APPLYING LINGUISTICS: DEVELOPING COGNITIVE SKILLS THROUGH MULTIMEDIA

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This paper examines the effectiveness of linguistic analysis in developing scientific thinking skills and scientific attitudes. It reports on a project established at a South Africa university in South Africa which engaged students in the analysis of code-mixed data. Students who participated in the project showed gains in being able to analyze linguistic data using problem solving skills. While transfer of such skills to mainstream science teaching was not investigated, the study confirms the effectiveness of linguistic analysis in engaging students in the activities associated with the development of skills for science.

Introduction

Within the New Zealand context the current emphasis on the need to develop a 'knowledge society' places the issue of knowledge of science amongst the broader New Zealand population on centre stage. In this regard, there are significant concerns in current debate relating to the status of science and science education in New Zealand.

1. In his book length treatment on New Zealand science education, Michael Mathews strongly criticizes the constructivist basis of the curriculum and its overemphasis on process over content (Matthews 1995). Such trends, according to Matthews, significantly undermine New Zealand science education as a whole. Picking up on a similar theme, Martin Hames, in his book *The Crisis in New Zealand Schools,* notes that the constructivist, learner-centered approach misleadingly encourages learners to use existing ideas and common sense as the basis of scientific enquiry and results in a "dumbed down" curriculum (Hames 2002: 95). In reviewing recent literature on the subject, Hames notes, however, that much of science is not only alien to common sense, but very often in direct conflict with everyday expectations and that the science curriculum's central focus on learners 'making sense' of the world is therefore too simplistic and strongly misguided.

2. Results of the Third International Mathematics and Science Survey (TIMSS) carried out in 1999 indicate that New Zealand year 9 science students managed only 19th position out of 38 countries in terms of mean science region (for instance, Australia was placed 7th, Korea 5th, Japan 4tb, and Singapore 2ud). In addition, while 84% of countries show a significant improvement in the measure of science achievement since the last TIMSS in 1994, New Zealand was one of the few countries where no such improvement is evident (for data see Chamberlain & Walker 2001: 23-24).

3. Achievement in science amongst Maori and Pacific students has historically been poor. Results from the Programme for International Student Assessment (PISA) 2000 (which surveyed 32 countries) indicate that, amongst other measures, Maori and Pacific students as

a whole scored below the international average while Pakeha students scored above it (NZEG 2002). The TIMSS survey mentioned above also highlighted similar trends, with Maori and Pacific students scoring at statistically significant lower levels in science achievement than Pakeha students (see data in Chamberlain 2002: 59-60). In his address at a hui regarding Maori science education, Dr Michael Walker, member of the Science and Innovation Advisory Council and an associate professor of science at The University of Auckland, states that traditionally the university had a 35% pass rate in the first year amongst Maori students in the Faculty of Science compared to 75% of mainstream [sic] students (Walker 2001: 6), and he asserts that '"at the coal face of science teaching, we have to recognise that science has historically been hostile to Maori" (2001: 5).

4. Concern has also been expressed about the lack of awareness of science amongst the general New Zealand public. In response to the results of two research projects undertaken for the Ministry of Science, Research and Technology in 1998, James Buwalda, Executive in the Ministry, notes that "It is interesting that so many people - 80% - think science and technology are important — yet as a whole, they don't seem to have a clear idea of what it is or how it fits in their lives" (MORST 1998). Similar issues continue to be reported in more recent research by Hipkins et al. (2002). They report that many New Zealanders appear to make 'common sense' rather than informed judgments about science, and conclude that, within the limits of their study (2002: 2):

> ... many New Zealanders do appear to have gaps in their understandings of basic science theory in areas that underpin contemporary research and debate. When basic principles are misunderstood misleading views of the nature and significance of research can develop.

It is in the light of such issues confronting New Zealand science education that this paper examines the possibilities of developing scientific thinking through engaging learners in linguistic analysis. It focuses on a project established by the Department of Linguistics at the University of the Western Cape, South Africa, an institution which has traditionally serviced students from historically disadvantaged communities in South Africa. The project aimed to develop students' abilities to design and analyze data, and test and reformulate hypotheses in a multimedia educational programme designed by staff in the department.

The programme, *Planet of Languages,* is based on a series of conversations between a Martian (an outsider) and two students about code-mixing in Xhosa (a Southern Bantu language) and English. The aim is for students to study the linguistic data and formulate hypotheses to explain the language mixing. The learning process begins with some awareness-raising exercises and then moves into using students' intuitive understanding of code-mixing to build and test a hypothesis that explains the rules that govern it. This hypothesis is then tested and reformulated against additional language data.

