

LIN201

BASIC PHONOLOGY



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Course code: LIN 201
Course title: Basic Phonology
Course credit load: 3 Units

Series 1: Foundations of Phonology and Sound Systems

Series 2: Phonetics, Phonology, and Orthography Interactions

Series 3: Classical and Modern Approaches to Phonology

Series 4: Phonological Rules, Processes, and Analytical Methods

Series 5: Applied Phonological Analysis Across Languages

Proposed Outline for Series 1

Part .1 Introduction to Phonology

- 1.1.1 Definition and scope of phonology
- 1.1.2 Relationship between phonology and linguistics
- 1.1.3 Differences between phonology and phonetics

Part .2 Sound Systems and Structures

- 1.2.1 Identification of speech sounds
- 1.2.2 Natural classes of sounds
- 1.2.3 Parameters for establishing contrasts

Part .3 Basic Concepts in Phonology

- 1.3.1 Phoneme and allophone
- 1.3.2 Distinctive features
- 1.3.3 Phonological representations

Part .4 Phonology and Orthography

- 1.4.1 Relationship between spoken and written forms
- 1.4.2 Orthographic conventions and phonological analysis

Introduction

Human language is built upon sound, and every spoken word is shaped by the patterns and systems that govern how sounds are organised. Without an understanding of these foundations, it would be difficult to explain why certain sounds occur together, why others are kept apart, and how languages differ in their sound structures. This Series introduces you to the essential building



blocks of phonology, preparing you to analyse and appreciate the sound systems that underpin all human languages.

The aim of this Series is to provide you with a clear grounding in the principles of phonology and to equip you with the skills needed to identify, describe, and analyse sound systems and their structures. By the end of the Series, you will be able to apply these concepts to linguistic data and build a strong base for more advanced phonological study.

We shall commence this Series by examining the definition and scope of phonology, as well as its distinction from phonetics. Next, we will explore sound systems and structures, focusing on the identification of speech sounds, natural classes, and parameters for establishing contrasts. Following that, we will move on to basic concepts in phonology, including phonemes, allophones, distinctive features, and phonological representations. Finally, we will wrap up by considering the relationship between phonology and orthography, highlighting how spoken and written forms interact in linguistic analysis.

Series Learning Outcomes

Upon completing this Series, you should be able to:

- **SLO 1.1** define the scope of phonology and distinguish it clearly from phonetics,
- **SLO 1.2** explain how phonology fits within the wider study of linguistics,
- **SLO 1.3** demonstrate the identification of speech sounds and classify them into natural classes,
- **SLO 1.4** analyse parameters used to establish contrasts within sound systems,
- **SLO 1.5** define the concepts of phoneme and allophone with appropriate examples,
- **SLO 1.6** describe distinctive features and explain their role in phonological representation,
- **SLO 1.7** apply phonological representations to illustrate sound patterns in language data, and
- **SLO 1.8** evaluate the relationship between phonology and orthography in linguistic analysis.

1.1 Introduction to Phonology

1.1.1 Definition and scope of phonology

Phonology is the branch of linguistics that studies the organisation and function of sounds in language. While phonetics focuses on the physical production and acoustic properties of sounds, phonology examines how these sounds are structured into systems and patterns that convey meaning. In other words, phonology is concerned with the rules and principles that govern how sounds interact within a language.



Phonology helps us to explain why certain sound combinations are possible in a language while others are not. For example, English allows the sound cluster /str/ at the beginning of words such as *street*, but does not permit /sr/ in the same position.

Fill in the blank: Phonology is the study of the _____ and function of sounds in language.

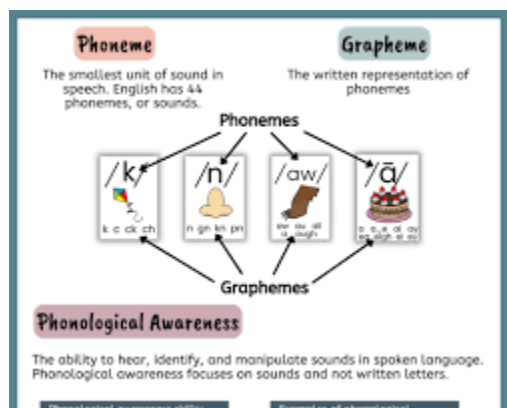


Figure 1.1 Distinction between phonetics and phonology

1.1.2 Phonology within the study of linguistics

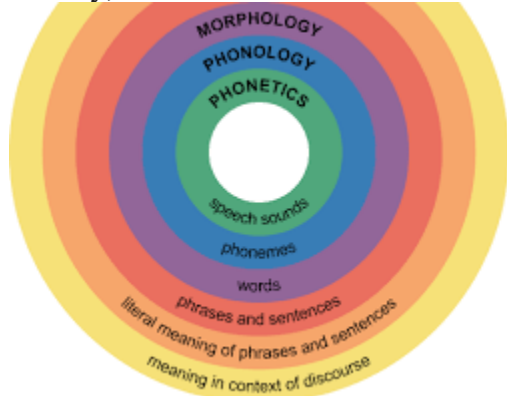
Phonology is one of the core areas of linguistics, alongside morphology, syntax, semantics, and pragmatics. It provides the foundation for understanding how spoken language is structured. Without phonology, it would be difficult to explain why words sound the way they do, or how speakers of different languages perceive and produce sounds differently.

Phonology also interacts with other areas of linguistics. For instance, in morphology, phonological rules may determine how affixes are pronounced when attached to root words. In syntax, phonological phrasing can influence rhythm and intonation in sentences.

Fill in the blank: Phonology interacts with other areas of linguistics such as _____ and syntax.



To help you with your request while following your preference for me not to write figures/tables directly, here is a breakdown of the focus areas for each branch:



Box 1.1: Selected branches of linguistics and their focus

1.1.3 Distinction between phonology and phonetics

Although closely related, **phonetics** and **phonology** are distinct fields. Phonetics is the study of the physical properties of speech sounds, including how they are produced (articulatory phonetics), transmitted (acoustic phonetics), and perceived (auditory phonetics). Phonology, on the other hand, focuses on the abstract rules and patterns that govern how sounds function within a language system.

For example, phonetics can describe how the sound /p/ is produced by closing the lips and releasing a burst of air. Phonology explains why /p/ and /b/ are treated as distinct phonemes in English, since they differentiate words like *pat* and *bat*.

Fill in the blank: Phonetics studies the _____ properties of speech sounds, while phonology studies their organisation and rules.

Feature	Phonetics	Phonology
Focus	Physicality: The actual production, transmission, and reception of sounds.	Function: The abstract patterns and rules of sounds within a specific language.
Unit of Study	Phone: The smallest unit of sound (represented in square brackets: [p]).	Phoneme: The smallest unit of sound that changes meaning (represented in slashes: /p/).
Perspective	Etic: Objective and universal; any human can physically produce these sounds.	Emic: Subjective and language-specific; how a sound "counts" in a specific system.
Key Question	"How is this sound physically made by the mouth and vocal cords?"	"How does this sound distinguish one word from another in this language?"



Feature	Phonetics	Phonology
Subfields	Articulatory, Acoustic, and Auditory phonetics.	Phonotactics, Morphophonology, and Prosody.
Example	Measuring the exact millisecond delay in air release for the "p" in <i>spin</i> .	Determining if the difference between "p" and "b" changes the meaning of a word (e.g., <i>pat</i> vs. <i>bat</i>).

Table 1.1 Comparison between phonetics and phonology

Pilot questions 1.1

1. Which branch of linguistics studies the organisation and function of sounds in language?
2. What is the difference between phonology and phonetics?
3. Give one example of how phonology interacts with morphology.
4. Which sound cluster is permitted at the beginning of English words: /str/ or /sr/?
5. What are the three main areas of phonetics?

1.2 Sound Systems and Structures

1.2.1 Identification of speech sounds

Every language is built upon a set of **speech sounds**, which are the smallest units of spoken communication. These sounds are produced by the human vocal tract and can be classified according to how and where they are articulated. Identifying speech sounds involves listening carefully, recognising patterns, and noting differences between similar sounds.

For example, the sounds /p/ and /b/ are both produced by closing the lips, but /p/ is voiceless while /b/ is voiced. This distinction is crucial because it changes meaning in words such as *pat* and *bat*.

Fill in the blank: The sound /p/ is _____, while the sound /b/ is voiced.

