

The role of Lingála spoken by Kinshasa chemistry teachers in the elaboration of specialized discourses

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1. Introduction

In Kinshasa, the capital of DR Congo, French is used as the language of instruction and Lingála as the default language of daily communication. However, students have a poor command of French. As shown elsewhere (Sene Mongaba 2011), now, in Kinshasa classrooms, there is a diglossic situation concerns the allocation of didactic functions of the same course between French and Lingála. French plays the role of written language (the course notes) and Lingála plays the role of oral language (the explanation of those course notes).

The paper focuses on the characterization of the Lingála spoken by chemistry teachers. The discourse analyzed here was produced by teachers in the context of interviews (oral discourse) concerning the teaching of chemistry (specialized discourse).

Our corpus-based work was conducted as follows: First, 22 teachers were interviewed on some chemistry topics (*chemical reaction, chemical bond, chemical equation, solvent, solute and solution*). The interviews were recorded and then a corpus was constituted from the transcripts of the recordings.

The analysis of the answers allowed us to characterize the teachers' code-switching in the context of elicitation.

2. Questionnaire Description

We used a previously established questionnaire to carry out directed interviews. We preferred interviews to a paper questionnaire for two reasons: first of all, in the preliminary survey we observed that generally speaking teachers are not used to writing in Lingála, and secondly, the process of explaining lessons is not adapted to this technique. Nevertheless, we began our interviews by giving them a paper questionnaire. Interviewees read the paper in order to understand what we expected of them. Then we started our interview. We used a dictaphone. After the interview, we transcribed the interview for future analysis.

3. Characterization of Lingála - French code switching in scientific discourse

a. The answers to the questionnaire tend to confirm Lingála-French code switching in the discourse of Kinshasa teachers. Here, we come across the Lingála register also known as *lingála facile* (*easy lingála*).

1.

Bon, ezalaka tango oyo bana bazo comprendre mateya te yango wana to profitaka, okotisi mwá lingála po o expliquer bana ba comprendre bien.

(When students find it difficult to understand what we teach, we switch to Lingála for explanations so they understand better).

If we consider the terms *comprendre, profiter, expliquer* and *bien* as loanwords, we cannot really talk about actual code switching. We also observe that those verbs are conjugated as Lingála verbs.

b. Specialized terms are systematically used in French, which is typical of the code switching employed by the teachers interviewed. The same trend appears generally for teachers within the formal education system in Kinshasa. This indicates or confirms the absence, at present, of familiarity with and practice of scientific vocabulary in Lingála.

2.

Napésaka ba**explication** na lingála sókí ba**élève** bazo**comprendre** te ba**terme chimique**.

(I give explanations in Lingála when students don't understand **chemistry terms**).

3.

Bon, **concernant chimie, tellement que** natangisaka na **troisième année** nasepelaka mingi na **chapitre** ya mibale oyo etali **étude** ya **tableau périodique**, **étude** ya **tableau périodique**. **Tellement que chimie** nyonso ezali **basée** na kati ya **tableau périodique**, **il y a même une partie** ya **biologie** ekotaka na kati ya **chimie**, Yango nde **partie** oyo nasepelaka mingi kotangisa bana.

Well, as far as **chemistry** is concerned, I so often teach the third year students [that] I especially like the second chapter on the **periodic table**; I like the lesson on the **periodic table**. It's so much at the core of **chemistry** in general, there is even a part of **biology** which is related to that: this is why it is the part I like teaching to students the most.

In the following example, though the French term was used, the interviewee also explained the term in Lingála.

4.

Totangisaka bana **mais** ngai **personnellement** nasepelaka mingi sókí tokomi na eteni ya **reaction chimique** : *eyano ya banzoto mibale oyo esanganaka po epesa nzoto mususu*.

We teach [everything] to students but personally I like when I get to the lesson where we teach about **chemical reactions**: the interaction of two substances which mix to create another.

c. It might be expected that this Lingála-French code switching could, for example, lead to more structured and coherent discourse. However, when we examine this discourse more closely, we realize that in some instances the formulation of the sentence does not exactly match what the speaker meant to say:

5.

Niveau ya compréhension eza te entre yo na bango
The level of comprehension doesn't exist between you (the teacher) and them).

What the teacher meant was:

6.

Niveau na bangó ya kocomprendre makambo ozalí koloba, ezali moké
Their level of comprehension of what you say is poor.

d. We can also observe the mutual influence of the two languages in the code switching. The expression

7.

