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PROMINENCE AND INFORMATION STRUCTURE IN PRONUNCIATION TEACHING MATERIALS

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Prominence is marking of particular syllables as salient in English speech. This marking is accomplished by the pitch, duration and intensity of the voice, and is multi-functional in English. Prominence is the target of increasing research both in regard to its form and its functions Prominence is also one of the most commonly taught suprasegmental features included in published pronunciation materials, and it is uniformly seen by pronunciation researchers as critical to intelligibility. The linguistic and pedagogical research on prominence, however, has diverged, and very little theoretical research is reflected in pronunciation teaching materials. This paper examines what current research shows about the form and functions of prominence in English, describes how prominence is represented in teaching materials, and suggests areas of current research that can profitably be applied to teaching materials.

INTRODUCTION

One of the most commonly taught suprasegmental features of English pronunciation is prominence (also known as sentence stress, nuclear stress, tonic, etc.). Prominence is not only commonly taught in pronunciation materials, it is also the subject of a wide range of current research in regard to both its form and its functions. In regard to form, prominence is the use of pitch, duration, and intensity to mark particular words/syllables in an utterance as salient. Functionally, prominence has multiple uses, the most important of which are to mark a default placement on the final content word of a phrase, to mark contrasting information, and to signal new information and given information. The purpose of this paper was to examine how pronunciation teaching materials reflect the findings of linguistic research on prominence and to suggest possible changes to teaching materials to connect them more closely to current findings.

PROMINENCE: FORM, FUNCTION AND PERCEPTION

Prominence – Its form

Prominence refers to the greater strength of a word or a syllable compared to other words or syllables surrounding it within a phonological phrase. In English, for example, some prominent syllables are perceived as more important than others, and they often bear stress accents (Beckman, 1986). Prominence in English can be phonetically marked in many ways. The most common acoustic cues to prominence are fundamental frequency (f0), duration, intensity, segmental clarity, and any combination of these features.

Particularly, prominent words often have salient f0 movements expressing pitch accents (Gussenhoven, Repp, Rietveld, Rump, & Terken, 1997; Ladd 1996; Pierrehumbert 1980; Rietveld & Gussenhoven, 1985; Terken, 1991), increased duration and/or intensity, increased spectral emphasis in the mid and high frequency regions relative to non-prominent words (Beckman 1986; Beckman & Edwards 1994; Cambier-Langeveld & Turk 1999; Cole, Kim, Choi, & Hasegawa-Johnson, 2007; Kochanski, Grabe, Coleman, & Rosner, 2005; Sluijter & van Heuven 1996; Tamburini 2005; Turk & White 1999). Prominent words are also often hyper-articulated, relative to non-prominent words. That is, these words are pronounced more clearly than usual, and as a result they have larger vowel spaces (Baker & Bradlow, 2009).

Prominence – Its functions

Prominence at the phrasal level is often identified with the information structure of the phrase. Specifically, prominent words often introduce information that is new or important to the goal of the discourse, or they may bear contrastive focus (Bolinger 1986). In contrast, words that lack prominence are typically considered given in the prior discourse, or anaphorically recoverable (Schwarzchild, 1999). The relationship between prominence and information structure is typically strong in rightmost prominent words (words that bear nuclear accents) in the phrase (Calhoun, 2006), whereas prominence in pre-nuclear positions seems to depend on other factors, such as those that affect rhythm (Cole, Mo, & Hasegawa-Johnson, 2010).

Prominence – Its perception

There are conflicting answers about which phonetics cues reliably mark prominence. Early perceptual studies of single words by Fry (1955, 1958) suggest that prominent syllables are marked, in decreasing order of importance, by duration, f0, and intensity. Using analyses from laboratory speech, Lieberman (1960) described a system for deducing lexical stress from acoustics. His work suggests that these three cues are similarly important; that is, each cue is a good predictor of prominence. Other studies using laboratory speech have yielded varying results. For example, perceptual studies by Gussenhoven et al. (1997), Rietveld and Gussenhoven, (1985), and Terken, (1991) found that f0 bumps in synthesized words were perceived as prominent. Beckman (1986) found that prominence substantially correlated with a combination of intensity and duration. Lastly, the synthesis experiments by Turk and Sawusch (1996) suggested that duration and intensity are perceived together as a single percept, although the results of their rating scale experiment indicated that intensity does not significantly contribute to perceived prominence.