Students work through the computer-based tutorial at their own pace and test their answers against computer-generated responses.

Theoretical rationale

Using linguistic data to develop cognitive skills

The theoretical rationale for the approach adopted in this programme comes from research from MIT (Honda & O'Neil 1993; 1998) which has revealed how the creative use of language study can facilitate the acquisition of scientific and generic cognitive skills. Language is a resource that learners bring with them and is something that can easily be used to engage learners in processes involving, for instance, hypothesis formation, testing of hypotheses, predicting and communicating about hypotheses. Honda and O'Neil show that amongst minority groups in Australia, the United States and South America, where there are minimal resources for the teaching of science, drawing on learners' knowledge of language as data to develop scientific thinking skills has been a highly valuable exercise.

Code-switching

Honda and O'Neil use students' knowledge of English grammar (for example, formation of past tense) as a resource in their research. We chose to use students' intuitive knowledge of the rules that govern code-mixing. Code-mixed data has, in our experience in South Africa, a clear potential to engage students' interest and motivate them to pursue a process of creative and exploratory learning. Although the practice of code-mixing is generally perceived by students as arbitrary and "'just a mess of language" (personal communication with students), there are in fact clear patterns and structures which control them, as has been extensively shown in the literature. Code- switching - the mixing of languages in linguistic interaction - is a common feature in multilingual communities throughout the world, including South Africa. The following examples demonstrate such mixing: example (1) involves Zulu-English mixing and example (2) Afrikaans-English mixing.

Example 1 (Kieswetter 1995: 44):

A. <u>Hey</u> uyaz le-<u>tuckshop</u> yethu! Awubheke manje sid- inga ama-<u>chips</u> asaphelile. (Hey, you know this tuckshop of ours! Just look now we need chips and they are finished)

B. <u>Even yesterday</u> besifuna i-<u>cold drink</u> bathe awa- bandi. (... we wanted a cold drink and they said they were not cold)

A. <u>It will be better</u> ukuba ivalwe le <u>shop</u>. (It will be better if they close this shop)

B. <u>Yes,</u> but akukuhle ukulamba. (Yes, but it is not nice to be hungry)

A. Okunye futhi wukuthi aba-<u>clean-i</u> nalamabhodwe abapheka ngawo. (Another thing, they don't clean those pots that they cook with)

Example 2 (McCormick 1995):

Ek het niks <u>against</u> Afrikaans nie. Kyk, ek wil nie he dat hulle moet wees soos ek nie. Ek wil he dat hulle <u>end up</u> be-terer as ek. Reg? <u>Never mind</u> wat ek is.
(I've got nothing against Afrikaans. Look, I don't want them to be like me. I want them to end up better than me. Right? Never mind what I am.)

A central figure in the study of code-switching (CS) has been Carol Myers-Scotton

who, together with Janice Jake, has developed the theoretical model followed in this study. (Note that traditionally the term 'code-switching' has been used to cover cases where there are switches across sentence boundaries, while the term 'code- mixing' has been used to refer to switching within the sentence. In Myers-Scotton's model 'code-switching' is used to cover both of these phenomena).

From a structural point of view, linguists have increasingly become interested in the patterning and systematicity that CS demonstrates. Myers-Scotton has proposed the Matrix Language Frame model (MLF) as a possible theoretical model to explain CS in this respect. Within the MLF, a distinction is drawn between the matrix language (ML) and the embedded language (EL) in mixed language discourse. The matrix language is the 'dominant' language which provides the grammatical frame for mixed constituents or structures. Thus, in example (1) above, Zulu is the matrix language. Other researchers have used the terms 'base language' for the matrix language and 'guest language' for the embedded language (see Myers- Scotton, 1997: 220-222, for the use of these and other terms). In this respect, the following types of constituents can be distinguished:

- ML islands: both the grammatical frame and the content morphemes come from the matrix language.
- EL islands: both the grammatical frame and the content morphemes come from the embedded language.
- Mixed constituents: These are constituents which contain content morphemes from both the ML and the EL.

