
 **Phonotactics:
Putting Sounds
Together to form
Syllables and Words**

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What Makes Learner's Speech Hard to Understand?

Intonation and Rhythm? (Brazil 1994) (Keys, 2000) (Fraser 2001)

Jenkins: "Lingua Franca Core" includes 'repertoire of consonants and consonant clusters.'

Huang and Radant (2009) majority of Mandarin learner errors in English are phonotactic.

Gasser (2006) Tonal languages have simpler segmental structure because distinctions are carried in tones.


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Phonotactic Errors

Sequential or linear errors in words

Sounds :

- are left out
- are substituted
- order is reversed (Consonant Clusters:CC)
- vowels are inserted between consonants (CC)

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00:30 /səʊ 'fainəli: ət hæ tu: /
So finally I ha(d) to


ʃu: ə 'nɑ:ðə 'ʃapfək ri: 'leɪtəd 'tu: wəi tek'nɒləʒi: ən ægri:kə'lʃə /
Choose another subject related to wine technology and agriculture

Interviewer: Okay...so are you interested in producing wine?

ʃe: ə: /bət bi: 'kɒs ə: /
Yeah, ah, but because, ah...


wi: daʊn hæf də 'hɪstri: ə 'baʊt də 'vɪtɪ:kawfə səʊ ət gɒt ə lɒt ɒ 'dɪfrəns wen ət ʃu: dɪs 'sɒpfək /
We don't have the history about the viticulture so I got a lot of difference when I choose this subject

FINAL CONSONANT DELETION CLUSTER REDUCTION CONSONANT DEVOICING

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Phonotactic Errors in English from a Variety of L1 Speakers

Word	Realisation	L1	Target
Explain	/ek'peɪ/	Thai	/eks'pleɪn/
Flemington	/flemɪŋtɒŋ/	Vietnamese	/flemɪŋtən/
technology	/te'ʃɒləʒi:/	Thai	/teknələdʒi:/
brokerage	/brəʊkeɪlɪʒ/	Cantonese	/brəʊkɛrɪdʒ/
spoons	/es'pʊns/	Spanish	/spu:nz/
dream	/zə'rɪm/	Vietnamese	/dri:m/
school	/skʊn/	Vietnamese	/sku:l/

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What Pronunciation Skills do these Learners have?

Intonation patterns?	✓
Word stress?	✓
Accurate vowel sounds?	✓
Range of English consonants?	✓
Ability to produce consonants in all positions and combinations in English words and syllables?	✗

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Your Turn...

Vietnamese /ŋɔk/ Ngoc
 Russian /kto/
 Greek /kseɔ/
 Italian /pane/ /pan:e/
 (pane vs panne)

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How do Phonotactic Rules Work?

Based on the syllable:

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  graph TD
    Syllable --> Onset
    Syllable --> Rhyme
    Rhyme --> Peak
    Rhyme --> Coda
  
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(from Gussenhoven and Jacobs, 2005)

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Syllable structures in Thai, Vietnamese and English

English	(C)(C)(L) V (V) (L)(C)(C)	L = liquid or semivowel eg. /l/, /r/, /w/ or /j/ (Gussenhoven & Jacobs 2005)
Thai	C(R)V(V)(C2) 2=b,d,g	R = rhotic (trill or lateral approximant) (Hudak, 2002)
Mandarin	CGV(C2)	G = glide (Kuo, 1994)
Vietnamese	CGVC2	C2=p,t,k,m,n,ng (koanh.net, 2012)

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Sonority Sequencing Principle

Hierarchy of sonority within the syllable*

6 5 4 3 2 1
 vowels → Glides → Liquids → Nasals → Fricatives → Stops
 high w, j l, r m, n, ŋ f, v, s, z, ʃ, ʒ p, b, t, d, k, g
 sonority ɸ, θ, ð, ð

print
 1 4 6 3 1

* adapted from Blevins, J. (1995) The syllable in phonological theory. In Goldsmith, J. (Ed.), *The Handbook of Phonological Theory*. Blackwell, Oxford.

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What Principles Govern Learner Changes to Syllable Structure?

