of the main pedagogical resources used in the classroom, should coherently reflect the methodological guidelines of curriculum programmes, promoting typological diversity and encouraging investigative learning. Such aspects, although revealing incipient signs of improvement, are still weak in Angolan didactic production.

These results indicate that, despite curriculum programme guidelines, the practical dimension of Biology teaching remains under-represented and not very diversified. To more comprehensively understand the extent of this mismatch between the prescribed and the implemented, the following section examines the alignment between the proposed activities and curriculum guidelines.

1.4. Alignment between proposed activities and curriculum guidelines

In the 7th grade, seven practical activities (PAs) were identified, while in the 8th grade six proposals were recorded. In the 9th grade, variation was observed between the editions analysed, with three PAs in textbook C1 (2014) and six in textbook C2 (2018). As a whole, these activities are unevenly distributed across grades, totalling 16 PAs in the version considering textbook C1 and 19 PAs when considering textbook C2 (Table 5), with this variation restricted to the 9th grade, since in the 7th and 8th grades no changes were observed between editions.

Although a slight increase is observed in the 9th grade, the total number remains far below the 62 PAs foreseen in the National Programmes for the Biology discipline (INIDE/MED, 2019), revealing low compliance with curriculum guidelines.

The results reveal a pattern of continuity and homogeneity between editions, with few methodological innovations and practically non-existent editorial evaluations. This situation contrasts with the educational reforms foreseen in Law No. 17/16 of 7 October 2016, amended by Law No. 32/20 of 12 August 2020, which emphasise the integration between curriculum, teacher training and didactic materials.

The repetition of proposals and absence of pedagogical updating compromise the development of the scientific, investigative and ethical competences foreseen in the programmes, reducing scientific literacy and the critical formation of students. As Pires (2017, p. 40) observes, “textbook analysis is essential to evaluate the implementation of educational objectives, especially in contexts where they constitute the main pedagogical resource available.”

The results suggest the need for actions such as: (i) periodic evaluation and certification of textbooks; (ii) diversification of authors and publishers; (iii) development of teacher guides with contextualised activities; and (iv) encouragement of low-cost investigative practices.

In synthesis, there is a misalignment between curriculum guidelines and textbooks, which remain centred on theoretical and transmissive approaches, contrasting with international trends that value investigative teaching and scientific literacy (Chiappetta & Fillman, 2007; Costa, 2006).

These weaknesses reveal consistent evidence of editorial stasis, limiting the formative potential of Biology in secondary education, and become even more evident when the didactic characteristics of the proposed activities are analysed, addressed in the following section.

Table 5.
Comparison between practical activities (PAs) foreseen in the programmes and in the Biology textbooks (7th–9th grades)

GRADE	TEMAS	AP NO PROGRAMA	AP NOS MANUAIS
7th	1. Structure and functioning of ecosystems	4	2
	2. Diversity of plants and animals	12	5
	3. Environmental factors	3	0
	Subtotal 7th Grade	19	7
8th	1. Food and maintenance of life	1	0
	2. Digestive function	1	1
	3. Circulatory function	1	1
	4. Respiratory function	0	1
	5. Urinary function	2	1
	6. Hormonal coordination	2	0
	7. Nervous coordination	2	2
	8. Reproductive function	5	0
	Subtotal 8th Grade	14	6
9th	1. Cell (structure and function)	10	3 (C1)* / 4 (C2)*
	2. Organisation of plants	14	2 (C2)*
	3. Organisation of animals	5	0
	Subtotal 9th Grade	29	3 (C1)* / 6 (C2)*
General Total		62	16/19

* Variação entre as edições C1 (2014) e C2 (2018): C1 apresenta 3 AP e C2 apresenta 6 AP.

Fonte: Elaboração própria a partir dos manuais escolares analisados.

* Variação entre as edições C1 (2014) e C2 (2018): C1 apresenta 3 AP e C2 apresenta 6 AP.

2. Didactic characteristics of the proposed practical activities

The analysis of PAs in Biology textbooks was carried out based on three didactic criteria (Leite, 2001; Leite & Dourado, 2007; Costa, 2006; Krasilchik, 2019): (i) preparation of the activity (prior guidelines on location, materials, time and organisation); (ii) moment of execution (insertion before, during or after theoretical exposition); and (iii) closing (synthesis, analysis of results or critical discussion). Tables 6, 7 and 8 summarise the data for the three grades analysed.