(This last category is of particular theoretical interest as it is clearly systematic and constrained. We therefore used data from this category for students to analyze in the programme, *Planet of Languages.)*

According to Myers-Scotton such 'mixed constituents' are governed by two essential constraints:

The morpheme order principle which stipulates that the ML determines the word order in mixed constituents

The system morpheme principle which, in very general terms, specifies that the ML rather than the EL provides the system morphemes for mixed constituents. Roughly speaking system morphemes are 'grammatical' morphemes (for more specific discussion see Myers-Scotton & Jake 2000: 5-6). Following these two principles the following forms (where Xhosa is the matrix language and English is the embedded language) are not possible mixed constituents (underlined):

*Ndifuna yam i-shoe
I-want my shoe
(I want my shoe)
*Ndi-watch-ed umdlalo
I-watch-ed play
(I watched the play)

With regard to the first structure, in Xhosa the possessive follows the noun rather than preceding it as in English so that

> Nidfuna <u>i-shoe yam</u>
> I-want shoe my
> (I want my shoe)

would be a 'grammatical' mixed constituent. The structure above therefore violates the morpheme order principle.

The second structure is ungrammatical as the English past tense morpheme, a systems morpheme, is used in a mixed constituent thus violating the systems morpheme principle. A mixed structure including only ML (Xhosa) systems morphemes is, however, grammatical:

> Ndi-watch-ile umdlalo
> I-watch-PST play
> (I watched the play)

An apparent exception to the above generalisations can be found in instances such as:

> Ama-boy-s ayageza
> Plural-boy-s they-PRSNT-silly
> (The boys are silly)

Here note that on the form 'amaboys' both the plural morpheme from Xhosa (ama-) as well as the English plural morpheme (- s) co-occur. This appears to challenge in particular the systems morpheme principle which specifies that only the matrix language can supply the systems morphemes. In their later work, which revises the earlier MLF model, Myers-Scotton and Jake (2000: 20) account for this by distinguishing between various kinds of systems morphemes, in particular between 'early' and 'late' systems morphemes. The English plural morpheme is in this model an 'early' systems morpheme which is then linked directly to the English content morpheme resulting in its co-occurrence with the Xhosa plural morpheme.

Myers-Scott on's model demonstrates clearly that, counter to prescriptive attitudes, code-switching is rule governed and complex. The model also provides a set of hypotheses to explain the sys- tematicity, and its development to account for the plural morphology demonstrates how hypotheses may need to be revised to account for additional data that in some way challenge initial explanations. As a framework to guide students' own development and refining of hypotheses, Myers-Scotton's work was thus particularly useful.

Skills for science
We used Harlen's (1992) description of the scientific process as a framework for conceptualising the kinds of skills or processes and attitudes we were hoping to develop. These included the following scientific processes:
- observing
- hypothesising (testing, reformulating)

- predicting
- investigating
- interpreting findings and drawing conclusions
- communicating

Harlen identifies the following scientific attitudes as essential to the process of scientific research:
- curiosity
- respect for evidence
- willingness to change ideas
- critical reflection

Honda and O'Neill's (1993; 1998) research demonstrates how some of these attitudes are not well developed at school, leading to students feeling alienated from scientific subject matter, and that such difficulties form part more generally of a crisis in science education (compare here too the similar themes that emerge in the discussion of the New Zealand scenario above). Honda and O'Neill's study shows, however, that analyzing language in the appropriate way can assist in the development of the appropriate cognitive skills and attitudes required for science.

Evaluation of the effectiveness of the programme
The programme was trialed in the second semester of the first-year Foundation course, *Language and Communication,* which is taught by members of the Linguistics Department. The majority (65%) of the students were speakers of an African language, predominantly Xhosa.

In this paper we examine the pre- and post-tests, worksheets, computer-captured data and interviews used to determine the efficacy of the programme (other aspects investigated but not discussed in this article included students' responses to computer-based learning more generally).

Pre- and post-tests
Out of a class of about 330 students, 261 students (79%) completed the pre-test and 198 (60%) completed the post-test. A total of 146 students (44%) completed both the pre- and post-tests The pre-test was given immediately prior to the computer tutorial and the post-test a week later. The test items are included in Appendix A.

Question 1 tested their ability to identify free, bound, grammatical and content morphemes in an English sentence (an understanding of these concepts being important for analyzing code switching data). Their answers were marked and their scores calculated. These results show some gains in knowledge of morphology with an overall increase in the average mark from 4.83 (60.4%) for the pre-test to 5.57 (70%) in the post-test. The median score in the pre-test was 5, the mode 4, while the median and mode in the post- test were 5 and 6 respectively. The t-test indicates a significant difference between the pre- and post-tests (t-statistic 3.54, p. < 0.001). The relatively high scores in the pre-test could be attributed to

the fact that the students had been introduced to these terms in a course in the previous semester.

