Code-mixing of Arabic and English in teaching science

ZAHRA MUSTAFA and MAHMOUD AL-KHATIB*

ABSTRACT: This paper investigates mixing Arabic and English in science lectures. The phenomenon is examined mainly with reference to frequency, grammatical categories involved, and adequacy of the syntactic constraints proposed in the literature for providing a structural description of this practice. The results show that the alternate use of the two languages in teaching is a prominent feature of the lectures and occurs in different grammatical categories to various degrees. However, the conditioning factors suggested in the literature are inappropriate for a grammatical characterization of code-mixing. So, it is suggested that further research should examine the sociolinguistic and psycholinguistic factors involved if a satisfactory description of such mixing is to be provided.

INTRODUCTION

Code-mixing as a strategy of communication between bilinguals and multilinguals has been an area of research for the last three decades or so. The different aspects of this phenomenon whether linguistic, sociolinguistic or psycholinguistic have been explored by many scholars to crystallize it within the framework of a theory. The theoretical paradigm of code-mixed speech is based on a number of assumptions discussed under two major headings: the function of code-mixing (e.g., Weinrich, 1963; Gumperz, 1969, 1971, 1976; Blom & Gumperz, 1972; Grosjean, 1982), and the structural characteristics of mixed speech (e.g., Lipski, 1978; Pfaff, 1979; Kachru, 1978, 1982; Sankoff & Poplack, 1981; Woolford, 1983; Ewing, 1984; Joshi, 1985; Bokamba, 1985, 1988, 1989; Abu-Haider, 1988).

Research on the functions of code-mixing and code-switching has shown that employing these strategies by multilinguals aims at conveying linguistic and semantic information. (e.g., Gumperz, 1970, 1971, 1976; Hoffman, 1971; Gal, 1979; Di Pietro, 1977; Scotton, 1976). The functions of using these strategies were summarized by Grosjean (1982) as the following: filling a linguistic need for lexical items, specifying the addressee or excluding someone from a conversation, changing the role of the speaker or the speaker's involvement, emphasizing group identity or quoting someone, and qualifying a message or conveying emotions. Bond and Lai (1987) suggested distancing as another function of code-mixing.

Studies investigating the structural features of code-mixed speech have demonstrated that there are syntactic constraints governing this phenomenon (e.g., Timm, 1978; Lipski, 1978; Pfaff, 1979; Poplack, 1980, 1982; Ewing, 1984; Joshi, 1985; Di Sciullo, Muysken & Singh, 1986; Abu-Haider, 1988). These restrictions have to do with the size of the constituents, free morphemes, adjectives, pronouns, conjunctions and complementizers, dual structures and equivalence in the languages mixed. However, most of these constraints have been invalidated in several recent studies (e.g., Bokamba, 1985, 1988, 1989; Berg-Seligson, 1986; El-Noory, 1985; Kamwangamalu, 1987).

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The findings of most studies examining the functions or structural characteristics of code mixing were based on analyzing the mixed speech of more than one speaker in social settings. In other words, the data on which these results were based were mostly code-mixed dialogues between bilinguals or multilinguals in social situations. This raises several questions regarding the setting and the speech event in which code-mixing occurs. For instance, is this practice of mixing two languages common in formal settings as well? If it is, does it feature in academic settings? If so, does the speech event involve more than one speaker, as in social situations, or is it possible for code-mixing to occur in those events which are mostly monologues, like lectures? If code-mixing features in lectures, to what extent do its form and function conform to those of dialogues in social settings?

This study will attempt to answer some of these questions through examining the form of code mixing in science lectures given by Arabic–English bilingual professors to Arabic–English bilingual university students.

To our knowledge, this area has not been investigated except for Pfaff’s (1979) and Yi An’s (1985) accounts which were based on very limited data.