L1 syllable structure
 Sonority Sequencing Principle
 Minimum Sonority Distance Principle
 Optimality Theory (faithfulness versus L1 and universal constraints)(Prince and Smolensky, 2004)
 Perceptual Salience Model (Coté, 2000)

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Optimality Theory: a Quick Look

Universal principles of syllable well formedness
 No language has a complete repertoire of these
 ranked differently in different languages
 2 kinds of constraints

- Markedness
- Faithfulness

Perceptual Salience (Coté, 2000)

Sounds are deleted or epenthesised according to the acoustic energy

- in the sound itself (voice, length, loudness)
- position – either enhances or diminishes acoustic energy

e.g. Onset versus coda

- Proximity to vowel CCCV
- Proximity to similar consonants

My Research

Experiment

13 speakers of Thai L1

Repeated 100 words containing consonant clusters

Words two syllables or less

e.g. *explain, transfer, software, abstract*

Observations and Findings

Position Effect: Final clusters hardest
Medial Clusters: No clear pattern

Perceptual Salience: More sonorant clusters better preserved

Sonority Sequencing principle:
Evident in processes of students with high overall errors; not low overall errors

Faithfulness and Markedness Constraints: Some evidence of a role

Increased Cluster Length: Very long clusters *much* harder

Position Effect: Final clusters hardest

Expected.

Fujimura et al (***) Consonants in onset are louder and clearer than consonants in the coda – supports perceptual salience.

Medial Clusters: No clear pattern

Maximum Onset Principle (Gussenhoven and Jacobs, 2005) Divide medial clusters into the shortest coda and the longest onset:

excuse → /ek-skju:z/

Perceptual Salience or Reranking of Constraints?

Word	Target	Production
<i>exciting</i>	/ek'sa It In/	/e'sa It In/
<i>example</i>	/eg'zæmpl/	/ek'sæmpl/
<i>break</i>	/bre Ik/	/bre Iʔ/
<i>expect</i>	/ek'spekt/	/e'spek/
<i>went</i>	/went/	/wenʔ/
<i>hand</i>	/hænd/	/hænd/
<i>once</i>	/wʌns/	/wʌns/

What do these examples indicate?

The louder or longer a sound is, the more likely it is to be preserved.

Salient sounds more successfully preserve syllable and cluster form.

Cluster reductions may be driven by universal principles or L1 constraints

There is a strong drive for faithfulness

Students with difficulties tend to simplify according to the SSP

Increased Cluster Length and Difficulty

Cluster Length		CC	CCC				CCCC
Mean % error	10	20	30	40	50	60	

Increased Cluster Length

? 'Double trouble'

- increased length > violation of SSP

? Second order constraints

c.f. Warker and Dell (2006)

When learners had to learn both consonant constraints, and vowel constraints, learning time was exponentially longer.

What can teachers do about it?

What do we teach first?

How do we teach it?

What do we teach first?

Clusters of higher perceptual salience

Voiced clusters, longer, more sonorant features

Well formed syllables

Aim for and reward, even if voicing or other features are lost.

Variety of sounds in all syllable positions Especially final position

Maximum onset principle

To aid medial clusters, once they can produce clusters of two or more elements in any position

How do Learners Learn Phonological Rules?

Flege and Liu (2001) Accuracy of consonant clusters increases not with time but with the quality and quantity of contact with the target language.

i.e. perception / discrimination is key

Warker and Dell (2006) Adults can learn to perceive and recall phonotactic rules and...

there is a *notable delay* between discrimination and production ()

Davidson (2004) This delay is NOT explained by motoric inexperience- More likely to be a problem of cognitive categorisation.

Flege (2009) Categorisation of sounds / rules can actually *slow down* learning.

Davidson (2004) Syllable place is highly marked i.e. it is hard to shift a sound from one syllable position to another

Warker (2006) Problem solving / monitoring improves production skills

Implications for Teaching

Many students will progress over time with **sufficient quality and quantity of input**.

Identify those who do not.

Teach **highly sonorant sounds first**, especially in medial and final position .

Keep clusters short : build length later.

Aim for **syllable well-formedness**.

Use **contrastive, problem solving activities** to improve perception and production.

Exaggerate the Part of the Cluster Most Likely to be Deleted

This works well with /l/ and /r/

p**RICE**

b**READ**

Write omitted sounds larger:

le**F**t

Shift Sounds from the Front to the Back of a Word:

This is fun!

reep>reepreepreepreep **pre-Intermediate.**

It also helps to 'loosen' the connection between consonant and syllable position.

Blend Two Words

I need a pencil.

I nee da pencil.

I need a pencil.



whisper this part.

Between Two Words, Treat Final Consonants Like a Cluster

dgdgdgdgdgdg

I would go...

In clusters containing two stops (p,t,k,b,d,g), teach students NOT to release the first consonant.

NB: ability to produce English stops without audible release is essential.

In summary

Where L1 has a simple, or unmarked syllable structure, learners' greatest pronunciation problems are likely to be phonotactic, or linear/sequential.

English has a very complex syllable structure relative to many world languages.

High quality interaction with English over time will resolve many problems, as the perception of these features is quickly learned.

Learners who remain of low intelligibility are likely to benefit from perception training, combined with problem solving activities that help them to form new categories.

Thank you

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