English Phonetics and Phonology

BBI 3202 (Unit 1-9/9)
Program Bacheler Pendidikan

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disediakan dalam bentuk bahan pengajaran dan pembelajaran kendiri di bawah program Pendidikan Jarak Jauh, Universiti Putra Malaysia. Sebarang pertanyaan dan cadangan untuk memperbaiki gaya penyampaian dan isi kandungan modul ini bolehlah dikemukakan kepada penulis dengan menggunakan alamat penerbit.

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This one hour examination will be a mixture of multiple choice and short answer questions, covering essentially Chapters 1-6 of the text and Units 1-5 of the module. It will make up 20% of your total points for the course.

**The Final Examination**

This one hour examination will also be a mixture of multiple choice and short answer questions, covering essentially Chapters 7-10 of the text and Units 4-9 of the module. It will make up 30% of your total points for the course.

**Required text and references**

The text for the course is:


You are encouraged to use any other references at your disposal, especially when doing the assignments. I have included some below.

**References**


Pennington, M. C. 1996 *Phonology in English Language Teaching*. London: Longman.


**How to Use the Required Text**

At the beginning of each unit of the module, you are assigned pages from the text to read. Do this first before you go to the module. It is important that you do the readings as examination questions will be based on the text and the module. At the end of each chapter in the text are exercises. You are encouraged to answer these and discuss them during your tutorials.
INTRODUCTION TO THE MODULE

The module is made up of 9 units, which essentially cover pertinent areas of the course: how sounds are made, description of consonants and vowels, sound changes, patterns of sounds and supra-segmentals. It is actually a compilation of notes taken from various sources, a necessary arrangement as some topics are covered excellently in one book while another may give a better account of other topics. The module is to supplement what you already know about the subject and what you are going to read in the required text. Therefore, as you go through the module and the text, always try to synthesize the information given so that you can better understand the whole course.

How to Use the Module

The module is divided into topics, which are also covered in the required text. However, you will find that some topics are not satisfactorily covered. In these instances, concentrate on the module and refer to other sources at your disposal.

Outline of the Module

Unit 1  Speech, Language and Communication
Unit 2  Physiological Phonetics: The Organs of Speech
Unit 3  Acoustic Phonetics: The Physics of Sound
Unit 4  Articulatory Phonetics: Consonants
Unit 5  Articulatory Phonetics: Vowels
Unit 6  Phonological Processes: Sounds in Contact
Unit 7  Phonology: The Patterns of Sound
Unit 8  Phonotactics
Unit 9  English Prosody: Stress and Intonation

Study Schedule

In distance learning, proper time management and establishing an effective study schedule are paramount to success. So, I have provided below a general schedule of study, which you are free to rework according to your needs. I hope it will be helpful.
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<tr>
<td>Final Exam</td>
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**A Last Reminder**

As you will discover, the nature of this course requires you to mainly identify, define and describe, all of which needs a certain amount of reading and memorizing. Although this may appear easy enough to accomplish, do not be misled. There is a lot of information to be comprehended and stored. I would also like to reiterate that the module is supplementary. You are therefore advised to synthesize all information available to you and arrange it in some form or order most convenient to you in order to achieve the objectives of the course. In other words, you cannot (and should not) leave your reading or studying to the last minute and only read either just the text or the module. You are expected to read, relate and adapt the information into one complete whole. And this requires you being in control of your learning. Good luck!
INTRODUCTION TO THE WRITER

Background information

Sharifah Zainab Syd. Abd. Rahman was formerly a lecturer with the English Language Department, Faculty of Modern Language Studies, Universiti Putra Malaysia. She is currently Head of Programme (TESL) at IDEAL. She holds a B.A. in Secondary Education from Wichita State University, Kansas and an M.A. in TESL from the University of Illinois at Urbana-Champaign. She was with the Department for ten years and has taught BBI 330 Speech Development, BBI 354 The Teaching of Aural-Oral Skills and PBI 330 TESL Methodology courses for the B. Ed. (TESL) programme and BBI 3202 English Phonetics and Phonology and BBI 3403 Speech Communication I courses for the B.A. (English) programme at UPM. Her areas of interest and research are linguistics, aural-oral skills and communication.

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SPEECH, LANGUAGE AND COMMUNICATION

Objectives

At the end of this topic, you should be able to

1. define speech and language
2. discuss the relationship of speech to language
3. define phonetics and phonology

Reading

Davenport Chapter 1 (pgs. 1-6)

Introduction

Before we go into the specific areas of phonetics and phonology, it is best that we step back and look at speech in general and its place in language and communication. This is important, especially when we consider and decide on the place of pronunciation teaching in language learning and teaching.

1. One of the attributes that makes us human and differentiates us from the other animals is the ability to communicate or exchange information, both simple and abstract. A normal human being achieves this mainly through two mediums: speech and writing.

2. Speech is the primary means of communication. It is also the most natural. Through biological evolution and intellectual development, vocalizations or animal cries have developed into
a sound signal system of high complexity and flexibility in meaning.

3. A normal child will first listen to linguistic sounds around him or her (e.g. elders' talk). Then he or she, because of the inborn need to communicate, will begin to imitate these sounds. This is the start of speech. From this stage onwards, the child will rapidly acquire the vocabulary and grammar of his or her native language. Even so, it will take a few years (i.e. till puberty) before the whole system (lexical, syntactical, phonological and morphological) is fully acquired.

4. The learning of another or second language, usually after puberty, will be difficult because it is not based on the immediate need to communicate (as with the native language) and is subjected to interference from the acquired native or first language system.

5. A first language is therefore naturally acquired while a second language involves conscious learning.

6. Writing is the visual representation of speech and is learned later in life. The written form is originally an attempt to signify the spoken language. There are still many cases of illiteracy in the world today and most people find writing quite difficult. For example, I am sure that we have all experienced 'writer's block' when writing that assignment or that letter that never went beyond the salutations but turned into an hour long telephone conversation instead! And a reference text is usually easier to understand after you have listened to the lecture. It is clear, from the above points, that speech precedes writing for both the individual and the community.

Question

(a) What is speech and what is writing?
7. This fact is often forgotten and the written form is often taken as the standard against which the spoken form is measured. As a result, writing may be responsible for changes and restraints in pronunciation. A good example of this is English, where there is a poor sound-symbol correspondence (or in simple terms, the spelling of English words does not tell us how they should be pronounced). This is one of the oft quoted reason why L2 students find it difficult to pronounce English words.

8. Whether we communicate through speech or writing, we use language. The possession of language is unique to humans. But what is language?

9. Language is "a systematic way of relating symbols to things or concepts symbolized, and such a system is common to all the peoples in the world".

10. An analysis of language reveals the presence of a system, which is rule-governed and unconscious. In other words, we are never conscious of why we say something is ungrammatical; we just know it is so! All these rules are commonly known as the grammar of a language.

11. All human beings have this internal grammar of their native language in their heads and, although unaware of doing so, they use it when they speak and write to produce grammatical sentences. This is termed by linguists as descriptive grammar. A more common use of the word grammar is prescriptive grammar, which is what grammarians or grammar teachers tell us to do and not do with respect to language.

12. Speech, being the primary and more natural medium of communication, is the basic manifestation of language (i.e. when we speak, we are showing our knowledge of the system or grammar we have in our heads). With respect to phonology, this include our knowledge of the rules of phonetics i.e. the sounds found in the language, the possible combination of sounds, how to produce the sounds etc.
13. Speech and language are not one thing; speech is the most basic way we realize language. We cannot open up a person's head to analyse language. The only possible way to do so is to study speech and writing, i.e. instances when language is used and produced. It follows then that an examination of spoken English should be based on, among others, the sounds of the language.

14. An analysis of the spoken form will show two levels. At one (concrete) level is the infinite number of speech sounds that can be produced e.g. we know that it is impossible to produce the same vowel sound in the word cat if we say the word ten times. We know that the sound will differ slightly every time we say the word. In fact, instrumental measurement has shown that the sounds are indeed different. Yet, for all the variation, we still identify the word we hear as cat. This is the other (abstract) level i.e. we seem to agree that, within a certain range, we will take the sound we hear as that vowel sound in the word cat regardless of how different it is when measured. We seem to have agreed to reduce the infinite variation/number of sounds we are able to produce to a manageable few.

15. The first level deals with sounds in relation to speech. This is the concrete (phonetical) level as all the sounds can be measured i.e. in terms of how to produce etc. The second level deals with sounds in relation to language. This is the abstract (phonological) level as each sound identified as a sound found in the language is, in actuality, a collection of approximate sounds that has been considered to be that individual sound (refer to the discussion above).
16. The sound or phoneme of a language, therefore, has two levels of analysis: (a) phonetically i.e. physical characteristics of the sound e.g. how it is produced etc. (b) phonologically i.e. pattern, distribution and combination of the sound etc.

