

THE THINK TANK MODEL AND ITS APPLICATION IN PHONOLOGY

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Abstract

One of the bilingual theories that is relevant to cognitive processes in language contact is the Think Tank theory. This theory has as its fundamental claim that L1 and L2 reside in the same language faculty with one not interfering on the growth and acquisition of the other. This study examines the theory in detail and makes a practical application of its major principle(s) to core language aspect- phonology. The paper argues that contrary to the claims of Think Tank, both L1 and L2 have separate phonological conventions; and that quite on the contrary, L1 influences greatly the acquisition of L2 and on the bilingual's phonological competence. Therefore, a pronunciation test on 10 common words was administered to a group of 10 students who have English as their L2 and Yoruba as their L1. The 10 students have the following age distributions, with respect to when they were fully exposed to English basics as L2 (0–4, 5–9). The result was formalised within Optimality Theory (OT). The study found that the theory violates the highly ranked constraints in

Yoruba L1 such as **MAX** (map input into output), ***VOICEFRIC** (voice fricatives are barred), **IDENT** (no deletion). The study concludes that the Think Tank applies only in children whose acquisition of English as L2 falls within 0-4 years. Therefore, any further stretch of the theory beyond that limit may be counter-productive.

Keywords: Think Tank, Acquisition, English L2, Yoruba, Optimality Theory, Phonology

Introduction

We begin this presentation by saying at the earliest stage of this paper that the Think Tank model is a linguistic metaphor, a highly formalised model of Cummins (1981) to cater for the linguistic operations that occur in the repertoire or linguistic mental receptacle of a bilingual. We can conceive of the Think Tank as thoughts-store house, or as Aitchison (1987, p. Viii) would prefer, *the human word-store*. The same Think Tank is available for L1 and L2. This makes sense since the lexicon- the mental dictionary – is one in humans. The same mental expertise underlies performance, why, input-output processing and processes in both languages are the same. There is no process overlapping of any sort!

The Model

The Think Tank model has Jim Cummins, a professor at the [Ontario Institute for Studies in Education](#) of the [University of Toronto](#) who works on [language development](#) and literacy development of learners of [English as an additional language](#) as its propounder. It is a reaction to two fundamental shortfalls of the earlier theory, the Balance theory. That theory made two fundamental flaws. First, that one language will automatically cause a decrease in the second language. Second, its view on IQ and school attainment was that bilinguals were inferior to monolinguals. As the Think Tank model will prove in this paper, these views were the opposite of linguistic realities. We are quick to add that it is a purely cognitive model. The Think Tank is a model, which attempts to provide a theoretical framework for interpreting, and perhaps, validating three crucial findings listed by Cummins (1981, P. 29) thus:

1. Time, either spent through the medium of minority children's L1 in the home or at school, does not in any way impede the development of L2 academic skills.
2. Promoting the development of minority children's L1 skills in the school significantly improves L2 academic skills among minority children who tend to perform poorly in L2-only schools.
3. Bilingualism and biliteracy appear to confer intellectual and academic advantages on the individual when proficiency in both languages continues to develop.

Assumptions of the Think Tank Model

The model makes three assumptions we summarise hereunder:

1. Talking and Thinking

Talking reflects thinking; and the thinking that underlies thought in both L1 and L2 are essentially the same. Therefore, only one Think Tank exists for expressing thoughts in both L1 and L2 and for comprehending thoughts expressed by others in L1 and L2. In other words, whichever language a bilingual uses, the thoughts that accompany talking, reading, writing and listening come from the same "place". Therefore, one integrated source of thought underlies the two languages. The same engine powers the two cylinders. The language of production or reception, notwithstanding, cognitive activity is centralized and integrated.

The process appears to us to be circular and endlessly infinite, especially if it involves bilingual interlocutors. Berwick & Chomsky (2016, p. 66) express the matter this way, "Language is therefore based on a recursive generative procedure that takes elementary word-like elements from some store, call it the lexicon, and applies repeatedly to yield structured expressions, without bound". This, to us means that performance in L1 and L2 is highly complex, computational, simultaneous, systematic and yet effortlessly done.

