“A psycholinguist walks into a classroom...”: A road-map for bridging research and practice in pronunciation teaching

Isabelle Darcy
Indiana University
Of bridges and gaps

- Very good topic
- Bridges bridge gaps
  - In our specific field, the gap between research [on how learners learn the sound systems of their second language] and practice [pronunciation teaching and its role in fostering the learning of sound systems]
- We don’t have a bridge currently
- We don’t even have a “gap” – currently...
The road toward bridging the gap

PSLLT 2017 – Salt Lake City

“where is the other side?”

Millau, © CEVM Eiffage
Psycholinguistics doesn’t “ask the right questions”!

Teaching doesn’t take research findings into account!

Is this true?
Pronunciation teaching...

- achieve accurate pronunciation
  o (= so that their production of sounds, stress, rhythm, and intonation begins to match an ideal pattern),
- and use it fluently
  o (= automatically, without having to concentrate extremely),
- in order to achieve comfortable intelligible pronunciation
  o (= speaking in a way that most listeners, both native and nonnative speakers, can understand without too much effort or confusion).

Some questions…

What

• Which method?
• Diagnosis?
• Listening instruction?
• Perception?

Why

• Does it work?
• Will it matter?
• Carry-over?
• Automatization?
• Learners’ differences?

How

• Which method?
• Diagnosis?
• Listening instruction?
• Perception?

Feedback, assessment

• Explicit feedback?
• How much, how often?
• Final and continuing assessment?

Whom, when

• Beginners? Advanced?
• How long, how often?

What matters most?
• Right focus?
• Spelling?
• Which “standard” & what’s “correct”??
Psycholinguistics…

- The study of the relationship between linguistic behavior and psychological processes, including the process of language acquisition
- Is about understanding
  - how children acquire language;
  - how people process and comprehend language;
  - how people produce language;
  - how people acquire a new language (second language acquisition)

Psycholinguistics: L2 phonology...

Representations
- Words?
- Phonological grammar?
- Segmental/suprasegmental categories?

Interfaces
- Metalinguistic representations
- Perception – lexical encoding – production?
- L1 – L2 – L3 interactions?
- Oral & visual modalities?

Neural structures & functions
- Brain regions?
- Brain efficiency?
- Individual differences?

Processing
- Access and use?
- Articulation, perception
- Segmentation?
- Word recognition?

Development
- Changes over time?
- Which factors matter? (age, input...)
- Perceptual learning?
- Laboratory training?
- Instruction?
PRONUNCIATION INSTRUCTION AND L2 PHONOLOGY RESEARCH
“Language is sound”

Pronunciation is indissociable from the rest of language behavior

• To make the language come alive requires the behaviors related to listening, speaking, reading and writing

• **Phonological**, lexical, and structural knowledge lie at the heart of the language

And that’s how...

One goal of pronunciation instruction is to help learners with the form of words!
And yet...

• Teachers and researchers do not know what to do with research findings when it comes to teaching pronunciation
  o Not enough research about pronunciation instruction (Gordon, 2015) and the effectiveness of specific methods to enhance intelligibility (Derwing & Munro, 2015, ch. 5)

• Research in L2 phonology focuses on accuracy

• Unfortunately, the effects of instruction have never been much of a focus
  o Example: speech perception research
Luckily there's PSLLT!

- This is changing (e.g. JSLP; Linda Grant, ed., 2014; Derwing & Munro, 2015; Isaacs and Trofimovich, eds., 2017; Reed & Levis, eds., 2016; or Levis & Munro, eds., 2017: 4-volume series on pronunciation...)

- Since Joan Morley’s call for research on L2 phonology and on the effects of instruction (Morley, 1991)...
  - Much work done in L2 phonology
  - Research on pronunciation instruction is a quickly growing field
Is L2 phonology relevant to pronunciation teaching?