DATA AND METHODOLOGY

The corpus of this study is based on seven recorded lectures given on topics in engineering, medicine, pharmacy, biology, chemistry and agriculture. The total time of lecturing was six hours and forty minutes: five lectures were for fifty minutes each and two for seventy-five minutes each. However, two lectures were disregarded because of poor recording, and so the lectures analyzed were for a total time of five hours only. The professors who participated in this study are Arabic–English balanced bilinguals teaching at Jordan University of Science and Technology. They are five male and two female Ph.D. holders in their late thirties or early forties. All of them had studied English as foreign language for eight to ten years and their university education for the three degrees (B.Sc., M.Sc., Ph.D.) was English medium, except for one whose education for the first degree was Russian medium. All of those professors have taught for a duration of two to eight years at university level in Jordan.

The professors were asked in advance for their permission to record lectures, and the recording was done by one of their students. They were interviewed afterwards by the researchers, to elicit their awareness of mixing the two languages in the lectures and the purpose of this practice.

It is worth noting that the students of Jordan University of Science and Technology study English as a foreign language for at least eight school years, and have to take two compulsory English courses at the University. Most of them are at the intermediate level in English and so they are Arabic dominant.

It should also be mentioned that the university policy decrees that the language of instruction is Arabic. However, in practice, English and Arabic are mixed in most science lectures. In addition, most of the textbooks and the references used for science courses are in English and the exams for these courses are given in English. However, in practice, English and Arabic are mixed in most lectures.

ANALYSIS

In the present study we are concerned with the phenomenon of code-mixing, which has been distinguished in the literature from two similar phenomena, borrowing and code-
switching. Code-mixing has been differentiated from borrowing on the grounds of the languages involved and their speakers. Borrowing can be observed in the speech of monolinguals as well as bilinguals or multilinguals. On the other hand, code-mixing occurs only in the speech of bi- or multilinguals (Sridhar & Sridhar, 1980; Kachru, 1982). The borrowing features are accurately pointed out in Gumperz (1982: 66):

Borrowing can be defined as the introduction of single words or short, frozen, idiomatic phrases from one variety (i.e., language) into the other. The items in question are incorporated into the grammatical system of the borrowing language. They are treated as part of its lexicons, take its morphological characteristics and enter into its syntactic structures.

Code-mixing and code-switching are differentiated on the grounds of the material switched and the position within which switching occurs (Kachru, 1978, 1982; Sridhar & Sridhar, 1980; Bokamba, 1988, 1989). This distinction is made clear in the following definitions of these linguistic subphenomena given in Bokamba (1989: 278):

a. Code-switching is the mixing of words, phrases and sentences from distinct grammatical (sub-) systems across sentence boundaries within the same speech event. In other words, CS is intersentential switching.

b. Code-mixing is embedding of various linguistic units such as affixes (bound morphemes), words (unbound morphemes) phrases and clauses from two grammatical (sub-) system within the same sentence and speech event. That is CM is intrasentential switching.

Code-mixing in the sense illustrated above was the basis for our data analysis. The recorded lectures were first transcribed, then analyzed for sentences in which both Arabic and English were used. The frequency of these sentences was compared with that of sentences which were totally in Arabic or totally in English. Then the mixed sentences were analyzed for the linguistic elements in which the alternation of the two languages occurred. These were classified into different linguistic categories and compared amongst themselves in terms of frequency. Finally, the syntactic environment in which the mixed elements occurred was investigated for any conditioning syntactic constraints.

**Results**

The findings of our study are as follows:

a. The analysis of the data showed that the lectures tended to use mixed sentences more often than totally Arabic or totally English sentences as appears in Table 1 below:

<table>
<thead>
<tr>
<th>Type of Sentences</th>
<th>No. of occurrences</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totally Arabic</td>
<td>147</td>
<td>14.3</td>
</tr>
<tr>
<td>Totally English</td>
<td>421</td>
<td>34.7</td>
</tr>
<tr>
<td>Mixed</td>
<td>621</td>
<td>51</td>
</tr>
<tr>
<td>Total number of sentences</td>
<td>1189</td>
<td>100</td>
</tr>
</tbody>
</table>

The results in the table suggest that the lecturers consider using both languages in the classroom essential for communicating information to their students. In fact, they were
aware of this practice because when interviewed, they responded to a question about
the language they use in lecturing by saying that it is basically English, with Arabic
expressions.

b. Upon closer examination of the distribution of the mixes in the speech of individual
lecturers, we found that except for lecturer 5, none of the participants showed
categorical use of either language, Arabic or English. Table 2 illustrates that distribu-
tion in percentages.