Experiments using natural speech (e.g., spontaneous speech) have found that f0 plays a relatively minor role in prominence perception. For example, in Silipo and Greenberg (1999, 2000), two trained linguists agreed, when asked to manually mark prosodic stress in spontaneous American English discourse, that intensity and duration played the major role in marking prominence and that pitch of vocalic nuclei played only a minor role. Similar results were found in another corpus study by Kochanski et al. (2005) which examined how prominence is acoustically marked in speech in a database covering several dialects of British and Irish English and three speech styles. It was found that speakers generally did not use f0 to distinguish prominent syllables from other syllables

within an utterance. Instead, prominence was primarily marked with intensity and duration.

Acoustic features related to prominence perception interact with other factors related to pragmatics and discourse, making it difficult to precisely specify how prominence is phonetically marked. For example, words from sparse lexical neighborhoods are often phonetically reduced compared to those from dense lexical neighborhoods (Munson, 2007; Wright, 2004). Moreover, words preceded by a highly probable context are more phonetically reduced than the same words in a less probable context (Lieberman, 1963). The classic example is the word *nine* in *a stitch in time saves nine* and *the number that you will hear is nine*, where the target word is preceded by a more probable context in the first sentence. Third, high frequency words in a language tend to have less salient f0 marking, reduced duration and intensity, and decreased vowel formant dispersions relative to low frequency words (Aylett & Turk 2004; Bell, Jurafsky, Fosler-Lussier, Girand, & Gregory, 2003; Fossler-Lussier & Morgan 1999; Gregory 2002; Ito, Speer & Beckman 2004; Munson 2007; Watson, Arnold & Tanenhaus 2008; Wright 2004).

Furthermore, a word's phonetic realization tends to be reduced on its second or subsequent mention (Baker & Bradlow, 2009; Fowler & Housum, 1987). While earlier studies suggest that second mention reduction might be induced by a word's discourse-given status (Bard, Lowe, & Altmann, 1989), recent research (Baker & Bradlow, 2009) suggests that the second mention reduction may also occur when the apparent second mention does not have the same referent as the first mention, indicating that second mention reduction is not purely semantically motivated. The effects of lexical frequency and previous mention may not only occur in the acoustic signal but also in the listener's mind. Cole et al. (2010) found that listeners tended to rate low frequency words as prominent even when these words lacked the necessary acoustic cues for prominence (in their study, increased duration and intensity).

INFORMATION STRUCTURE IN TEACHING MATERIALS

In English pronunciation teaching materials, prominence is typically presented as a required element of prosody. The form involves marking a syllable in a phrase as more prominent than other syllables. Prominent syllables are typically said to occur once (and sometimes more than once) within each spoken phrase. In regard to pitch, a prominent syllable is usually represented with a pitch excursion up or down from the pitch line, as in (1) and (2). In (1), the stressed syllable of the final word has a jump in pitch (the prominent syllable). This is followed a fall in pitch to the end of the sentence. In (2), the utterance has the same prominent syllable, but it starts at a relatively low pitch before rising to a high pitch on the last syllable.

(1) I'm going to Argen **TI** n a.

(2) You're going to Argen **TI** n a?

In (1) and (2), prominence is in the default position for English, that is, on the stressed syllable of the last content word in the phrase. Up to 90% of English phrases in spontaneous spoken language have prominence in this position (Crystal, 1969). Prominence placement may deviate from the default position in a number of sentence structures because some information is not expressed in the phrase. In (3), prominence (marked in CAPS) is not on the final content word because the sentence ends with a time-adverbial (Allerton & Cruttenden, 1979; Dickerson, 1989).

(3) He's GOing soon.