• Focus on accuracy
  - How learners learn something, how fast, … how different are they from native speakers

• vs. Focus on intelligibility

• Indirectly
  - Can guide priorities and diagnosis
  - Can highlight factors that facilitate learning
  - Can serve as a road map for research
Two psycholinguistic areas

• The **mental lexicon**, the learning of the phonological form of words (“phono-lexical” acquisition), and spoken word recognition
  - Pronunciation, vocabulary, listening

• The role of **individual differences** in cognitive abilities
  - Intersections with L2 phonology and instruction
1. THE MENTAL LEXICON
Word recognition in fluent speech

• Map the incoming speech signal onto lexical representations stored in memory

(McClelland & Elman, 1986; Norris, 1994)

“... the unfolding information in an acoustic stream of temporally distributed information is mapped onto one of thousands of representations in memory”

(Jusczyk & Luce 2002, p.12)

(McQueen, Cutler, & Norris, 2006)
The problem #1

- The problem is that this unfolding information looks like this:

- Variability in speech due to coarticulation during production, phonological processes, etc. is a problem

- The task of the hearer is to identify the ‘word units’

(Hockett 1955, p. 210)
Competition from phantom words

• For Dutch listeners (L2 English): Non-words (*groof) can be recognized as words (groove)
• Do embedded non-words enter the competition process as words for L2 learners?
  • Would a sequence like “big roof” prime the word groove?

Yes, they do:

Cutler, 2005

Broersma & Cutler, 2008

“The pronunciation of near-words such as groove in real speech contexts such as big roof is just as capable of activating groove for a L2 listener as the isolated form goof. These contexts cause phantom word activation for L2 listeners, while L1 listeners experience no such effect.” (p. 29)
The problem #2: lexical representations

• And the other problem is that the representations in the mind of the (L2) listener might look like this:

Cook & Gor, 2015; Darcy et al., 2012; Darcy, Daidone & Kojima, 2013; Escudero, Hayes-Harb & Mitterer, 2008; Pajak, Creel & Levy 2016; Pallier et al., 2001; Trofimovitch & John, 2011; Weber & Cutler 2004 …
Speeded Auditory Lexical Decision

PROBING PHONOLEXICAL REPRESENTATIONS
Consonants

L2 Russian

Palatalized / Plain consonants

[palatalized] [si] [ti] [ni] [li] [ri] ...
[plain] [s] [t] [n] [l] [r] ...

L1 English

Intermediate

Advanced

Russian: Control items

Auditory word-picture matching

Lexical decision (error %)

Learners: Very high error rates on test nonwords

e.g. [stolj] treated as a real word

Similar findings with L2 German and L2 Japanese: Darcy, Daidone & Kojima (2013)

The Mental Lexicon

Simonchyk & Darcy (2017)

PSLLT Proceedings
Across the whole phonological system

Suprasegmentals


Word stress is contrastive in Spanish, not in French:

[sabana] ‘savannah’ - [sábanə] ‘sheet’;

Example stimuli:

- górrro is a word (‘hat’)
- gorró is not

Lexical decision task

French L2 learners: ~60% error for test non-words (all groups)

Syllable structure

Darcy & Thomas (submitted)

Onset clusters exist in English ("blue", "play"), not in Korean. They are perceptually repaired with [ʊ] epenthesis: b[ʊ]lue (Kabak & Idsardi, 2007; Dupoux et al., 1999)

Lexical decision task (180 trials)

Test u: [bʊ'lʊː] -- [pʊ'lɐi]

Control i: [bɪ'lʊː] -- [pɪ'lɐi]

Filler words + nonwords

Learners: ~40% error for [bʊ'lʊː] items (up to 80%), not for control i.
What does this all mean?

• Word recognition in a second language is less selective
  - Competition from both lexicons, unnecessary competitors

• Lexical representations reflect L1-based phonology
  - L1-based processing across the whole system

• Lexical effects can persist independently of improvements in learners’ perception (e.g. Darcy, Daidone & Kojima, 2013; Darcy et al., 2012)
  - Reliable perception helps but does not guarantee accurate lexical encoding (Simonchyk, 2017)
  - Representations are also fuzzy even with easy contrasts (Cook & Gor, 2015; Cook, Pandža, Lancaster, & Gor, 2016)
INTERESTING!
BUT WHY DO WE CARE?
Why do lexical representations matter?

• **Vocabulary** knowledge: less ambiguity between words

• **Production**: higher intelligibility (syllable structure, stress patterns, consonants)
  - Production accuracy correlates with lexical accuracy
    (Simonchyk, 2017)
  - For automatized retrieval under constrained resources

• **Listening**: Recognizing words more easily
  - By reducing competition
THREE (PROMISING) DIRECTIONS

PHONO-LEXICAL ACQUISITION

Vocabulary

Connected speech training

Bimodal input: audio + written input

WORD RECOGNITION (listening, processing)
Vocabulary
Acquiring new words

“A lexical entry in the lexicon of the average adult, literate, native speaker contains **semantic, pragmatic, stylistic, collocational, syntactic, categorial, morphological, phonological, articulatory and orthographic** features.” (Hulstijn 2001, p. 259)