Table 6.
Didactic aspects of practical activities (7th Grade)

SUB-THEME	TEXTBOOK	PREPARATION	IMPLEMENTATION	CLOSING
Diversity of ecosystems	A1 / A2	No	Yes	No
Diversity of Plants	A1 / A2	No	Yes	No
Great diversity of Animals	A1 / A2	No	Yes	No

Source: Own elaboration based on the analysed textbooks.

Table 7.
Didactic aspects of practical activities (8th Grade)

THEME	TEXTBOOK	PREPARATION	IMPLEMENTATION	CLOSING
Digestive function	B1 / B2	No	Yes	No
Circulatory function	B1 / B2	No	Yes	No
Respiratory function	B1 / B2	No	Yes	No
Urinary function	B1 / B2	No	Yes	No
Nervous coordination	B1 / B2	No	Yes	No

Source: Own elaboration based on the analysed textbooks.

Table 8.
Didactic aspects of practical activities (9th Grade)

THEME/SUB-THEME	TEXTBOOK	PREPARATION	IMPLEMENTATION	CLOSING
The cell	C1	No	Yes	No
	C2			Yes
Organisation of plants	C2	No	Yes	Yes

Fonte: Elaboração própria a partir dos manuais escolares analisados.

In general, the data reveal significant structural deficiencies. No textbook contemplates the preparation phase, and only in the 9th grade (C2, 2018) is there a reference to discussion as a closing activity, albeit in a limited way (Figure 1). This absence compromises both the initial involvement of students and the consolidation of learning, as the PAs remain disconnected from clear objectives and moments of critical reflection on the results (Rocha & Terán, 2010; Rodrigues, 2014; Krasilchik, 2019).

The closing stage is essential to consolidate learning, formulate hypotheses and interpret data (Rodrigues, 2014; Costa, 2006). As Leite (2001) highlights, without clarity in objectives and without adequate procedure, the activity loses pedagogical effectiveness.

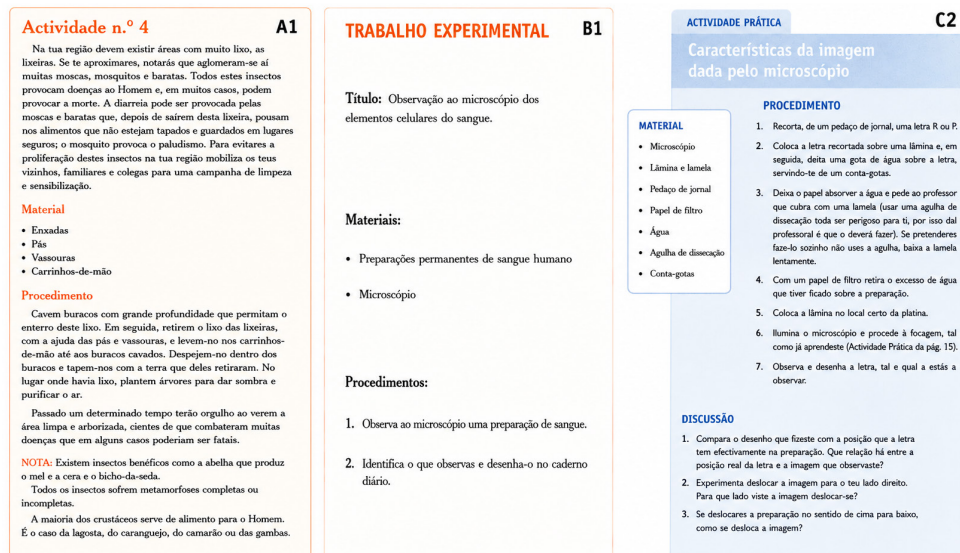


Figure 1. Excerpts from pages 90 (textbook A1 – 2003), 100 (textbook B1 – 2014) and 18 (textbook C2 – 2018), referring to practical activities without preparation and without closing.
Source: Own elaboration based on the analysed textbooks.

It was also observed that most PAs are inserted during or after theoretical exposition, assuming a merely illustrative, rather than investigative, function (Costa, 2006). This pattern reinforces what was found in the previous section: scarcity, low typological diversity and weak methodological innovation.