17. In simple terms, we can say that phonetics is a narrow/specific study of speech sounds i.e. the organs of speech, the production of speech sounds, the transmission of speech sounds etc. (these are the sub-sections of phonetics) while phonology is a broad/general study of the possible sounds in a language and how they can be combined. For example, phonology involves differentiating between phonemes while phonetics will involve identifying variations of one phoneme i.e. allophones. Phonetics then is a part of phonology.

Question

(c) With respect to speech, how can we analyse language?

18. Physiological phonetics is the study of the anatomical organs involved in producing speech sounds.

19. Acoustic phonetics is the study of the physical properties of speech sounds i.e. loudness, pitch, resonance etc.

20. Articulatory phonetics is the study of the human speech production mechanism i.e. how the sounds are made.

Conclusion

The notes above and your assigned reading should give you a fairly clear picture of what constitute language and speech. We
can see that phonology is a basic part of any language and that a study of language cannot but include a study of phonetics and phonology because it makes up a part of the internal grammar of every individual. When we learn a new language, we must learn its sounds, among other things. It follows then that the teaching of the sounds are also important. In our case, the language under analysis is English, a language you are currently teaching or will be teaching. If you have been questioning why you need to take such a subject, I think you can now begin to understand the answer. You must have mastery of the phonetics and phonology of English in order to teach it.

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**Answers**

(a) *Speech is the primary medium of communication and it is learned early in life.*

   *Writing is the visual representation of speech and it is learned later in life, usually in school.*

(b) *Speech shows a rule-governed system in the sounds that can be made and in the distribution of the sounds. Each language is represented by a certain group of sounds and sound combinations.*

(c) *Speech is the basic manifestation of language. To analyse language, we must analyse speech, i.e. the possible sounds and sound combinations etc. In other words, we must analyse its phonetics and phonology.*
2

PHYSIOLOGICAL PHONETICS: THE ORGANS OF SPEECH

Objectives

At the end of this topic, you should be able to

1. describe the airstream mechanisms
2. identify and describe all the organs of speech
3. discuss the significance of the topic to the teaching and learning of pronunciation

Reading

Davenport  Chapter 2 (pgs. 7-16)

Introduction

When discussing how sounds are made, there are two important elements that must be included: the airstream mechanism and the organs involved in producing speech sounds.

The Airstream Mechanism

1. For speech to be possible, there must first be movement of air, which is known as the airstream. This may be either incoming (ingressive) or outgoing (egressive).

2. English and most other languages use an egressive airstream i.e. English speech sounds are made with the air going out. The only instance that English uses an ingressive airstream is when
speech is produced during strenuous exercise or talking excitedly while out of breath.

3. The airstream can be initiated at three places. First, at the lungs. An airstream initiated by the lungs is known as pulmonic. All languages use pulmonic air for speech sounds; some languages also use other airstream mechanisms. English therefore uses a pulmonic egressive airstream. Second is an airstream initiated by movements of the larynx. This is known as the pharyngeal/glottalic airstream. Lastly is the airstream initiated by the tongue, which is known as the velaric/oral airstream (refer to Figure 1).

4. The most usual source of energy for speech production is an airstream expelled from the lungs (pulmonic). Utterances are therefore dependant on and shaped by the capacity of the lungs and the muscles of the rib cage.

Questions

(a) What is an airstream mechanism?
(b) Where can the airstream originate from?
(c) Why is an airstream mechanism important?

The Speech Organs

5. The organs involved in producing speech sounds can basically be divided into three groups (following the movement of air from where it originated, i.e. the lungs): the subglottal organs, the larynx, and the supraglottal organs.

The Subglottal Organs

6. These are organs below the larynx/glottis and situated in the chest cavity. They consist of the bronchi, diaphragm and
Intercostal muscles. Together, these organs act as initiator of the air stream for the production of speech sounds.

7. Below the larynx, the trachea branches into the two bronchi which lead to the two lungs.

8. The intercostal muscles control the movement of the rib cage and the flow of air in and out of the lungs.

9. The diaphragm is a wall of muscle separating the abdominal cavity from the chest cavity and helps regulate the inhaling and exhaling of air.

Question

(d) Why are the subglottal organs important for speech production

The Larynx

10. Also called the Adam's apple or the voice box, the larynx is situated at the upper end of the trachea, below the pharynx. It is here that sound is produced.

11. Within the larynx are the vocal folds (or vocal cords), a pair of muscular bands that controls the passage of air to and from the lungs.

12. The front ends of the vocal folds are attached to the thyroid cartilage (Adam's apple) and the back ends are attached to the arytenoid cartilages, each of which can swivel and stretch the vocal folds (refer to Figure 2).

13. This movement of the arytenoid cartilages, either for respiration or speaking, causes the vocal folds to move apart or
come together. When the vocal folds are apart, the space in between is known as the glottis (refer to Figure 2).

14. Many speech sounds are produced with the vocal folds phonating/vibrating. This means that pressure of the air from the lungs forces the vocal folds to open and then shut again. When repeated many times, this produces a buzzing sound. Speech sounds made with the vocal folds vibrating are called voiced sounds while those made with the vocal folds apart (i.e. not vibrating) are known as voiceless sounds.

15. In speech, the valve function of the vocal folds has been adapted in basically three ways. First, the vocal folds may be tightly closed, with lung air pent up below it, producing a glottal stop [ʔ]. Second, the vocal folds may be wide open as in normal breathing or when producing voiceless sounds. Lastly, the vocal folds may be vibrating, i.e. they are brought sufficiently close together that they will open and close due to the air pressure from the lungs, thus producing voice or phonation. This is the most common function of the vocal folds in speech production. In men, the vocal folds may open and (vibrate) between 100 to 150 times per second while in women, the rate is between 200 to 325 times per second. This gives us our normal pitch. We can, within limits, control the rate of vibration and thus change the pitch of our voice. In addition, the amount of air that escapes at each opening of the vocal folds can also be modified. This will affect the loudness of the sound produced.

16. The larynx is used in two other ways apart from producing speech sounds. First, when swallowing, the epiglottis will cover the larynx and the vocal folds come together. This prevents food or liquid from entering the trachea. Second, in strenuous upper body muscular activity (e.g. lifting a heavy object), the larynx help the rib cage from collapsing. Many upper body muscles are anchored to the rib cage. When these muscles are used, they strain against the rib for support. If the vocal folds are not tightly shut, such a strain will force air out
of the lungs and the rib cage would collapse, reducing the strength of the muscles (you can try this by trying to speak while lifting a heavy object).

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**Question**

(e) What is the larynx?

(f) How can the vocal folds be adapted?

(g) Why is the larynx important in speech production?

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**The Supraglottal Organs**

17. These are organs situated above the larynx, in three cavities which make up the vocal tract. These organs are responsible for modifying and moulding the airstream as it leaves the larynx, thus producing the various speech sounds.

18. The cavities (pharyngeal, oral and nasal) are known as the resonating cavities, so called because they add resonance to the sounds produced as the air passes the vocal folds and is further modified.

19. The oral cavity can be modified greatly in size and shape by movements of the jaw and tongue. The nasal cavity can be opened or closed by movements of the soft palate/velum (either lowered or raised), affecting the quality of speech sounds made. The pharyngeal cavity is situated at the back of the mouth, from the epiglottis right up to the raised velum. It is a long chamber and its shape and volume may be modified by movements of the back of the tongue, the velum, and the larynx. It is involved in the production of certain English vowels.
20. Following the airstream as it leaves the vocal folds, we will find that right above the larynx is the epiglottis, which functions as a cover for the glottis during swallowing and to guide food into the esophagus and on to the stomach.

21. Next is the pharynx, which is the area behind the root of the tongue. Some languages, such as Arabic, have pharyngeal sound.

22. Going further up, we will meet the velum/soft palate. It is the soft part of the roof of the mouth (you can feel it if you arch your tongue backwards and upwards) and ends with the dangling uvula. Here, the airstream is effected in one of three ways.

23. First, the velum may be lowered, as in normal breathing, and the air can escape through the oral and nasal cavities. Sounds produced this way are the French nasalized vowels. Second, the velum may be lowered but there is a complete obstruction of the airstream somewhere in the oral cavity. The air can only escape through the nasal cavity. In English, this produces the nasal consonants. Lastly, the velum may be raised, completely blocking passage to the nasal cavity, and the airstream can only escape through the oral cavity. Sounds produced are called oral sounds and all English sounds, except for the nasal consonants, are produced this way.

24. If the velum cannot be raised due to some abnormality or there is an abnormal opening in the palate/roof of the mouth (cleft palate), then air will invariably escape through the nasal cavity and all sounds produced will be nasalized, making speech quite unintelligible (in severe cases). I am sure we have
all met individuals who sound as if they are perpetually having a bad cold. Now you know the reason!

25. Next is the palate/hard palate, also known as the roof of the mouth. It extends from the alveolar ridge to the velum. Sounds made in this region are known as palatal sounds.

26. Moving along with the airstream towards the lips, we come to the alveolar ridge. This is the ridge directly behind the upper front teeth (you can feel it with your tongue). Sounds made here are known as alveolar sounds.