Toyaka kofaire intervenir lingála na kotangisa
We have Lingála intervene in our lessons

shows the speaker feels the need to use causative and that he/she opts for the French lexical item to express that notion. If the speaker had been using French, he/she would have probably said *c'est en ce moment qu'intervient le lingála* or *c'est en ce moment que nous utilisons le lingála* (that's when we use Lingála).

e. Here, we place ourselves in a monolectal (Meeuwis 1997) perspective of the *lingála facile* register, which means, we consider that the teachers' discourse does not show actual code switching, since the global lexis in the language production is to be viewed as one code - *lingála facile*. In this perspective we can say that the teacher produces structured discourse in Lingála, as the syntax and the semantics used are those of Lingála. Though certain lexical items are in French, the interviewees develop their discourse within the syntax structure of Lingála. This can be inferred from the absence of articles before nouns and from the presence of the genitive *ya* instead of the French *de*.

From this angle, the only case of code switching is where the speaker produces a whole sentence in the syntactic and semantic structure of French: *Si je peux en citer*

quelques unes par exemple, or, again, where specialized terms are used, as described above.

8.

Vraiment eza ebele. Si je peux en citer quelques unes par exemple chimie analytique, notion ya concentration par exemple elekaka **sans problème, atomistique étude de l'atome surtout coté découverte ya atome na coté ya spectre** quoi disons eza na yango mwa ebele nasentaka à l'aise tango natangisaka yango.

There are really many [of them]. If I can quote a few, for example, analytical chemistry, [where] for example the notion of concentration is understood without any particular problems, atomistics, the study of the atom, especially the part about the discovery of the atom. As to the spectrum, I'd say there are several [topics] where I feel at ease when I teach them.

There are also cases of morphosyntactic integration of French lexical items, such as French verbs conjugated in Lingála or French nouns taking on the class-marker prefix of plural {ba-}.

9.

Sentir --> -sent- --> kosentir --> na-sent-aka --> nasentaka
S'appliquer --> -s'appliqu- --> kos'appliquer --> es'apliquaka
Souhaiter --> -souhait- --> kosouhaiter --> na-souhait-aka
Classe --> ba-classe --> baclasse

The example that follows again shows that, in spite of the seeming code switching, the discourse is actually expressed in *lingála facile*:

10.

Ngai nasouhaitaka **que contenu** ezala **beaucoup plus pratique** po **c'est-à-dire** po **chimie** tozovivre na **vie courante**. **C'est-à-dire** ekofaciliter bana bamona **réalité** ya **chimie, réalité palpable** quoi. Po **souvent** tozomona **bathéorie** eloko **tel, reaction avec tel**, bana bazomona te, **parfois** na posa ya komona **mais sur terrain** biloko yango eza te. **J'aimerais** biloko wana ezala **facile** na kokutana.

I would like the content to be much more practical, because, I mean, like the chemistry we encounter in our daily life, I mean, this will make it easier for students to grasp the realities of chemistry, palpable realities, I mean. Because we often deal with theory: a certain object, a certain reaction between this and that, and the kids don't quite follow. Sometimes they need to actually see it but we have no material on the ground. I wish it were easier to have some at our disposal.

Now, having situated ourselves within the framework of *lingála facile*, we can analyze the structure of the discourse produced by teachers. We can say it is typically characterized by code switching, where specialized terms and the main verbs connected to teaching are used in French.

The last example that follows again shows that, in spite of the seeming code switching, the discourse is actually expressed in *lingála facile*. Towards the conclusion of the discourse, the teacher produces a complete sentence in Lingála, well structured from the point of view of educational discourse.

11.

Koloba lingála, sóki ozali ko**expliquer** bana bazali koyeba eloko yango malamu malamu te, okoki koloba na lingála po o**concretiser enseignement** pe **enseignement** ezala **pratique**. Na tango okoloba lingála, omoni **que** bana bazoposer yo ba**question** ebele pe bazo**comprendre**. Okoki kolimbolela bango na Lingála mwa moke po bayeba, nini ozokoloba pe nini ozali kotangisa.

In general, you tend to speak Lingala, if you explain the lesson to the students and they do not understand very well what you are saying; you can speak Lingala to make your teaching more 'down-to-earth', so that teaching is closer to practical life. When you speak Lingala, you find that students ask you many questions and they understand. You can, in short, explain to them in Lingála to help them understand what you are saying and what you are teaching.

f. Lastly, a few words about the term "bon" (*well*) frequently introducing teachers' discourse. As a matter of fact, when it comes to having to look for the right words in a statement, Kinshasa speakers generally use the introductory word: "bon".