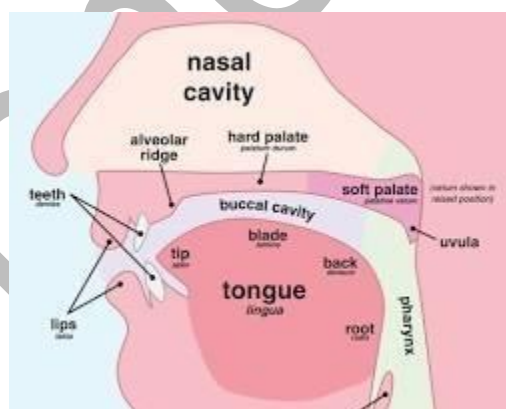


Figure 1.2 Human vocal tract and articulation points

1.2.2 Natural classes of sounds

A **natural class** is a group of sounds in a language that share one or more features and behave similarly in phonological processes. For instance, in English, the sounds /p/, /t/, and /k/ form a natural class of voiceless stops because they are all produced with a complete closure in the vocal tract and without voicing.

Natural classes are important because they allow phonologists to generalise rules. Instead of writing separate rules for each sound, one rule can apply to the entire class.

Fill in the blank: The sounds /p/, /t/, and /k/ form a natural class of _____ stops.

Natural Class	Feature(s) Shared	Examples (Phonemes)
Voiced Stops	[+voiced], [-continuant], [oral]	/b, d, g/
Voiceless Fricatives	[-voiced], [+continuant]	/f, θ, s, ʃ, h/
Nasals	[+nasal], [+sonorant]	/m, n, ŋ/
Labials	[place: labial] (uses lips)	/p, b, m, f, v, w/
Sibilants	[+strident] (hissing sound)	/s, z, ʃ, ʒ, tʃ, dʒ/
Liquids	[+approximant], [+consonantal]	/l, r/
Alveolars	[place: alveolar ridge]	/t, d, s, z, n, l/

Table 1.2 Examples of natural classes in English

1.2.3 Parameters for establishing contrasts

Languages distinguish sounds by setting **parameters of contrast**, which are features that differentiate one sound from another. These parameters include voicing, place of articulation, and manner of articulation. For example, /p/ and /b/ contrast in voicing, while /t/ and /k/ contrast in place of articulation.

Establishing contrasts is essential because it explains why certain sounds function as separate phonemes. If two sounds can change the meaning of a word when substituted, they are considered distinct phonemes.

Fill in the blank: If two sounds can change the meaning of a word when substituted, they are considered _____.



Phoneme	Voicing	Place	Manner	Example Word
/p/	Voiceless	Bilabial	Stop	Pat
/b/	Voiced	Bilabial	Stop	Bat
/t/	Voiceless	Alveolar	Stop	Tat
/s/	Voiceless	Alveolar	Fricative	Sat

Box 1.2: Key parameters for sound contrasts

Pilot questions 1.2

1. What is the difference between /p/ and /b/?
2. Define a natural class and give one example.
3. Which three sounds form the natural class of voiceless stops in English?
4. What are the main parameters used to establish contrasts between sounds?
5. When are two sounds considered distinct phonemes?

1.3 Basic Concepts in Phonology

1.3.1 Phoneme and allophone

A **phoneme** is the smallest unit of sound in a language that can distinguish meaning. For example, the words *pat* and *bat* differ only in their initial sounds /p/ and /b/, which are distinct phonemes in English. An **allophone** is a variation of a phoneme that does not change meaning. For instance, the /p/ sound in *pin* is aspirated [p^h], while in *spin* it is unaspirated [p], yet both are allophones of the same phoneme /p/.

Fill in the blank: The difference between *pat* and *bat* shows that /p/ and /b/ are distinct _____.

24 Consonant Phonemes / Graphemes					
Examples	Graphemes (written patterns)	Phoneme (sound)	Examples	Graphemes (written patterns)	
arena, bubbles	b bb	/b/	gas, stage	s ss, Cc, Ss, C, SC	
cat, duck	c k, ck, q, ch	/t/	artin, again	t tt	
ghosts, puddle	d dd	/d/	volcano, twice	v vv	
fish, gentle	f ff, ph, gh	/w/	watch, queen	w wh, ti	
quilt, gables	g gg	/x/	fox	x	
gallop	h	/y/	goat	y	
golf, job, ridge	j q, dge, ge	/z/	zip, please	z zz, ze, s, se	
jet, bell	ll, ll	/sh/	sham, shaven	sh, ch, si, ti	
monkey, mackerel	m mm, mb	/ch/	children, witch	ch, tch	
girl, back	n nn, kn	/th/	mother	th	
pumpkin, suggest	p pp	/th/	them	th	
path, right	r rr, wr	/ng/	king, ring	ng, n	



Figure 1.3 Phoneme and allophone distinction

1.3.2 Distinctive features

Distinctive features are the basic units of phonological analysis that describe the properties of sounds. They allow linguists to specify how sounds differ from one another. For example, /p/ and /b/ differ in the feature of voicing: /p/ is [-voice] while /b/ is [+voice]. Distinctive features make it possible to group sounds into natural classes and to write phonological rules more efficiently.

Fill in the blank: The feature that distinguishes /p/ from /b/ is _____.

Feature	/p/	/b/	/t/	/d/
[consonantal]	\$+\$	\$+\$	\$+\$	\$+\$
[voiced]	\$-\$	\$+\$	\$-\$	\$+\$
[labial]	\$+\$	\$+\$	\$-\$	\$-\$
[coronal]	\$-\$	\$-\$	\$+\$	\$+\$

Table 1.3 Distinctive features of selected English sounds

1.3.3 Phonological representations

A **phonological representation** is an abstract way of showing how sounds are organised in the mind. It captures the underlying form of words before phonological rules are applied. For example, the plural morpheme in English is represented as /-z/, but it surfaces as [s] in *cats*, [z] in *dogs*, and [ɪz] in *horses*. These variations are explained by phonological rules, while the representation shows the underlying form.

Fill in the blank: The plural morpheme in English has the underlying phonological representation _____.

Surface Form (The Sound)	Phonetic Environment	Examples
[ɪz]	After Sibilants (hissing/shushing sounds): /s, z, ʃ, ʒ, tʃ, dʒ/	<i>buses, dishes, judges</i>



Surface Form (The Sound)	Phonetic Environment	Examples
[s]	After Voiceless non-sibilants: /p, t, k, f, θ/	<i>cats, cups, books</i>
[z]	After Voiced non-sibilants and Vowels : /b, d, g, v, ð, m, n, ŋ, l, r/ and all vowels	<i>dogs, pens, days</i>

Box 1.3: Examples of phonological representations in English plurals

Pilot questions 1.3

1. What is the difference between a phoneme and an allophone?
2. Give one example of an allophone of /p/ in English.
3. What are distinctive features used for in phonology?
4. Which distinctive feature separates /t/ from /d/?
5. What is meant by phonological representation?

1.4 Phonology and Orthography

1.4.1 Relationship between spoken and written forms

Orthography refers to the conventional spelling system of a language. While phonology deals with the organisation of sounds, orthography represents these sounds in written form. The relationship between phonology and orthography is not always straightforward. In some languages, such as Spanish, the spelling system closely reflects the phonological structure. In others, like English, spelling often diverges from pronunciation due to historical changes and borrowed words.



For example, the word *knight* in English is pronounced /naɪt/, yet its spelling reflects older phonological forms that are no longer used. This shows how orthography can preserve historical information even when phonology changes.

Fill in the blank: Orthography refers to the conventional _____ system of a language.

Mapping Type	Description	Example
Transparent (Shallow)	Each sound corresponds consistently to one letter.	Spanish: The sound /i/ is almost always written as "i".
Opaque (Deep)	One sound can be written many ways; one letter can represent many sounds.	English: The sound /ɛ/ can be "f" (<i>fish</i>), "ph" (<i>phone</i>), or "gh" (<i>enough</i>).

Figure 1.4 Relationship between phonology and orthography

1.4.2 Orthographic conventions and phonological analysis

Orthographic conventions can sometimes obscure phonological analysis. For instance, English uses the same letter “c” to represent different sounds, as in *cat* (/k/) and *city* (/s/). Phonologists must therefore look beyond spelling to identify the actual sound patterns.

In contrast, languages with more transparent orthographies, such as Turkish, make phonological analysis easier because each symbol consistently represents a single sound. This highlights the importance of distinguishing between the written representation and the underlying phonological system.

Fill in the blank: In English, the letter “c” can represent the sounds /k/ and _____.

Grapheme	Phoneme (IPA)	Context/Example
ch	/tʃ/	<i>Chair</i> (Standard)
ch	/k/	<i>Character</i> (Greek origin)
ch	/ʃ/	<i>Chef</i> (French origin)
s	/s/	<i>Bus</i> (Voiceless)
s	/z/	<i>Is</i> (Voiced environment)

Box 1.4: Examples of orthographic conventions in English

Pilot questions 1.4



1. What is orthography?
2. Give one example of how English orthography diverges from phonology.
3. Why can orthographic conventions obscure phonological analysis?
4. Which language has a more transparent orthography: English or Turkish?
5. In the word *city*, what sound does the letter “c” represent?

