

Terminology Development in African Languages: Challenges and Prospects for Teaching School Subjects—The cases of Bamanankan (Mali) And Malagasy (Madagascar)

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Abstract

Terminology development is an essential step toward the integration of African languages into educational systems as languages of instruction. Drawing on the cases of Mali and Madagascar, this paper examines the key issues and challenges related to terminology development for the effective teaching and learning of school subjects.

Keywords: African languages, language of instruction, bilingual education, school subjects, language policy Bamanankan, Malagasy, terminology

Bamukan

Dodapeko yiriwali dakun ye diyagoya ye walasa ka farafinnakanw don kalanko siratige la i n'a fo kalankekanw. Nin seben in b'i sinsin Mali ni Madagasikari taw misaliw kan k'u geleyabaw segesege minnu nesinnen don dodapeko ma walasa ka kalansenw lakalanni puman soro.

Dape kolomaw : farafinnakanw, bamanankan, maligasikan, kalankekan, kalan kanfilama, lamo kanfilama, kanbaara bolodacogo, kalansen, kalanyoro kalansenw, kalansenw degeli, kalansenw lakalanni, dodapeko

Famintinana

Ny fananganana voambolana manokana dia dingana tsy azo ihodivirana amin'ny fampidirana ny teny afrikanina ao anatin'ny rafitra fanabeazana ho toy ny fiteny fampianarana. Miorina amin'ny toe-javatra any Mali sy Madagasikara, ity lahatsoratra ity dia mandinika ny fanamby mifandraika amin'ny fampiasana voambolana amin'ny fampianarana taranja isan-karazany eny an-tsekoly.

Teny manandanja: fiteny afrikanina, bamanankan, malagasy, fiteny fampianarana, fampianarana amin'ny fiteny roa, fandrindrana fiteny, taranja ampianarina, fampianarana ny taranja, fianarana ny taranja, voambolana

Résumé

L'équipement terminologique est une étape incontournable pour l'intégration des langues africaines dans les systèmes éducatifs en tant que langues d'instruction. À partir des contextes malien et malgache, cet article explore les enjeux liés à la terminologie pour l'enseignement des disciplines scolaires.



Mots clés : Langues africaines, langue d'enseignement, éducation bilingue, matières scolaires, politique linguistique, bamanankan, malgache, terminologie

Introduction

The terminology development of African languages has become a central issue in linguistic and educational policies across the continent and represents an essential step for countries seeking to use national languages as mediums of instruction (Bamgbose, 1987; Mahlalela-Thusi & Heugh, 2010; Plüddeman, 2015; Nhongo, R. & Tshotsho, 2020). Since these national languages have generally not been used officially or systematically as languages of instruction in various subjects, it is crucial to create specific terminologies suited to classroom activities and each subject taught. This process of terminology creation thus emerges as a strategic lever for successful learning and for building scientific thought rooted in national languages and cultures.

Our paper explores the didactic and sociolinguistic challenges of the terminology development of African languages through two contexts: the use of Bamanankan, one of Mali's thirteen national and official languages¹, and the use of Malagasy, the national and official language of Madagascar. These two countries — part of pioneers in integrating national languages into schooling (Madagascar since 1972, Mali since 1979) — offer privileged contexts for analyzing the relationships between language planning, terminological development and pedagogical practices.

The educational policies implemented in both countries have been accompanied by large-scale efforts in terminology creation and standardization. These initiatives, led by institutions such as the *Direction nationale de l'alphabétisation fonctionnelle et de la linguistique appliquée* (DNAFLA) and the Académie malienne des langues (AMALAN) in Mali and the *Direction de la Planification et de l'Orientation de l'Enseignement* as well as the *Académie malgache* in Madagascar, have produced specialized lexicons, subject-specific glossaries and textbooks in national languages. These terminology productions have played a key role in establishing instruction in national languages or bilingual education programs, enabling teachers to teach scientific, technical, and social subjects using languages familiar to their students.

¹ These 13 national languages were recently recognized as official languages in the Constitution voted by July 2023

However, the implementation of these terminologies in classrooms reveals tensions between linguistic standardization and pedagogical appropriation, as well as between national planning frameworks and local classroom practices.

The aim of this article is therefore to analyze the issues, approaches, and conditions surrounding the use of terminology in the teaching of school subjects in African languages specifically in Bamanankan and Malagasy.

The article is organized into three sections. We begin with a theoretical framework on the terminology development of languages. We then adopt a historical perspective on the approaches taken by Mali and Madagascar. Finally, we examine the practical conditions for the use of terminology in classrooms.

1. Terminology Development of Languages

1.1. Conceptual Framework

Sager (1990: 3) lays the definitional foundations of the word “terminology”:

In contemporary usage, it is necessary to distinguish three meanings of the word:

1. the activity defined in the first paragraph, i.e. the set of practices and methods used for the collection, description and presentation of terms;
2. a theory, i.e. the set of premises, arguments and conclusions required for explaining the relationships between concepts and terms which are fundamental for a coherent activity under 1;
3. a vocabulary of a special subject field.

In this paper addressing the use of terminology in the context of educational language policies, we mainly refer to the third meaning: we use *terminology* in the sense of a set of terms, along with their definitions, that are specific to a particular field of knowledge or human activity within a given language (Babault, 2016).

In education, terminology largely consists of the specialized lexicon of the various disciplines — that is, all the terms corresponding to the concepts that serve as learning objects within each subject. Following Kageura (2002: 10), we define a concept as “an abstract unit which consists of the characteristics of a number of concrete or abstract objects which are selected according to specific scientific or conventional criteria appropriate for a domain”. Thus, the following examples can be considered part of the specialized lexicon in English for the three disciplines listed below:

- Mathematics: *add, multiply, triple, angle*
- Science: *skin, limb, respiratory system, drinking water*
- Geography: *continent, population, climate*

The notion of *concept* is crucial, as Wüster (1974: 67) already said in his seminal works:

All terminology work starts with CONCEPTS. It aims to draw sharp distinctions between concepts. In terminology, the realm of concepts is regarded as independent of the realm of names. That is why terminologists talk about 'concepts', whereas most linguists talk about 'word meanings' in relation to common language. (our translation)².