12.

bon, na ba**classe** nyonso **matière** nyonso nasepelaka na yango kotangisa.

Well, I love teaching all topics in all years.

13.

Bon, eza na bana ba**compren**aka français **bien** te

Well, some students don't understand French that well.

4. Elicitation: Striving to define and coin scientific terms in the context of oral language production

We are now going to analyse an example of elicitation, where the speaker is led to produce a specialized term in Lingála. We have asked them to produce an oral text explaining some fundamental concepts of chemistry. We proposed the following notions: *chemical reaction*, *chemical equation*, *chemical bond*, *solvent*, *solute* and *solution*. The aim of this elicitation is to investigate the possibilities of identifying the terms for scientific concepts in the language production of native speakers who are specialists of a certain branch. The answers given by the interviewees are listed in a hierarchical order as follows: vague answer, approximative answer, answer containing elements of a definition and answers proposing a term.

1. Chemical reaction

A vague answer:

14.

Réaction chimique eza neti likambo ekoki oyo esalemi na miniti wana nde yango wana eza réaction chimique.

A chemical reaction is like a fact taking place at a particular moment, that's a chemical reaction.

An approximative answer: here, the wish to explain in Lingála leads the speaker to use the general term "*biloko*" (things) instead of the specialized terms *reactant* and *product*.

15.

Réaction chimique na Lingála, tokoki kobenga yango, eza lokola tokoki kosangisa biloko mibale po biloko wana echangé epesa biloko moko boye

In Lingála, we can say that a chemical reaction is the way we can mix two things (*reactant*) in order for them to change and result in other things (*product*).

The teacher speaking below shows some degree of linguistic insecurity and does not hold in great esteem the Lingála register he speaks, which he regards as slang. However, he ends up producing an approximative definition using the deverbative *esálameli* (*e-sál-am-el-i* : the way of being made/produced) and the verb *kosangisa* (*ko-sang-is-a* : to mix).

16.

Reaction chimie, bon, omoni lingála biso tokoma koloba oyo eza penza lingála te, mais eza mwa argo. Bon, nakomeka. Reaction chimique eza lokola esalameli ya biloko oyo basangisi.

A chemical reaction is - well, you see, the Lingála we speak is not really the true Lingála. It's a sort of slang. Anyway, I'm going to try: a chemical reaction is like the way things are produced when they are mixed.

The approximative answer below renders the idea of the mixture within the notion of *chemical reaction*, though, as we will see, a *chemical reaction* is not a mixture. Besides, the term *reactant* and not *product* should be used. A reactant is what we initially have to make a reaction. A *product* is what we obtain after the *reaction* took place. A chemical reaction is the

process of obtaining one or more products (end substances) by blending one or more reactants (initial substances).

17.

Réaction chimique na lingála ezali kosangisa baproducts, biloko.
A chemical reaction is mixing products, things.

In the following answer, the basic notions are there, though the terms used do not correspond to the definition of *chemical reaction* but correspond to the process of making *molecules* or *ions*.

18.

Reaction chimique ezali lolenge baatomi basanganaka yambo ya kobongwana na eloko mosusu. Nabengaka yango mbongwana ya baatomi.

A chemical reaction is the way atoms are combined before transforming into something else. I call that "mbongwana ya baatomi" (lit. *transformation of atoms*).

Discourse in Lingála is structured and clear when it comes to clarifying concepts through examples.

19.

Réaction chimique na lingála eza tokozwa eloko exemple fufu tozwi mayi tolambi totokisi heure ekotoka tozwi fufu na biso tosali nini totié après avoir kotia tobalusi nini fufu na biso. Na fufu wana tosilisi, kasi nyonso ensemble wana donc fufu eza **produit** tozwi **reaction chimique**. Au départ tozwi mayi na fufu wana eza **ba Corps** du départ tobenngaka yango **ba réactifs**. **Réactif** eza **corps** du départ yango mayi ekotoka ozwi fufu otié sókí nzungu etoki apres obalusi fufu. Bozwi fufu. Fufu wana okomona tobengaka yango **produit**. C'est ça eza **réaction chimique**.

A chemical reaction in Lingála – as an example we will take something like *fufu*. We get some water, we put it in a pot, and we make it boil. When it is about to boil, we take our *fufu*, and what do we do, we put it in, and after that, what do we stir? Our *fufu*. All we obtain in the end, and therefore the *fufu* obtained in the end, is the product. We have performed a chemical reaction. At first we had water and fufu flour, these are the initial ingredients we can call reactants. The reactant is the initial ingredient. When water starts to boil, you take *fufu*, you put it in. When the pot boils after stirring, you have obtained your *fufu*. That *fufu* is what you call product. That's a chemical reaction.