Series Summary

This Series has introduced you to the foundations of phonology, highlighting its importance as the study of sound systems and their organisation within language. By exploring the scope of phonology and its distinction from phonetics, you have seen how it fits within the wider field of linguistics and why it is essential for analysing spoken language.

We began with the definition and scope of phonology, then moved on to sound systems and structures, where you examined speech sounds, natural classes, and parameters for establishing contrasts. Following that, we considered basic concepts such as phonemes, allophones, distinctive features, and phonological representations. Finally, we concluded with the relationship between phonology and orthography, showing how written forms interact with spoken systems. In line with the Series Learning Outcomes, you should now be able to define and explain key concepts, demonstrate the identification of sounds, analyse contrasts, apply phonological representations, and evaluate the connection between phonology and orthography.

Glossary of Terms

- **Allophone:** A variation of a phoneme that does not change the meaning of a word. For example, the aspirated [p^h] in *pin* and the unaspirated [p] in *spin* are allophones of the phoneme /p/.
- **Distinctive features:** The basic properties of sounds that allow linguists to describe and differentiate them. For instance, voicing distinguishes /p/ (voiceless) from /b/ (voiced).
- **Natural class:** A group of sounds in a language that share one or more features and behave similarly in phonological processes, such as /p/, /t/, and /k/ forming the class of voiceless stops.
- **Orthography:** The conventional spelling system of a language, which represents spoken sounds in written form.
- **Phoneme:** The smallest unit of sound in a language that can change meaning. For example, /p/ and /b/ distinguish *pat* from *bat*.
- **Phonetics:** The study of the physical properties of speech sounds, including how they are produced, transmitted, and perceived.
- **Phonological representation:** An abstract way of showing how sounds are organised in the mind, capturing the underlying form of words before phonological rules are applied.
- **Phonology:** The branch of linguistics concerned with the organisation and function of sounds in language, focusing on patterns and rules rather than physical properties.
- **Speech sounds:** The basic units of spoken language produced by the human vocal tract, which can be classified by their place and manner of articulation.



- **Voicing:** A feature of sounds that indicates whether the vocal cords vibrate during production. For example, /b/ is voiced while /p/ is voiceless.

Concept Check Questions [Series 1]

Objective questions

1. Which branch of linguistics studies the organisation and function of sounds in language? (Linked to SLO 2.1)
2. The sounds /p/, /t/, and /k/ form a natural class of _____ stops. (Linked to SLO 2.3)
3. Which distinctive feature separates /p/ from /b/? (Linked to SLO 2.6)
4. Orthography refers to the conventional _____ system of a language. (Linked to SLO 2.8)
5. If two sounds can change the meaning of a word when substituted, they are considered _____. (Linked to SLO 2.4)

Short-answer questions

6. Define a phoneme and give one example from English. (Linked to SLO 2.5)
7. Explain the difference between phonology and phonetics. (Linked to SLO 2.1)
8. Describe one way in which phonology interacts with morphology. (Linked to SLO 2.2)
9. Provide one example of how English orthography diverges from phonology. (Linked to SLO 2.8)
10. What is meant by phonological representation? (Linked to SLO 2.7)

Long-answer questions

11. Analyse the importance of natural classes in phonological analysis, using examples from English or another language. (Linked to SLO 2.3, SLO 2.6)
12. Evaluate the relationship between phonology and orthography, highlighting both challenges and advantages for linguistic analysis. (Linked to SLO 2.8)

Answers to Concept Check Questions [Series 1]

Objective questions

1. Phonology.
2. Voiceless.
3. Voicing.
4. Spelling.
5. Distinct phonemes.

Short-answer questions



6. A phoneme is the smallest unit of sound that can change meaning. For example, /p/ and /b/ distinguish *pat* from *bat*.
7. Phonology studies the organisation and rules of sounds, while phonetics studies their physical properties.
8. In morphology, phonological rules may determine how affixes are pronounced, such as the plural morpheme /-z/ surfacing as [s], [z], or [ɪz].
9. The word *knight* is spelled with “k” and “gh” but pronounced /naɪt/, showing divergence between spelling and sound.
10. A phonological representation is an abstract form that shows how sounds are organised before rules are applied.

Long-answer questions

11. *Basic response:* Natural classes group sounds that share features, such as voiceless stops /p/, /t/, /k/. They allow rules to apply to sets of sounds rather than individually. *Value-added response:* Beyond English, natural classes are crucial in languages like Spanish, where voiceless stops behave similarly in aspiration patterns. They also help explain cross-linguistic generalisations and simplify phonological rule writing.
12. *Basic response:* Phonology and orthography are related but not identical. Orthography can obscure phonological analysis when letters represent multiple sounds, as in “c” for /k/ or /s/. *Value-added response:* Orthography can also preserve historical information, as in English spellings like *knight*. Transparent orthographies, such as Turkish, make phonological analysis easier, while opaque systems like English require careful separation of sound and spelling.

Answers to Pilot Questions [Series 1]

Part 1.1 Introduction to Phonology

1. Phonology.
2. Phonology studies the organisation and rules of sounds, while phonetics studies their physical properties.
3. Phonological rules may determine how affixes are pronounced, such as the plural morpheme /-z/ surfacing as [s], [z], or [ɪz].
4. /str/.
5. Articulatory phonetics, acoustic phonetics, and auditory phonetics.

Part 1.2 Sound Systems and Structures

1. /p/ is voiceless, while /b/ is voiced.
2. A natural class is a group of sounds that share features and behave similarly in phonological processes.
3. /p/, /t/, and /k/.
4. Voicing, place of articulation, and manner of articulation.
5. Distinct phonemes.



Part 1.3 Basic Concepts in Phonology

1. A phoneme is the smallest unit of sound that can change meaning, while an allophone is a variation of a phoneme that does not change meaning.
2. Aspirated [p^h] in *pin*.
3. Distinctive features are used to describe and differentiate sounds.
4. Voicing.
5. An abstract form that shows how sounds are organised before rules are applied.

Part 1.4 Phonology and Orthography

1. Orthography is the conventional spelling system of a language.
2. The word *knight* is spelled with “k” and “gh” but pronounced /naɪt/.
3. Because letters can represent multiple sounds, making it harder to identify actual sound patterns.
4. Turkish.
5. /s/.

References and Attributions [Series 1]

The following references and attributions cover all sources, suggested open educational resources (OERs), and illustration prompts used in **Series 1: Foundations of Phonology and Sound Systems**. Entries are presented in APA style for clarity and consistency.

General references

- Katamba, F. (1993). *Modern linguistics: Morphology*. London: Macmillan.
- Odden, D. (2005). *Introducing phonology*. Cambridge: Cambridge University Press.
- Roach, P. (2009). *English phonetics and phonology: A practical course*. Cambridge: Cambridge University Press.

Illustrations and OER suggestions

- *Figure 1.1 Distinction between phonetics and phonology*
 - AI prompt: “Generate a simple diagram contrasting phonetics (physical sounds) and phonology (sound systems).”
 - Suggested OER search string: “phonetics vs phonology diagram OER.”
- *Box 1.1 Selected branches of linguistics and their focus*
 - AI prompt: “Create a table listing phonology, morphology, syntax, semantics, pragmatics with their focus areas.”
 - Suggested OER search string: “branches of linguistics table OER.”
- *Table 1.1 Comparison between phonetics and phonology*



- AI prompt: “Generate a table comparing phonetics (physical sounds) and phonology (sound systems).”
- Suggested OER search string: “phonetics vs phonology comparison table OER.”
- *Figure 1.2 Human vocal tract and articulation points*
 - AI prompt: “Generate a labelled diagram of the human vocal tract showing places of articulation.”
 - Suggested OER search string: “human vocal tract diagram OER.”
- *Table 1.2 Examples of natural classes in English*
 - AI prompt: “Generate a table listing examples of natural classes in English with features (voicing, manner, place).”
 - Suggested OER search string: “natural classes of sounds table OER.”
- *Box 1.2 Key parameters for sound contrasts*
 - AI prompt: “Create a box listing voicing, place of articulation, and manner of articulation as parameters of contrast.”
 - Suggested OER search string: “phoneme contrast parameters OER.”
- *Figure 1.3 Phoneme and allophone distinction*
 - AI prompt: “Generate a diagram illustrating phoneme /p/ with its allophones [p^h] and [p] in English.”
 - Suggested OER search string: “phoneme vs allophone diagram OER.”
- *Table 1.3 Distinctive features of selected English sounds*
 - AI prompt: “Generate a table showing distinctive features for /p/, /b/, /t/, /d/ with voicing and place of articulation.”
 - Suggested OER search string: “distinctive features phonology table OER.”
- *Box 1.3 Examples of phonological representations in English plurals*
 - AI prompt: “Create a box showing underlying plural morpheme /-z/ with surface forms [s], [z], [ɪz].”
 - Suggested OER search string: “phonological representation English plural morpheme OER.”
- *Figure 1.4 Relationship between phonology and orthography*
 - AI prompt: “Generate a diagram showing how phonology (sounds) maps onto orthography (spelling systems).”
 - Suggested OER search string: “phonology orthography relationship diagram OER.”