27. The airstream now passes the most flexible, moveable speech organ - the tongue. When the tongue is at rest, with its tip behind the lower teeth, the part that lies opposite the palate is called the front and that which faces the velum is known as the back. The part facing the pharyngeal wall (and can't be seen) is called the root. The tapering section facing the alveolar ridge is known as the blade and the extreme end is called the tip (refer to Figure 3). It is the tongue, together with the lips, that will considerably affect the shape and size of the oral cavity, thus modifying the airstream and sound produced.

28. Next is the teeth. In speech production, it is the upper teeth that are more involved. Sounds involving the teeth are known as dental sounds.

29. Lastly, before the air is finally released, it passes the lips. These may be used to close the oral cavity for certain consonants and may be rounded for some vowels. Sounds utilizing the lips are called labial sounds (bilabial when both lips are involved).

Questions

(l) What are the supraglottal organs?
(l) Why are they important in speech production?
Conclusion

In this chapter, we have looked at the origin of the airstream responsible for speech production and the organs that modify this airstream on its way out of the lungs. The subglottal organs function as initiator of the airstream, the larynx provides the vibrating mechanism to change the airstream into sound, and the supraglottal organs act as the principal articulators, where the airstream is modified and moulded to form the various speech sounds.

Knowledge of the airstream mechanism and speech organs is crucial in teaching the sounds of a language. For example, when teaching the sounds of English to your students, it helps to know where to place the tongue, what to do with the lips, how to breathe and make the voice louder etc, as you will be able to improve your articulation and help your students articulate better. You may even be able to diagnose speech problems (e.g. nasality) as not a problem of style but one with a biological basis (e.g. cleft palate) and so propose proper treatment.

With respect to the organs of speech, the description of any sound should include:

(i) origin and direction of the airstream
   - pulmonic, pharyngeal/glottalic, velaric
   - egressive, ingressive

(ii) state of the vocal folds
   - vibrating (voiced)
   - not vibrating (voiceless)

(iii) the position of the velum
   - lowered (nasal)
   - raised (oral)

(iv) the position of the lips and tongue
   (articulators)
Answers

(a) An airstream mechanism is the movement of air for the production of speech sounds. It could be ingressive or egressive.

(b) An airstream can be initiated at the lungs (pulmonic), the larynx (pharyngeal) or the tongue (velaric).

(c) An airstream mechanism is important because without air, there cannot be any speech sound.

(d) The subglottal organs are important for initiating the airstream for speech production.

(e) The larynx is a pair of muscular bands that controls the passage of air to and from the lungs.

(f) The vocal folds can be adapted in three ways. They may be tightly closed, wide open or vibrating.

(g) The larynx is important in speech production because it is responsible for initiating speech sounds through vibration of the vocal folds.

(h) The cavities are important because they function as resonating chambers, making the speech sounds louder.

(i) The supraglottal organs are speech organs located above the larynx and they include the pharynx, velum, palate, alveolar ridge, tongue, teeth and lips.

(j) The supraglottal organs are important in speech production because they are the principal articulators, i.e. they modify the airstream as it leaves the larynx, thus producing different sounds (e.g. English consonants and vowels).
<table>
<thead>
<tr>
<th>Pulmonic (Lungs initiate)</th>
<th>Pharyngeal (Glottalic) (Larynx initiates)</th>
<th>Velaric (Oral) (Tongue initiates)</th>
<th>Esophageal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Egressive Usage</strong></td>
<td>Universal; all languages have pulmonic sounds. With rare exceptions, it is the only airstream mechanism used in English and other European languages.</td>
<td>Rare. Some consonants in some African and Amerindian languages.</td>
<td>Used by most laryngectomees, but not in any natural language.</td>
</tr>
<tr>
<td><strong>Mechanism</strong></td>
<td>Air is forced out of the lungs by diaphragm and intercostal muscles. Voicing possible. Cannot be used by laryngectomiee.</td>
<td>Air is forced out of the pharynx by raising of the larynx with closed vocal folds.</td>
<td>Air is forced out of oral cavity by action of tongue against velum. Voicing is theoretically possible with normal larynx, but this mechanism is not used by anyone with a normal larynx.</td>
</tr>
<tr>
<td><strong>Ingressive Usage</strong></td>
<td>Rare. Usually a variant of the egressive pulmonic airstream, used when speaking excitedly while out of breath. Sometimes used by deaf (and some normally hearing) children.</td>
<td>Rare, though more common than egressive pharyngeal. Some consonants (called “pharyngalized” or “glottalized”) in some African and Amerindian languages.</td>
<td>Unknown for speech of any kind.</td>
</tr>
<tr>
<td><strong>Mechanism</strong></td>
<td>Air is brought into lungs by diaphragm and intercostal muscles. Voicing is possible. Cannot be used by laryngectomiee.</td>
<td>Air is sucked into oral and pharyngeal cavities by lowering larynx with closed vocal folds. No voicing possible. Cannot be used by laryngectomiee.</td>
<td>(Air is injected by swallowing or by velaric ingressive mechanism.)</td>
</tr>
</tbody>
</table>

Figure 1: Airstream Mechanisms
(from Mackay, *Introducing Practical Phonetics*, pg.61)
Figure 2: The vocal folds as seen from above. A. Normal respiration (vocal folds apart). B. Heavy respiration (wide apart). C. Whispering (restricted, noisy airflow through small opening). D. Phonation (vibrating, as indicated by dotted line). E. Physical exertion (pressed tightly together providing airtight seal).

(from Mackay. *Introducing Practical Phonetics*. pg. 57)

Figure 3: Sections of the Tongue
3
ACOUSTIC PHONETICS: THE PHYSICS OF SOUND

Objectives

At the end of this topic, you should be able to

1. define acoustic terms that relate to the production of speech sounds
2. describe the application of acoustics to the production of speech sounds

Reading

Davenport Chapter 5 (pgs. 56-71)

Introduction

A study of speech sounds will not be complete without taking into consideration the physical nature of the sounds we hear. This is the domain of acoustic phonetics. However, we will only consider aspects of acoustic as they pertain to the production of speech sounds. First, we will look at some properties or characteristics of sound. Then we will consider how these characteristics are translated to speech production. As we are teachers and not speech therapists, a too detailed look at the fundamentals of acoustic is unnecessary. But if you are interested in this area of phonetics, you may read about it in physics texts and references.
Physical Properties of Sound

1. Sound is the passage of a disturbance through air. It travels through the air at a rate of about 1,100 feet per second; it travels faster through denser materials. Sound cannot pass through a vacuum.

2. Sound travels by wave motion i.e. individual air molecules move up and down. One complete wave is called a cycle (refer to Fig.1). How often a wave cycle repeats itself over a period of time is termed the frequency of the wave. The more wave cycles, the higher the frequency. The standard unit of frequency is cycles per second or hertz (Hz).

3. Waves have physical size; they can be big or small. The height of the wave is known as amplitude and is determined by the amount of energy used to create the wave (refer to Figure 1). The more energy exerted by the lungs, the greater the amplitude, and the higher the wave.

4. Frequency and amplitude is independent of each other, i.e. frequency is not determined by amplitude and vice versa.

5. The time it takes to complete a wave cycle is known as period. A rhythmical wave motion, i.e. each cycle is exactly like the preceding and following cycle, is called periodic while a wave motion with each cycle unlike the others is termed aperiodic (refer to Figure 2). A periodic wave will be perceived as having a musical or tonal quality e.g. a prolonged vowel sound. An aperiodic wave will be perceived as noise (harsh and noisy) e.g. a hiss.

6. The following two characteristics serve to reinforce or amplify the sound produced. The first is harmonics, which are additional tones that accompany any periodic tone. These are whole-number multiples of the basic frequency and they create sort of an 'echo' to the sound produced. The second is resonance, which are particular frequencies in any enclosed or partially enclosed air space that will reinforce sound waves.
Questions

(a) What is frequency?
(b) What is amplitude?
(c) What are periodic and aperiodic waves?

Aspects of Acoustic Phonetics in Speech Production

7. When we listen to an utterance, we perceive an everchanging pattern of sound quality, pitch, loudness and length.

8. The formation of sound requires a vibrating medium (the most common medium through which sound travels is air) to be set in motion by some form of energy. We now know that for English speech sounds, the energy comes from air pressure in the lungs which causes the vocal folds to vibrate.

9. These vibrations occur in waves and determine the frequency, i.e. the more wave cycles per second, the higher the frequency. We can’t measure the frequency in a human voice. It is manifested as pitch; sounds of high frequency are perceived as high-pitched while low frequency sounds are perceived as low-pitched.

10. Loudness is dependent on the size or amplitude of the vibration, which in turn is dependent on the air pressure from the lungs. Generally, the greater the air pressure, the higher the amplitude and the louder the sound is perceived.

11. The vibrations of the vocal folds cause vibrations of the airstream as it passes through and is modified by the resonating cavities and out of the mouth/nose. These vibrations occur in waves, which are either regular (producing tone e.g. a vowel sound or musical tone) or irregular (producing noise).
12. The vibration of the vocal folds produces air waves of a regular pattern (i.e. the fundamental tone or frequency). This is the natural tone of our voice, what we are born with. Accompanying this fundamental tone or frequency are a number of overtones or harmonics, a sort of 'echo' of the fundamental tone or frequency which are different for different individuals. This provides a difference in sound quality.