In the answer above, the teacher explains the notion of *chemical reaction* without trying to coin it in Lingála, but the explanation allows us to understand what he is talking about. The speaker uses specialized terms in French and is precise in his use of terminology.

In the answer below, we can already detect the production of a scientific definition in Lingála:

20.

Reaction chimique : eyano ya banzoto mibale oyo esanganaka po epesa nzoto mususu.

A chemical reaction is the result of two substances which combine resulting in another substance.

This answer is completely in Lingála and defines a chemical reaction as *eyano* (the response, the result) of two substances combining (lit. *mutually mixing*) and resulting in another substance.

The presence of the verb extension {-an-} (reciprocative marker) in the verb *ko-sang-an-a* contains the idea of a mutual action. *Ko-sang-an-a*, therefore, is the result of homogeneous mixing. The detail added by the teacher *po epesa nzoto mususu* (resulting in another substance), allows to differentiate a *chemical reaction* from a mere *homogeneous mixture* where *substances*, in spite of looking like a single unit, do not result in a new substance.

2. Chemical equation

Bad definition, but good language structure in the example below:

21.

Equation chimique ezali réarrangement ya **bibuki** na bamolécules.
A chemical equation is the rearrangement of elements and molecules.

Although this definition does not correspond to the definition of *chemical equation*, I would like to point out the fact that the terminology produced on written material can be easily adopted by speakers, since the term *bibuki* I have used in the bilingual periodic tables which are already available in Kinshasa is taken up by this teacher to refer to chemical elements.

In fact, a *chemical equation* is a mathematic representation of a *chemical reaction*.

A confused answer: The following answer corresponds more to the definition of *chemical reaction* than of *chemical equation*.

22.

Equation chimique, equation chimique nakoki koloba eza lokola esangiseli ya biloko mibale po epesa eloko oyo ekokani pe na esangiseli ya biloko wana mibale.

A chemical equation - a chemical equation, I can say it's an *esangiseli* (a way of mixing) two things so they result in an equivalent thing and the *esangiseli* (way of mixing) those two things.

Nevertheless, it is to be appreciated that the interviewee used the deverbative *esangiseli* (meaning 'way of mixing'):

Kosangisa > -sang-is- > e-sang-is-el-i > esangiseli

{-is-} : causative marker

{-el-} : applicative marker

{e-} : marker of noun class 7

The answer below is correct though not detailed. We will point out that the speaker here uses French for specialized terms and the main verb of the sentence.

23.

Bon, équation chimique na lingála eza lokola ko**représenter** réaction, wana tolobi.

Well, a chemical equation is how to represent a chemical reaction, I'd say.

The definition below already contains the notions of representation (*kolimbola bolakisi*) of molecules and the possibility of their combining, but the term *kosangana* implies the idea of homogeneity, of getting together and/or of combining.

24.

Equation chimique ezali bolakisi programme ya baatomi ndenge bakoki kosangana.

Chemical equation is the representation of the way atoms are programmed to combine.

3. The chemical bond

A vague answer:

25.

Liaison ezali kosangisa ya biloko mibale to ebele.
A chemical bond is mixing two or more things.

An approximative answer:

26.

Liaison chimique na lingála ezali kosangisa baatome na kati ya molecule.

A chemical bond is mixing (binding) atoms within the molecule.

Below we have a more appropriate answer, with code switching of words *force* (*bokási*, force) and *corps* (*nzóto*, substance), but the presence of generic terms makes it approximative.

27.

Liaison chimique na lingála eza lokola force. Kosangisa biloko mibale po epesa corps moko.

A chemical bond is like force. Mixing two things to make a substance.

The more appropriate term, instead of *kosangisa*, would be *kotútanisa* (to bring in contact), *kokanganisa* (to bind together). The speaker uses here the generic term of *bilóko* to talk about *atoms*, whereas he should have used the term *atómi*, which is the Lingála equivalent of the French term *atome*.

A more appropriate text would have been the following:

28.

Liaison chimique na lingála eza lokola **force**. **Kosangisa** baatomi mibale po epesa **corps moko**.

A chemical bond is a force. Mixing two atoms to make one substance.

Or

29.

Liaison chimique na lingála eza lokola **bokasi**. **Kokanganisa** **banzoto** mibale po epesa **nzoto mosusu ya sika**.