New terminological designations— also called *neonyms* in contrast to *neologisms* belonging to general language (Rondeau, 1984; 116) — can be categorized as *primary*³ or *secondary neology* (Humbley, 2012: 112). According to Humbley (ibid.), *primary neology* refers to cases where “a concept receives a name for the first time (e.g., *e-mail* in English),” whereas *secondary neology* occurs “when the existing denomination is either adapted (*courrier électronique, courriel, mél* in French) or adopted as is (*e-mail* in French)” (our translation)⁴.

It is important to note that terminology development for the use of languages as media of instruction mobilizes both *primary* and *secondary neology*, although secondary neology is more prominently represented in the early stages of implementing teaching in national languages. While the objective is often to provide equivalents for pre-existing concepts in the target languages— thus facilitating the construction of academic knowledge and partially or fully replacing previously used foreign languages—this process may also involve the creation of new terms when required by specific pedagogical or disciplinary needs.

Terminology development forms part of broader language policy and planning processes, which have been extensively theorized since the 1960s. Kloss (1969), one of the pioneers in the field, distinguishes between two components of language planning:

- measures aimed at influencing behaviors regarding the *use of languages*, known as *status planning*;
- measures aimed at influencing behaviors regarding the *forms of language use*, known as *corpus planning*.

² Originaltext: “Jede Terminologiarbeit geht von den BEGRIFFEN aus. Sie zielt auf scharfe Abgrenzung zwischen den Begriffen. Das Reich der Begriffe wird in der Terminologie als unabhängig vom Reich der Benennungen angesehen. Daher sprechen die Terminologen von 'Begriffen', wo die meisten Sprachwissenschaftler in Bezug auf die Gemeinsprache von 'Wortinhalten' sprechen.”

³ Original dénomination : “néologie primaire et néologie secondaire”

⁴ Original text: “Il nous semble prudent d’observer la distinction prônée par G. Rondeau (1984 : 123-124) entre néologie primaire, où un concept reçoit pour la première fois une dénomination (par exemple, e-mail en anglais), et néologie secondaire, où l’on adapte (*courrier électronique, courriel, mél...*) ou adopte la dénomination qui existe dans la communauté linguistique dont elle est issue (e-mail en français).”

Terminology development falls directly under *corpus planning*, and more specifically under what Rousseau (2005: 97) called “aménagement terminologique”: “Area of intervention of language planning aimed at describing, modernizing, or developing terminology and its social dissemination in one or more languages whose use is recommended by the state or an authoritative social actor.” (our translation)⁵.

Work carried out over recent decades on terminology development highlights not only the cognitive aspects of terminology creation, related to the structuring of a given field of knowledge by linking terms and concepts, but also its social aspects. Temmerman (2011: 155) points to the evolution of terminology research since the end of the 20th century towards taking into account variation, which had previously been overlooked due to the importance given to the principle of univocity between terms and concepts:

In the Vienna school tradition, terminologists were trained to play an active role in the standardization of specialized languages, i.e. to help determine a one-to-one match between terms and concepts. In recent years the disproportionate concern with this type of standardization has been called into question. It tended to overshadow the basic objectives of terminology as a scientific discipline, i.e. to study the nature and characteristics of vocabulary of special languages in order to adapt for example terminological resources to users' requirements. The insight that terms - like other words and phrases - are created in and continue to evolve within textual, situational and cognitive contexts (Temmerman et al, 2005) gave rise to new theoretical approaches in special language studies and terminology.

Beyond terminological variation that “can be caused by new developments in the world that surrounds us (external situational factors)⁶ or “[...] can be the result of the dynamics and the evolution that is characteristic of all languages” (Temmerman, op. cit.: 156), some cultural aspects are particularly relevant in the case of the terminological development of African languages. Diki Kidiri (1999: 573) questions the terminological approach and the constructed nature of its results:

We are dealing here with a situation where the new realities to be named exist independently of our culture, having mostly been created in the West. We have questioned, on the one hand, the nature of these new realities and, on the other hand, how they have been named in the Western cultures where they were created. Are these names, which are considered precise and scientific when it

⁵ Original text: “Domaine d'intervention de l'aménagement linguistique visant la description, la modernisation ou le développement des terminologies, leur diffusion sociale, dans une ou plusieurs langues, dont l'Etat ou un acteur social faisant autorité préconise l'usage.”

⁶ Temmerman (2011) presents specific examples from the field of ecology to show how ideological orientations, which evolve over time, can influence terminological choices.

comes to technological products or specialized fields, because they accurately describe the essence of things as revealed to us by science as objective knowledge? (our translation)⁷

These social and cultural aspects play an essential role in the development of terminology for African languages used as languages of instruction. They will be illustrated in the second part of this article, focused on the terminological approaches and choices in Mali and Madagascar.

1.2. Lexical Creation Processes in Terminology Development

Lexical creation for the terminology development of any language relies on both morphological and semantic processes. The main processes are described below, with examples drawn from Bamanankan and Malagasy.

1.2.1. Morphological Processes

On the morphological level, the two principal processes used in terminology creation are *derivation* and *compounding* (Rondeau, 1984; Cabré, 1999).

Derivation involves adding a series of affixes to lexical bases drawn from what Rondeau (1984) called the “core vocabulary”⁸ of the language—units that already exist within the language.

In Malagasy, for instance, the prefix *faha-* (used for nominalization) is used to form *fahasimbana* (“degradation”) from *simba* (“to damage, deteriorate”). In *bamanankan*, the suffix *-lan* (instrumental or means noun) has been used to create *binfagalan* (“herb + kill + lan”) to denote “herbicide.” Similarly, the suffix *-ba* (augmentative or superlative) was used to create *muraba* (“cold + big”) to refer to COVID-19.

The creation of lexical units or syntagmatic groups through *compounding* is also very common. For example, in Malagasy, the term *telolafy* (“three sides”) means “triangle,” and *taova fisefoana* means “respiratory system.” Notably, the formation of syntagmatic groups allows the structuring of terminology into coherent lexical series. Thus, alongside *taova fisefoana* (“respiratory system”), one also finds *taova fandevonan-kanina* (“digestive system”) and *taova fananahana* (“reproductive system”). These different occurrences are taken from the

⁷ Original text: “Nous sommes ici dans un cas de figure où les réalités nouvelles à dénommer existent indépendamment de notre culture, étant le plus souvent créées en Occident. Nous nous sommes interrogé, d’une part, sur la nature de ces réalités nouvelles et, d’autre part, sur comment elles ont été dénommées dans les cultures occidentales où elles ont été créées. Ces dénominations, réputées précises et scientifiques lorsqu’il s’agit de produits technologiques ou de domaines de spécialité, le sont-elles parce qu’elles désignent de façon précise l’essence des choses telle qu’elle nous est révélée par la science en tant que connaissance objective ?”