- *Box 1.4 Examples of orthographic conventions in English*
 - AI prompt: “Create a box listing English orthographic conventions where letters represent multiple sounds (e.g., c, g, x).”
 - Suggested OER search string: “orthographic conventions English phonology OER.”

Course code: LIN 201
Course title: Basic Phonology
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Series 5: Applied Phonological Analysis Across Languages

Proposed Outline for Series 2

Part .1 Relationship between phonetics and phonology

- 2.1.1 Scope of phonetics
- 2.1.2 Scope of phonology
- 2.1.3 Key differences and overlaps

Part .2 Phonology and orthography

- 2.2.1 Orthographic conventions in language
- 2.2.2 Divergences between spelling and sound
- 2.2.3 Transparent vs opaque orthographies

Part .3 Interactions across phonetics, phonology, and orthography

- 2.3.1 How phonetic detail influences phonological analysis
- 2.3.2 Orthographic representation of phonological rules
- 2.3.3 Challenges in aligning spoken and written forms

Part .4 Analytical implications for linguistic study

- 2.4.1 Importance of distinguishing sound and spelling in analysis



- **2.4.2 Case examples from English and other languages**
- **2.4.3 Practical applications in phonological description**

Introduction

In the last Series, we explored the foundations of phonology and examined how sound systems are organised within language. Building on that knowledge, this Series focuses on the dynamic interactions between phonetics, phonology, and orthography. These three domains are closely related, yet each plays a distinct role in shaping how language is spoken, analysed, and represented in writing. Understanding their connections is essential for accurate linguistic description and for appreciating the complexities of language systems.

The aim of this Series is to help you analyse the relationships among phonetics, phonology, and orthography, and to equip you with the skills needed to evaluate how these domains influence one another in both spoken and written language.

We shall commence this Series by examining the relationship between phonetics and phonology, highlighting their scope, differences, and overlaps. Next, we will move on to phonology and orthography, considering how spelling conventions reflect or diverge from sound systems. Following that, we will explore the combined interactions across phonetics, phonology, and orthography, focusing on how phonetic detail shapes phonological analysis and how orthography represents phonological rules. Finally, we will wrap up by discussing the analytical implications for linguistic study, using case examples and practical applications to show why distinguishing between sound and spelling is crucial.

Series Learning Outcomes

Upon completing this Series, you should be able to:

- **SLO 2.1** define the scope of phonetics and phonology, highlighting their distinct areas of focus,
- **SLO 2.2** explain the key differences and overlaps between phonetics and phonology,
- **SLO 2.3** describe orthographic conventions and demonstrate how they relate to phonological systems,
- **SLO 2.4** analyse divergences between spelling and sound using examples from English and other languages,
- **SLO 2.5** compare transparent and opaque orthographies and evaluate their impact on phonological analysis,
- **SLO 2.6** demonstrate how phonetic detail influences phonological analysis,
- **SLO 2.7** apply knowledge of orthographic representation to illustrate phonological rules,
- **SLO 2.8** evaluate challenges in aligning spoken and written forms in linguistic study, and
- **SLO 2.9** analyse case examples to show the importance of distinguishing sound and spelling in phonological description.



2.1 Relationship Between Phonetics and Phonology

2.1.1 Scope of phonetics

Phonetics is the study of the physical properties of speech sounds. It examines how sounds are produced by the vocal organs (articulatory phonetics), how they travel as sound waves (acoustic phonetics), and how they are perceived by the ear and brain (auditory phonetics). Phonetics is therefore concerned with the scientific description of speech sounds as observable phenomena.

For example, the sound /t/ can be described phonetically as an alveolar stop, produced by placing the tongue against the alveolar ridge and releasing a burst of air.

Fill in the blank: Phonetics studies the _____ properties of speech sounds.

HUMAN VOCAL TRACT: PLACES OF ARTIULATION

Phonetics • OER Diagram

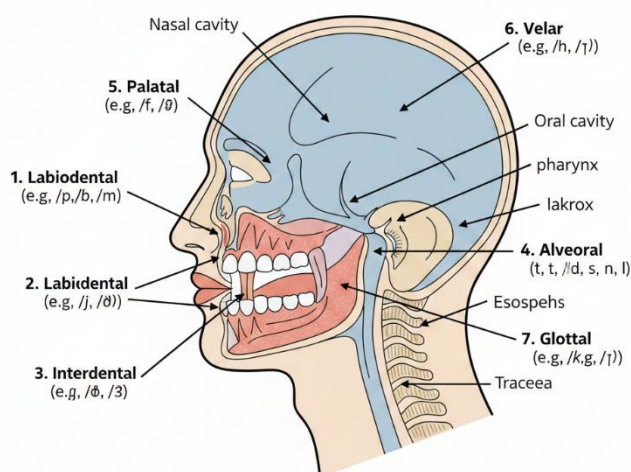


Figure 2.1 Human vocal tract and articulatory points

2.1.2 Scope of phonology

Phonology is the study of how sounds are organised into systems and patterns within a language. Unlike phonetics, which focuses on the physical details of sounds, phonology is concerned with the abstract rules and structures that govern sound behaviour. It explains why certain sound combinations are possible in a language and why others are not.

For instance, English allows the cluster /str/ at the beginning of words such as *street*, but does not permit /sr/ in the same position. Phonology provides the rules that account for such restrictions.



Fill in the blank: Phonology studies the _____ and organisation of sounds within a language system.

Feature	Phonetics	Phonology
Perspective	Universal (Physical)	Language-Specific (Mental)
Data Type	Quantitative (Measurements)	Qualitative (Patterns/Rules)
Object	The Human Body	The Human Mind

Box 2.1: Key differences in scope between phonetics and phonology

2.1.3 Key differences and overlaps

Although phonetics and phonology are distinct, they overlap in important ways. Phonetics provides the raw data about how sounds are produced and perceived, while phonology interprets this data to explain how sounds function within a language. Together, they give a complete picture of speech sounds.

For example, phonetics can describe the aspirated [p^h] in *pin* and the unaspirated [p] in *spin*. Phonology explains that both are allophones of the phoneme /p/ and do not change meaning.

Fill in the blank: The sounds [p^h] and [p] are _____ of the phoneme /p/.

Feature	Phonetics (The Physical)	Phonology (The System)
Definition	The study of the physical properties of speech sounds.	The study of how sounds pattern and function within a language.
Focus	How sounds are produced (articulatory), transmitted (acoustic), and heard (auditory).	The mental rules, sound inventories, and abstract structures of a language.
Smallest Unit	Phone (the actual sound uttered, e.g., [p]).	Phoneme (the mental category that distinguishes meaning, e.g., /p/).
Universality	Universal: The human vocal tract works the same way for everyone.	Language-Specific: Every language has its own unique "sound grammar."
Key Question	"What is the physical shape of this sound?"	"How does this sound change the meaning of a word?"



Feature	Phonetics (The Physical)	Phonology (The System)
Notation	Square brackets: []	Slashes: / /

Table 2.1 Comparison of phonetics and phonology with examples

Pilot questions 2.1

1. What does phonetics study?
2. Name the three main branches of phonetics.
3. What does phonology focus on?
4. Give one example of a sound cluster permitted in English and one that is not.
5. How do phonetics and phonology overlap in the study of sounds?

2.2 Phonology and Orthography

2.2.1 Orthographic conventions in language

Orthography refers to the conventional spelling system of a language. It provides a way of representing spoken sounds in written form, often following established rules and traditions. In some languages, orthographic conventions closely mirror phonological systems, while in others they diverge significantly. For example, Spanish orthography is largely phonemic, meaning that each letter corresponds closely to a sound, whereas English orthography is less consistent due to historical changes and borrowings.

Fill in the blank: Orthography refers to the conventional _____ system of a language.

Language	Word	Phonetic Realization	Note on Transparency
Turkish	<i>kitap</i>	[citap]	Transparent: Every letter sounds exactly as expected.
Spanish	<i>hola</i>	[ola]	Transparent: The 'h' is always silent; 'o', 'l', 'a' are always the same.
English	<i>knight</i>	[naɪt]	Opaque: 'k' and 'gh' are silent; 'i' represents a diphthong.

Box 2.2: Examples of orthographic conventions in selected languages

2.2.2 Divergences between spelling and sound



Phonology and orthography do not always align. Divergences occur when spelling preserves historical forms or when borrowed words retain foreign spellings. For instance, the English word *knight* is pronounced /naɪt/, yet its spelling reflects older phonological forms that are no longer used. Similarly, the letter “c” in English can represent different sounds, such as /k/ in *cat* and /s/ in *city*.