Perhaps the most commonly taught non-final placement of prominence is when prominence signals the information structure of discourse. This function of prominence includes two aspects of the system. First, a word or syllable is marked as prominent because it is new information. Second, and equally important, final content words may be non-prominent when they are no longer new, that is, when they are given.

The identification of new and given information is typically presented as being straightforward, with lexical items that were previously new being repeated (and so becoming given). Other lexical items that were not previously in the discourse then presented as new, and are thus identifiable through their prominence. An example of this is found in (4), from Grant (2012, p. 114).

(4) A. Let's continue our discussion of polLUtion. / B. YESterday / C. we deFINED pollution. / D. ToDAY / E. we'll talk about the IMpact of pollution / F. its far-reaching efFECTS. / G. Many people think pollution is just a problem for SCIentists / H. but it's NOT just a problem for scientists. / I. It affects EVeryone. / J. Because it affects human LIVES, / K. it's a HEALTH problem. / L. Because it affects PROperty, / M. it's an ecoNOmic problem. / N. And because it affects out appreciation of NAture, / O. it's an aesTHEtic problem."

In (4), we see a constructed paragraph to show how prominence (in CAPITAL letters) highlights new information and how lack of prominence on final content words can signal that the lexical item can mark information as given. For example, the word *pollution* is marked with prominence in phrase A. In A, *pollution* is phrase final and there is no reason to mark anything else as prominent because it is the first phrase. In C and E, *pollution* is again phrase final but is not prominent. *Pollution* has become given information, and prominence marks the new information, the next to last content word (*deFINED* and *IMpact*). Another example of a lexical item starting as prominent and then becoming non-prominent is the word *PROBlem* in phrase G. The word is repeated in H, K, M and O, three times as the last content word. But in each case, *problem* does not receive prominence because it is given information.

Prominence and information structure in pronunciation teaching materials

When considering texts like that found in (4), the Given/New distinction seems straightforward at first glance. The cognitive challenges of identifying Given/New in constructed texts is passed over, and the even greater cognitive challenges of making use of prominence to express information structure in spontaneous speech is almost never addressed. (Levis, 2001; Levis & Grant, 2003). The ways that L2 learners are taught about information structure raise several concerns.

- *Prominence is multi-functional in English and does not simply mark New and Given information*. Because prominence may also be used to call attention to contrasts (Levis & Muller Levis, 2018), to correct misinformation and to emphatically agree (Grant, 2012), L2 learners may struggle to distinguish other functions of prominence from prominence's role in marking information structure.
- *Information structure is not always as clear as constructed passages suggest*. New information placement overlaps with final content word placement because new information is often on the final content word due to grammatical elision, e.g., *I lost my umBRELla. What KIND?* (*What kind* has prominence on the final content word, but is short for *What kind of umbrella did you lose?* The missing words after *KIND* are understood from the original question.)
- *Lexical repetition does not always involve the same words, and lexical items that refer to the same thing are not always marked as given*. Information that is not lexically identical may be considered given because of its understood relationship to the original word (e.g., *Did you buy the CAtamaran? No, I had to get a SMALler boat*.) On the other hand, related words may be presented as different from the initial mention (e.g., *Have you even flow in an AIRplane? Sure. Last month, I went to Europe on a large JET.)*
- *Teaching students to recognize new and given information is difficult*. The cognitive aspects of such decisions, especially in longer or spontaneous texts, seems to assume native speaker competence in interpretation (Levis, 1999).
- *Teaching the pronunciation of information structure is easiest when using a prewritten text and when using clearly defined rules*. Although this type of pronunciation practice can be effective in the short run, it does not necessarily last (Hahn, 2002) or transfer to spontaneous speech.

As an illustration of how simplifying information structure for pronunciation teaching can actually make the topic quite complex, Table 1 shows how informational stress (Given-New) is taught in one pronunciation book (Reed & Michaud, 2005, p. 127). The explanation mixes several functions together and talks about words being prominent because they are important, an unexplained evaluation, rather than because they are final. The explanations also conflate the typical prominence on content words and the less common prominence on function words, the use of prominence for contrasts, and finally, conflates new information and contrast without explaining what is being contrasted.