13. The shape and size of the resonating cavities can be changed, and will have its own vibrating resonance. When the vibrating airstream or wave enters the resonating cavities, those harmonics that coincide with the vibrating resonance of the cavities will be amplified, thus making the sound louder. Thus, a certain range of harmonics plus a certain shape of the resonating cavities will produce a certain band of amplified sound waves, which in turn produces a certain sound (e.g. a vowel). This produces another difference in sound quality.

14. Sounds may also be perceived to be of different length. In English, we will have the impression that some syllables are longer than others, thus making them easier to recognise. The absolute duration of sounds or syllables will depend on the speed of utterance. An average rate of delivery may contain from 6 to 20 sounds per second.

Questions

(d) What is frequency and amplitude as manifested in speech production?
(e) What is the function of harmonics and resonance in speech production?
Conclusion

In this topic, we have looked at some of the principles of acoustics and how they apply to speech production. We know now that the airstream passing through the vocal folds travel in a wave motion that has frequency and amplitude, which determine the pitch and loudness of the sound produced. We also know that the vibration of the vocal folds produces periodic wave motion with a fundamental frequency accompanied by harmonics. In the resonating cavities, these harmonics are matched to the resonance of the cavities, thus amplifying the sound produced. Therefore each speech sound will have its own set of amplified wave band or formant.
**Answers**

(a) Frequency is how often a wave cycle repeats itself over a period of time. The standard unit of frequency is cycles per second or hertz (Hz).

(b) Amplitude is the height of a wave and is determined by the amount of energy used to create the wave.

(c) Periodic wave is a rhythmical wave motion, i.e. each cycle is exactly like the preceding and following cycle; a periodic wave will be perceived as having a musical or tonal quality e.g. a prolonged vowel sound.

   Aperiodic wave is an unrhymthical wave motion, i.e. each cycle is unlike the one before or after it; an aperiodic wave will be perceived as noise (harsh and noisy) e.g. a hiss.

(d) Frequency in speech production is manifested as pitch; sounds of high frequency are perceived as high-pitched while low frequency sounds are perceived as low-pitched.

   Amplitude in speech production is manifested in loudness. Generally, the greater the air pressure, the higher the amplitude and the louder the sound is perceived.

(e) Harmonics and resonance function as amplifier for the speech sounds produced. Harmonics are additional tones that accompany any sound, including speech sounds while resonance is produced by the resonating cavities. Together, they make the speech sounds audible.
Figure 1: Amplitude and wavelength. A. Same wavelength, different amplitudes. The amplitude refers to the height of the wave crests. B. Same amplitude, different wavelengths. The wavelength is the physical length of one cycle (in inches, feet, meters, or other unit of length).

Figure 2: A. A periodic wave. B. An aperiodic wave.

(from Mackay. *Introducing Practical Phonetics*. pgs. 67 & 69)
4
ARTICULATORY PHONETICS: CONSONANTS

Objectives

At the end of this topic, you should be able to

1. define articulatory terms with respect to consonants
2. identify and label basic English consonants
3. discuss the importance of articulatory phonetics to the teaching of consonants

Reading

Davenport Chapter 3 (pgs. 18-37)
Davenport Chapter 6 (pgs. 73-93)

Introduction

After discussing the relationship of speech and language, the organs involved in speech production, and aspects of acoustic phonetics in the production of speech sounds, we now come to the heart of phonetics and phonology - the production of speech sounds itself. It must be remembered that the terms 'vowel' and 'consonant' always refer to sounds, never to letters or symbols. In this topic, we will be looking at the English consonants and vowels. It is important that you memorize the phonetic description of each sound. We start with consonants.

Consonants

1. Consonants are classified according to place of articulation (i.e. the point in the oral cavity where the airstream is modified),
manner of articulation (i.e. the way the airstream is modified),
and voicing (i.e. whether the vocal folds are vibrating or not).

Place of Articulation

2. Place of articulation involves articulators (i.e. the organs of
speech used) and point of articulation (i.e. exact place in the
oral cavity where sound is made). These are given in the table
below.

<table>
<thead>
<tr>
<th>Articulator +</th>
<th>Point of Articulation</th>
<th>= Combined Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>lower lip</td>
<td>+ upper lip</td>
<td>= bilabial</td>
</tr>
<tr>
<td>lower lip</td>
<td>+ upper teeth</td>
<td>= labiodental</td>
</tr>
<tr>
<td>tip (tongue)</td>
<td>+ upper teeth</td>
<td>= tip-dental</td>
</tr>
<tr>
<td>tip (tongue)</td>
<td>+ alveolar ridge</td>
<td>= tip-alveolar</td>
</tr>
<tr>
<td>blade (tongue)</td>
<td>+ alveopalatal region</td>
<td>= blade-alveopalatal</td>
</tr>
<tr>
<td>back (tongue)</td>
<td>+ velum</td>
<td>= back-velar</td>
</tr>
</tbody>
</table>

Questions

(a) How are consonants classified?
(b) What is described under place of articulation?
(c) What are the articulator and point of articulation for a
back-velar sound?
Manner of Articulation

3. In the production of consonants, the airstream is either completely blocked, greatly restricted or diverted through the nose. When compared to vowels, whose production involve a relatively open oral cavity, consonants tend to be more noisy and less melodic/tonal (e.g. you can sing an [a] but not an [s]).

4. The airstream coming from the lungs may be modified in 2 basic ways, i.e. stops and continuants.

5. Stops are made when the airstream is completely blocked by a total closure of an articulator against a point of articulation. There are two types of stops:

a. Plosives

- these are consonants made when the air pressure builds up behind the blocked point and then is released suddenly

- blockage of the airstream may occur at any one of the four points of articulation: labial, alveolar, velar, or glottal

\[
\begin{align*}
[p] & \quad \text{voiceless bilabial plosive} \\
[b] & \quad \text{voiced bilabial plosive} \\
[t] & \quad \text{voiceless tip-alveolar plosive} \\
[d] & \quad \text{voiced tip-alveolar plosive} \\
[k] & \quad \text{voiceless back-velar plosive} \\
[g] & \quad \text{voiced back-velar plosive} \\
[z] & \quad \text{glottal stop}
\end{align*}
\]
b. **Affricates**

- these are consonants made when air pressure builds up behind the blocked point and then is released slowly or, in other words, they are stops that begin with a plosive followed by a slow release of air, creating a fricative sound.

- blockage of the airstream occurs at the alveopalatal region

[c] voiceless blade-alveopalatal affricate

[J] voiced blade-alveopalatal affricate

---

**Questions**

(d) How can the airstream be modified for the production of consonants?

(e) What is a stop?

(f) What is the difference between a plosive and an affricate?

6. Continuants are consonants made when the airstream is modified, but not stopped, by the articulator and point of articulation.

7. There are four categories of continuants, i.e. fricatives, nasals, laterals and semiconsonants. Each category may be subdivided according to articulator and point of articulation. Within these subcategories are voiced and voiceless fricatives, voiced nasals, voiced laterals and voiced semi-consonants.

8. Fricatives are made by bringing an articulator close to a point of articulation such that air squeezes between the two without
being stopped, creating hissing or friction sound.

9. There are five points at which English fricatives are made: labio-dental, tip-dental, tip-alveolar, blade-alveopalatal and glottal.

a. Labio-Dental Fricatives
   - these sounds are made with the lower lip touching the upper teeth
     [f] voiceless labio-dental fricative
     [v] voiced labio-dental fricative

b. Tip-Dental Fricatives
   - these sounds are made with the tip of the tongue either between the upper and lower front teeth or the tip of the tongue lightly touching the back of the upper front teeth
     [θ] voiceless tip-dental fricative
     [ð] voiced tip-dental fricative

c. Tip-Alveolar Fricatives
   - these sounds comprise a subset called sibilants
     - these sounds are made with the edges of the tongue tip almost touching the alveolar ridge and a groove or channel across the middle of the tip. The jet of air hitting the alveolar ridge makes a hissing sound
     [s] voiceless tip-alveolar fricative
     [z] voiced tip-alveolar fricative
d. **Blade-Alveopalatal Fricatives**

- these sounds are also sibilants
- these sounds are made with the tongue pulled back slightly, the blade of the tongue almost touches against the alveopalatal area, and the air is forced through a groove over the middle of the blade

\[ \frac{\} \] voiceless *blade-alveopalatal fricative*

\[ \frac{} \] voiced *blade-alveopalatal fricative*

e. **Glottal Fricative**

- this sound occurs only in syllable-initial position
- this sound is made with a small amount of constriction at the glottis and is sometimes accompanied by a slight friction sound. The tongue and lip position are those of the following vowel

\[ \frac{h} \] voiceless *glottal fricative*

---

**Questions**

(g) *What are continuants?*

(h) *What is a fricative?*

---

10. Nasal consonants are of the subvariety called sonorants*. 

11. They are made with the oral cavity obstructed at some point

---

*Sonorants are speech sounds that are made with the airstream not stopped and neither is friction created between an articulator and point of articulation. Sounds that are described as sonorants include laterals, nasals, semiconsonants and vowels.*
and the uvula lowered so that the airstream flows through the nasal cavity.