⁸ Original denomination: “le fonds de la langue”

glossary published by the Malagasy authorities (MINESEB, 1986) or from textbooks (MENRS, 2006).

The same process was applied in creating the bilingual French–Bamanankan grammatical terminology (Doumbia, 2001; Calvet & Keïta, 2014). The lexical unit *bamanan turu* or its orthography variant *tulu* (meaning “crest” or “tuft”) was chosen to designate the accent, in the sense of a diacritical mark. From this lexical base, a compounding process was used to designate different types of accents:

- *turuba* (*turu* + *ba*, “large crest”) for the circumflex accent,
- *kininfeturu* (*kininfē* + *turu*, “right-hand crest”) for the acute accent,
- *numanfeturu* (*numanfē* + *turu*, “left-hand crest”) for the grave accent.

1.2.2. Semantic Processes

On the semantic level, several processes of lexical creation can be employed. Here, we will describe the three main ones: *semantic transfer*, *semantic calque* and *borrowing*.

a) Semantic Transfer

The process of semantic transfer consists in extending the meaning of an existing lexical unit to create a new term, following what Rajaspera (1996) calls *intuitive associations*.

In Malagasy, we previously mentioned the term *fahasimbana* (“degradation”), derived from the root *simba* (“to damage”). Another example is *fampimirana* (“equation”), which is based on the verb *mirana* (“to balance”). In both cases, *neonymy* relies on a conceptual metaphor: a general semantic field (balance, deterioration) is mobilized to construct the designation of a scientific concept.

In Bamanankan, the term *nɔn*, originally meaning “to lick, to erode,” was used in a process of lexical compounding to translate the expression “soil erosion.” The resulting form, *dugukolonɔn* (literally “earth + lick”), illustrates how semantically motivated combinations of existing lexemes may be used to create new scientific or technical terms.

b) Semantic Calque

A *semantic calque* consists in reproducing, in the target language, the lexical structure or cognitive image of a term from another language by literally translating its constituent elements.

For instance, in Bamanankan, *sankanso* (literally “sky-above-house”) corresponds to the English “multi-storey building” or, more broadly, “skyscraper.” In Malagasy, *hazakazaka maharitra* (“race + endurance”) was created to translate the concept of “endurance race” in the domain of sports.”

c) Borrowing

Borrowing involves introducing into the national language a term from another language—typically with phonetic and sometimes morphological adaptation (De Caldas, 2011).

Bamanankan provides numerous examples of borrowings that have been fully integrated into its linguistic system, such as *matematiki* in *dɔnniya matematiki ani fɛɛɛɛkan* (“sciences, mathematics and technology”), or *miliyɔnsɛɛ* (“million”), *miliyarisɛɛ* (“billion”), and *tangili* (“rectangle”).

Similarly, in Malagasy, terminological bodies have adopted, among others, *fôrmôla* (“formaldehyde”) and *galvanometatra* (“galvanometer”), combining phonetic adaptation with morphological adjustment to fit the syllabic structure of the language.

2. Terminology Development of Bamanankan and Malagasy for Education: Historical and Methodological Overview

2.1. The Case of Mali

2.1.1. Historical and Institutional Foundations

In Mali, the issue of the language of instruction emerged as early as the 1962 Education Reform, which advocated for the introduction of national languages in schools. This reform was part of a pan-African movement aimed at breaking linguistic dependence inherited from colonization and promoting African languages as instruments of development (CONFEMEN, 1982; Nounta, 2015).

Decree No. 235-PGRM of October 4, 1962, set the conditions for the experimental use of national languages in education. Later, Decree No. 85-PGRM of 1967 established the official alphabets for four national languages (fulfulde, songhay et tamasheq), including Bamanankan. These legal instruments laid the foundations for a structured language planning policy.

During the 1970s, the creation of the National Directorate of Functional Literacy and Applied Linguistics (DNAFLA) marked a decisive step. Under its leadership, Mali produced several key terminological tools, including:

- *Guide de transcription et de lecture du bambara* (1979)
- *Éléments de terminologie* (Agriculture, Anatomy, Linguistics) (1980)
- *Lexique bambara-français* and *Lexique français-bambara* (1980, in collaboration with AFVP)
- *Un aspect du génie de la langue bambara* (1975)

These publications aimed to provide trainers, teachers, and textbook authors with a shared lexical base for teaching subjects in Bamanankan. These terminologies were later integrated

into school textbooks and teaching guides developed as part of the implementation of bilingual French–Bamanankan education in Mali.

A notable example is the *Dɔnniyakalan* science textbook (2004) and the *Bamanan Curriculum Pedagogical Guide* (2004). The themes covered in *Dɔnniyakalan* (Danbele & Sɔngomo, 2004) illustrate how the developed terminologies were used for teaching observation sciences in 5th - and 6th -grade classes. Topics range from human anatomy to electric motors, including food, bacteria, and seed transformation.

The purpose of these terminological publications was not merely linguistic: it was to establish the scientific legitimacy of the language by providing it with a technical vocabulary capable of describing the realities of its environment. This linguistic legitimacy is crucial for building social trust in African scientific research, as emphasized by Kago & Cissé (2022: 3) in the context of the COVID-19 pandemic:

One of the outcomes of the current COVID-19 pandemic is an increased urgency to establish robust biotechnology infrastructures on the African continent. Both the African Union and Africa-CDC have articulated goals to increase the production of vaccines on the continent from 1% to 60% by 2040 (Irwin, 2021). To achieve these goals, African countries need not only logistic and technical capacity, but also societal trust in scientific interventions. We posit that using AILs [African Indigenous Languages] in scientific engagement will go a long way to increase sustainability and longevity of efforts such as these.

The situation of bilingual schools in Mali provides a useful indicator of the implementation of the national language policy in education. According to official data from the Ministry of National Education, Mali had 14,530 schools at the first cycle of basic education in 2021, although the number of bilingual institutions was not specified.

A study conducted the same year by Mignot et al. (2021) for UNICEF estimated that there were around 6,000 bilingual schools, covering all types (French–national language and French–Arabic). These schools represent the main experimental mechanism for bilingual education, where French remains dominant but coexists with the 13 national languages, which were recently recognized as official languages in the Constitution voted by July 2023.