Table 2. Distribution of the three types of sentences by the language used in the speech of
each lecturer

<table>
<thead>
<tr>
<th>Lecturer</th>
<th>% sentences in Arabic</th>
<th>% sentences in English</th>
<th>% mixed sentences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>20</td>
<td>79</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>25</td>
<td>67</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>20</td>
<td>68</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td>37</td>
<td>54</td>
</tr>
<tr>
<td>5</td>
<td>21</td>
<td>56</td>
<td>23</td>
</tr>
</tbody>
</table>

The figures in Table 2 demonstrate that mixed sentences are much more frequent in the
speech of each lecturer, except for participant 5, than sentences totally in either of the
languages. These figures are surprising compared with the response of the lecturers to a
question concerning the language they use in lecturing. Although they were aware of
mixing English and Arabic in the classroom, it seems that they were not aware of the
extent to which they practise it.

c. When we examined the distribution of the mixed elements by syntactic category we
found that the majority of the mixes in our corpus were at the level of single nouns,
followed by phrases, and then clauses, as indicated in Table 3.

Table 3. Distribution of mixed elements by syntactic
category

<table>
<thead>
<tr>
<th>Syntactic category</th>
<th>Number of mixes</th>
<th>% of total mixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single nouns</td>
<td>243</td>
<td>36.0</td>
</tr>
<tr>
<td>Phrases</td>
<td>180</td>
<td>26.3</td>
</tr>
<tr>
<td>Clauses</td>
<td>110</td>
<td>16.0</td>
</tr>
<tr>
<td>Single adjectives</td>
<td>44</td>
<td>6.4</td>
</tr>
<tr>
<td>Article</td>
<td>36</td>
<td>5.3</td>
</tr>
<tr>
<td>Conjunctions</td>
<td>29</td>
<td>4.0</td>
</tr>
<tr>
<td>Pronouns</td>
<td>15</td>
<td>2.0</td>
</tr>
<tr>
<td>Single adverbs</td>
<td>14</td>
<td>2.0</td>
</tr>
<tr>
<td>Single verbs</td>
<td>6</td>
<td>1.0</td>
</tr>
<tr>
<td>Prepositions</td>
<td>6</td>
<td>1.0</td>
</tr>
</tbody>
</table>

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The figures show that 36 percent of the total mixes were single nouns, 26.3 percent phrases, and 16 percent clauses. It also shows that single verbs and prepositions were almost prohibited from mixing, with a percentage of only 1 percent for each. Similarly pronouns and single adverbs were very infrequently mixed with just 2 percent for each. However, single adjectives, articles and conjunctions showed a higher tendency for mixing with 6.5 percent, 5.3 percent, 4 percent, respectively.

Having demonstrated that code-mixing occurs frequently in academic lectures, an important question to be explored is: to what extent is code-mixing governed by the syntactic constraints claimed to be restricting mixed speech in social settings?

SYNTACTIC CONSTRAINTS

Previous work on the structural characteristics of code-mixing shows that this phenomenon is conditioned by a number of syntactic constraints (Kachru, 1978; Lipski, 1978; Timm, 1978; Pfaff, 1979; Poplack, 1980, 1982; Sridhar & Sridhar, 1980; Joshi, 1985; Ewing, 1984; Di Sciullo et al., 1986; Abu-Haider, 1988). However, several recent studies have demonstrated that some of these constraints are language specific and cannot be generalized (Bokamba, 1985, 1988, 1989; El-Noory, 1985; Berg-Seligson, 1986; Kamwangamalu, 1987). In our study, we are going to investigate which of these constraints, if any, govern mixing Arabic and English in science lectures.

The syntactic constraints that have been proposed in the literature are the following:

1. The size-of-constituent constraint
   According to this constraint, major constituents (i.e., NPs, VPs) tend to be mixed more frequently than terminal constituents (e.g., Det, Adj, V, N, etc.) (Schauffer, 1978; Timm, 1978; Poplack, 1980).