A chemical bond is a force. Binding two substances to make up a new one.

The following definition explains the concept without providing the term, but contains all the necessary elements allowing coining the term. The notion of force is expressed through the example of the magnet.

30.

Liaison chimique ezali lolenge baatomi bakoki kokangana bango na bango na lolenge ya **aimant**

A chemical bond is the manner in which atoms can bind together like a magnet.

In the answer below, the teacher draws on his knowledge of French as well as chemistry in order to come up with an appropriate term to express the concept of *chemical bond* in Lingála. He proposes the term *e-kang-el-i* (what is used to bind).

31.

Liaison chimique ezali ekangeli ya biloko mibale **parce que** sókí tolobi **liaison** ewuti na **verbe liée** donc biloko mibale ekangani.

A chemical bond is the *ekangeli* of (the way in which you bind) two things, because, if we say 'bond', that comes from the verb 'to bind', and so the two things *ekangáni* (are bound).

His reasoning can be described as follows:

Se lier --> kokangana --> ko-kang-an-a--> ekangáni --> e-kang-án-í --> e-kang-el-i

{ko-} : noun class 15 marker (class of infinitives)

{e-} : noun class 7 marker

{-an-} : reciprocative marker

{-el-} : instrumentative marker

4. Solution, Solvent and Solute

A vague answer: the answer below refers to a mixture with no indication of a chemical context.

32.

Solution ezali eloko oyo ozwi par rapport ya biloko mibale oyo osangisi.

A solution is what you obtain after mixing two things.

33.

Soluté eza eloko wana eza makasi mais ya mayi ekolembisa yango.
A solute is the solid which which water softens.

In the approximative answer below, the interviewee describes the possible states of matter which may intervene in a solution without specifying the conditions. The use of the generic term *biloko* also adds to the approximation.

34.

Bon, solution na lingála eza lokola kosangisa biloko mibale oyo eza différent, ça signifie le corps solide pe mususu liquide.

Well, a solution is like mixing two different things, it means one part is solid and the other one is liquid.

The definitions below are more appropriate but reductive. This can be justified in contexts such as third year teaching, where chemistry essentially involves dealing with the aqueous state (in water).

35.

Soluté ezali nde eloko oyo emelami na mayi oyo tobengi solvant

The solute is what is dissolved in water, which we call solvent.

36.

Solvant ezali eloko moko eza ya mayi sikoyo ezalaka oyo emelaka biloko misusu.

A solvent is a liquid which dissolves (eats up) other things.

In his/her code switching discourse, which is in fact the reasoning of a terminologist, the teacher, in the example below, starts off by using the French verb (*kosedissoudre*) before getting to the Lingála equivalent (*komelama*). The French verb *dissoudre* (to dissolve) becomes then *komela* in Lingála.

37.

Soluté ezali eloko oyo eza kosedissoudre na eloko mosusu to ekoki komelama na eloko mosusu alors surtout okoki koloba que eloko oyo ekoki komelama alors solvant ezali eloko oyo ezali komela moninga mosusu.

A solute is what is or can be dissolved (*ekoki komelama*) in another thing. Then, you can say the solute is the thing which can be dissolved and the solvent is the thing which dissolves (*komela*) another.

To dissolve : *komela*

To be dissolved : *komelama* ({-am-} : passive marker)

In the following answer, the interviewee comes up with a term for solution: *bosangani*. It is an appropriate définition for the notion of solution (lit. *process of mixing solvent and solute*).

38.

Solvant ezali esaleli oyo ekoki kosalisa na mbongwana ya bamatière. Soluté ezali esaleli pe lokola solvant kasi, soluté ezali ya mingi te. Solution : ezali bosangani solvant na soluté.

The solvent is the *esaleli* (lit. tool used to make) which can help in *mbóngwáná* (global transformation) of matter. A solute is an *esaleli*, just like the solvent, but it is in small quantities.

The solution is the *bosangani* (deep mixing) of solvent and solute.

Morphologically, the interviewee first used two deverbatives: *esaleli* and *mbóngwáná*. The term *esaleli* (meaning 'a tool used for making') is generated by the combination of the prefix {e-}, the marker of noun class 7 and the verb extension {-el-}, which is the instrumentative marker. The term *mbóngwáná* (meaning 'the global result of a process of transformation') is generated by the combination of the prefix {m-}, the marker of noun class 9 and the verb extension {-an-}, which is generally a reciprocative marker, but, in some cases, as here, is used as a passive marker (Motingea 2006, Meeuwis 2010). The term *bosangani* (meaning 'the process of mixing (together) homogeneously ') is generated by the combination

of the prefix {bo-}, the marker of noun class 14 and the verb extension {-an-}, which is the reciprocative marker.