2. Identical Meaning Processes

Meaning processes in L1 and L2, the model would claim, are identical or similar; yet they are not cross-linguistically translatable. Put differently, although the same ability underlies the two languages, precise connotations of words are language-specific and culturally biased. For example, a Yoruba-English bilingual may not succeed in directly translating the words in the table below into English with the hopes of achieving the same semantic implications as in his L1.

S/N	Yoruba	English
1.	Gangan	Talking drum
2.	Iya-ilu	Mother of drum
3.	Bembe	A broad/wide drum

Thus, the various words will connote different things to L1 and L2 language users, according to the extent and scope of the experiences of the different language users, contexts of use and functions of the instruments in the different cultural milieus. Yes, two languages can result in an increased richness of meaning and cultural connotations. Additionally, whereas concrete objects that are similarly manipulated by people in different linguistic communities, countries or contexts such as *pencil, pen, whiteboard eraser* will have similar meanings in the bilingual's different languages, abstract nominal expressions (peace, war), including words for expressing even similar emotions (love, hate) will not. The same thing applies to mathematical expressions. These words may be easier to express in L1 than L2 and vice versa. Even so, not all the information is stored in the same Think Tank and the individual does not have access to all the stored information.

3. *Linguistic Experience*

The operation and development of the Think Tank is dependent on the individual's linguistic experience. Therefore, the development of the total Think Tank is directly proportionate to the individual language user's proficiency in such language skills as understanding, speaking, reading and writing either or both language(s). However, if the proficiency is low, then the quantity and quality of the input-output flow between the Think Tank and the environment through the channel will be proportionately reduced. In other words, both languages contribute to the growth of the Think Tank. Speaking, listening, reading or writing in the first or second language are equally important to the whole Tank development. However, the operation and development of the Think Tank may be negatively affected, if children, against their will, are made to operate in a second language where they have little or no proficiency.

For example, they may be made to use a poorly developed second language in school, perhaps in terms of the quality and quantity of what they take in from the teacher's curriculum materials. Consequently, what they produce by oral and written means will be relatively impoverished (Baker, 1988). Cummins (1982, p. 30) says, " In minority-language children (for example, Finns

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in Sweden), if both linguistic channels remain relatively restricted over a prolonged period of time in the type of input and output that can be handled, then growth of the Think Tank will slow down and eventually stagnate.” Thus, the Think Tank can atrophy. This is exactly what happens to the capacity of the human brain. The brain is not static; it is elastic. It is a constantly changing mass of cell connections, which are deeply affected by experience. Skutnabb-Kangas (1981, p. 131) buttress this point by saying, “The result often is that they fail miserably at school, regardless of superficial oral fluency.” The model is diagrammed in fig.1 below



Figure 2: The Think Tank Model: Double Talk # Double Think

Source: Cummins (1981, P. 29)

This human head diagram is informative. The diagram concedes that two languages do not merge; they are necessarily separated. Even so, the Think Tank works in a unitary way. When the Tank is richly and well fed, the result is a well-developed engine of bilingualism which does not work on half throttle.

The Think Tank Mechanism

How the Think Tank model operates is quite interesting. According to Cummins, there exists in the lexicon, the Think Tank Manager with the main control functions, whose job is to moderate what goes in and out (input-output relations) from L1 and L2 into of the Think Tank and ensures that nothing is amiss. The manager does this through:

- i. *Inspection and Monitoring Control.* This function requires that the Manager inspects

the input-output contents of the Think Tank, sieves the information as appropriate and where necessary, modifies the contents. This means that the Manager will ensure that the two languages are contrasted so that sentence order, grammar, and meaning for each language are neatly stored, can easily be correctly summoned from store and, if necessary, corrected. For example, the bilingual learner identifies the lexical items in the Think Tank. He assesses the grammar of each language and compares how the same thoughts are expressed in each language. He is alert to, and monitors grammatical mistakes brought to his attention and corrects these. Inspecting and monitoring the two languages through which he is able to appreciate word meaning and become aware of how language works is one reason why bilinguals may have a subtle advantage over monoglots or unilinguals in word meanings and language awareness

ii. *Switch Control:* Switching between languages can be very taxing. For a switch to be grammatical, it must agree with the grammatical frame of the two languages. For example, one of the languages serves as the host language or the Matrix language which grammatical frame primarily determines what goes where, when and how (Myers-Scotton, 2006). This form requires a complex cognitive processes. The task of the Manager then, the model stipulates, is to exert a control on the switch processes. The Manager will trigger the bilingual's sense so that he will be able to switch to appropriate language. For example, in a day-to-day conversation say in Nigerian university, a bilingual may begin a conversation in the language of his interlocutor, an L2, in most cases (usually, English), but switches to his L1 as soon as a native speaker of his language appears. To include the first interlocutor, he switches between the L1 and L2.