As part of the restructuring of its education system, the Government of Mali launched a major reform with the Ten-Year Education Development Program (PRODEC) in 1999, implemented in three phases starting in 2001. At the heart of this reform, the adoption of a bilingual curriculum represents a key pedagogical and structural innovation.

The program stipulates that:

The implementation of the bilingual curriculum (national language/French) in schools will take into account both the children's language of learning and the available teaching potential for each language" (PRODEC2, 2019: 50; our translation)⁹.

According to the roadmap of PRODEC2, Phases II and III aim to consolidate the bilingual curriculum, extend it to all linguistic areas, and reinforce its application across the national territory.

To this day, however, the Malian education system remains largely organized around the traditional French-only model of instruction. Within this framework, French continues to function as the main language of instruction and communication in both public and private primary schools. From the very first years of schooling, all learning—including basic literacy and numeracy—is conducted in French, a language often foreign to students' home and social environments (Doumbia, 2024).

This predominance of French perpetuates its role as the exclusive language of academic knowledge and success, effectively marginalizing the use of national languages within the formal classroom setting (Nounta, 2015).

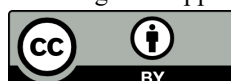
2.1.2. Terminological Approaches: Between Planning and Linguistic Creativity

The modernization of Malian languages placed terminology development at the very heart of its concerns—a process both essential and complex (Ouane, 1991; Ballo, 2026). This undertaking involved a constant oscillation between rigorous planning and creative language use, mobilizing various approaches:

- drawing from the endogenous resources of the languages,
- borrowing from the international repertoire,
- creating new lexical entries, and
- ensuring acceptance and actual use of the proposed terms.

Although the linguistic teams and units responsible for these missions demonstrated genuine awareness of these dimensions, the terms they produced often failed to achieve the expected level of usage or acceptance. This mismatch gradually led to the decline of the terminology commissions, whose activities became confined to a small circle of steadfast specialists (Ouane, 1991). These analyses of the gradual decline of terminology commissions are supported by those of Ballo (2026). Indeed, the latter shows that terminological productions

⁹ Original text: "L'implantation du curriculum bilingue langue nationale /français dans les écoles sera faite en tenant compte des différentes langues d'apprentissage des enfants ainsi que du potentiel enseignant par langue".



largely remain confined to specialists, and that some of the proposed equivalents struggle to gain acceptance in actual usage, being “subject to [...] rejection by users of the repertoire” (ibid.).

To better understand the concrete modalities of this planning process, it is useful to consider the analytical model proposed by Maïga (2014), who describes three main approaches that characterize the work of the DNAFLA (National Directorate of Functional Literacy and Applied Linguistics):

a) The *In Vitro* Method

This method generally takes place in a laboratory setting among researchers who have a strong command of the foreign language—considered to be “richer”—and of linguistic notions such as *consonant*, *vowel*, *syllable*, *word*, or *sentence*.

These researchers collaborate to develop and validate terms, which are then tested with the target audience. After a successful experimental phase—especially during reading and arithmetic lessons—these terms are popularized and integrated into pedagogical practice.

In Bamanankan, much of the grammatical terminology (Doumbia, 2001, p.6) was created using this method, as illustrated by the following terms:

- *dafata* (“sound to complete”) → consonant
- *dafalen* (“complete sound”) → vowel
- *kanɲɛ* (“unit of the voice”) → syllable
- *kumasen* (“foot of speech”) → sentence

b) The Workshop Method

This approach brings together researchers and national or regional experts from targeted fields (health, environment, education, etc.). It therefore goes beyond the strictly linguistic domain.

The process unfolds as follows: an expert presents a lecture in French, which is then discussed, refined, and formalized with scientific rigor. This presentation becomes the reference document for a subsequent translation phase into the target language, conducted jointly by linguists, educators, and field practitioners.

The presence of practitioners ensures that existing lexical resources of the language are exploited while also allowing for the testing of proposed neologisms in context.

A relevant example of this approach is the project “Research and Linguistics in Mali: Attempt at Transcribing French Genetic Concepts into Bamanankan”, published in 2022 by the

Malaria Research and Training Center and the University of Science, Techniques, and Technology of Bamako. Examples of bilingual terminologies developed within this project are presented in the table below.

Table 1: bilingual glossary (Coulibaly et al., 2022:20)

#	Termes (français ou anglais)	Concept/traduction en bamanankan
178	Science	Donni, donniya
179	Screening	Faranfasiyali
180	Semi gravide	Kono mobali
181	Sequence	Sekansi/sikolodenhake sigicogo
182	Sexing	Cew ni musow boli jogon na
183	Souche sauvage	Sigida sosow
184	Station météo	Waati kibaruyaw talan, tayoro

c) The Spontaneous Method

In this case, neology emerges from social and media use before being adopted into institutionalized terminologies.

Terms in Bamanankan such as *jiwalankata* (“water + overflow” for *flood*) or *jabaranin* (“gourd + image” for *television*) illustrate this popular linguistic creativity, which often precedes official codifications. Terminology development, therefore, is not limited to academic work: it also stems from the social and discursive dynamics of a living language (Budin & Oeser, 1995).

2.2. The Case of Madagascar

2.2.1. Historical Background

In Madagascar, the First Republic (1960–1972) brought about few changes to the linguistic order established under French colonization. Ordinance No. 60-049 of 22 June 1960 nevertheless provided for the establishment of different types of primary schools in which instruction would be delivered either in Malagasy (for basic education centers) or mainly in French (for schools preparing students for entrance into secondary education). For the secondary level, the language of instruction was not specified in official texts, but the textbooks used and the examination subjects were in French. Moreover, French was not only the medium of instruction, but most subjects also served as pretexts for studying it, as clearly stated in the official guidelines for the teaching of history and geography: “Your courses will primarily be

French lessons here, ‘about’ history and geography” (Circular No. 12 983 EN/SA 6, 1 September 1965; our translation)¹⁰.