Even in the most recent editions (A2, B2 and C2), no significant advances are observed regarding didactic structure. The repetition of proposals over more than a decade indicates an absence of critical updating and signs of editorial stasis, with direct impacts on pedagogical innovation (Figure 2).

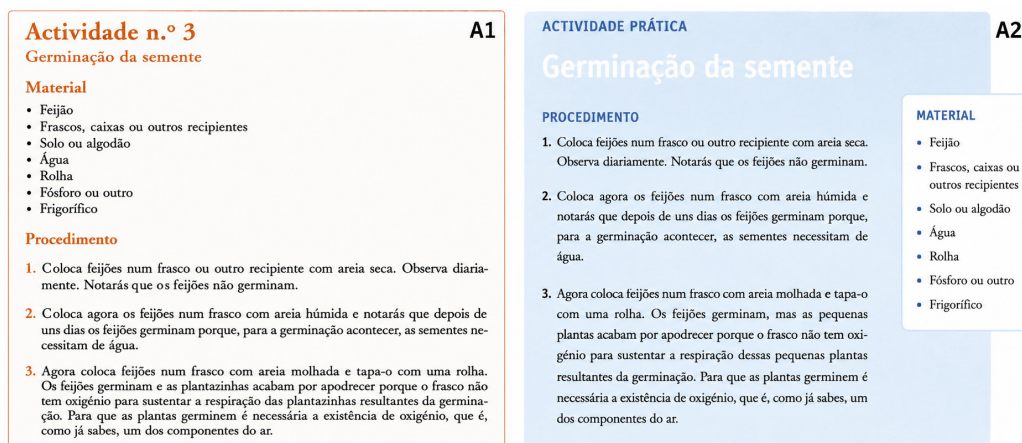


Figure 2. Excerpts from page 59 of Biology Textbooks (A1 – 2003 and A2 – 2018), referring to the practical activity on bean germination, evidencing editorial and pedagogical stasis over 15 years.
Source: Own elaboration based on the analysed textbooks.

In summary, the inexistence of a three-phase structure (preparation, execution and closing) reveals a limited understanding of the pedagogical potential of PAs. Transformed into mere execution exercises, they cease to promote investigation and critical reflection, contradicting curriculum guidelines and reducing their formative potential.

According to Costa (2006), the lack of prior planning makes it difficult for students to understand the purpose of the practice and its connection with theoretical contents; in turn, the absence of closing limits critical reflection on the experience, compromising the development of analysis, synthesis and argumentation skills. For Silva (2019), this fragmentation results both from un dynamic editorial decisions and from gaps in curriculum policies, hindering the mediation between the official curriculum and teaching practice.

Considering the defined unit of analysis (practical activities), the results indicate that, as evidenced in the previous section, the structural fragility of PAs limits the development of the investigative and ethical competences foreseen in the Biology Programmes and in the aims of the Education and Teaching System of Angola (Law No. 32/20, 2020).

Thus, in addition to being quantitatively insufficient, the proposed activities reveal significant qualitative weaknesses, restricting their contribution to the scientific and citizenship formation of students.

3. Evaluation of the structure, illustration and feasibility of practical activities

The qualitative analysis of PAs also considered categorisation, structuring, presence of illustrations and feasibility (Tables 9, 10 and 11).

Table 9.

Evaluation of PAs proposed in 7th grade textbooks regarding categorisation, structuring, presence of illustrations and feasibility (A1 and A2)

THEME / SUB-THEME	TEXTBOOK	CATEGORISATION	STRUTURING	ILLUSTRATION	FEASIBILITY
Diversity of ecosystems	A1	Actividade	Structured and unstructured	—	environment
	A2	Visita de estudo		Photo	
Diversity of Plants	A1	Actividade	Structured	—	environment
	A2	Actividade prática			
Great diversity of Animals	A1	Actividade	Structured	Photo	environment and group formation
	A2	Actividade prática			

Source: Own elaboration based on the analysed textbooks.

3.1. 7th Grade Textbooks

In textbooks A1 and A2, the PAs appear under the designation “Activity” or “Practical activity” and study visit, with a partial structure (title, materials and procedures), but without indication of objectives, guiding questions or expected results (Table 9). Only one proposal presents an illustration (Figure 3), and feasibility is mentioned vaguely, with generic references to the “environment”, without logistical, pedagogical or safety detailing.