In the answer below, the teacher has produced the Lingála term for mixture: *bosangisi*. The term *bosangisi* (meaning 'the process of mixing something') is generated by the combination of the prefix {bo-}, the marker of noun class 14 and the verb extension {-is-}, which is the causative marker.

In the same example, the other terms (*solids*, *liquids*) providing the necessary details in the description are in French.

39.

Solution c'est le melange, eza lokola **bosangisi**, **bosangisi** mingi mingi ezalaka **baliquide**, ozwi **liquide** tel na **liquide** tel osangisi to pe **liquide** na **solide** osangisi yango. **Liquide** na **liquide** osangisi yango eza **solution** donc **liquide** na **liquide** osangisi yango epesi **ce qu'on appelle une solution**.

The solution is the mixture. It's like a *bosangisi*. *Bosangisi* are often liquids. You take a liquid and you mix it with another liquid or a solid, and what you mix produces what is called a solution.

In the following example, the term *bosangisi* is applied to the notion of *mixture*. Although the speaker produces that first term, he then defines the other concepts by using the French term without proposing terms in Lingála.

40.

Solution ezali *bosangisi* ya soluté na solvant. Solvant ezali ezali eloko oyo bazwi to batie ebele na *bosangisi*. Soluté ezali eloko oyo bazwi to batie muke na *bosangisi*.

A solution is the *bosangisi* (the mixture) of solute and solvent. The solvent is the object one takes and pours in great quantities in the *bosangisi*. The solute is the object one places in small quantities in the *bosangisi*.

The following interviewee uses a spontaneous native-speaker mechanism of language production in order to produce the term *lisangani*, generated by the prefix {li-} which is the marker of noun class 5, the verb root {-sang-} and the reciprocative marker {-an-} (meaning 'the relation resulting between things mixing together').

41.

La solution toloba kaka neti *lisangani*
The solution, let's just call it *lisangani*.

We can say that the terms *bosangisi*, *bosangani* and *lisangani* are semantically close and the terminologist has to elucidate the differences in order to provide the notion of solution with the appropriate term.

In the following answer, the interviewee already coins verb forms which can be used in Lingála as deverbatives for solvent and solute.

42.

Bon, solvant eza **eloko oyo emelaka**, disons ! Soluté eza **eloko oyo emelami**.

Well, the solvent is the thing which dissolves (*emela*, eats up), I'd say! The solute is what is dissolved (*emelami*).

As a matter of fact, in Lingála,

from *elóko óyo emelaka* we can coin the deverbative *emela* (the thing which dissolves)

from *elóko oyo emelámí* we can coin the deverbative *emelami* (the thing which is dissolved).

In the example above, I have marked tones in order to show the difference between the conjugated verb form and the deverbative (*emelámí* < > *emelami*)

In the answer below, the interviewee starts off defining the terms in French. That allows him to clarify his ideas before attempting a definition in Lingála which resembles the answer given by the previous interviewee.

43.

Bon, solvant, na français tolobi un solvant c'est ce qui dissout. la substance qui dissout. Un soluté est une substance qui est dissoute, bon na lingála tokoki koloba solvant ezali eloko oyo emelaka, soluté eloko oyo batié po bamela, eloko oyo emelami, eloko oyo emelami yango nde soluté. Ndakisa tozwi mungwa totié na mayi. Mungwa tozobenga eloko oyo emelami **tandisque** mayi eloko oyo emeli.

Well, the solvent, in French we say a solvent is something which dissolves. A substance which dissolves another. The solute is the substance which is dissolved. And in Lingála we can say that the solvent is the thing which dissolves, the solute is what we pour in to be dissolved, the thing which is dissolved, that's the solute. For example, we take some salt, we put it in water. Salt is what is dissolved, whereas water is the thing which has done the dissolving.

As we said when discussing about *chemical reaction*, discourse in Lingála is structured and clear when it comes to clarifying concepts through examples. The interviewees have used illustration by examples in order to express these concepts in Lingála. When confronted sometimes with the difficulty of explaining theoretical notions in Lingála in spite of the lack of terminology, teacher draw on examples and exercices in order to get across the notions to their students.

44.

Par exemple ozwi mungwa, otie na kati ya mayi. mungwa elimwé na kati ya mayi. Donc mayi penza eza solvant.