The violent unrest that shook Madagascar in 1972 marked a turning point in the educational system, breaking with its earlier characteristics. Various measures were taken that same year to give greater prominence to Malagasy in education. This shift can be illustrated by the reforms introduced to the entrance examination for secondary education: the inclusion of Malagasy as a subject (Decree No. 494-AC of 8 February 1972), the reduction of the weight given to French examinations (Decree No. 1577-AC of 28 April 1972), and the option granted to students to take the arithmetic and general knowledge tests in either French or Malagasy (Decree No. 3993-ENAC of 18 November 1972) (Rakotofiringa, cited in Babault, 2006).

The official policy of *Malagasization* of the education system was launched in the 1976 school year for the first year of secondary education, with the intention of extending it progressively each year to the end of the cycle. The Education Act of 1978 outlined the framework of this new linguistic policy:

Malagasization, which in this domain is defined as the adaptation of curricula and teaching methods to national needs and objectives, also implies the use of the national language as the medium of instruction. The objective, in accordance with the Red Book, is the use of a common Malagasy; until this common Malagasy is established, the official Malagasy, its regional variants, and French will be used. (Law No. 78.040 of 17 July 1978; our translation)¹¹

This reform thus envisaged not only a shift in the language of instruction in public schools (*status planning*), but also significant *corpus planning* initiatives, with the aim of creating a new variety of Malagasy—the so-called *common Malagasy* (*malagasy iombonana*), a revised form of official Malagasy incorporating regional varieties. This project never came to fruition (Babault, 2006), but terminological work in mathematics, physical sciences, and biology began as early as 1973, drawing heavily on dialectal varieties (Rajaspera, 1996). These terminologies were disseminated through school textbooks published in 1975 and in subsequent years.

In 1986, the CNAPMAD (*Centre National de Production de Matériels Didactiques*) published a compilation of the terminological work produced for education (MINESEB, 1986).

¹⁰ Original text: « Vos cours seront d’abord des cours de français ici « à propos » de l’histoire et de la géographie».

¹¹ Original text: « La malgachisation qui se définit en ce domaine comme l’adaptation aux besoins et aux objectifs nationaux des programmes et des méthodes pédagogiques, implique également l’usage de la langue nationale comme langue d’enseignement. L’objectif est, conformément au Livre rouge, l’emploi du malgache commun et, jusqu’à la mise au point de ce malgache commun, seront utilisés le malgache officiel, le malgache dans ses variantes régionales et le français”

This compilation, spanning 235 pages, brought together terminologies for 42 general (chemistry, physical education, geography, history, mathematics, etc.) and technical subjects (electrical engineering, automotive mechanics, metallurgy, etc.), attesting to the scale of the work carried out over fifteen years at the request of the Ministry of Secondary and Basic Education.

A return to French as the main language of instruction occurred in the early 1990s (see Babault, 2006, for a detailed analysis). To this day, official regulations stipulate the use of Malagasy as the language of instruction in public schools during the first three years of primary education, followed by a division of subjects between Malagasy and French, with French being more prevalent. In practice, however, the balance between Malagasy and French in classroom practices varies greatly depending on schools and teachers. As for textbooks, they comply with official regulations and are written in Malagasy or French depending on the subject and grade level.

2.2.2. Terminological Approaches

We lack precise information on the methods followed by each of the commissions established to create disciplinary terminologies. The account provided by Rajaspera (1996) of the procedure used in the field of physics is therefore particularly valuable, and it seems appropriate to reproduce most of it here:

According to our 1978 surveys on the working methods of the specialized teams in physics, the intellectual process of textbook authors and terminologists followed these steps:

1. description of observed physical realities and phenomena;
2. elaboration of concepts and definitions;
3. search for Malagasy designations deemed appropriate for these concepts and definitions;
4. ‘verification’ through the corresponding French expressions and compilation of a glossary (*vakobolana*).

Take, for instance, the notion of ‘level’. After observation, the terminologist perceives the concept from a reality defined as ‘the boundary of the upper surface of a liquid’ (*faritry ny velatra anabon’ny ranoka*); they then assign it the denomination *haabo* (a term of dialectal origin), whose meaning is verified against the French equivalent ‘niveau’ (level).

In other words, during the early stages of Malagasization, the process required first a study of physical phenomena, then of the concepts, before addressing the linguistic problems of definitions, designations, and verification through translation. [...]

This sequence of mental operations, which departs from many preconceived ideas and the habits of calque translation, resorts to translation control—if translation occurs at all—only a posteriori. This is what constitutes the originality of terminological research in physical sciences. (op. cit.: 442; our translation¹²)

This account highlights the tension between the desire to produce terminology independent of the exogenous (foreign) language and the need to maintain semantic alignment with internationally recognized scientific concepts. It anticipates, in many ways, the principles later theorized in Diki-Kidiri's (2008) notion of *cultural terminology*.

Another noteworthy aspect of the Malagasy terminological approach lies in the way commissions drew upon existing lexical units in the language to create specialized terms. This principle, described by Rondeau (1984) as a general terminological strategy, was implemented in Madagascar in an enriched form, thanks to the inclusion of dialectal varieties. Rajaspera (1996) thus explains how the lexical unit *lio* ("blood"), found in several southern dialects and contrasting with *ra*, meaning "blood" in official Malagasy, underwent a metonymic transfer whereby it came to denote "blood cell" in biological terminology. The term was subsequently extended to *lio mena* ("red blood cell") and *lio fotsy* ("white blood cell").

3. Use of Terminology in the Classroom

After having described the terminology development for teaching school subjects in the in Mali and Madagascar, it is important to examine how these terminologies are actually used in classroom practice.

First, we wish to draw attention to the fact that, generally speaking, the specialized vocabulary of different subjects is not necessarily transparent to students, regardless of the status of the language used (whether it is a first language or a foreign language). While numerous research studies conducted in sub-Saharan Africa have rightly emphasized for decades the harmful effects on students of institutionalized exolingual instruction from the earliest years of schooling (Desai et al., 2010; Nounta, 2015; Agouzoum, 2016), it would

¹² Due to the length of the excerpt, we refer readers to the cited article for the original version.

nonetheless be misleading to adopt a perspective that overestimates the accessibility of subject content when conveyed in a first language, as opposed to a foreign one.

We will therefore first address the notion of lexical transparency, before turning to the role played by specialized vocabulary in learning processes.

3.1. Varying Degrees of Term Transparency

The degree of *transparency* (Gajo, 2003) of terms varies widely and can be represented along a continuum ranging from maximum transparency to maximum opacity. The position of specialized terms on the transparency/opacity axis depends on parameters such as:

- the degree of concreteness of the term's referents;
- the level of exposure to these terms in everyday life;
- the nature of the lexical units that make up specialized expressions;
- the semantic links between specialized terms and the general, everyday lexicon.