Mappings
(Barcroft, 2015)
Retention through elaboration

(Hulstijn & Laufer, 2001, 541-542; Hulstijn, 2001; Nation & Newton, 1997)
Retention through elaboration + repetition

- phonological
- articulatory
- morphological
- orthographic
- syntactic
- semantic
- pragmatic
- stylistic

➢ Reactivation and repetition are needed for automaticity in lexical access

Kimppa, 2017; Nation & Newton, 1997
Effective instruction: dual focus

Repetition in retrieval recycling... of familiar materials

⇒ automaticity

Elaboration Authenticity Communicative, meaning-oriented activities

⇒ transfer

Automaticity + Carryover

= PHONO-LEXICAL ACQUISITION?

www.YouGlish.com
UTube
Picture matching
Word matching...

Gatbonton & Segalowitz, 1988; Trofimovich & Gatbonton, 2006
Connected Speech Training

Whatcha doing?

????

The road toward bridging the gap

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Why connected speech training?

What are you doing?
I can inquire.
Did you eat yet?
I don’t believe him.
We ought to have come.

Ladefoged, A course in Phonetics
(http://hctv.humnet.ucla.edu/departments/linguistics/VowelsandConsonants/course/chapter5)

Gökgöz-Kurt’s Dissertation (2016)

**Treatment:** 4 Experimental classes (N = 33)
- received online training and explicit instruction for 3 weeks (60 mins in total)
- *Between-word palatalization*

**Control:** 4 Control classes (N = 25) did the “normal” curriculum

**Two-option forced-choice perception test**
- Pre-test and post-test
- Max. score = 44.
- All items were different from those in online training modules

They all could **use** [dʒuz] any of these. They all could **choose** [tʃuz] any of these

![Graph showing gains from pre-test to post-test](image)

- Treatment (n = 33)
- Control (n = 25)

![Graph details](image)

2.81

(p = .007)

0.68
Summary

• Online training works!
  o (on an immediate forced-choice perception post-test)
• Connected speech can be taught usefully
  o See also Cauldwell, 2013

More research needed to know if this might generalize to listening in communicative situations

WORD RECOGNITION (listening, processing)
The way she listened was more eloquent than speech.

Laura (Otto Preminger, 1944).

Bi-modal input
Bi-modal input?

• Variation, reductions, connected speech, unfamiliar dialect or accent are challenging (Connine, Blasko, & Titone, 1993; Sumner & Samuel, 2005; Floccia et al., 2006; Ikeno & Hansen, 2007; Tamati, 2014; Schmidt, 2009)

• **Word identification** in continuous speech produced by native speakers, is difficult in L2, even when all individual words are familiar (Brown, 1990)

• The combination of **written + audio** input has the potential to help develop word recognition and segmentation skills by making input more intelligible (Levi, Winters & Pisoni, 2007; Mitterer & McQueen, 2009; Escudero, Hayes-Harb & Mitterer, 2008; Showalter and Hayes-Harb, 2013)
Bi-modal input studies & listening

• Overall positive influence of captioned (vs. non captioned) media on comprehension (e.g. television Teletext captions, Vanderplank, 1988; Markham, 1989; Markham et al., 2001; Winke et al., 2010; Montero-Perez et. al.’s meta-analysis, 2013)

• What about segmentation and word recognition?
  o Written measures; No control group without sound

➤ Is it really because of improved *segmentation* and word recognition skills? Or just due to the fact that they have a text and can read, even without listening?
(More) Research is needed

- Markham (1999) used a *listening* multiple choice
- Charles and Trenkic (2015): improvements due to **better segmentation skills**, and not *just* to the fact that learners were provided with written input
  - Good assessment task for lexical access and segmentation via shadowing (**Mitterer & McQueen 2009**)
  - Good controls (“No sound” group!)
  - Generalization to new utterances and new speakers

Charles and Trenkic (2015): Results

Conclusion: captions helped with segmentation of spoken input, and the effect really is about *spoken input*, not about general comprehension.
2. EXECUTIVE FUNCTIONS AND INDIVIDUAL DIFFERENCES
Executive functions

• Higher-level cognitive skills we use to control and coordinate our other cognitive abilities and behaviors