For example, you take some salt and you put it in water. Salt disappears in water. Therefore, water is really a solvent.

This is also confirmed in the following example:

45.

Solution eza melange. tokozwa exemple mayi. mayi eza solvant chimiquement parlant. mayi eza solvant tokobenga pe mayi substance. aza substance, aza corps, aza solvant, eza eloko ekomisa eloko na ndenge esengeli. eloko wana ezalaki makasi sóki batié yango na mayi, tout esili donc tokozwa mayi plus mungwa totié yango place moko mungwa nyonso ekosila na kati ya mayi. Tango okogouté mayi wana okosentir eau saveur. mayi wana ekokoma mungwa. Bon, ensemble ya biloko wana, solvant plus soluté, tobenga yango solution. solution ezowuta à partir ya mayi na mungwa.

A solution is a mixture. Let's for example take water. From the point of view of chemistry, water is a solvent. Water is a solvent; we also call it a substance. It's a substance; it's the substance which brings about transformation of another thing into the desired state. The thing was solid, if we place it in water, everything's gone. So, we take some water and some salt, we put them together, all the salt is going to disappear in the water. When you taste that water, you are going to find that water has acquired a certain taste. That water has become salty. Well, it is the mixture of those things, the solvent and the solute, which we call a solution. A solution comes from water and salt.

5. Conclusion

The teachers' answers have not, in general, been clear and precise on terms like *chemical reactions*, *chemical equation* and *chemical bond*. However, results have been clearer and more precise on notions such as *solvent*, *solute* and *solution*.

The oral character of the interview can justify the strong degree of approximation in answers, but the main argument which can explain why teachers have not been able to provide satisfactory definitions of terms lies in the fact that they have not learned that terminology and discourse in their schooling or in textbooks. This constitutes a problem for

the efficiency of reformulation in local languages aimed to give a better understanding of the notions taught.

The notions of *solvent*, *solute* and *solution* are concrete concepts, which are easy to express through examples from daily life, whereas notions like *chemical reactions*, *chemical equation* and *chemical bond* are harder to define if a satisfactory vocabulary is not available. This can explain the different level of preciseness by the same interviewee when talking about the two groups of notions.

Besides, chemistry discourse calls for a high level of univocality in the terms used. When the interviewees use, for example, the verb *kosangisa* (indifferently for mixing, bringing in contact, combining and binding), they produce educational discourse of a disturbing level of approximation, quite capable of creating confusion in the students with damaging effects on the acquisition of the notions taught. As a matter of fact, the notion of *kosangisa* is most linked to the idea of *mixing*. Now, referring to the *binding of atoms* in terms of *mixing atoms* does not convey the same concept. Atoms bind into a molecule. On the other hand, the verb *kosangana* should be used to express the notions of *combining* and *mixing in a homogeneous manner*. The reciprocative nuance of the verb (*ko-sang-an-a*) can well express combination, as well as a homogeneous mixture.

Finally, the fact that teachers use generic words of everyday language instead of specialized or appropriate words also contributes towards the production of approximative discourse. For example, interviewees use the term *elóko* (thing) to refer to different concepts like *material*, *an object*, *a reactant*, *a product*, *an atom*, *a substance*... all these concepts, expressed as *elóko* during the interview, need each to be given an appropriate term.

The interviewees have sometimes, when faced with the difficulty of reformulating or using appropriate terms to explain a chemical notion, used an example in order to express these concepts in Lingála. As also confirmed in the interviews, as a result teachers resort to examples and to exercises to get across these notions to their students.

The survey we have analyzed here reveals the need to produce coherent texts in the form of articles, textbooks or scientific essays to supply to teachers, so they can improve their acquisition process of knowledge, their ability to reformulate and as a result their ability to transmit knowledge.

The different answers provided by the teachers have therefore encouraged us to pursue our work on the identification of morphosemantic relations between affixes and the deverbatives generated through verbal derivation.

5.1. Questionnaire Contextualization

The introduction contextualizes the approach we took to inform the interviewee about our goals. The first section of the questionnaire is a bilingual Lingála-French text. The second part is general information about the interviewee and the third part is constituted by interview questions. The presence of the French text is related to our earlier findings which have shown that if Lingála appears as the sole language, interviewees tend to devalue the paper.