We will now examine each of these parameters, illustrating them with examples from Bamanankan, Malagasy, and English, in order to emphasize that issues related to term transparency arise in every language, regardless of the maturity of its terminological tradition.

a) The Degree of Concreteness of the Term's Referents

Whatever the discipline, it is likely to include terms that are more abstract than others — either because they refer to concepts (as opposed to tangible entities), or because the nature of the referents makes their semantic features less readily perceptible.

In science, for instance, the conceptual content of the term *organ* may be considered less directly perceptible than that of the term *joint*. Thus, concreteness and abstraction should not be seen as discrete categories, but rather as points along a continuum. The more a term corresponds to a concrete referent, the more likely it is to fall on the “transparent” side of the transparency/opacity axis.

b) The Degree of Exposure to Terms in Everyday Life

Terms that students encounter in everyday communication tend to be more transparent than those they rarely or never come across. For example, in mathematics, words such as *add* or *triangle* may seem more familiar to students than *parallelogram* (bearing in mind that familiarity with terms varies according to context).

Even if these terms are used in the classroom with a meaning different from their everyday sense, students will still tend to recognize them, notably through analogical associations.

Therefore, terms frequently encountered in everyday communication will tend to be more transparent than those that are seldom or never used outside of academic contexts.

c) The Nature of the Lexical Units Forming Specialized Phrases (Syntagma)

Since many scientific terms are created through compounding, the degree of their transparency largely depends on the nature of the lexical units used in their formation.

In English, a great number of scientific terms are formed from Greek or Latin roots, resulting in words such as *parallelogram*, *amphibian*, or *hemisphere*. For example, *hemisphere* comes from the Ancient Greek units ἡμί (*hemi*, “half”) and σφαῖρα (*sphaira*, “sphere”). Such compositions generally produce terms that are not very transparent—unless one knows the meanings of these roots or has encountered them in other terms, which is uncommon since words built from these roots typically belong to the scholarly lexicon.

In Malagasy, the equivalent of *hemisphere* is *ila bolantany*, composed of the units *ila*, *bola*, and *tany*¹³. These three units belong to a Malagasy linguistic background, unlike those in *hemisphere* in English. However, while *tany* (“soil”) is frequently used in everyday speech, the semantic content of the other two units is not necessarily accessible to young Malagasy speakers, even though associative links may be made between *bola* and *baolina* (“ball”) or *mamolavola* (“to shape into a ball”).

Two translation proposals emerge for *hemisphere* in Bamanankan : *dugukolo fankelen* (“half of the Earth”) and its variants *dugukolo kininfa* / *dugukolo numanfa*, centered on the idea of division, as well as *selekejan* (“broad corner”) and its variants *kinin selekejan* (“right broad corner”), *numan selekejan* (“left broad corner”), which emphasizes the geometrical dimension. These two translation proposals exhibit different degrees of transparency. The second, *selekejan* and its variants, is less transparent than the first, *dugukolo fankelen*. In contrast, the variants of the latter, *dugukolo kininfa* (“right side of the Earth”) and *dugukolo numanfa* (“left side of the Earth”), are even more transparent, as they incorporate positional or directional vocabulary likely to be more familiar to learners. This semantic transparency facilitates the interpretation of the term and supports the understanding of the concept of hemispheres.

3.2. Functions of Specialized Terms in Classroom practices

¹³ Dictionnaire Encyclopédique Malgache. <https://motmalgache.org/bins/homePage>

As shown in the previous section, the main function of specialized terms is not to provide direct access to meaning. However, specialized terms play an essential role in school learning by supporting and structuring these learning processes.

By their very nature, since they refer to concepts that are part of the content taught in class, the specialized vocabulary of school subjects is inseparable from that content. In other words, students are exposed to this vocabulary and its specific meanings at the very moment when the corresponding content is being addressed in class. It should also be noted that the parallel development of school knowledge and its modes of formulation is of course not limited to vocabulary alone. There is a clear parallelism between the successive levels of discursive formulation used in class and the conceptual deepening achieved by students (Vigner, 2001; Reuter et al., 2013).

Here, it is necessary to distinguish between cases in which the terms and their conceptual content can be easily linked to students' existing perceptions or experiences—and thus do not require immediate in-depth understanding—and those in which, on the contrary, significant cognitive effort is required to assimilate the concepts.

The first case can be illustrated by the concept of *addition*, which teachers can introduce concretely as early as grade 1, or even at preschool level, through the use of countable objects that students can manipulate. Teachers rely on these manipulations to introduce both the concept and the term that designates it.

The situation is quite different in the second type of case, where genuine cognitive work is needed to assimilate the content—for example, with concepts such as *natural degradation of the environment* or *multiple of a number* (as found in grade 3 and grade 4 geography and arithmetic textbooks in Madagascar). The frequency of this second type of case increases over the years of schooling and becomes predominant in secondary education. However, it is not entirely absent from the early years of schooling, as shown by examples taken from Malagasy textbooks (mentioned at the beginning of this paragraph).

In such situations—where both the concepts and their designations require complementary learning—some degree of opacity in the specialized term is not necessarily an obstacle. On the contrary, it may encourage questioning and deeper understanding that apparent transparency would not have prompted. When recognized and addressed didactically, the opacity of specialized disciplinary vocabulary can, up to a certain point, serve as a tool for conceptualization. We will return to this point in the section on bilingual education.

The second form of structuring provided by specialized terminology lies in its mediating function between already internalized knowledge and new knowledge. Once the concept of *addition* mentioned earlier has been learned, it becomes a foundation for acquiring other mathematical concepts, such as *multiplication*. This mediating role played by terminology between prior knowledge and new learning is crucial—both at the classroom level and in curriculum or textbook design.

Let us take again the example of *natural degradation of the environment*, discussed in a grade 3 geography textbook from Madagascar (MENRS, 2006: 57). The page begins with a photograph of completely dried-out soil, accompanied by observation questions (1 to 4), followed by explanations, a summary of key information (*Tadidiko*), a self-assessment activity (*Tombanako ny ezako*), and a glossary (*Voambolana*).