12. There are three primary points at which nasals are made: bilabial, tip-alveolar, and back-velar.
   a. **Voiced Bilabial Nasal**
      - this sound is made when the lips are closed, voicing is present, and the airstream is passing through the nasal cavity
      
      \[
      [m] \text{ voiced bilabial nasal}
      \]
   
   b. **Voiced Tip-Alveolar Nasal**
      - this sound is made when the oral cavity is blocked by the tongue tip on the alveolar ridge, voicing is present, and the airstream is passing through the nasal cavity
      
      \[
      [n] \text{ voiced tip-alveolar nasal}
      \]

   c. **Voiced Back-Velar Nasal**
      - this sound occurs in syllable-final position only
      - this sound is made when the oral cavity is blocked by the back of the tongue against the velum, voicing is present, and the airstream is passing through the nasal cavity
      
      \[
      [ŋ] \text{ voiced back-velar nasal}
      \]

13. Lateral consonants are of the subvariety called sonorants

14. Laterals are made with the air escaping around the sides of the tongue while the middle part of the tongue is pressed against some point of articulation.
a. **Voiced Tip-Alveolar Lateral**

- this sound is made with the tip of the tongue against the alveolar ridge, voicing is present, and the airstream passes around the sides of the tongue

[1] *voiced tip-alveolar lateral*

15. Semiconsonants are also of the subvariety called sonorants.

16. These sounds share characteristics of both vowels and consonants.

17. They are like vowels in that they are formed with less narrowing of the articulator toward the point of articulation than is common for consonants.

18. They are like consonants in that their location in the syllable is the same as that of consonants, i.e. they never replace the vowel of a syllable.

a. **Voiced Labial-Velar Semiconsonant**

- this sound is made with rounded lips while simultaneously the back of the tongue is raised toward the velum; voicing is present

- the term is labial-velar, NOT labio-velar; the term labio reserved for the articulator, as in labio-dental; labio-velar would mean the bottom lip touching the velum, an impossible convolution

- this sound occurs before vowels, never after vowels

[ w ] *voiced labial-velar semiconsonant*
b. **Voiced Tip-Alveolar Retroflexed Semiconsonant**

- this sound is typically made in the alveolar region with the tongue pulled up slightly, but not touching the alveolar ridge (this position makes the tongue slightly concave); voicing is present

  \[ r \] voiced tip-alveolar retroflexed semiconsonant

c. **Voiced Blade-Alveopalatal Semiconsonant**

- this sound is made with the blade of the tongue approaching the alveopalatal region; the tip of the tongue may be pointing toward the upper teeth or held behind the lower front teeth; constriction occurs between the tongue blade and the alveopalatal area; voicing is present

  \[ j \] voiced blade-alveopalatal semiconsonant

---

**Questions**

(i) What are nasals, laterals and semiconsonants?
(ii) How is a semiconsonant like a vowel? a consonant?

---

**Conclusion**

We have looked at the English consonants. There are a few things that must be kept in mind. First, consonant sounds (and vowels) will be modified in context i.e. in normal speech, the sounds are not made individually but are spoken in a flow, with one sound mixing with the sound following it. We will look at this in the next topic. Second,
with articulatory phonetics, we can actually know which articulator is involved and the point of articulation. This is especially true for consonants where knowledge of articulatory phonetics can help teachers to solve their students' pronunciation problems e.g. a teacher can tell students where to place their tongues and lips etc. It is clear that knowledge of articulatory phonetics is important to teachers. Third, with respect to phonetic symbols of consonants and vowels, you will notice that there is quite a variety. What I have given you in the notes, especially for vowels, is a rather simplified version. You are free to use whichever symbols you are familiar with. What is important is that you have identified the correct sound and that you are consistent in the symbols you use i.e. if you are comfortable with the British symbols, then you should stick to them throughout. Lastly, the order of features in a descriptive label for consonants is as follows:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>phonation</td>
<td>phase</td>
<td>articulation</td>
<td>manner</td>
<td></td>
</tr>
<tr>
<td>(voiced/voiceless)</td>
<td>phase</td>
<td>phase</td>
<td>of art.</td>
<td></td>
</tr>
<tr>
<td>[p]</td>
<td>voiceless</td>
<td>unaspirated</td>
<td>bilabial</td>
<td>plosive</td>
</tr>
</tbody>
</table>
Answers

(a) Consonants are classified according to place of articulation (i.e. the point in the oral cavity where the airstream is modified), manner of articulation (i.e. the way the airstream is modified), and voicing (i.e. whether the vocal folds are vibrating or not).

(b) Place of articulation involves articulators (i.e. the organs of speech used) and point of articulation (i.e. exact place in the oral cavity where sound is made).

(c) The articulator is the back of the tongue and the point of articulation is the velar region.

(d) In the production of consonants, the airstream is either completely blocked, greatly restricted or diverted through the nose.

(e) A stop is a consonant sound made when the airstream is completely blocked by a total closure of an articulator against a point of articulation. There are two types of stops: plosives and affricates.

(f) In plosives, the airstream is blocked and released suddenly while in affricates, the airstream is blocked and released slowly.

(g) Continuants are consonants made when the airstream is modified, but not stopped, by the articulator and point of articulation. There are four categories of continuants, i.e. fricatives, nasals, laterals and semiconsonants.

(h) A fricative is a consonant sound made by bringing an articulator close to a point of articulation such that air squeezes between the two without being stopped, creating hissing or friction sound.

(i) Nasals, laterals and semiconsonants are consonant sounds of the sub-category sibilants.

Nasals are made with the oral cavity obstructed at the lips, alveolar ridge and velar, and the uvula lowered so that the airstream flows through the nasal cavity. Laterals are made with the air escaping around the sides of the tongue while the middle part of the tongue is pressed against the alveolar ridge.
(j) They are like vowels in that they are formed with less narrowing of the articulator toward the point of articulation than is common for consonants. They are like consonants in that their location in the syllable is the same as that of consonants, i.e. they never replace the vowel of a syllable.
5
ARTICULATORY PHONETICS: VOWELS

Objectives

At the end of this topic, you should be able to

1. define articulatory terms with respect to vowels
2. identify and label basic English vowels
3. discuss the importance of articulatory phonetics to the teaching of vowels

Reading

Davenport Chapter 4 (pgs. 39-55)

Introduction

After looking at consonants, we now look at vowels. Unlike consonants, vowels are more difficult to describe as there are no point and manner of articulation. Just as for consonants, it is important that you memorize the phonetic description of each sound. Another point to note is that, although there is an enormous vocalic variety present in English which needs a certain level of phonetic sophistication to describe, the vowel system presented here will be broad in phonetic precision.

1. In the articulation of vowels, the airflow is unimpeded and the vocal folds are generally vibrating.

2. Specifically for vowels, the effective shape and size of our vocal tract are changed through the following movements of the
speech organs:

(a) raising or lowering the jaw, which changes the amount of space inside the mouth
(b) arching the tongue to varying degrees, and in different places (front and back)
(c) rounding or spreading the lips, which changes the resonant characteristics of the vocal tract
(d) moving the tongue root, which changes the size of the pharynx.

3. The main dimension used to classify vowels is tongue position and jaw height. For this, a vowel quadrangle is used. The vertical dimension of the vowel quadrangle is known as the vowel height; vowels are labeled either as high, mid or low. The horizontal dimension is labeled in terms of how far front the point of articulation is; vowels are labeled either as front, central or back. In labeling a vowel, both dimensions must be given; the height dimension is normally given first.

4. Two more dimensions of vowel articulation are lip-rounding and rhotacization.

5. Lip-rounding is sometimes a necessary dimension to include in classifying vowels, especially in cases where there are two vowels which are articulated at the same point and the only difference is that one vowel is made with rounded lips while the other is not (e.g. French). In English, however, there is no such need as there are no pairs of vowels whose articulation is identical except for rounding. All English front vowels are unrounded while back vowels are rounded. So the vowels are usually identified without reference to lip-rounding.

6. Rhotacization means giving the vowel an r-like quality e.g. vowels in words such as "bird", "fur", "heard". Note that while the spelling shows a vowel followed by a consonant 'r', the sound is just one vowel. What is spelled with the letter 'r' is actually a vowel which is rhotacized.

7. Another common dimension in vowel articulation is tenseness. This has to do with the greater tension in the facial and other
muscles of speech when producing long vowels. Also, in the change of the pharyngeal cavity due to the movement of the tongue root when producing these same vowels.

Questions

(a) In the articulation of vowels, how are the speech organs used?
(b) What are the dimensions used in classifying vowels?