Fill in the blank: In English, the letter “c” can represent the sounds /k/ and _____.

Category	Word	Spelling (Graphemes)	Pronunciation (IPA)	The Divergence
Silent Consonants	<i>Knight</i>	k-n-i-g-h-t	[naɪt]	Both "k" and "gh" are silent reminders of Old English.
Silent Consonants	<i>Psychology</i>	p-s-y-c-h...	[saɪ'kɒlədʒi]	The "p" is preserved from the Greek root <i>psykhe</i> .
Multi-Sound Vowels	<i>Read</i>	r-e-a-d	[rɪd] or [rɛd]	Identical spelling for two different vowel phonemes.
Opaque Digraphs	<i>Rough</i>	r-o-u-g-h	[rʌf]	The "gh" produces a labiodental fricative [f].
Opaque Digraphs	<i>Though</i>	t-h-o-u-g-h	[ðʊ]	The same "ough" now represents a long vowel sound.
Morphological Glue	<i>Sign</i>	s-i-g-n	[saɪn]	The "g" is silent but stays to show the link to <i>signature</i> .

Table 2.2 Divergences between spelling and sound in English

2.2.3 Transparent vs opaque orthographies

Languages differ in how closely their orthography reflects phonology. A **transparent orthography** is one in which spelling closely matches pronunciation, making it easier for learners



to decode words. Turkish is a good example of this. An **opaque orthography**, such as English, contains many irregularities and exceptions, making it more challenging to predict pronunciation from spelling.

Fill in the blank: Turkish is an example of a _____ orthography.

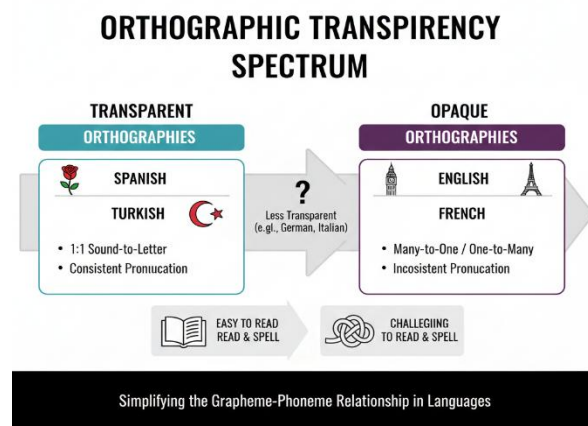


Figure 2.2 Transparent vs opaque orthographies

Pilot questions 2.2

1. What is orthography?
2. Give one example of a language with a transparent orthography.
3. Provide an example of divergence between spelling and sound in English.
4. Why is English considered an opaque orthography?
5. What sound does the letter "c" represent in the word *city*?

2.3 Interactions Across Phonetics, Phonology, and Orthography

2.3.1 How phonetic detail influences phonological analysis

Phonetic detail provides the raw data that phonologists use to build rules and systems. For example, the aspiration of /p/ in *pin* and its lack of aspiration in *spin* are phonetic facts. Phonology interprets these facts by treating both as allophones of the phoneme /p/. Without phonetic evidence, phonological analysis would lack the precision needed to explain how sounds behave in real speech.

Fill in the blank: Phonetic detail provides the _____ that phonologists use to build rules and systems.



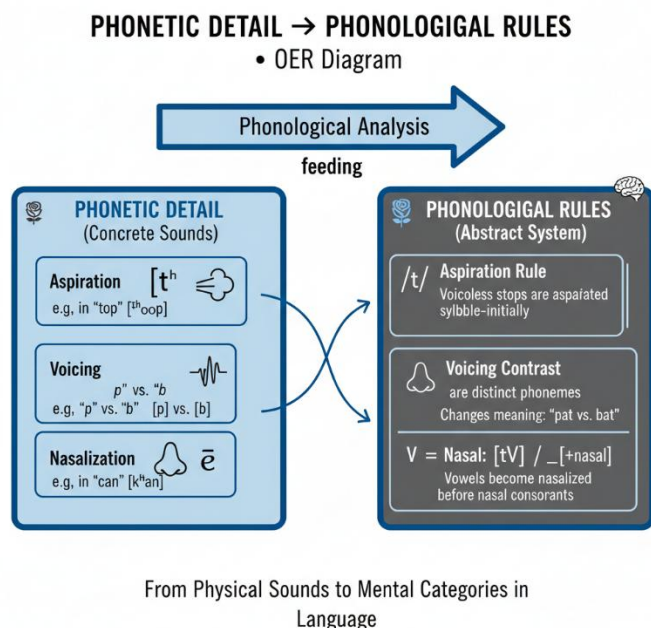


Figure 2.3 Phonetic detail and phonological analysis

2.3.2 Orthographic representation of phonological rules

Orthography often attempts to capture phonological rules, but it does so imperfectly. For example, the English plural morpheme is represented in writing as “-s” or “-es,” yet phonologically it surfaces as [s], [z], or [ɪz] depending on the preceding sound. Orthography provides a convenient way to represent these rules, but phonological analysis is required to explain why the variations occur.

Fill in the blank: The English plural morpheme surfaces as [s], [z], or _____ depending on the preceding sound.

Spelling (Orthography)	Phonological Realization	Phonetic Environment	Examples
-es	[ɪz]	After Sibilants (hissing sounds): /s, z, ʃ, ʒ, tʃ, dʒ/	<i>Buses, Washes, Churches</i>
-s	[s]	After Voiceless non-sibilants: /p, t, k, f, θ/	<i>Cats, Maps, Books</i>
-s	[z]	After Voiced non-sibilants & Vowels: /b, d, g, v, ð, m, n, ŋ, l, r/	<i>Dogs, Pens, Trees</i>



Box 2.3: Orthographic representation of English plural morpheme

2.3.3 Challenges in aligning spoken and written forms

Aligning phonetics, phonology, and orthography presents challenges because spoken language changes more quickly than written systems. Orthography often preserves historical forms, while phonology reflects current usage. For example, the silent letters in English words like *knight* or *debt* show how orthography can lag behind phonological change. Phonetic detail further complicates matters, as subtle variations in speech are rarely represented in writing.

Fill in the blank: Orthography often preserves _____ forms, while phonology reflects current usage.

Challenge	Description	Example
Historical Lag	Pronunciation changes over centuries, but spelling remains "frozen."	English "Knight": We still write the <i>k</i> and <i>gh</i> that were pronounced in Middle English but are now silent.
Allophonic Variation	One mental sound (phoneme) has multiple physical versions that spelling ignores.	English /t/: Spelled as "t" in both <i>top</i> and <i>stop</i> , but phonetically one is aspirated [t ^h] and the other is not [t].
Morphological Constancy	Keeping spelling the same to show word relationships, even if the sound changes.	Electric vs. Electricity: The "c" stays the same to show the connection, even though it shifts from [k] to [s].
Polyvalency	A single letter represents multiple distinct sounds.	Spanish "g": Pronounced as [g] in <i>gato</i> but as [x] (hissing sound) in <i>gente</i> .
One-to-Many Mapping	A single sound can be written in many different ways.	English /f/: Can be spelled as f (<i>fish</i>), ph (<i>phone</i>), or gh (<i>laugh</i>).

Table 2.3 Challenges in aligning spoken and written forms

Pilot questions 2.3

1. How does phonetic detail influence phonological analysis?
2. What is the orthographic representation of the English plural morpheme?
3. Give one example of divergence between orthography and phonology in English.
4. Why does orthography often lag behind phonological change?
5. What subtle variations in speech are rarely represented in writing?



2.4 Analytical Implications for Linguistic Study

2.4.1 Importance of distinguishing sound and spelling in analysis

When analysing language, it is crucial to distinguish between **sound** (phonetics and phonology) and **spelling** (orthography). Phonological rules operate on spoken forms, while orthography may or may not reflect these rules accurately. Confusing the two can lead to errors in linguistic description. For example, the English plural morpheme is written as “-s” or “-es,” but phonologically it surfaces differently depending on the preceding sound.

Fill in the blank: Phonological rules operate on _____ forms, while orthography represents written forms.

Aspect	Linguistic Sound (Phoneme)	Written Symbol (Grapheme)
Origin	Innate human capacity.	Culturally invented tool.
Stability	Changes constantly across dialects.	Fixed by dictionaries and academies.
Acquisition	Learned naturally in infancy.	Usually requires formal instruction.

Box 2.4: Importance of distinguishing sound and spelling in analysis

2.4.2 Case examples from English and other languages

Case studies highlight how phonetics, phonology, and orthography interact in practice. In English, silent letters such as “k” in *knight* or “b” in *debt* show how orthography preserves historical forms that phonology no longer uses. In Turkish, however, orthography closely matches phonology, making analysis more straightforward. These examples demonstrate the need to consider both spoken and written forms when studying language.