Figure 1: page of a textbook in geography (MENRS, 2006: 57)

B. Ny fahasimbana voajanahary ny tontolo iainana



Taninay any Amboasary

Diniho ny sary:

1. Manao ahoana ny nofontany ?
2. Nahoana no fongana ny zavamaniry ?
3. Inona avy koa no antony hafa mety hamono ny zavamaniry ?
4. Inona no mitranga raha fongana tanteraka ny zavamaniry ?

Misy ireo toe-javatra voajanahary mety hanimba ny tontolo iainana : rivodoza, tondradrano, volokano, haintany, varatra, tsiodrivotra ... mamono ny hazo sy ny volinanahary, izay miteraka ny fahafonganan'ny biby.

5. Hazavao, manao ahoana no fanimban'ny loza voajanahary ny tontolo iainana ?

Tadidiko

Ny tontolo iainana dia ahitana ny zava-mananaina (olombelona, biby, zavamaniry), sy ny zava-tsy mananaina (rivotra, rano, nofontany, trano, vatolampy...). Mety ho simban'ny toe-javatra voajanahary, toy ny rivodoza, tondradrano, haintany... izy.

Tombanako ny ezako

■ Amin'ireto toe-javatra voajanahary ireto, iza avy no mahatonga fahasimban'ny tontolo iainana ? Hamarino ny valintena.

1. Onjan-dranomasina
2. Tsiodrivotra
3. Orana
4. Masoandro
5. Volana
6. Rivodoza

Voambolana

voatrolona : nataon'olombelona.
ambanivohitra : mifandraika amin'ny eny ambanivolo.
ambonivohitra : mifandraika amin'ny eny an-tanandehibe.
loza voajanahary : fahavoazana goavana mianjady tsy vokatry ny nataon'olombelona.

Below is our translation of questions 1 to 4:

1. How is the ground?
2. Why has the vegetation disappeared?
3. What other causes can destroy vegetation?
4. What happens if vegetation disappears completely?

The term *vegetation* particularly draws our attention here. It belongs to the specialized terminology of geography because of its hypernymic and classificatory nature. This term does not appear in the glossary at the bottom of the lesson page, nor is it explained on that page or on the preceding ones. It can therefore be understood that it is implicitly considered known and mastered by the students. The prior internalization of the term and its conceptual content is thus expected to enable the teacher and the students to use it as a foundation for constructing new

knowledge—in this case, the concept of *natural degradation of the environment*, which is the central theme of the page.

This phenomenon—relying on known terms to build new concepts—represents a crucial function of terminology in educational contexts. Without it, no conceptual progression would be possible. This close relationship between terms and the concepts they represent is summarized by Reuter et al. (2013: 46):

Certain forms of knowledge may appear at one stage of the school curriculum as an explicit object of instruction, and at another stage as implicit knowledge to be mobilized in performing a task that does not explicitly require it. (our translation).

3.3. The Case of Bilingual Education

The use of Bamanankan and Malagasy as languages of instruction in Mali and Madagascar respectively fits within two main methodological models commonly followed in bilingual education:

- The use of Bamanankan or Malagasy during the early years of schooling, followed by a transition to French as the official language of instruction for most or all subjects — in line with an early transition model (Heugh, 2019). In Mali, this model applies only to bilingual schools, whereas in Madagascar it has been generalized to all public primary schools;
- The use of Bamanankan or Malagasy alongside French within the same classroom session (see extracts 1 and 2 below), reflecting a pedagogical translanguaging approach (Cenoz & Gorter, 2021), whether or not this is officially prescribed in the curricula.

Both the transition model and pedagogical translanguaging have implications for the use of terminology in teaching and learning practices—medium-term in the first case, and immediate in the second. Here, we will focus on the second case, as it involves the simultaneous presence of both languages in classroom practice, thereby intensifying the impact of bilingualism on the use of terminology.

3.3.1. Divergences in the Conceptualization of Reality

The specialized vocabulary of school subjects belongs to terminology and therefore corresponds to concepts validated by a community of scholars. However, the integration of instruction into specific social, cultural, and linguistic systems challenges the principle of

univocity in terminology (Rondeau, 1984) because of differences in how each language conceptualizes and categorizes reality.

Rabenoro (2005) provides a particularly significant example. While attempting to translate sentences from a French textbook for grade 6 into Malagasy, she highlighted the difficulty of finding equivalents for numerous words. For instance, the French term *héros* (“hero”) has no single equivalent that applies across all contexts. Even bilingual dictionaries disagree on both the appropriate term and the most accurate paraphrase for translating this word.

This semantic divergence is not confined to literature. A relevant example can be drawn from two grade 4 geography classes in Mali. In both classes, the lesson focused on rivers, particularly on the concept of *river tributaries*, called *babolofara* (or the shortened form *babolo*) in Bamanankan (Doumbia, 2024).

The excerpts show that the term contains two semantic features: “flows into another watercourse” and “branch of a river.” In Extract 1 below, students spontaneously interpret *babolo* (line 233) based on its most transparent semantic trait (“branch of a river”), drawing on a morphological decomposition of the word.

*Excerpt 1: Mali, District of Bamako, urban area, public schools, bilingual Bamanankan–French curriculum, 4th grade (M11_Geography class_111120)*¹⁴

230 MTR: ***babolo ye mun ye?*** — *What is a tributary?*
231 ELV: ***babolo?*** — *Tributary?*
232 MTR: ***ahan babolo.*** — *Yes, a tributary.*
233 ELV1: ***sirafara.*** — *Bifurcation.*
234 MTR: ***babolo sisan baba.*** — *Tributary — now, the main river.*
235 ELV1: ***basirafara.*** — *River bifurcation.*
236 MTR: ***i ma fili basirafara o jena.*** — *That’s not bad — “river bifurcation,” that’s good.*

240 MTR¹⁵: ***ba min be sira fara ka taa fan were fe o ye babolo ye a faamuna wa?*** — *A river that branches off to take another path — that’s what we call a tributary. Do you understand?*
244 MTR: ***bien jɔnni be babolo dɔ tɔgɔ fɔ n jɛ na ahan?*** — *Now, who can give me the name of a tributary? Yes?*
245 ELV: ***ba jalannin.*** — *The small dry river.*
246 MTR: ***ba jalannin, ba jalannin ye yɔrɔ jumen ye?*** — *The small dry river — where is it*

¹⁴ The statements in bold and italics are produced directly in Bamanankan by the participants, while their translations appear in italics only.