Question 2 aimed to assess students' attitudes towards code- mixing. They were asked to indicate whether they thought code- mixing was a rule-governed phenomenon (response a), or not (response b) or whether they were unsure (response c). Results revealed a major shift in attitude, with a statistically significant difference in the number of people who feel that language mixing is rule- governed, from 7% in the pre-test, to 51% in the post-test (chi-square = 68.5, p< 0.0001).

Question 3 aimed to evaluate students' knowledge of hypotheses by asking them which of a set of statements they felt was NOT true of a hypothesis. They were told more than one statement could be selected, but in fact the only statement which was NOT true, was statement (a). The results indicate a slight increase in the number of students who selected (a) and a slight decrease in the number who selected the other options although these results should be treated with circumspection as students generally found the phrasing confusing. (The differences between those who chose statement (a) as opposed to the other options in the pre- and post- tests was not statistically significant; chi-square = 3.24, p > 0.05).

Computer-captured data
The computer-captured data included the answers to two prompts within the programme. The first required students to formulate their own hypothesis to explain the kind of language mixing that the Martian's data reveal. They are asked to type their answers into a data box. They were then given the following to check their answers against: *In language mixing, the speaker can use content morphemes from both the matrix and the embedded languages, but only grammatical morphemes from the matrix language.*

The second prompt comes after the presentation of new data which show that under some circumstances, both the embedded and matrix language plural morphemes may be used, as in 'Amaboys ayageza', and students are asked to reformulate their hypothesis to account for this exception. They are given the prompt, 'The only exception to this rule is ...' in the data box and then the answer for checking: *You cannot mix grammatical morphemes from the embedded language. You have to use grammatical morphemes from the matrix language only. The only exception is the noun. Here a grammatical morpheme can be mixed from the embedded language, but only if the plural grammatical morpheme from the matrix language is used.*

The computer data makes for interesting reading! Overall, students' answers demonstrate that either they may not have understood what the question required of them or confirm our observation from the lab sessions that while the programme clearly engaged students, limitations in students' word-processing and computer skills had a negative impact on this particular task.

The most common response of students was to leave the data boxes blank, in other words, to skip the question altogether. Of those that did attempt an answer, a sample follows with

commentary. If a pair of answers has been presented, as in (1), the first answer is what a student typed into the first data box, and the second is his or her formulation of the exception to this hypothesis.

Some students attempted to formulate hypotheses, but either fell short of the desired answer (1) or gave confusing answers (2). Several students gave examples of code-mixed language in their answers (3) but the examples were not always relevant as they did not illustrate the use of both the matrix and embedded language plural morphemes (4). A number of students expressed their own opinions and only one or two actually managed to give the correct answers
(5) Quite a few students (7) were clearly not serious at all!

(1)   Language is very creative and allows itself to mix many languages together and still make sense of it all.
        The only exception to this rule is that you must have plurals in both the languages not only one of them. The only exception to this rule is noun.

(2)   Language is governed by the rules.
        The only exception to this rule is mixing of languages. The morphemes of the embedded language has to have a similar meaning to a morpheme in the matrix language. The grammar comes from xhosa and content from English.

(3)   The only exception to this rule is amaboys awawathandi am- agirls.

(4)   The only exception to this rule is ndithanda the way athetha ngayo.

(5)   Hypothesis language mixing is not good for linguistics or communication.
        WHEN MIXING LANGUAGES, ONE HAS TO MAKE SURE THAT WHATEVER IS BEING SAID MAKES SENSE.
        The only exception to this rule is FOR A SENTENCE TO MAKE SENSE.
        My hypothesis is that it good to mix the languages so that communication can go on and become more easily.
        The only exception to this rule is the use of one language.

(6)   The content morpheme may come from both languages, the grammar morpheme may only come from Xhosa, while the matrix language is the basic one, e.g. Xhosa, the embedded language is the one from which words are "borrowed".
        The only exception to this rule is grammatical morphemes attached to the embedded language noun may come from either the matrix or embedded language.