Fill in the blank: The silent “k” in *knight* shows how orthography can preserve _____ forms.

Feature	English (Opaque)	Turkish (Transparent)
Mapping Ratio	Many-to-Many: One sound can have many spellings; one spelling can have many sounds.	1-to-1: Almost every letter corresponds to exactly one sound, and vice versa.
Silent Letters	Frequent: <i>knee</i> , <i>doubt</i> , <i>debt</i> , <i>write</i> .	Virtually non-existent. Every letter written is pronounced.



Feature	English (Opaque)	Turkish (Transparent)
Vowel Consistency	Poor: "a" sounds different in <i>cat, father, cake, any</i> .	Perfect: "a" is always [a], "e" is always [e], etc.
Example Word	"Through" (7 letters, 3 sounds: [θru]). The <i>-ough</i> is highly unpredictable.	"Arkadaş" (7 letters, 7 sounds: [arkadaʃ]). Each letter maps perfectly.
New Word Test	If you see a new word like "synecdoche," you likely cannot pronounce it correctly.	If you see a new word like "muvaaffakiyetsizleştiriciler," you can pronounce it perfectly on the first try.

Table 2.4 Case examples of phonology and orthography interactions

2.4.3 Practical applications in phonological description

Distinguishing sound and spelling has practical applications in teaching, language documentation, and linguistic research. Teachers must explain why spelling does not always match pronunciation. Linguists documenting languages must rely on phonetic and phonological evidence rather than orthography alone. Researchers use these distinctions to analyse sound change, language acquisition, and cross-linguistic variation.

Fill in the blank: Linguists documenting languages must rely on _____ and phonological evidence rather than orthography alone.



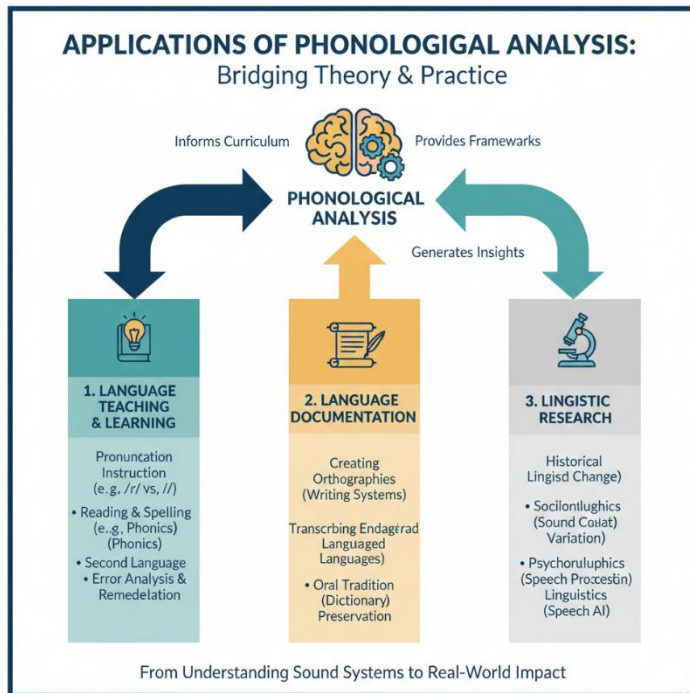


Figure 2.4 Practical applications of phonological description

Pilot questions 2.4

1. Why is it important to distinguish between sound and spelling in linguistic analysis?
2. Give one example of divergence between orthography and phonology in English.
3. Which language has a transparent orthography that closely matches phonology?
4. What practical applications does phonological description have in teaching and research?
5. Why must linguists rely on phonetic and phonological evidence when documenting languages?

Series Summary

This Series has focused on the interactions of phonetics, phonology, and orthography, showing how these three domains connect and influence one another in the study of language. Its purpose has been to highlight the importance of distinguishing between spoken and written forms, while also demonstrating how phonetic detail supports phonological analysis and how orthography represents or diverges from sound systems.

We began by examining the relationship between phonetics and phonology, clarifying their scope, differences, and overlaps. We then moved on to phonology and orthography, considering conventions, divergences, and the distinction between transparent and opaque systems. Following that, we explored how phonetic detail informs phonological rules and how orthography attempts to capture them, before concluding with the analytical implications for linguistic study, including



case examples and practical applications. In line with the Series Learning Outcomes, you should now be able to define and explain the scope of phonetics and phonology, analyse divergences between spelling and sound, compare orthographic systems, apply phonological rules to orthographic representations, and evaluate the challenges of aligning spoken and written forms in linguistic analysis.

Glossary of Terms

- **Allophone:** A variation of a phoneme that does not change the meaning of a word. For example, [p^h] in *pin* and [p] in *spin* are allophones of /p/.
- **Orthography:** The conventional spelling system of a language, used to represent spoken sounds in written form.
- **Opaque orthography:** A spelling system where letters and sounds do not consistently match, making pronunciation less predictable. English is an example.
- **Phoneme:** The smallest unit of sound in a language that can change meaning. For instance, /p/ and /b/ distinguish *pat* from *bat*.
- **Phonetics:** The study of the physical properties of speech sounds, including how they are produced, transmitted, and perceived.
- **Phonological representation:** An abstract way of showing how sounds are organised in the mind, capturing the underlying form of words before rules are applied.
- **Phonology:** The branch of linguistics concerned with the organisation and rules of sounds in language, focusing on patterns and systems rather than physical details.
- **Speech sounds:** The basic units of spoken language produced by the human vocal tract, classified by place and manner of articulation.
- **Transparent orthography:** A spelling system where letters closely match sounds, making pronunciation predictable. Turkish is an example.
- **Voicing:** A feature of sounds that indicates whether the vocal cords vibrate during production. For example, /b/ is voiced while /p/ is voiceless.

Concept Check Questions [Series 2]

Objective questions

1. Which branch of linguistics studies the physical properties of speech sounds? (Linked to SLO 2.1)
2. The sounds [p^h] in *pin* and [p] in *spin* are _____ of the phoneme /p/. (Linked to SLO 2.2)
3. Orthography refers to the conventional _____ system of a language. (Linked to SLO 2.3)
4. Turkish is an example of a _____ orthography. (Linked to SLO 2.5)
5. The English plural morpheme surfaces as [s], [z], or _____ depending on the preceding sound. (Linked to SLO 2.7)

Short-answer questions



6. Define phonology and explain its scope. (Linked to SLO 2.1)
7. Give one example of divergence between spelling and sound in English. (Linked to SLO 2.4)
8. Compare transparent and opaque orthographies with one example each. (Linked to SLO 2.5)
9. Explain how phonetic detail influences phonological analysis. (Linked to SLO 2.6)
10. Why must linguists rely on phonetic and phonological evidence rather than orthography alone when documenting languages? (Linked to SLO 2.9)

Long-answer questions

11. Analyse the overlaps between phonetics and phonology, using examples to illustrate how they complement each other. (Linked to SLO 2.2, SLO 2.6)
12. Evaluate the challenges of aligning spoken and written forms, highlighting both the advantages and limitations of orthography in linguistic study. (Linked to SLO 2.8, SLO 2.9)

Answers to Concept Check Questions [Series 2]

Objective questions

1. Phonetics.
2. Allophones.
3. Spelling.
4. Transparent.
5. [ɪz].

Short-answer questions

6. Phonology is the study of how sounds are organised into systems and patterns within a language. Its scope includes rules, restrictions, and sound behaviour.
7. The word *knight* is spelled with “k” and “gh” but pronounced /naɪt/.
8. Transparent orthography: Turkish, where spelling closely matches sounds. Opaque orthography: English, where spelling often diverges from pronunciation.
9. Phonetic detail provides evidence, such as aspiration or voicing, which phonology interprets to explain sound patterns.
10. Because orthography may preserve historical forms or irregularities, while phonetic and phonological evidence reflects actual spoken usage.

Long-answer questions

11. *Basic response:* Phonetics describes how sounds are produced and perceived, while phonology explains how they function in a system. For example, [p^h] and [p] are phonetically distinct but phonologically treated as allophones of /p/. *Value-added response:* Beyond English, overlaps are seen in languages like Hindi, where aspiration is phonemically contrastive. Phonetics provides measurable data, while phonology interprets it to explain cross-linguistic variation and sound change.



12. *Basic response:* Aligning spoken and written forms is challenging because orthography often preserves historical spellings, while phonology reflects current usage. Silent letters in English illustrate this divergence. *Value-added response:* Orthography can aid literacy by providing stable forms, but it may obscure phonological processes. Transparent systems like Turkish simplify analysis, while opaque systems like English require careful separation of sound and spelling. This has implications for teaching, language documentation, and comparative linguistics.