8. The front vowels are:

[ i: ] high front unrounded (long) vowel

feet machine
seat copy
beat valley

[ i ] high front unrounded (short) vowel

sht midst
bit rich
lip sick

[ er ] mid front unrounded (long) vowel

raid fail
face tame
lake pain

[ e ] mid front lax (short) vowel

bet bred
set kept
fell test
[æ]  low front unrounded vowel

rag           match
bat           scrap
fat           lamp

9. The back vowels are:

[u:]  high back rounded (long) vowel

shoe          food
ryde          tooth
blue          group

[u]  high back rounded (short) vowel

look          bush
took          should
foot          would

[o]  mid back rounded vowel

no            coat
low           rode
toe           phone

[ɔ]  low back rounded vowel

law           soft
caught        talk
boss           long
10. The central vowels are:

[ʌ] mid central unrounded (stressed) vowel

- bug
- cut
- luck

- rough
- judge
- won

[ə] mid central unrounded reduced vowel

- around
- arise
- sofa

- added
- churches
- brevity

[a] low central unrounded vowel

- father
- chop
- shop

- box
- stop
- rock

11. Two additional central vowels are those of the rhotacised variety. They are:

[ɜ] mid central rhotacised (stressed) vowel

- bird
- fur
- learn

- jerk
- worm
- urgent

[ə] mid central reduced rhotacised vowel

- teacher
- colour
- collar

- pattern
- battery
- aspiration
12. Besides the vowels above, English has three diphthongs or "glides". These are actually two different vowel sounds fused together or one vowel sound gliding into another. Diphthongs are associated with low vowels i.e. the tongue starts in a low position and then moves to a high front position.

13. The diphthongs are:

\[
\begin{array}{ccc}
[\text{ai}] & \text{lie} & \text{like} \\
 & \text{fight} & \text{wise} \\
 & \text{rice} & \text{jime} \\
[\text{au}] & \text{now} & \text{loud} \\
 & \text{doubt} & \text{mouse} \\
 & \text{found} & \text{owl} \\
[\text{oi}] & \text{boy} & \text{noise} \\
 & \text{voice} & \text{join} \\
 & \text{joyce} & \text{loyal}
\end{array}
\]

**Questions**

(c) What are the front vowels?
(d) What are the back vowels?
(e) What are diphthongs?

**Conclusion**

The vowel categories given in these notes are purposely simplified and 'Americanized'. Further explanation will be given during your tutorials and face-to-face sessions.
Vowels may be more difficult to describe as the airflow is not blocked in any way in their production. Nonetheless, teachers can direct students about dimensions used to classify vowels e.g. jaw height, lip rounding etc.

Another point to be made is about tenseness in vowels. This is a difficult concept to explain, but it has to do with the movements of the tongue root. As this is at the back of the mouth, it is difficult to see. It is easiest to just remember that long vowels are often tense.
Answers

(a) The speech organs are used through the following movements:
(i) raising or lowering the jaw, which changes the amount of space inside the mouth
(ii) arching the tongue to varying degrees, and in different places (front and back)
(iii) rounding or spreading the lips, which changes the resonant characteristics of the vocal tract
(iv) moving the tongue root, which changes the size of the pharynx.
(b) The dimensions used in classifying vowels are tongue position and jaw height, lip rounding and rhotacisation.
(c) The front vowels are:

[ iː ] high front unrounded (long) vowel
[ i ] high front unrounded (short) vowel
[ ei ] mid front unrounded (long) vowel
[ e ] mid front unrounded (short) vowel
[ æ ] low front unrounded vowel

(d) The back vowels are:

[ uː ] high back rounded (long) vowel
[ u ] high back rounded (short) vowel
[ o ] mid back rounded vowel
[ ɔ ] low back rounded vowel

(e) Diphthongs are actually two different vowel sounds fused together or one vowel sound gliding into another. They are associated with low vowels i.e. the tongue starts in a low position and then moves to a high front position.
6
PHONOLOGICAL PROCESSES: SOUNDS IN CONTACT

Objectives

At the end of this topic, you should be able to

1. define phonological processes
2. identify obligatory and optional processes
3. discuss the importance of phonological processes in pronunciation

Reading

Davenport Chapter 8 (pgs. 114-127)

Introduction

In speech, sounds do not occur in isolation. Speech is not made up of individual consonant and vowel but is sounds that "flow" into each other i.e. your speech organs are ready for the next sound just as soon as you finish one sound. Sounds, therefore, are modified when they come in contact. This process is termed phonological processes and we will look at some of them. Before we start, one thing that you should keep in mind is that the discussion and examples below are not meant to be exhaustive or as detailed as the book. You must refer to the book for the complete list. What is given below is meant as a guide, the 'skeleton' on which you can place the various processes given in the book.

1. During speech, the articulators are in constant movement. Usually, we start making a sound before completing the sound before it.
2. It logically follows that a sound will be influenced by sounds before and after it, causing it to change. This change is the result of phonological processes, which delete, add and modify sounds present in a normal pronunciation of a word.

3. These processes are completely normal and is expected. Without them, speech may be incomprehensible. For the speaker, they make pronunciation easier while for the listener, the processes serve to eliminate phonetic difficulties.

4. There are two general processes at work in modifying speech sounds in contact, i.e. obligatory and optional processes.

Obligatory Processes

5. These processes are 'unconscious' (i.e. not subject to deliberate manipulation), bring about minimal changes (i.e. modify a single unit of a phonetic segment) and are obligatory (i.e. the sequences of sounds affected are not pronounceable unless the processes apply first).

6. Therefore, obligatory processes cannot give rise to alternative pronunciation of the same word.

7. There are two obligatory processes: aspiration and assimilation.

Aspiration

8. Aspiration is an extra puff of air accompanying voiceless stop sounds when they occur before a stressed syllable or voiceless stop sounds before a stressed syllable with an intervening [1]. [r], [w] and [j].

9. Aspiration is denoted with a raised 'h' to the right of the voiceless stop, i.e. [ʰ].

\[
\text{pin [pʰɪn]} \quad \text{time [tʰaɪm]}
\]
coat [kɔt] cheap [tʃɪp]
play [pleɪ] trim [trɪm]

10. However, aspiration does not occur after [s] in the same word.

    pie [piə] but spy [spai]
    tick [tɪk] but stick [stɪk]

11. Aspiration makes a sound easier to perceive as it has the effect of increasing the difference between voiced and voiceless stops.

Assimilation

12. Assimilation makes a sound become more like an adjacent sound in terms of some articulatory feature such as voicing, place of articulation or manner of articulation. It is an extremely common process.

Voicing Assimilation

13. Voicing assimilation occurs when adjacent sounds come to agree with one another in voicing. For example, the pronunciation of the plural suffix 's'. The suffix chosen usually agrees in voicing with the final consonants of words, i.e. the voiceless [s] is chosen as the plural for the word ending in a voiceless consonant and the voiced [z] is added to words ending in voiced sounds.

    cats [kæts]            dogs [dɔgz]
    lips [lɪps]            cars [kɑrз]

Place Assimilation

14. Place assimilation occurs when adjacent sounds are made to agree in point of articulation. For example, the nasals in the prefix 'in' (meaning 'not') below exhibit place assimilation.
In each set of words, the point of articulation of the nasal in the prefix depends on the point of articulation of the consonant immediately following it. So in Set I, as 'balance' and 'perfect' both begin with bilabial sounds, the nasal of the prefix is also bilabial [m]. The same is true for Set II. Both 'tolerable' and 'definite' begin with a tip-alveolar sound. So the nasal prefix is tip-alveolar [n]. In Set III, 'competent' and 'considerate' both begin with a back-velar sound. It follows that the nasal prefix is pronounced as a back-velar [ŋ]. This is, however, not reflected in the spelling as English does not have a letter corresponding to [ŋ].

15. Another example of place assimilation is dentalization or shifting to the dental position. This process occurs when a tip-alveolar sound ([n], [l], [t], and [d]), coming before a tip-dental fricative ([θ] or [s]), will be front-shifted to a tip-dental position. Dentalization is denoted with an 'inverted hacheck', i.e. [^].

- tenth [tenθ]       month [mʌθ]
- wealth [welθ]     all three [ɔːθ]
- but the [bʌθ]   hit them [hit ʌθm]
- said that [sɛid ʌθt]   would they [wʊd ʌθ]

Manner Assimilation

16. Manner assimilation occurs when adjacent sounds come to agree in manner of articulation. For example, an English vowel that comes before a nasal consonant will be nasalized. This is termed nasalization of vowels and occurs because while the speaker is still articulating the vowel, the velum is already lowered in anticipation of the nasal sound. Nasalization is denoted with a 'tilda' above the vowel sound, i.e. [˘].
can [kæn]    bingo [bɪŋgo]

Questions

(a) What are phonological processes? Are they necessary?
(b) What are the effects of obligatory processes?
(c) What are aspiration and assimilation?

Optional Processes

17. These phonological processes function primarily to mark differences in speech styles. Fast, casual or inattentive speech uses phonological processes that make sequences of sound easy to pronounce while slow, formal or emphatic speech styles uses processes that make sequences of sound easy to perceive. So these processes are 'consciously' chosen by the speaker, depending on how he or she wants to sound like.