When do you use informational stress?	
Dialogue	**Explanation**
A: Where's the book?	The content word "book" is the most important word in this question. It receives standard sentence-level stress.
B: The book's on the counter	The word "book" is now old information, so the content word "counter"-the new piece of information-is stressed (informational stress).
A: Next to the paper?	The content word "paper" is the most important word in this question. It's new information. Notice that the stressed words in all the examples so far have been content words. Usually the most important word in a sentence is a content word. However, this isn't always the case.
B: No, *under* the paper.	Here, the most important word is the preposition "under" (a function word) because it's a new piece of information and because it contrasts with "next to."
A: I've already looked under the paper.	The content word "looked" is the new piece of information. "Looked" receives informational stress.
B: Well, look *again*	Now the word "look" is old information. The word "again" is stressed because it is the new piece of information and it's contrastive.

The relationship of the default placement of prominence on the last content word, and the use of prominence to mark new information occurring on the last content word is sometimes addressed by pronunciation textbooks, but there is usually be no clear explanation about why the same prominence placement has two different explanations, as in the examples in (5) and (6) from Lane (2005, p. 166). The example also does not show new information that is not at the end of a sentence. This requires language learners and teachers to provide such information on their own. If they do not understand the system, however, this may prove impossible.

(5) Beginning a Conversation: When you begin a conversation, you often highlight the last content word.

What did you do on the WEEKend?

(6) Highlighting New Information: New information is often presented in the last content word of a sentence.

(What did you do on the WEEKend?) I went DANcing.

Some textbooks try to be more systematic in explaining new information, but in doing so they may increase cognitive complexity, as in the examples in (7)-(9) from Dauer (1993, p. 231). Dauer explains what is meant by new and old (given) information

Pronunciation involves both cognitive and procedural knowledge

SENTENCE STRESS ON NEW INFORMATION

Sentence stress is also moved to separate new information from old information. Old information is what the speaker assumes the listener already knows, either because it was just mentioned in a previous sentence or because it is part of the physical situation. Sentence stress will fall on the new information. If the old information is repeated, it will not receive sentence stress. In the following examples, the same meaning can also be expressed by using auxiliaries, omitting the old information, reordering the sentence, or using pronouns.

(7) A: Who borrowed my eraser?

B: I borrowed it. (== I did.)

I is new information, not known by A; *borrowed it* is old information.

(8) A: I bought a new car.

B: What **kind** of car did you buy? (== What kind?)

(9) Teacher: This is a difficult test. (== This test is difficult.)

The teacher has the test in her hands, so it's known or old information.

Simplifying to make information accessible often involves assumptions about whey certain types of lexical items are prominent while others are not, as in (10) from Gilbert (2012, p. 60) in which new information is described as marking a new thought, as though each lexical item represented a thought. Additionally, there is now clear statement of why *KIND* is new in B: but *of* is not.

(10) After a conversation begins, any word can become a new thought (the new focus of information).

A: I lost my HAT. ("Hat" is the last content word. It is the focus of the sentence.)

B: What KIND of hat? ("Kind" is now the focus. It is the new thought, and "hat" is an old thought.)

A: It was a RAIN hat. ("Rain" is now the focus. It is the new thought.)

In (11), the difficulty of representing new information can be seen in the use of words within the same lexical set, in this case, money and dollars, which is clearly a synonym for money within an American English context, yet is described as representing new information (Miller, 2000, p. 71).

(11) Use focus to highlight new information. Stress the word that gives the new information.

A: I need to borrow some **MO**ney. ("money" is new information)

B: How **MUCH** money? ("money" is now old information)

A: Well, not **TOO** much money. ("much" and "money" are both old information)

B: I have about ten **DOL**lars. ("dollars" is new information)

A: I was hoping to borrow **TWEN**ty dollars. ("dollars" is now old information)

SUGGESTED CHANGES FOR MATERIALS

Prominence is considered by pronunciation researchers as a critical feature for intelligibility (Hahn, 2004; Jenkins, 2000), especially in relation to prominence's function in marking information structure. However, current pronunciation materials, in their desire to make new and given information accessible to L2 learners, often simplify in ways that do not reflect what research tells us about prominence. In this section, we suggest directions for changes in pronunciation materials that can make current insights into prominence and its role in signaling information structure. Here we present four suggestions for connecting pronunciation teaching practices more closely to research.