This pattern corroborates the methodological weaknesses already observed in previous analyses: even in themes valued by the programme, the proposals do not favour the development of investigative competences nor promote critical reflection on biological phenomena (Figure 3). The absence of didactic guidelines, associated with low visual and descriptive diversity, reduces the formative potential of the activities, transforming them into mere observation or reproduction tasks.

Moreover, the similarity between versions A1 (2003) and A2 (2018) reveals signs of editorial stasis, characterised by the repetition of the same proposals over 15 years, without methodological updating or adaptation to curricular advances. Such persistence reinforces the need for critical revision of textbooks, in order to ensure coherence between content, methodology and formative objectives.

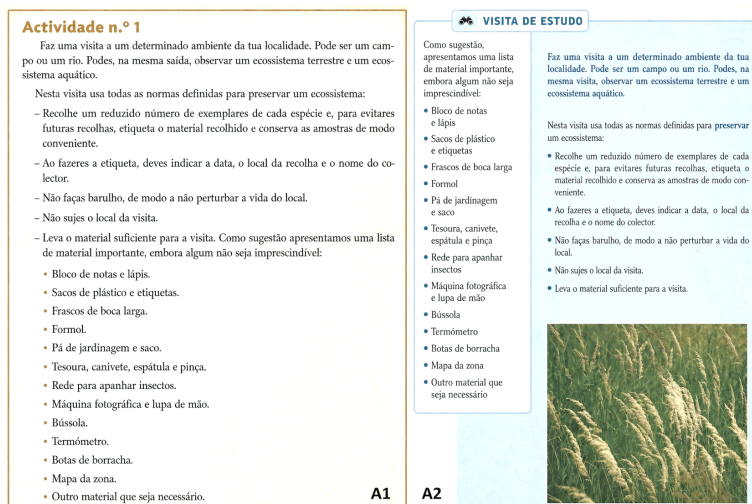


Figure 3. Excerpts from page 12 of Biology Textbooks (A1 – 2003 and A2 – 2018), referring to the practical activity on diversity of ecosystems.

Source: Own elaboration based on the analysed textbooks. Authorship: Piedade Silissóli Agostinho Mande.

3.2. Manuais da 8ª classe

Nos manuais B1 e B2 predominam propostas classificadas como trabalhos experimentais e laboratoriais (Tabela 10). Embora B2 apresente ilustrações em todas as actividades, ambos carecem de objectivos explícitos, questões orientadoras e momentos de discussão ou sistematização dos resultados. Quanto à exequibilidade, há referência a alguns recursos (microscópio, laboratório, tempo previsto, formação de grupos), porém sem detalhamento didáctico sobre procedimentos, segurança ou adaptação às condições reais das escolas.

Tabela 10. Avaliação das actividades práticas (AP) propostas nos manuais escolares da 8ª classe quanto à categorização, estruturação, presença de ilustrações e exequibilidade (B1 e B2)

THEME	TEXT BOOK	CATEGORISATION	STRUTURING	ILLUSTRATION	FEASIBILITY
Digestive function	B1	Laboratory practice	Structured	—	Laboratory and scheduled time
	B2			Photo	
Circulatory function	B1	Experimental work	Structured	—	Microscope
	B2			Photo	
Respiratory function	B1	Experimental work	Structured	—	Group formation and scheduled time
	B2			Photo	
Urinary function	B1	Experimental work	Structured	—	Laboratory
	B2			Photo	
Nervous coordination	B1	Experimental work	Structured	Photo	Laboratory
	B2			Photo	

Source: Own elaboration based on the analysed textbooks.

Despite presenting greater diversity of visual and thematic resources compared to the 7th grade, the structure of the PAs remains simplified and centred on the execution of instructions (Figure 4), which reduces their investigative potential and maintains them in a predominantly illustrative function (Costa, 2006; Krasilchik, 2019).