18. Due to this, these phonological processes are optional, i.e. they merely change the pronunciation of a word that is already pronounceable.

19. We will look at four processes: flapping, insertion, deletion and syllability.

Flapping

20. In American English, a flap often replaces the [t] when this sound occurs between stressed and unstressed syllables or between two unstressed syllables. To a lesser extent, [d] is also replaced by the flap. For many native English speakers, the tip-alveolar stops in ATOM and ADAM are identical. The flap is
phonetically transcribed as [ɨ].

\[
\text{better} \ [\text{beɪtər}] \quad \text{matter} \ [\text{mætər}]
\]

**Insertion**

21. Speakers often insert sounds into words, the most common being the 'schwa', i.e. [ə]. This may be done to break up awkward consonant clusters e.g. pronouncing 'athlete' as [æθliːt]. Other reasons for insertion include self-conscious articulate or emphatic speech e.g. pronouncing 'prayed' (which is generally pronounced as a single syllable) as [prɛɪd] (which contains two syllables).

**Deletion**

22. Native English speakers frequently delete sounds, especially unstressed vowels. For example, 'mathematics' is often pronounced [mæθmætɪks] without the [ə] while in 'family', the [i] is unstressed and thus deleted in casual speech, yielding [fæmli:]

**Syllabicity**

23. Nasals and laterals can function as syllables by themselves (i.e. they take the place of the vowel-consonant combination characteristic of a syllable). They are known as syllabic consonants. In no place are these syllabic consonants obligatory as, at any place where they may be pronounced, a vowel such as [ə] may precede the consonant and form the syllable. Syllabic consonants are denoted as [ɹ].

\[
\text{rhythm} \ [\text{rɪθm}] \quad \text{hidden} \ [\text{hɪdn}] \quad \text{puddle} \ [\text{pʌdl}]
\]
Questions

(d) What are the effects of optional processes?
(e) Why are they optional?

Conclusion

It is important to remember that phonological processes are a natural part of speech. A good speaker will naturally apply the processes above. Without them, speech will seem awfully stilted and artificial. I have not gone into details here as the book gives a good account of the more important processes involved. But you are encouraged to refer to and include from whatever additional sources you have at your disposal. Another important contribution of phonological processes is that they produce variant forms of the English phones. These are termed allophones. We will look at allophones in the next topic.
Answers

(a) Phonological processes change a sound as it comes in contact with sounds before and after it. Specifically, they delete, add and modify sounds present in a normal pronunciation of a word.

Phonological processes are necessary because they are completely normal and is expected. Without them, speech may be incomprehensible. For the speaker, they make pronunciation easier while for the listener, the processes serve to eliminate phonetic difficulties.

(b) Obligatory processes are not deliberately done, bring about minimal changes i.e. modify a single unit of a phonetic segment and must be applied first before the affected sounds can be pronounced.

(c) Aspiration is an extra puff of air accompanying voiceless stop sounds when they occur before a stressed syllable or voiceless stop sounds before a stressed syllable with an intervening [l], [r], [w] and [j].

Assimilation makes a sound become more like an adjacent sound in terms of some articulatory feature such as voicing, place of articulation or manner of articulation.

(d) Optional phonological processes mark differences in speech styles, i.e. the speaker chooses consciously how he or she wants to sound like. Fast, casual or inattentive speech uses phonological processes that make sequences of sound easy to pronounce while slow, formal or emphatic speech styles uses processes that make sequences of sound easy to perceive.

(e) Phonological processes are optional because they merely change the pronunciation of a word that is already pronounceable.
PHONOLOGY: THE PATTERNS OF SOUND

Objectives

At the end of this topic, you should be able to

1. define phoneme, phonemics and phonetics
2. define minimal pair, complementary distribution and free variation.
3. discuss the importance of phonology to the teaching of pronunciation

Reading

Davenport Chapter 7 (pgs. 95-110)

Introduction

After looking at how individual consonants and vowels change when in contact with other consonants and vowels, we now take a step back for a more 'global' view. The study of phonetics has shown us that there is tremendous variability in human speech. In fact, no two pronunciations of a word are ever exactly the same, even when given successively by the same speaker on the same occasion. But if this is so, how is oral communication possible at all? The answer lies in phonology.

1. Phonology is the study of speech sounds and how they are patterned in a language. In such a study, there are two levels of analysis. One is a narrow or specific look at each sound found in the language. This is the level of phonetics. But, based on
what we have looked at in the preceding topics, to only focus on phonetics would be very tedious indeed. We know that there is an infinite capacity for speech sounds because everytime we utter a consonant or vowel, it will be different from its previous utterance. But oral communication is possible because first, variation has limits imposed by the physical constraints of the human vocal tract, and two, each speech community (i.e. people like you and me) selects as its phonetic inventory a subset of sounds from those physically possible and sets limits on what can count as a possible sequence of sounds. The system of sounds and sound pattern which result from these restrictions constitute phonology.

2. It follows that an analysis of such a system is more manageable. This is the domain of phonemics i.e. a broad or general study of speech sounds.

3. The analysis must start with the most basic element i.e. the sound or phone. The smallest unit of sound is known as a phoneme. To be more precise, a phoneme is actually a group of phones in a language that is never used in a contrastive way and is considered by the speakers of that language to be one sound. This is why a phoneme is considered an abstraction, i.e. there is no one instance that a sound or phone is truly a phoneme. It is always a variation of the phone. All the variant forms of this one sound or phoneme are called allophones (some examples of which we have looked at in the previous topic).

4. How do we decide whether a sound is a phoneme or an allophone? To do so we need to look at its phonetic similarity and function in a language.

5. Phonetic similarity means looking at the place and manner of articulation. Allophones of a phoneme would generally have the same place and manner of articulation.

6. A phoneme's function in a language has to do with whether it acts predictably or contrastively.
7. When two words are alike in all except one phone, and this one exception brings a difference in meaning, the phones are said to act in a contrastive way. So the two phones are different phonemes and the words are known as a minimal pair. For example,

\[
\text{pin} \ [\text{p}\text{i}\text{n}] \quad \text{bin} \ [\text{b}\text{i}\text{n}] 
\]

The phonetic feature that brings about the contrast is voicing. When the exception does not bring about a difference in meaning, then the two sounds are not functioning contrastively. They therefore are not two different phonemes; they are considered allophones of the same phoneme. Minimal pairs are one of the ways used to determine the phonemes of a language.

8. The phonemic structure/system vary from language to language. Two phones may be different phonemes in one language but are allophones in another language.

9. Allophones, unlike phonemes, function in a predictable way. Each allophone of a phoneme normally has its own environment i.e. only one allophone can occur at a certain place in a word. The allophones are said to be in complementary distribution i.e. their environments are mutually exclusive.

10. There are, however, some allophones that are in free variation i.e. their environments are not mutually exclusive. This means that any allophone can occur at that place in a word.

11. The phoneme therefore is an abstraction with a certain degree of reality in the mind of the speaker. This is clearly shown in L2 learners whose native language has a different phonemic structure than the second language. For example, to a Spanish speaker, who is learning English, [d] and [θ] are allophones (as they are in Spanish) and not different phonemes (as they are in English). He will tend to pronounce both sounds interchangeably, according to the rules for the allophones in Spanish. With respect to English, he does not need to be taught how to articulate the phonemes because he can do so precisely. In other words, at the phonetics level, he faces no problems.
What he needs to be taught is the fact that in English, both [d] and [ð] are different phonemes and to distinguish between the two phonemes and to produce them at appropriate places. To do this, phonemics is needed.

Questions

(a) What is a phoneme? Why is it considered an abstraction?
(b) What is a minimal pair? Why is it important?
(c) What is an allophone?
(d) What is complementary distribution and free variation?

Conclusion

Phonology is the study of sound patterns, i.e. what sounds are a part of a particular language (in our case it is English). To do this, we have to identify and define the smallest unit of sound, i.e. the phoneme.

With this look at phonology, we can now see that the study of speech sounds include two levels of equal importance, i.e. phonetic and phonemic analysis. One analysis cannot, without the other, actually fully explain the phenomenon of speech production. A phonetic analysis is important as through it we get information about the production and distribution of specific phones in the language. A phonemic analysis is equally important as through it we get information about patterns of sounds that exists in the mind of a speaker. A speaker may have no problems with producing the various sounds in his or her language but for some reasons, his or her patterning of the sounds is different from other people. A phonemic analysis will be able to clarify just what the speaker's system is and perhaps help explain the difference.
Answers

(a) A phoneme is a group of phones in a language that is never used in a contrastive way and is considered by the speakers of that language to be one sound. A phoneme is considered an abstraction because there is no one instance that a sound or phone is truly a phoneme. It is always a variation of the phone.

(b) A minimal pair is two words which are alike in all except one phone, and this one exception brings a difference in meaning. The phones are said to act in a contrastive way and are therefore different phonemes. A minimal pair is important because it is one of the ways used to determine the phonemes of a language.