¹⁵ For the sake of readability, we have removed from this article the corpus annotations made from a different analytical perspective, which were originally presented on separate lines. This explains why successive turns of speech are not necessarily numbered with consecutive digits. Unless explicitly indicated by us, marked with three asterisks (***), two consecutive lines correspond to two successive turns of speech, even when numbering gaps occur.

located?

252 MTR: *Segou babolo an b'a f'o ma ko Banin.* — The tributary of Ségou is called Banin.

255 MTR: *babolo o ye babolo ye ani Sankarani.* — That's a tributary — like the Sankarani.

256 MTR: *Banin ani Sankaranin olu de ye babolo ye.* — Banin and Sankarani are tributaries.

257 MTR: *maintenant o Banin n'o Sankaraninw i b'a sɔɔ olu de fana farafaralen de tugunin k'o ke Bafin ni Bakoyi.* — Now, these Banin and Sankarani also branch further upstream to form the Bafin and the Bakoyi.

In Excerpt 2, unlike in the previous one, students associate *babolo* only with the generic idea of “water,” as seen in line 567. The two semantic traits of the term are then clarified and emphasized by the teacher (as in line 240 in Extract 1 and line 569 in Extract 2). There is, however, no single French lexical equivalent that fully captures both conceptual dimensions.

Excerpt 2: Mali, District of Bamako, urban area, public schools, bilingual Bamanankan–French curriculum, 4th grade (M10_Geography class_180621)

565 MTR: *aw be babolofara dɔn wa babolofara?* — Do you know what a tributary is?

566 MTR: *babolofara ye mun ye babolofara?* — What is a tributary?

567 ELV1: *ji* — Water.

568 MTR: *ji de don a ji be bɔ min?* — Yes, it's water, but what is its source?

569 MTR: *babolofara ye ji ye min be boli kana bila baji la.* — It's a stream that flows toward a river.

570 MTR: *babolofara ye ji ye min be boli ka taa bila baji la.* — It's a stream that flows into a river.

571 MTR: *babolofara ka ca an ka fleuve Niger la.* — Our Niger River has many tributaries.

572 MTR: *i b'a sɔɔ a bolofara dɔ be taa u b'a f'o ma Bafin, dɔ be yen Bakoyi, Banin olu y'an ka babolofaraw ye.* — There's a tributary called Bafin, others called Bakoyi and Banin — these are examples of tributaries.

These differences in the semantic content of terms across the two languages of instruction call into question any attempt to implement bilingual teaching based solely on translating teaching content. The examples above clearly demonstrate that instructional approaches grounded in translation — whether repeating a lesson in another language or simply translating key concepts — cannot be effective. Only an approach that strategically integrates both languages, taking into account their specific discursive and conceptual systems, can enable students to develop genuinely integrated knowledge in both languages of instruction.

In recent years, research has proposed various models for articulating relationships between languages of instruction (Hornberger, 2003; Babault, 2013; Steffen, 2013; Guérif et al., 2023, etc.). Rather than examining these studies in detail, we will conclude this paper by analyzing

how teachers, in simultaneous bilingual teaching situations, make pedagogical use of semantic opacity in the terms and concepts they teach.

3.3.2. Pedagogical Use of Opacity in Simultaneous Bilingual Teaching

The semantic opacity of terms in the two languages of instruction within the same educational system can be pedagogically exploited to enhance learning—particularly by encouraging students to discern differences in classification systems between the two languages. The constant back-and-forth between languages acts as a catalyst for learning, enriching the conceptual content internalized by students. This contrasts with two separate monolingual approaches, which would prevent connections between naming systems and conceptualizations of reality.

Extract 3, from a science lesson on the topic of the electric torch, illustrates this interplay between languages used to clarify the term *filament* (the wire in a light bulb that produces light when heated by an electric current). The term recurs several times in the teacher’s speech and appears opaque to students, prompting the teacher to reformulate it bilingually in lines 529 and 536.

Excerpt 3: Mali, District of Bamako, urban area, public schools, bilingual Bamanankan–French curriculum, 4th grade (M07_Observation science class_120421)

523 *MTR: Well, we say that the current from the battery passes through the electric wires of the lamp... 525 *MTR: We say that the electric wire of the bulb — the filament — gives light immediately. 529 *MTR: When you press the switch, there’s a small wire — <i>n’i y’a bə ampoule kənɔna na min be yen</i> — the small wire inside the bulb, the one we call the <i>filament</i> (when it’s removed from the inside of the bulb, that’s what you see). 532 *MTR: We say that the electric wire of the bulb — the filament — lights up instantly.	536 *MTR: bulb <i>yɛɛ korilen don ni verre verrenin dɔ ye (.) verrenin dɔ de kelen be k’a koori min be kənɔna na ni fil jate don</i> — that is what we call the <i>filament</i> (the bulb itself is enclosed in glass, a small glass surrounds it, and inside there is a wire called the filament). 541 *MTR: Well, we say that these filaments also produce light immediately. 543 *MTR: <We say that a pocket flashlight is not, isn’t it, cumbersome?> [///] It’s easy to carry.
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The notion of conceptual densification and enrichment is crucial from a didactic standpoint. It marks the difference, in terms of learning potential, between classroom situations in which students merely memorize definitions and those in which they construct their understanding through trial, questioning of prior knowledge, and teacher scaffolding. This process leads to a genuine densification of knowledge (Babault et al., 2026).

Conclusion

The creation of terminologies for the use of African languages as languages of instruction addresses not only pedagogical challenges—facilitating students’ access to conceptual content—but also broader issues of recognition of national languages as legitimate tools for constructing academic and scientific knowledge.

As we have seen, developing terminologies for each school subject is an essential step in implementing language-in-education policies. However, while terminology is indispensable for structuring knowledge, its purpose is not to provide immediate access to semantic content; in fact, it may sometimes obscure it. Moreover, even though the metalanguage is theoretically linked to scientific terminologies in each discipline, there is not always complete semantic overlap across different languages.

It is therefore crucial that education policymakers and practitioners fully understand the complex issues surrounding the classroom use of national-language terminologies—both the risks of their implicit use and their potential structuring power, including in bilingual contexts. Only under these conditions can terminological development efforts in national languages have meaningful impact, both on students’ cognitive development and on the sociolinguistic status of these languages. Creating terminology is thus a necessary condition, but not a guarantee, for effective education in national languages.

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