iii. *Valve Control:* The Think Tank Manager may deliberately operate a valve control. The valve control is a mechanism that regulates the flow of input into and output from the Think Tank. The valve is often consciously opened, and shut to regulate the language of communication. For example, a bilingual child in school may choose to open the valve of the school language, often his L2, if this becomes necessary while he closes the L1 valve. When a bilingual is keen in learning a second language, he deliberately seeks an opportunity to open the second language valve. Someone who is not so proud of his native tongue among peers in school or elsewhere, perhaps because he is in the minority, may shut down the L1 valve and open the L2 valve to belong

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(Cummins, 1981). The Think Tank Manager and his cognitive role in bilingual operation is diagrammed below in figure 2:

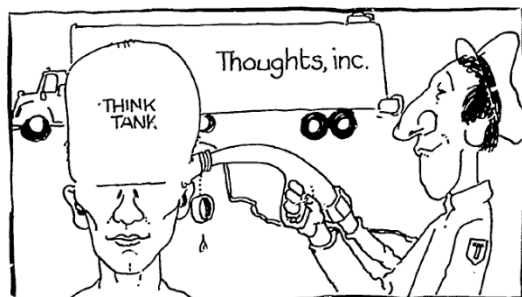


Figure 3: Think Tank Manager: Source Cummins (1981, P. 30)

There is clear evidence that the Think Tank model is a highly complex means of accounting for what bilinguals do with their codes and how human the in-built biological mechanisms go into action to process the input and the output for most effective surface forms selected for linguistic purposes during any communicative or speech event.

Application of Think Tank Theory to L2 Phonology

In this section of the paper, an attempt is made to test the fundamental claims of Think Tank theory, namely, L1 and L2 enjoy freedom of place and space, and are autonomous with one having no negative impact on the other as long as both are well fed and appropriate selections are made. We argue that this claim may not be completely accurate. First, both L1 and L2 have separate phonological conventions, a point also recognised in Think Tank. Second, quite on the contrary, L1 influences greatly on the acquisition of L2 and on the bilingual phonological competence.

A study by Mack (2003) on phonological production and acquisition provides some insight. She found that very early exposure to L2 guarantees success, even for bilingual children, without any influence of one language on the other. After experimenting with Korean students who arrived US within the age range of 0-15+, she discovered that only those who had first exposure to English before age five perceived the boundary between the two phonemes in the same range as the native

speakers. She found that if an L2 learner must form an entirely new category, as the /I/ vowel as for Korean speakers, only those with extremely early exposure will perform like monolingual native speakers. Mack (2003, p.10) concludes:

When asked to discriminate computer synthesized continua of the vowel pair /i-I/ (a distinction which does not exist in Korean), only those who had first exposure to English before age five perceived the boundary between the two phonemes in the same range as the native speakers.

This conclusion has two implications. First, language acquisition capacity atrophies after age 5. Second, in bilingualism, one language exerts certain degree of influence on a bilingual learner's language acquisition of the L2.

In table 1,

Table 1: Bilingual Phonological Acquisition

S/N	Gloss	EE	YE
1	Northern	/nɔ:ðn/	/nɔdan/
2	Vision	/vɪʒn/	/viʃɔ:n/
3	Decision	/dɪsɪʒn/	/disiʃɔ:n/
4	limb	/lɪm/	/limb/
5	Thigh	/θai/	/tai/
6	Think	/θɪŋk/	/tɪnk/
7	Anthem	/ænthə/	/antem/

8	Method	/meθəd/	/metod/
9	Breath	/breθ/	/bret/
10	There	/ðeə/	/di:e/

Keys

EE: English English (Standard British English) pronunciation

YE: Yoruba English pronunciation (where Yoruba English refers to a sub-variety of Nigerian English)