(c) An allophone is the phonetic variant of a sound or phoneme. More specifically, when two sounds are not functioning contrastively, i.e. when the exception between them does not bring about a difference in meaning, they are considered allophones of the same phoneme.

(d) Complementary distribution has to do with allophones. It means that each allophone of a phoneme has its own environment i.e. only one allophone can occur at a certain place in a word. The environments are mutually exclusive. Free variation also has to do with allophones. This is when the environments of the allophones are not mutually exclusive, i.e. any allophone can occur at that place in a word.
8
PHONOTACTICS

Objectives

At the end of this topic, you should be able to

1. define a syllable
2. define phonotactics
3. discuss the practical implications of phonotactics

Reading

Davenport  Chapter 9 (pgs. 129-152)
Davenport  Chapter 10 (pgs. 154-173)

Introduction

Knowing a language means, among other things, knowing how to make the sounds possible in that particular language. This means knowing its phonemes, phonemic and phonetic structure. But this is insufficient because sometimes it is the combination of phonemes that causes problems even when the individual phonemes can be pronounced in isolation or in other combinations. Here lies the importance of phonotactics, which is the study of how phonemes are combined and ordered in a particular language or dialect.

1. In discussing the combination of sounds that are possible, it is important to know the syllable; phonotactic rules are based mostly on the syllable rather than on the word.

2. Earlier, we have examined the nature of sounds, i.e. vowels and
consonants, either on phonetic grounds (how the sounds are produced) or phonological grounds (patterns and distribution of sounds). Syllables can be described in the same way.

3. Phonoetically, syllables can be described in relation to the way they are produced and the way they sound.

A syllable...

(a) can be defined as consisting of a center which has little or no obstruction to airflow and which sounds comparatively loud (i.e. a vowel/diphthong); before and after this center (i.e. at the beginning and the end of the syllable), there will be greater obstruction to airflow and/or less loud sound (i.e. a consonant).

OR

(b) normally has a vowel / vowel-like sound acting as a nucleus; every syllable has one vowel / diphthong, which may be preceded and / or followed by one or more consonants.

OR

(c) may contain a vowel-like / vocalic sound.

OR

(d) can best be characterized by the degree of openness of individual phones; a syllable is characterized by a more open segment surrounded by less open segments / by nothing at all. (All phones are rated according to the degree of openness of the vocal tract ... the low vowels are the most open, followed by high vowels, liquids, nasals, glides, fricatives, flaps, affricates, and plosives).

4. A minimum syllable would be a single vowel in isolation, preceded and followed by silence (e.g. the words "I", "eye").
5. A syllable may have an onset, i.e. there is more than just silence preceding the center of the syllable (e.g. "bar" /ba/, "key"/ki:/).

6. A syllable may have no onset but has a coda, i.e. there is more than just silence following the center of the syllable (e.g. "ease" /ez/, "oat" / ot/).

7. A syllable may have onset and coda, i.e. there is more than just silence preceding and following the center of the syllable (e.g. "seat" /sit/, "pool" /pu:l/).

8. A syllable that ends with a consonant is called a closed syllable; a syllable that ends in a vowel with no consonant following is called an open syllable.

9. The consonant that begins a syllable is called the releasing consonant; the consonant that closes a syllable is called the arresting consonant.

8. A group of consonants together in the same syllable without vowels in between is called a cluster / blend.

9. Phonologically, syllables can be described in terms of the possible combinations of English phonemes, i.e. what can occur at the beginning of the first word when we begin to speak after a pause.

10. The English syllable can have from 0 to 3 consonants, followed by a mandatory vowel / diphthong, followed by 0 to 4 consonants i.e. the formula is (CCC) V (CCCC). (It is pronunciation and not spelling that matters).

11. Not any phoneme can go in any place in the formula; ...

(a) there are never two plosive consonants in a cluster before a vowel.

(b) if the releasing cluster contains two consonants, one of which is a plosive, the cluster must take one of these two
forms:

1. /s/ + voiceless plosive
2. a plosive + an approximant

(c) In all cases where 3 consonants precede a vowel, the pattern must be such: /s/ + a voiceless plosive + an approximant.

(d) a cluster may be formed of a (voiceless) fricative and certain approximants.

(e) nasals also form releasing clusters i.e. a fricative + nasal or nasal + /ʃ/.

(f) alveopalatal fricatives cannot enter into releasing clusters.

(g) any consonant can release a syllable singly (i.e. can begin a word) except /n/ (this sound never precedes a vowel in the same syllable) and /z/ (this sound normally only releases a syllable other than the first syllable in a word).

(h) only long / tense vowels occur in word-final open syllables.

12. The restrictions on clusters above apply within single syllables; they do not carry across syllable boundaries.

Questions

1. What is phonotactics? What part does it play in speech production?
2. What is a syllable?
Conclusion

Based on what we have looked at, there are some practical implications of phonotactics that can be drawn. The most significant is the fact that the patterning of phonemes is regular and systematic, governed by phonotactic rules. Secondly, as a result of this, an individual may be able to pronounce a sound in one context but not in another. An individual 'phonological grammar' would include rules describing this phonotactic patterning, and these rules may or may not be the same as yours or those of 'standard' English. As a consequence, there is a huge difference between not being able to pronounce a certain sound and not being used to pronouncing it in certain contexts or combinations. This is where phonotactic rules will come in handy. Lastly, when analyzing errors made by an individual, it may be useful to determine whether the problem is phonotactic in nature, i.e. are the errors everywhere or in certain combinations. If errors are made everywhere, then the problem is a phonetic one requiring articulatory work. If the individual makes errors in certain combinations, then structured pronunciation exercises based on phonotactic rules should help.
Answers

(a) Phonotactics is the study of how phonemes are combined and ordered in a particular language or dialect. Knowledge of phonotactics is important because sometimes it is the combination of phonemes that causes problems even when the individual phonemes can be pronounced in isolation or in other combinations. Additionally, knowledge of phonotactics can help in analyzing errors.

(b) Phonetically, a syllable can be defined as consisting of a center which has little or no obstruction to airflow and which sounds comparatively loud (i.e. a vowel/diphthong); before and after this center (i.e. at the beginning and the end of the syllable), there will be greater obstruction to airflow and/less loud sound (i.e. a consonant).

Phonologically, syllables can be described in terms of the possible combinations of English phonemes, i.e. what can occur at the beginning of the first word when we begin to speak after a pause.
ENGLISH PROSODY: STRESS AND INTONATION

Objectives

At the end of this topic, you should be able to

1. define word and sentence stress
2. describe intonation patterns
3. discuss relevance of knowledge of prosody to speech production

Introduction

We now come to, perhaps, the most difficult part of the course i.e. stress and intonation. This is probably due to the fact that these features are even more subjected to individual speech habits than other parts that we have looked at thus far. For some, the prosodic features of the native language may become a great hindrance. As the book gives a thorough treatment of the topic, I will not try to provide you with what has essentially been covered. What I have included here are some practical implications of prosody to our knowledge of English phonetics and phonology.
1. Any discussion of English phonetics and phonology will include a description of individual segments (segmentals), i.e. consonants and vowels. But speech is not just the phonation of these individual segments. In speech, these individual segments are combined to form larger units i.e. syllables and words, creating what can be termed as the stream of speech. How these segments change in the speech stream has been dealt with under phonological processes. Added to the changes are phonological features called suprasegmentals or prosodies; they are stress, pitch and intonation.

2. These suprasegmental features make a major contribution to speech. Inappropriate use of stress, timing or intonation will lead to speech which is at worst unintelligible and at best stilted and unnatural (I am sure we can all recall trying to understand a certain individual’s speech which sound very much like English but which you, for some reason, can’t understand. Chances are the reason is due to the individual’s wrong use stress and intonation).

3. Languages make use of stress at three levels, i.e. in the word, in the short phrase and in the sentence. At the word level, an individual may pronounce the phones of a word correctly but if they are stressed incorrectly, the word will be quite unintelligible to the native speaker.

4. However, in a language such as English, there are few rules for word stress. It might be placed anywhere in a word, so the stress pattern must be learned separately for each word. This system offers the advantage of allowing meaning contrasts, i.e. the same string of phonemes may have different pronunciations and therefore different meanings according to stress placement.

5. In a sentence, stress operates on certain words, affecting the interpretation of the sentence as a whole. As a result of the varying degrees of stress on words in a sentence, the pronunciation of individual words may be very different in a sentence from their pronunciation in isolation.
6. Intonation is patterns or contours of pitch change which carry meaningful information. Intonation patterns will distinguish between otherwise phonetically similar sentences. For example, 'This is my house' can be changed from a statement to a question to an exclamation etc. by just changing the intonation.

7. It is interesting to note that the first aspect of language that a child learns is the general patterns of intonation and rhythm. Before a child begins to speak, it is common for him or her to engage in jargon, i.e. he or she hums and babbles syllables in recognizable intonation patterns of the language he or she is exposed to.

**Conclusion**

As the book provides many exercises on these prosodic features, you are encouraged to attempt them as preparation for your test. Happy trying.