   This constraint has been invalidated in many studies which demonstrate that nouns and verbs represent the vast majority of elements switched in mixed speech (Pfaff, 1979; Scotton, 1983; Bokamba, 1985, 1988; Berg-Seligson, 1986). The results of our analysis provide further counterexamples to this restriction since single nouns formed the largest number of mixed elements in our corpus with a percentage reaching up 36 percent as shown earlier in Table 3.

2. The free morpheme constraint
   The free morpheme constraint (FMC) stipulates that a switch is prohibited from occurring between a bound morpheme and a lexical form unless the latter has been phonologically integrated into the former (Poplack, 1982: 12).

   Several studies have shown that this restriction is violated in numerous code-mixed sentences in several pairs of languages. For instance, Luambo (1985) provides counterexamples from Limpala–French mixes and Scotton (1983) gives evidence from Nairobi–Swahili–English mixed speech. When we examined our data, we found numerous sentences that violate FMC, as illustrated in (a), (b), and (c) below:

   (a) ?il-mawaad haadi rah nikhii ?anhaa lammaa nikhii ?an ?il environmental aspects of them.
      the materials these will talk (1st pl) them [f] when talk (1st pl) about the environmental aspects of them.
      We will talk about these materials when we talk about the environmental aspects of them.
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(b) *kul ʔ- wasat huadāa tabzan laa yuʔkal fa this is the core.*
All the middle this of course not eaten, so this is the core.
All of this middle of course is not eaten, so this is the core.

(c) *ʔidan ḥakena bi normal condition, ʔil-intrapleural pressure qaddej* Then said (1st pl) in normal condition the intrapleural pressure, how much?
Then, how much did we say is the intrapleural pressure in the normal condition?

The above sentences show that the switching occurred between the Arabic bound morpheme /ʔil/ and the English NP environmental aspects in (a) and intrapleural pressure in (c). In both cases the Arabic bound morpheme is prefixed to the English NP. Other counterexamples to the FMC are the Arabic bound conjunction /fa/ which is prefixed to the English demonstrative *this* in (b) and the Arabic bound preposition /bi/ which is prefixed to the English NP normal condition in (c).

3. The adjectival [noun] phrase constraint

This constraint was proposed by Pfaff (1979: 306) and it states that adjective/noun mixes must match the surface word order of both the language of the adjective and the language of the head.

This restriction was proved to be valid in several studies dealing with the structural characteristics of code-mixed speech such as Woolford (1983) and Clyne (1987), among others. On the other hand, counter-examples from Lingala–French and English–French mixes were reported recently in Bokamba (1989).

Further examples violating this constraint were extracted from our data. The following sentences demonstrate this violation:

(a) *ʔil communities -s- sayiira ʔallamu istmaal-l- manure* The communities the small learned (3rd pl) using the manure.
The small communities learned using the manure.

(b) *mumkin nʃ uf ʔaʃ yaʔ minus ʔaanya yifaaʃal maʔhaa* Can see (1st pl) things minus other react with it
We can see other minus things which it reacts with.

The above counterexamples show that the head noun can be in the guest language and the adjective in the host language as illustrated in (a); communities is followed by the adjective /-s sayiira/ conforming to Arabic word order but violating English word order. Also the head noun can be in the host language and the adjective in the guest language as in (b); /ʔaʃ yaaʔ/ is followed by the adjective minus according to Arabic, not English, word order.

4. The conjunction constraint

According to this constraint a guest language conjunction is prohibited from occurring in a host language ordinate sentence unless it has been assimilated (Kachru, 1978, 1982; Singh, 1981). This restriction does not allow the conjunction to occur in a language other than that of the sentence following it (Gumperz, 1982).

A number of counterexamples were reported in the literature to have occurred in the mixed speech of bilinguals of Spanish–English (Pfaff, 1979) Lingala–Swahili and French–English (Bokamba, 1989).

Our corpus has numerous sentences violating the conjunction constraint as illustrated in (a) and (b) below:
In (a) the Arabic conjunction /li?annu/ is preceding an English conjunct, which oddly involves an Arabic element, the article /?il/. In (b) the conjunction /laakin/ is preceded and followed by English conjuncts, in fact, it is the only Arabic element in the sentence.