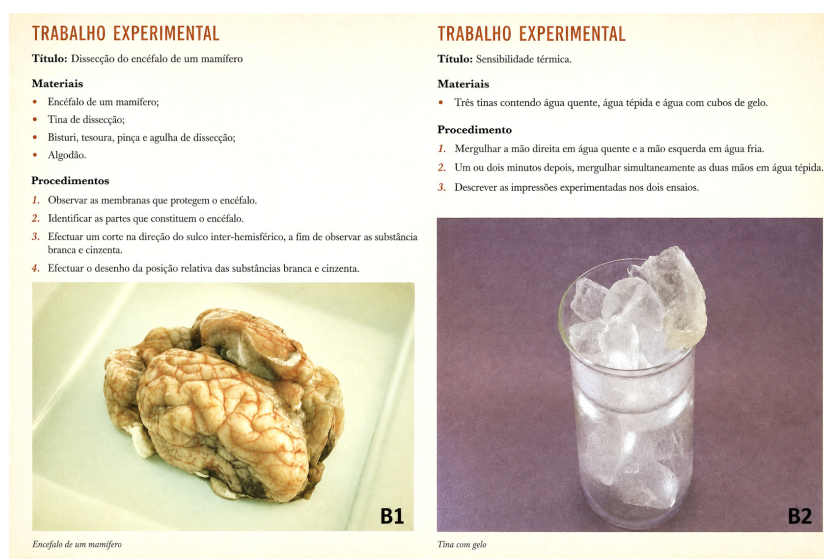


Figure 4. Excerpts from pages 165 and 166 of Biology Textbooks (B1 – 2014 and B2 – 2015), referring to laboratory and experimental practical activities.

Source: Own elaboration based on the analysed textbooks.

Furthermore, the comparison between B1 (2014) and B2 (2015) shows continuity of formats and descriptions, with only minor changes in the form of presentation (insertion of photographs and small wording adjustments), without correspondence with curricular changes. This pattern reinforces the editorial stasis already observed in the 7th grade editions, revealing the absence of methodological innovation and articulation between contents and investigative competences.

3.3. 9th Grade Textbooks

The PAs in textbooks C1 and C2 also appear under the designations “Activity” or “Practical activity” (Table 11). Both present a basic structure, with title, materials and procedures, but only C2 includes questions for discussion (Figure 5), constituting a specific advance. Illustrations in the form of diagrams and photographs facilitate understanding of procedures (Marques & Rosa, 2015), although they do not, by themselves, guarantee a critical and investigative approach.

Table 11 .

Evaluation of PAs proposed in 9th grade textbooks regarding categorisation, structuring, presence of illustrations and feasibility (C1 and C2)

THEME	TEXTBOOK	CATEGORISATION	STRUTURING	ILLUSTRATION	FEASIBILITY
The cell	C1	Activity	Strutured	Photo and schematic drawing	Material: Microscope
	C2	Practical activity		Schematic drawing	
Organisation of plants	C1	—	—	—	—
	C2	Practical activity	Strutured	Schematic drawing, photos	Time

Source: Own elaboration based on the analysed textbooks.

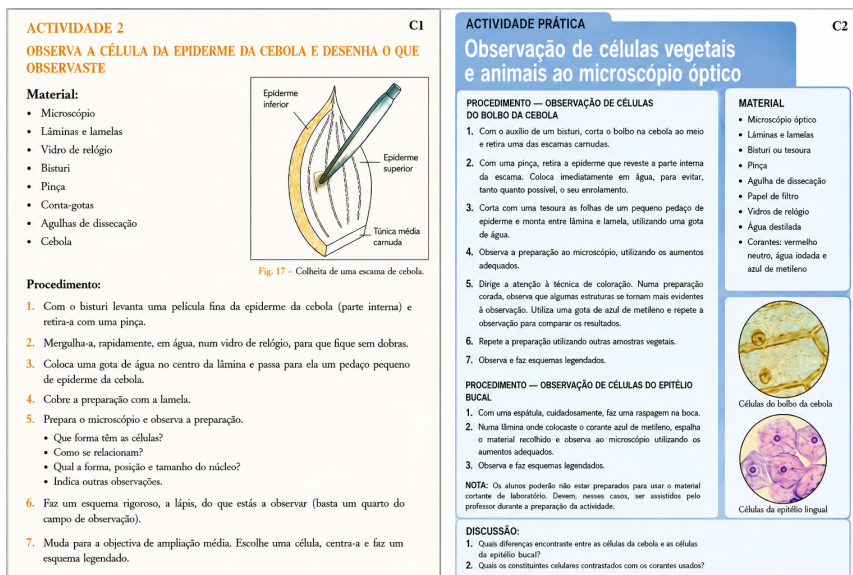


Figure 5. Excerpts from pages 22 (C1 – 2014) and 37 (C2 – 2018) of Biology Textbooks, referring to practical activities on the cell.