Interpretation and Analysis

From the data presented, the following observations and findings were made. First, whereas an L1 pronounces certain words without a vocalic segment phonetically present; L2 learners insert the vowel even at the surface value as with the cases below

/nɔ:ðn/ → /nɔdɔn/

/vɪɜn/ → /viʃɔ:n/

/disɪɜn/ → /disiʃɔ:n/

To accomplish this, the L2 speaker epenthesizes. Second, the L2 speakers above age five, substitute one sound for the other: voiceless fricative for voiced fricative in most cases, as in two of the examples, provided earlier, :

/vɪɜn/ → /viʃɔ:n/

/disɪɜn/ → /disiʃɔ:n/

/θai/ → /tai/

/θɪŋk/ → /tɪŋk/

/æntə/ → /antem/

/metəd/ → /metod/

/brɛθ/ → /bret/

/ðeə/ → /di:e/

Lastly, consider the single case of vocalism, where the bilingual speakers would not skip an orthographically present segment during pronunciation, as it is the case with the following.

/lɪm/ → /limb/

Data formalisation

To prove that L1 influences L2, and thus account for the linguistic behaviour of the older L2 speakers of English, contrary to the claims of Think Tank, the data for the study is formalised within Optimality Theory's (OT). OT, a theory propounded by Prince and Smolensky (2004) is a simple theory of constraints, which says that the difference between one grammar and another is the difference in constraint ranking, since the same universal constraints are available. To this end, the following highly ranked constraints in each case explains why the L2 speakers perform the phonological actions identified.

First, *epenthesis* is triggered by a highly ranked constraint in Yoruba **MAX** which requires that input segments must be clearly mapped into output. This is because Nigerian languages have CV syllable structure, against the CVC of L2, and a variant is counterproductive. L2 speakers are influenced by this and so they cannot afford to leave a segment without visible vocalic element. Another triggered constraints is ***VOICE_{FRIC}** which bars voice fricatives. This explains why *voiceless fricatives* are substituted for the voice. In the case of *vocalism*, the older L2 speakers were conditioned by yet another highly ranked constraint, **IDENT** which forbids deletion. The constraint requires that it is preferred to retain segments than to delete them.

Consequently, L1 does influence L2 and there is no case of linguistic autonomy in a bilingual language faculty. This is crucial; every language has its own clearly defined constraints, which are
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not impervious to the constraints of a neighbouring language. Should all languages enjoy compartmentalisation, a sort of stand-alone privilege in the lexicon under the watch of a Think Tank Manager, dual unilingualism, rather than bilingualism, would have been the result. Happily, Think Tank is a bilingual, not a unilingual theory of acquisition.

Summary and Conclusion

We summarise the whole essence of the Think Tank Model in the words of Barker (1988, P. 174) thus:

1. Bilingualism is viable because people have the capacity to store adequately two or more languages.
2. Conceptual and academic skills (cognitive functioning and educational attainment) may be developed equally well with two languages as through one language.
3. Cognitive functioning and educational attainment may be fed through one monolingual channel or equally successfully through two language channels. Both channels feed the same "Tank".
4. To the extent that bilingual education successfully fosters conceptual and academic development, full bilingualism is a viable and valuable outcome of such education.
5. When one or both language channels are externally or internally stopped from functioning fully (e.g. through low motivation to learn a language, or pressure to replace the home language with the majority language), cognitive functioning and academic development may be impeded.

In conclusion, the Think Tank model, offers a fresh look at bilingual. The model provides a picture model to conceive the relationship between cognitive functioning or processes, bilingual education and bilingualism. However, the drawback of the model lies in its very strength, L1 and L2 influences each other since no language is an island in a contact or bilingual situation. The think Tank theory applies at best to children exposed to L2 between age 0-5; above this age, the language acquisition device weakens and atrophies, allowing interference to set in. Therefore, any further stretch of the theory beyond that limit will be counter-productive. In summary, it will be

underrating to say that Think Tank theory is too powerful and irrelevant to bilingual situation. Conversely, it will amount to overrating to claim that the theory is a perfect reflection of a bilingual's true contact situation.

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