5. The clitic pronoun constraint

This restriction suggested by Pfaff (1979: 303) states that clitic pronoun objects are realized in the same language as the verb to which they are cliticized and in the same position required by the syntactic rules of that language.

Evidence against this constraint was presented in Scotton (1983) and Bokamba (1989). In our data there were no instances of mixes involving verbs and clitic pronouns. This could be due to the infrequent occurrence of clitic pronouns in our corpus.

6. The equivalence constraint

According to this constraint code switches will tend to occur at points in discourse where the juxtaposition of L₁ and L₂ elements does not violate a syntactic rule of either language, i.e., at points around which the surface structure of the two languages map on to each other (Poplack, 1980: 586).

This constraint has been invalidated in several studies. Narty (1982), provides counter-examples from Adanme–English, and Bokamba (1989) presents examples violating this restriction from Lingala–French and English–French mixed speech.

The following sentences from our corpus counterexemplify the equivalence constraint:

(a) ?il-communities ?is-sayyira ʕallamu ?istiʕmaal -l- manure
    The communities the small learned (3rd pi) using the manure.
    The small communities learned using the manure.
(b) ?i-s-saturation tabaʕhaa toayyar kʕliir
    The saturation its (fem) changed a lot.
    Its saturation changed a lot.

What these sentences show with regard to the equivalence constraint is this; first, in (a) the adjective /?is-sayyira/ follows the English noun (communities) conforming to the constituent order in the Arabic NP, but violating that of the English NP. Second, in (b) the possessive NP /tabaʕhaa/ follows the noun (saturation) again conforming to the constituent order in an NP with a possessive in Arabic. However, this order violates the order in an NP, with a possessive in English.

7. The dual structure principle

This principle, proposed in Sridhar and Sridhar (1980: 412) states that the internal structure of the guest language need not conform to the constituent structure rules of the host language, so long as its placement in the host language obeys the rules of the host language.
This principle seems to account for most of the counterexamples to the constraints discussed above. These examples show two structural features: First, the position in which the guest language constituent occurs is dictated by the syntax of the host language. Second, this constituent occurs as a subconstituent inside a main host language constituent, which has elements conforming to the latter syntax. The following sentences from Adəqme–English mixed speech (Narty, 1982: 187) illustrate what is meant by these two syntactic characteristics:

a. e wo green dress KO
(s)he (pst. tone) wear green dress Art
She wore a green dress/garment
b. i. he front tire wheele enyo
I (Pst tone) buy front tire new (Super 1.) two
I bought two very new front tires.

This principle, on the other hand, provides wrong predictions in certain cases such as an NP containing only a noun and an adjective, possessives, pronominal subject and object as demonstrated in Bokamba (1989). There are a number of sentences in our corpus violating this principle, as illustrated in (a) and (b) below:

(a) rah ykuun fi -1- ?awraaq wi fi -1- maaddah -1- xudariyyah toxic-material
will be in -the- leaves and in -the- material -the- green toxic material
There will be toxic material in the leaves and the green material.

(b) Remember we said testing carries out long range experiment hatta n/jufu
decomposition rate tabaʔhaa.
Remember we said that testing carries out long range experiment to see its decomposition
rate.

In (a) the guest language NP (toxic material) meets the first condition but violates the other. Similarly in (b) the possessive NP /tabaʔhaa/ does not occur in a position that obeys English syntax; on the contrary, its placement obeys Arabic syntax.

CONCLUSION

The analysis presented in this study shows that the syntactic constraint proposed in the literature to be restricting code-mixing do not apply to our data. These results support Bokamba's (1989) findings concerning the universality of these constraints. However, the results do not deny the possibility of the existence of some constraints on mixing certain pairs of languages. This research project shows that syntactic constraints do not provide a method for describing and interpreting the morphosyntactic features of code-mixing. Consequently it is not possible to depend on the structural characteristics exemplified in code-mixed speech to draw psycholinguistic inferences about this phenomenon. The alternative description of code-mixing must be sociopsychological. This type of description is beyond the scope of this study but it will hopefully be explored in the future.

REFERENCES


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(Received 20 April 1993.)