(7)   THASMAY LOVES
            SHERMAN THE BARBERIAN she is obsessed with the
        fact that
        he sees good in her and in her alone, you are dreaming, he hates all earth ruling creatures.

        we ndoda unjani about the yesterday test beacous i sor u denster
        or ecsosted bat u know dont give up it is life u have to be strong
        and interlingent about want u think

i am hungry

Worksheets
The worksheet (included in Appendix B) was completed by 251 students immediately after they had completed the *Planet of Languages* programme. It aimed to evaluate their ability to apply the important concepts and skills covered in the programme. The worksheet consisted of five questions which were marked and the scores entered onto a data base. The students struggled somewhat with the first question (average score - 49%) which asked them to identify content, grammatical, free and bound morphemes in an English sentence. However, some students apparently had difficulty understanding what the question required of them, so this result may have been negatively affected. They were more able to identify grammatical and content morphemes in question 2 (72%) and the embedded and matrix languages in question 3 (67%). Question 4a asked students to identify the embedded language morphemes in a variety of unseen data drawn from various languages, and this they were more or less able to do (average score = 52%). However, when it came to the testing of a hypothesis against this data in question 4b and the formulation of a new hypothesis in the light of new data in question 5, students were much less successful.

Students clearly had problems working with and formulating hypotheses. Indeed, this is a very difficult activity requiring the ability to use abstract technical language, probably beyond the ability of the average first-year student. In the revision of *Planet of Languages* we plan to give students two possible hypotheses and ask them to simply choose the most appropriate one to explain the patterns they have noted.

Interviews
The interviews were conducted by the two research assistants and one of the lecturers in their own tutorial groups. The total number of groups interviewed was 6 and included about 110 students. The interviews were conducted as focus-group interviews with an open- ended set of questions to guide interviewers, but from which they could deviate if they wished.

The interview data simply indicated that the students had enjoyed the programme and one student commented, "it was something different from the boring tutorials and lectures"!

When asked what they had learnt about code-mixing, they mentioned that they had learnt that language mixing is rule-governed and about terms such as 'matrix' and 'embedded' and what a hypothesis is. One student commented: "What I've noticed is that we have been code-mixing in our daily conversation but we never knew that we were doing it until this programme came along and now we are able to scrutinise word-by-word and see that one has been code- mixing. It brought light to some of us even though we were doing it not noticing it".

When asked if the programme had changed their attitudes towards code-mixing, many students affirmed that indeed it had. One student commented: "Before, I never used to like it when people I knew talked to me in their own language but now I understand and I do not mind", indicating a more tolerant attitude towards code- mixing. Another student

commented: "Before, I thought that it was only Xhosa speakers who code-mixed but now 1 know that everybody does", and, "I learnt that code-mixing is an official thing because everybody does it".

When students were asked about their previous experiences of data analysis and hypothesis formation, most of the students said they had not practised these kinds of skills at school. Although most of them were not sure about their abilities to formulate hypotheses now, one student commented that the programme had shown him "how to go about doing some research, gather data and finding out how things go together".

Conclusion

We believe the study was successful in a number of ways:

1. Students clearly gained an understanding and appreciation of language mixing as a rule-governed phenomenon. The emergence (in, at least, a substantial proportion of students) of a change of attitude to language mixing, from a more prescriptive to more considered response (a more appropriate scientific attitude), was perhaps the most significant outcome of working through the programme.

2. Students developed the key scientific skill of analyzing data on the basis of specific hypotheses through solving specific problems related to code-switching. This was demonstrated by their per- fonnance in the worksheets and through comments they made in the evaluations and interviews.

3. The results of the worksheet and computer-captured data demonstrate that, although students could apply a hypothesis in the analysis of data, they were less successful in actively formulating them. However, as noted above, this is, in retrospect, a challenging cognitive task involving abstract technical language and probably beyond the ability of students, especially students whose own knowledge of English, let alone scientifically worded English, is shaky. This result has fed into the revision of the programme which at- tempts rather to 'scaffold' students' understanding by giving them two possible hypotheses and asking them simply to choose the most appropriate one to explain the patterns they have noted.

While the study clearly showed gains in developing some scientific attitudes and skills, an area not investigated is the degree to which these skills are transferable. This is a critical area for further research and could be investigated through, for example, using the programme with first-year science students and a testing of the extent to which they were able subsequently to analyze scientific data and test hypotheses.

We believe that the study has a range of implications for the New Zealand context as outlined above. While the use of code- mixed data may not be appropriate, using alternative linguistic data (such as features of New Zealand English and/or Te Reo Maori) is an obvious alternative for developing more effective learning activities and appropriate attitudes to science, besides facilitating an appreciation of its basic methods (such as forming and testing hypotheses and respect for evidence) and a solid foundation to challenge 'common sense', 'non-scientific' understandings of the world. The inclusion of such linguistic analysis

in the curriculum may also provide useful support to Maori and Pacific students' engagement and performance in science.