• **Attention control (AC)** (Segalowitz & Frenkel-Fishman, 2005)
  - Cocktail-party effect
  - **Noticing** (Mora & Gilabert, 2012; Safronova & Mora, 2013)
  - *idea* as [aɪdɪː] or *consequence* as “conSEQUence”
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• **Inhibition skill** (Friedman and Miyake 2004; Lev-Ari & Peperkamp, 2013)
  - Suppress an automatic response, resist interference
  - Reduce L1-based processing
Executive functions and L2 phonology

- Complex relationship

  (Darcy, Mora & Daidone, 2016)

  (Darcy et al., 2015; Trofimovich & Gatbonton, 2006)

  (O’Brien et al., 2007)

  (Gökgöz-Kurt, 2016)

  (Garcia-Amaya, 2012)

- Relationships are multiple, modest (will we ever explain > 20% of variance?), depend on task demands and learning contexts (e.g. Darcy & Mora, 2017) and need further research!

- What about causality relationships? Need the research!
Connected speech processing and attention control

  - Does explicit training lead to gains in connected speech perception?
  - Is there a relationship between students’ gains and their attention control?
    - a) Attention Network Test (ANT) (Fan, et al., 2009, 2013) [conflict effect]
    - b) Speech-Based Attention Switching Task (Mora & Darcy, 2017; Darcy, Park & Yang, 2015) [switch cost effect]

If there is a relationship (more efficient attention control and gains on the listening task), we expect negative correlations.

- more efficient attention control is indexed by smaller values of effect
AGAIN: COOL STUFF
BUT...
Executive functions relate to L2 phonological processing

Higher executive functioning ↔ more accurate pronunciation and phonological processing

Potentially important consequences for teaching and learning pronunciation

Isolated dimensions of phonological systems, not intelligibility

What is the role of executive functions for developing intelligibility?
Do executive functions relate to pronunciation *instruction*?

- Match between learners’ abilities and instruction (*Snow 1989*)
- When learners’ attention is drawn to phonological elements, it helps (indirect evidence). For example:
  - Explicit instruction (*Derwing, Munro & Wiebe, 1998*; *Gordon, Darcy & Ewert, 2013*)
  - Corrective feedback (*Hardison, 2004*; *Saito, 2011*)
  - High variability training studies (*Bradlow et al., 1997*; *Wang et al., 2003*)
  - Heightened phonological awareness relates to higher pronunciation ratings (*Kennedy & Trofimovich, 2010*), and is perhaps driven by phonological memory (*Venkatagiri & Levis, 2007*).

- Supports direct link between attention skills and explicit pronunciation teaching (see previous studies) => but we need the research!
Outline for a road-map

... A DOUBLE AGENDA
We need foundations

- About all aspects of L2 phonology acquisition and processing (see Morley, 1991)
  - Phonological grammar (all areas of phonological knowledge: segments, phonotactics, suprasegments)
  - Mental lexicon, perception, production => intelligibility
  - Listening to reduced and conversational speech
  - Individual differences in executive functions

- About instruction and acquisition (see Morley, 1991)
  - How, what, when, why, and assessment
And the bridge...

• To what extent can instruction actually shape L2 acquisition:
  - help with updating lexical representations?
  - help with word recognition in conversation?
  - facilitate perception development?
  - help automatize articulatory routines?
  - lead to actual transfer and automatization?

• Which kind of instruction can do this, and why/how?
  - how much, how often, and how early?
1. The mental lexicon

Vocabulary instruction includes attention to FORM

Connected speech training

Bimodal input approaches

PHONO-LEXICAL ACQUISITION

WORD RECOGNITION (listening, processing)

WRITING
2. Individual differences

- What is the link between executive functions (EF) and intelligibility?
- Would learners with higher EF-scores benefit more from *explicit* pronunciation instruction? *(Trofimovich & Gatbonton, 2006)* What about others?

Enter the domain of science “fiction”…

- Turning it around: can we **train EF** for some learners? *(Jaeggi et al., 2011 and cognitive training approaches)*
- Alternatively: Can we **tailor instruction** to make it more usable and beneficial for a variety of learners? *(Snow, 1989)*
  - e.g. by having more attention-directing activities for those learners who have difficulties with attention focusing
Let’s keep working!

Grand Canyon, Arizona
Photo by Claire Renaud
THANK YOU!

Isabelle Darcy: idarcy@indiana.edu

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Ryan Lidster
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Joan C. Mora
Vance Schaefer
John Scott
Ala Simonchyk
Chung-Lin Yang

Second Language Psycholinguistics Lab
http://www.iub.edu/~psyling/
REFERENCES