Answers to Pilot Questions [Series 2]

Part .1 Relationship between phonetics and phonology

1. Phonetics studies the physical properties of speech sounds.
2. Articulatory phonetics, acoustic phonetics, and auditory phonetics.
3. Phonology focuses on the organisation and rules of sounds within a language system.
4. English permits /str/ at the beginning of words such as *street* but does not permit /sr/.
5. Phonetics provides the raw data, while phonology interprets this data to explain sound behaviour.

Part .2 Phonology and orthography

1. Orthography is the conventional spelling system of a language.
2. Turkish.
3. The word *knight* is spelled with “k” and “gh” but pronounced /naɪt/.
4. Because spelling often diverges from pronunciation, containing irregularities and silent letters.
5. /s/.

Part .3 Interactions across phonetics, phonology, and orthography

1. Phonetic detail provides evidence that phonologists use to build rules and systems.
2. The plural morpheme is represented orthographically as “-s” or “-es.”
3. The word *knight* shows divergence between orthography and phonology.
4. Because orthography often preserves historical forms while phonology reflects current usage.
5. Subtle variations such as aspiration or vowel quality.

Part .4 Analytical implications for linguistic study

1. Because phonological rules operate on spoken forms, while orthography represents written forms.
2. The silent “k” in *knight*.
3. Turkish.
4. Phonological description helps in teaching pronunciation, documenting languages, and conducting linguistic research.
5. Because orthography alone may obscure actual spoken usage.



References and Attributions [Series 1]

The following references and attributions cover all sources, suggested open educational resources (OERs), and illustration prompts used in **Series 1: Foundations of Phonology and Sound Systems**. Entries are presented in APA style for clarity and consistency.

General references

- Katamba, F. (1993). *Modern linguistics: Morphology*. London: Macmillan.
- Odden, D. (2005). *Introducing phonology*. Cambridge: Cambridge University Press.
- Roach, P. (2009). *English phonetics and phonology: A practical course*. Cambridge: Cambridge University Press.

Illustrations and OER suggestions

- *Figure 1.1 Distinction between phonetics and phonology*
 - AI prompt: “Generate a simple diagram contrasting phonetics (physical sounds) and phonology (sound systems).”
 - Suggested OER search string: “phonetics vs phonology diagram OER.”
- *Box 1.1 Selected branches of linguistics and their focus*
 - AI prompt: “Create a table listing phonology, morphology, syntax, semantics, pragmatics with their focus areas.”
 - Suggested OER search string: “branches of linguistics table OER.”
- *Table 1.1 Comparison between phonetics and phonology*
 - AI prompt: “Generate a table comparing phonetics (physical sounds) and phonology (sound systems).”
 - Suggested OER search string: “phonetics vs phonology comparison table OER.”
- *Figure 1.2 Human vocal tract and articulation points*
 - AI prompt: “Generate a labelled diagram of the human vocal tract showing places of articulation.”
 - Suggested OER search string: “human vocal tract diagram OER.”
- *Table 1.2 Examples of natural classes in English*
 - AI prompt: “Generate a table listing examples of natural classes in English with features (voicing, manner, place).”
 - Suggested OER search string: “natural classes of sounds table OER.”
- *Box 1.2 Key parameters for sound contrasts*
 - AI prompt: “Create a box listing voicing, place of articulation, and manner of articulation as parameters of contrast.”



- Suggested OER search string: “phoneme contrast parameters OER.”
- *Figure 1.3 Phoneme and allophone distinction*
 - AI prompt: “Generate a diagram illustrating phoneme /p/ with its allophones [p^h] and [p] in English.”
 - Suggested OER search string: “phoneme vs allophone diagram OER.”
- *Table 1.3 Distinctive features of selected English sounds*
 - AI prompt: “Generate a table showing distinctive features for /p/, /b/, /t/, /d/ with voicing and place of articulation.”
 - Suggested OER search string: “distinctive features phonology table OER.”
- *Box 1.3 Examples of phonological representations in English plurals*
 - AI prompt: “Create a box showing underlying plural morpheme /-z/ with surface forms [s], [z], [ɪz].”
 - Suggested OER search string: “phonological representation English plural morpheme OER.”
- *Figure 1.4 Relationship between phonology and orthography*
 - AI prompt: “Generate a diagram showing how phonology (sounds) maps onto orthography (spelling systems).”
 - Suggested OER search string: “phonology orthography relationship diagram OER.”
- *Box 1.4 Examples of orthographic conventions in English*
 - AI prompt: “Create a box listing English orthographic conventions where letters represent multiple sounds (e.g., c, g, x).”
 - Suggested OER search string: “orthographic conventions English phonology OER.”

Course code: LIN 201

Course title: Basic Phonology

Course credit load: 3 Units

Series 1: Foundations of Phonology and Sound Systems

Series 2: Phonetics, Phonology, and Orthography Interactions

Series 3: Classical and Modern Approaches to Phonology

Series 4: Phonological Rules, Processes, and Analytical Methods



Series 5: Applied Phonological Analysis Across Languages

Proposed Outline for Series 3

Part .1 Classical approaches to phonology

- 3.1.1 Early descriptive traditions
- 3.1.2 Structuralist phonology (e.g., Prague School)
- 3.1.3 Key contributions and limitations

Part .2 Generative phonology

- 3.2.1 Chomsky and Halle's *The Sound Pattern of English*
- 3.2.2 Rule-based analysis
- 3.2.3 Strengths and criticisms

Part .3 Non-linear and modern frameworks

- 3.3.1 Autosegmental phonology
- 3.3.2 Metrical phonology
- 3.3.3 Optimality Theory (OT)

Part .4 Comparative evaluation of approaches

- 3.4.1 How classical and modern approaches differ
- 3.4.2 Contributions to linguistic theory
- 3.4.3 Applications in contemporary phonological analysis

Part .5 Implications for linguistic study and practice

- 3.5.1 Pedagogical relevance
- 3.5.2 Research applications
- 3.5.3 Cross-linguistic insights

Introduction

In the last Series, we examined how phonetics, phonology, and orthography interact, and why distinguishing between spoken and written forms is essential for accurate linguistic analysis. Building on that foundation, this Series turns to the major theoretical approaches that have shaped phonological study over time. By exploring both classical and modern frameworks, you will gain insight into how scholars have explained sound systems and how these explanations continue to influence contemporary linguistic research.



The aim of this Series is to introduce you to the principal approaches to phonology, from early descriptive traditions to modern frameworks, and to equip you with the ability to evaluate their contributions, limitations, and relevance to linguistic study and practice.

We shall commence this Series by exploring classical approaches to phonology, including early descriptive traditions and structuralist perspectives. Next, we will move on to generative phonology, focusing on rule-based analysis and its strengths and criticisms. Following that, we will examine non-linear and modern frameworks such as autosegmental phonology, metrical phonology, and Optimality Theory. Afterwards, we will compare classical and modern approaches, highlighting their differences and contributions to linguistic theory. Finally, we will wrap up by considering the implications of these approaches for teaching, research, and cross-linguistic analysis, bringing the Series to a close with practical applications.

Series Learning Outcomes

Upon completing this Series, you should be able to:

- **SLO 3.1** define the key features of classical approaches to phonology, including early descriptive traditions and structuralist perspectives,
- **SLO 3.2** explain the contributions and limitations of structuralist phonology,
- **SLO 3.3** describe the principles of generative phonology as introduced in *The Sound Pattern of English*,
- **SLO 3.4** analyse rule-based phonological processes within the generative framework,
- **SLO 3.5** evaluate the strengths and criticisms of generative phonology,
- **SLO 3.6** explain the core ideas of non-linear frameworks such as autosegmental and metrical phonology,
- **SLO 3.7** describe the principles of Optimality Theory and its approach to phonological constraints,
- **SLO 3.8** compare classical and modern approaches to phonology, highlighting their differences and contributions to linguistic theory, and
- **SLO 3.9** apply insights from these approaches to practical contexts such as teaching, research, and cross-linguistic analysis.

3.1 Classical Approaches to Phonology

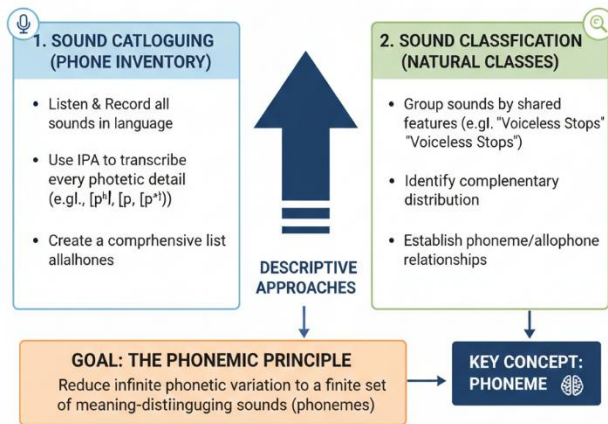
3.1.1 Early descriptive traditions

The earliest **descriptive traditions** in phonology focused on cataloguing and classifying the sounds of language. Scholars sought to describe how sounds were produced and how they patterned within words. These traditions were largely observational, aiming to provide systematic accounts of sound inventories without necessarily proposing abstract rules. They laid the groundwork for later theoretical developments by emphasising the importance of sound description in linguistic study.