1. Use real spoken data (and longer texts) to help learners perceive prominence in speech and to help learners work out patterns

This recommendation is to use not only constructed texts in teaching new and given information, but asks us to also make use of authentic spoken texts. L2 learners, especially at higher proficiency levels, can analyze such texts to cognitively engage with how speakers construct discourse and highlight particular words and syllables to communicate their message.

2. Describe how to identify "information", what makes something "new" or "given", and the relationship of new information to the default pattern

Information or thoughts are implicitly associated with particular lexical items in discourse, but materials often assume L2 learners will be able to apply example texts to

new texts and to spontaneous speech. This is not accurate. While the pronunciation of prominence may be quite teachable (Levis and Muller Levis, 2018; Pennington & Ellis, 2000), the cognitive aspects of prominence placement are far more difficult and cannot only be addressed in relation to perception and production.

3. Explicitly practice given/old information

Marking new information is often taught as the only important function of prominence, but equally important is the marking of given information. While new information is marked as phonologically salient, given information must be backgrounded both to avoid calling attention to it and to contrast with the salience of the prominent syllables. Our experience has been that L2 learners can mark words associated with new information as prominent but that following words associated with given information are also marked as prominent rather than being deaccented. Almost no pronunciation teaching materials explicitly teach deaccenting of given information despite its importance in the prosodic shape of an utterance.

4. Include exercises to fill out the communicative framework for teaching pronunciation (Celce-Murcia et al., 2010) to encourage moving beyond controlled production to cognitive understanding of information structure.

Pronunciation teaching involves varied activities and exercises to address the complex and interrelated skills involved in L2 learning. L2 learners, especially adult learners, need cognitively oriented explanations of the pronunciation feature and how it functions, practice hearing and interpreting the feature, and training and rehearsal in producing the feature with and without attention to communicative meaning. In Table 1, we use the five-part communicative teaching framework of Celce-Murcia, Brinton and Goodwin (2010) to suggest possible changes to the way we teach prominence and information structure.

Table 1

What is Currently Available in Textbooks and What is Needed

Communicative Pronunciation Teaching Stages	Evaluation of current materials
Explanation/Analysis	Current: Often inadequate, with poorly described rules. Needed: Descriptions of patterns that reflect to complexity of information structure, and how information structure is related to other functions of prominence.
Perception	Current: Simple listening only with no perception training (e.g., identify prominent words in a spoken text).

	Needed: Better perception activities using multiple voices. Use of authentic speech that demonstrates information structure. Discussion exercises allowing L2 learners to discuss and interpret meaning.
Controlled production (strong focus on intonation form, e.g., read aloud)	Current: This stage dominates practice activities related to prominence. Needed: More practice on marking prominence and deaccenting given information. Practice using delayed repetition exercises rather than simple reading aloud. The goal here is to build automaticity of production.
Guided production (some focus on meaning required along with some focus on intonation form, e.g., simple information gap activities)	Current: Rare in published materials Needed: More exercises that allow learners to practice the form of prominence while also paying attention to meaning in their practice. This would involve activities such as simple information gap and role play exercises.
Communicative production (focus on meaning dominates, e.g., discussion or debate)	Current: Rare in published materials Needed: Activities that allow free expression but that also require learners to express new and given information, such as presentations or debates. These can be recorded and used for analysis before repeating the activity.

CONCLUSION

The use of prominence to signal the information structure of discourse is a critical aspect of communicative ability in English. It is also a cognitively challenging aspect of speech for L2 learners who may not understand either the pronunciation or the functions of prominence. We suggest that more effective teaching of this feature must take into account non-pedagogical research on prominence and on information structure.

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