Source: Own elaboration based on the analysed textbooks.

As Hodson (1993) argues, practical activities should promote not only the learning of content but also the development of investigative skills and the understanding of the nature of science. For this, it is necessary to overcome simplified and transmissive approaches, adopting more contextualised practices oriented towards reflection. In the light of Hodson’s (1993) perspective, practical activities in Science teaching should not be restricted to the execution of procedures or the verification of content, but should constitute spaces of investigation, reflection and meaning construction, simultaneously promoting investigative competences and the understanding of the nature of science. However, the evidence observed in textbooks C1 and C2, namely the predominantly procedural structure, the absence of explicit objectives and, in the case of C1, the non-existence of discussion questions, indicate the persistence of simplified and transmissive approaches, distant from an investigative and reflective orientation.

In all the analysed grades, the PAs present limited methodological structure, marked by the absence of clear objectives, discussion stages and expected results. Although textbook C2 represents a punctual advance, descriptive and poorly contextualised proposals prevail, which do not favour the integrated development of the scientific, investigative and ethical competences foreseen in the Biology programmes (INIDE/MED, 2019).

Complementarily, preliminary data from the Aprender e Ensinar Botânica Project (2014–2024), developed with 621 first-year Biology undergraduates, indicate that 99.8% of the participants had exclusively theoretical Botany classes in Secondary Education, centred on the use of the blackboard, chalk and dictation (scarcity of school textbooks) (Capitango, 2025). Additional evidence (2017–2024) demonstrates that none of the 145 participants, among undergraduates and experienced teachers, implemented practical activities in Biology teaching, attributing such absence to insufficient methodological training, scarcity of resources and lack of institutional support.

These findings suggest that the structural fragilities of textbooks tend to reproduce themselves in pedagogical practices, feeding a cycle of theoretical, decontextualised and reproductive teaching. Such a scenario reveals a problem of a systemic nature, which demands articulation between curricular policies, teacher training and didactic production. Only with this integration will it be possible to transform practical activities into genuine experiences of investigation, reflection and construction of biological knowledge.

- The results indicate low alignment of the practical activities (PAs) in Biology textbooks for the Lower Secondary Education with the national curricular guidelines, reflecting fragilities in their formative potential. A reduced number and low diversity of PAs were observed, with a predominance of field proposals in the 7th grade and simple experiments in the 8th and 9th grades, contradicting the recommendation of balanced integration between field, laboratory-based and experimental activities.
- The absence of explicit objectives, of preparation and conclusion stages, as well as of moments of critical reflection, confers upon the PAs a predominantly illustrative character, reinforcing memorisation practices to the detriment of investigation and scientific problematisation. These limits express structural deficiencies associated with editorial production, curricular regulation and teacher training, including repetition of content across editions and insufficient preparation for experimental work, revealing evidence of low editorial innovation that compromises pedagogical updating and the fulfilment of curricular objectives.
- Considering that the textbook constitutes the main pedagogical resource, such limitations directly affect the equity and quality of scientific education, contradicting the formative aims foreseen by the Basic Law of the Education and Teaching System. Preliminary data from **Aprender e Ensinar Botânica** Project (2014–2024) confirm this relationship: the majority of future teachers experienced exclusively theoretical classes, and none of the observed participants implemented practical activities, indicating the reproduction of textbook fragilities in school practices.
- The results suggest the need for: (i) systematic review of school textbooks, ensuring their coherence with the curricular programmes; (ii) creation of a national system for the evaluation and certification of textbooks; (iii) diversification of authors and publishers; and (iv) strengthening of teacher training, with incentive to the elaboration of low-cost investigative practices contextualised to the local reality.
- Overcoming these limitations requires articulation between curricular policies, teaching practices and didactic production, so that practical activities cease to be mere illustrative exercises and become authentic experiences of investigation, reflection and construction of biological knowledge. Such transformation is essential to promote a critical, contextualised and socially relevant scientific education in the Angolan context.

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