The study also has implications for the criticisms of the New Zealand Science Curriculum outlined above. Analyzing linguistic data, for instance, allows an accessible route for students to engage in 'real' science, using language as the empirical base. This may avoid the possible pitfalls of an overly constructivist, 'common sense' oriented approach to science teaching.

More generally the study showed that multimedia programmes have the potential to engage students in linguistic analysis. While developing such programmes requires coordination of efforts across technical support and content experts, as well as an understanding of the potential of multimedia as a learning resource, the outcomes are clearly worthwhile.

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Appendix A Questions used for pre- and post-Test

1. *The big women played with those pretty toys.*
    a. Write down two free morphemes from this sentence:
    b. Write down two bound morphemes from this sentence:
    c. Write down two grammatical morphemes from this sentence:
    d. Write down two content/lexical morphemes from this sentence:

2. Look at the following examples which show language mixing:
    ■ *Afrikaans: Ek het niks against Afrikaans nie. Ek wil he dat my kinders beter end up as ek.*
    ■ *Xhosa: Heyi. ubuyifundile i-newspaper izolo. About i- spacehip ebesuppose ukuba silandishe e-town?*

    Now circle one of the following answers to show how you feel about such mixing:
    a. Such mixed language is structured and follows rules.
    b. Such mixed language is not structured and does not follow rules
    c. I am not sure whether such mixed language is structured and follows rules.

One of the things you are going to learn in this tutorial is how people may make an hypothesis about language. Which of the following do you think is NOT true of an hypothesis (you may circle more than one if you feel this is necessary):

- a. It is a statement that is always true.
- b. It is a statement that can be tested.
- c. It is scientific statement
- d. It is an informed guess.
- e. It is used to make predictions

Appendix B Questions used for worksheet

Identify each of the morphemes in the following sentence and state whether the morpheme is:

a. a content or grammatical morpheme
b. whether it is a free morpheme or a bound morpheme
c. the part of speech for each of the free morphemes you identified.

The first one has been done for you:
The happiest person in my class reads these books (i) The:
(a) grammatical (b) free (c) determiner

Look at the following examples and label each morpheme as grammatical or content. The English gloss (words underneath the sentence) should help you. The first one has been done for you

a. Die hond-e [Afrikaans] The dog-PLURAL (The dogs)

      Die: grammatical

<div align="center">hond: content -e: grammatical</div>

b. Ndi-hamb-ile [Xhosa] 1-go-PAST
(I went)

c. Ba-sa-tsamaya toropo-ng [Southern Sotho] They-still-travel
town-LOCATION MARKER (They are still travelling in town)

d. con piccoli cobra [Italian] with little cobra
(with [a] little cobra)

e. laulaa-ko han [Hungarian] sing-QUESTION he
(Is he singing?)

f. kop-atc [Polish] 'dig-to'
(To dig)

3. Look at the following examples and state which is the matrix and the embedded language. Give reasons for your answer.

a. Xhosa/English (data from a white farmer)
We *burushaed* against the wind. The *bhagus* were *khonkota'mg* like hell.
(We beat against the wind. The dogs were barking like hell)

b. Afrikaans/English
Ek wil he dat hulle *live* beter as ek.
(I want them [my children] to live better than me)

c. Spanish/English
No la han *implement*-ado.
Not it yet implement-PAST (They have not implemented it yet)

d. Hungarian/English Jats-ok *school*-ot.
Jats-SUBJECT school-LOCATION (Jats is at school)

e. Zulu/English
Ama-*chips* ethu asaphelile. Chips ours they-still-finished (Our chips are still finished)

f. English/Afrikaans Die *dogs* het geblaf. (The dogs barked)

Make sure you have read through and understand BOTH the hypotheses made in the programme - the initial hypothesis and the revised hypothesis, then answer the following questions.

a. Write down the embedded language morphemes from 3a) to 3f)-

b. Do the examples of language mixing confirm or falsify the revised hypothesis in *Planet of Languages'[1]*. Give reasons for your answer.

Look carefully at the following example of (i) Zulu/Afrikaans mixing:

Zikhona, *macir* zonke zikhulunywa ngabanye abantu.
(They [languages] are there, but all are spoken by other people)

Here we find the Afrikaans word 'maar' (meaning 'but'). Such words are called conjunctions. These are words or morphemes which link the parts of a sentence together. Other English examples are 'because', 'and', 'so' and 'while'. Mixing of such items is common in many languages.

a.   Would you consider these morphemes to be content or grammatical?
b.   Does your answer to a) suggest a need to revise the hypothesis? If so or if not, give reasons.