Lingála Text

Na cadre ya thèse na ngái pó na koluka ndéngé ya kobongisa kotángisa chimie na RD Congo, nazalí na pósá ya makanisi na bínó bakóló terrain. Yangó wáná nakosenga na bínó kopésá ngái baréponse na mitúná (baquestion) nakotúna bínó. Lokóla bato na ngái bazalí bachimiste té, nakosenga bínó bóloba na dictaphone. Comme ça ngái nakozwa maloba na bínó, nakokoma yangó pé nakososola (koanalyser) yangó na ndéngé ya lengwisitíki (nzebi ya minoko). Sókí bolingí kotía maloba na dictaphone té, bokokí kokoma biyano na bínó na papier óyo. Nakosenga bínó bóyanola (borépondre) na lingála pó mosálá na ngái ezalí koluka kososola lingála níni balakisi (baprof) basáelaka pé ndéngé níni bolobelaka makambo ya science na lingála. Posa na ngái ezalí kokoka kokoma mikandá ya chimie na lingála óyo bínó bokosepela ékomama na mikandá ya chimie.

English Translation

In the framework of our work, which strives to contribute to improving the teaching of chemistry in the DRC, we need your help as an expert in the field through answering a few oral questions. Since our investigators are not chemists, they will record your answers on a dictaphone to enable us to later transcribe and analyze them in terms of linguistics. If you do not want us to record your spoken answers, you can also give us written answers. We ask you to reply in Lingála, since our work is to analyze the Lingála used by teachers and how you deal with scientific topics in that language. Our goal is simply to write chemistry books in the kind of Lingála that you would like to see in a chemistry book. Thank you.

French Text

Dans le cadre de notre travail de thèse qui vise à améliorer l'enseignement de la chimie en RD Congo, nous sollicitons votre aide en tant qu'expert de terrain en répondant oralement à quelques questions. Étant donné que nos enquêteurs ne sont pas des chimistes, ils vont enregistrer vos paroles sur un dictaphone pour nous permettre par la suite de les transcrire et de les analyser sur le plan de la linguistique. Si vous ne voulez pas que nous enregistrons vos réponses à l'oral, vous pouvez aussi nous donner des réponses écrites. Nous vous demandons de nous répondre en lingála puisque que notre travail consiste à analyser le lingála utilisé par les enseignants et comment vous abordez les matières scientifiques dans cette langue. Notre but est simplement de pouvoir écrire des livres de chimie dans un lingála que vous souhaiteriez voir dans un livre de chimie. Je vous remercie.

5.2. General information

Nom (kómbó):	(Name)
École :	(School)
Commune :	(Municipality)
Diplôme :	(Qualifications)
Cours enseigné (s):	(Course taught)
Classe (s) enseignée (s) :	(Year taught)
Né à :	(Place of birth)
Habite Kinshasa depuis :	(Living in Kinshasa since)

The aim of this general information is to evaluate the interviewee's competence in Lingála (based on the time they have been in Kinshasa) and their chemistry competence (degree, course and years taught).

5.3. Interview Questions

The interview is made up of 9 questions. The first four questions and the last one focus on the sociolinguistics framework of Kinshasa classrooms. The answers given by the teachers allowed us to describe the Lingála-French code switching in the teachers' discourse and the way of structuring scientific discourse.

Questions 5 to 8 are related to the elicitation of the process of coining chemical terms in the language production of chemistry teachers of middle school in Kinshasa.

1. *Tángo nini pé pó na nini ekomaka que óloba na lingála na classe?*
When and why do you use Lingála in class?
2. *Eténi nini ya matéya osepelaka kotángisa míngi?*
What part of your course do you prefer teaching?
3. *Okosepela bákoma livre ya chimie na ndéngé nini? Makambo nini okosepela ézala na káti?*
What would you like to see in a chemistry textbook?
4. *Na óyo etáli labo, osálaka ndéngé nini ?*
As far as lab tests are concerned, what do you do?
5. *Okokí kolimbola (koexpliquer) réaction chimique na lingála? Okobénga yangó nini ?*
Can you explain the notion of chemical reaction in Lingála? How would you call it?
6. *Okokí kolimbola (koexpliquer) équation chimique na lingála? Okobénga yangó nini ?*
Can you explain the notion of chemical equation in Lingála? How would you call it?
7. *Okokí kolimbola (koexpliquer) liaison chimique na lingála? Okobénga yangó nini ?*
Can you explain the notion of chemical bond in Lingála? How would you call it?
8. *Okokí kolimbola (koexpliquer) solution, solvant pé soluté na lingála? Okobénga yangó nini ?*
Can you explain the notions of solution, solvent and solute in Lingála? How would you call them?
9. *Ozali na maloba ya kobakisa?*
Have you got anything to add?

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