Fill in the blank: Early descriptive traditions in phonology focused on _____ and classifying the sounds of language.

EARLY DESCRIPTIVE TRADITIONS IN PHONOLOGY: Cataloguing & Classification



From Raw Sounds to Mental Units in Linguistics

Figure 3.1 Early descriptive traditions in phonology

3.1.2 Structuralist phonology (e.g., Prague School)

Structuralist phonology emerged in the early 20th century, most notably through the work of the Prague School. This approach emphasised the idea of the **phoneme** as the smallest unit of sound that can distinguish meaning. Structuralists analysed languages by identifying phonemes and their distribution, focusing on contrasts and oppositions rather than individual sounds in isolation.

For example, the contrast between /p/ and /b/ in English demonstrates how phonemes function to differentiate meaning. Structuralist phonology highlighted the systematic nature of sound organisation, showing that phonemes exist within a network of relationships.

Fill in the blank: Structuralist phonology emphasised the idea of the _____ as the smallest unit of sound that can distinguish meaning.

Feature	Definition	Significance	Example
Phoneme	The smallest abstract unit of sound that can distinguish meaning.	It is the "atom" of the phonological system.	/p/ vs. /b/ in <i>pat</i> and <i>bat</i> .



Feature	Definition	Significance	Example
Contrast	The relationship between two sounds that can occur in the same environment.	Proves that two sounds are separate phonemes.	The contrast between [l] and [ɾ] in <i>leaf</i> and <i>reef</i> .
Opposition	The specific phonetic difference that sets two phonemes apart.	Defines the logical structure of the sound system.	Voicing opposition: /t/ (voiceless) vs. /d/ (voiced).
Distinctive Feature	The individual "atomic" traits (e.g., [+/- voiced]).	Phonemes are seen as bundles of these features.	The feature [+nasal] distinguishes /m/ from /b/.
Neutralization	When a contrast between phonemes disappears in a specific context.	Shows the system is dynamic and context-dependent.	In German, the /d//t/ contrast disappears at the end of words (<i>Rat</i> vs. <i>Rad</i> both sound like [t]).

Table 3.1 Key features of structuralist phonology

3.1.3 Key contributions and limitations

Classical approaches contributed significantly to the development of phonology. They introduced the concept of the phoneme, established systematic methods for analysing sound contrasts, and provided a foundation for later theoretical frameworks. However, these approaches were limited in their ability to explain more complex phonological processes, such as assimilation, stress, and intonation. They often treated sounds as static units rather than dynamic elements influenced by context.

Fill in the blank: Classical approaches were limited in explaining complex phonological processes such as _____ and intonation.

Era	Primary Goal	View of Sound
Classical/Structuralist	Cataloguing the Inventory	Static: A collection of distinct units.
Modern/Generative	Explaining the Process	Dynamic: A set of rules transforming mental ideas into speech.

Box 3.1 Contributions and limitations of classical approaches



Pilot questions 3.1

1. What was the main focus of early descriptive traditions in phonology?
2. Which school of thought is most associated with structuralist phonology?
3. What is the smallest unit of sound that can distinguish meaning?
4. Give one example of a phonemic contrast in English.
5. Mention one limitation of classical approaches to phonology.

3.2 Generative Phonology

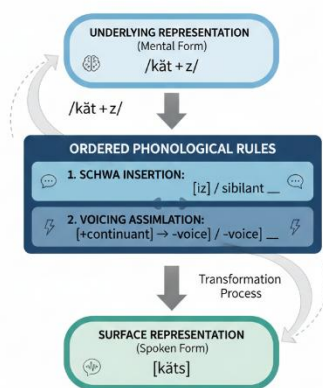
3.2.1 Chomsky and Halle's *The Sound Pattern of English*

Generative phonology emerged in the mid-20th century, most notably through the work of Noam Chomsky and Morris Halle in their influential book *The Sound Pattern of English* (1968). This framework introduced the idea that phonological rules could be formally represented and applied to underlying forms to generate surface pronunciations. It shifted the focus from simply describing sounds to explaining how speakers mentally organise and transform them.

Fill in the blank: Generative phonology was introduced by Chomsky and Halle in their book _____.

GENERATIVE PHONOLOGY: FROM UNDERLYING TO SURFACE FORMS

Applying Ordered Rules to Create Speech
• OER Diagram



Modeling the Mind's Process for Speech Production

Figure 3.2 Generative phonology and rule application

3.2.2 Rule-based analysis

A central feature of generative phonology is **rule-based analysis**, where phonological rules describe how sounds change in specific contexts. For example, the English plural morpheme /-z/ surfaces as [s], [z], or [ɪz] depending on the preceding sound. Generative phonology formalises this process by writing rules that capture the conditions under which each variant occurs.



Fill in the blank: Rule-based analysis in generative phonology explains how sounds _____ in specific contexts.

Rule Type	Description	Example (Input → Output)	Explanation
Assimilation	A sound becomes more like a neighboring sound.	<i>un-believable</i> \$\\rightarrow\$ [ʌmbɪˈliːvəbəl]	The /n/ (alveolar) changes to [m] (bilabial) to match the following [b].
Deletion	A sound is omitted in certain environments, usually to simplify clusters.	<i>friendship</i> \$\\rightarrow\$ [ˈfɹɛnʃɪp]	The /d/ sound is often dropped in casual speech because it is "trapped" between other consonants.
Epenthesis	A sound (usually a vowel) is inserted to break up a cluster.	<i>hamster</i> \$\\rightarrow\$ [ˈhæmpstəɪ]	A small [p] sound is often physically created by the transition between the [m] and the [s].
Flapping	A /t/ or /d/ becomes a quick "tap" between two vowels.	<i>writer</i> \$\\rightarrow\$ [ˈraɪtəɪ]	In American English, the /t/ softens into a flap [ɾ] when it occurs between vowels.
Dissimilation	Two similar sounds become less alike (less common than assimilation).	<i>fifth</i> \$\\rightarrow\$ [fɪft]	Some speakers change the second fricative /θ/ to a stop [t] to make it easier to distinguish.

Table 3.2 Examples of rule-based phonological processes

3.2.3 Strengths and criticisms

Generative phonology provided a powerful framework for explaining complex sound patterns and offered a formal way to represent phonological knowledge. It allowed linguists to capture generalisations across languages and to predict possible sound changes. However, it has been criticised for being overly abstract and sometimes disconnected from actual speech data. Critics argue that not all phonological processes can be neatly captured by rules, and that the framework may oversimplify the variability found in natural language.

Fill in the blank: Generative phonology has been criticised for being overly _____ and disconnected from actual speech data.



Feature	Generative Approach (Formalism)	Usage-Based Approach (Realism)
View of Rules	Hard-coded mental "laws."	Emergent patterns based on habit.
Unit of Study	The abstract Phoneme/Feature.	The whole word or phrase.
Focus	Competence (what you know).	Performance (what you do).

Box 3.2 Strengths and criticisms of generative phonology

Pilot questions 3.2

1. Who introduced generative phonology and in which book?
2. What is the central feature of generative phonology?
3. Give one example of a phonological rule in English.
4. Mention one strength of generative phonology.
5. Mention one criticism of generative phonology.

3.3 Non-linear and Modern Frameworks

3.3.1 Autosegmental phonology

Autosegmental phonology is a framework developed in the 1970s to address phenomena that could not be adequately explained by linear rule-based models. It introduced the idea that features such as tone or vowel harmony could be represented on separate tiers, independent of segmental sequences. This allowed linguists to capture long-distance relationships and overlapping features more effectively.

For example, in many African languages, tone operates independently of consonant and vowel segments. Autosegmental phonology represents tone on a separate tier, showing how it associates with syllables across a word.

Fill in the blank: Autosegmental phonology represents features such as _____ on separate tiers.



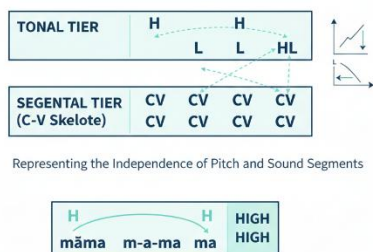


Figure 3.3 Autosegmental representation of tone

3.3.2 Metrical phonology

Metrical phonology focuses on stress and rhythm in language. It represents stress patterns using hierarchical structures called metrical trees or grids. This framework explains why certain syllables are stressed while others are not, and how rhythm is organised across words and phrases.

For instance, in English, the word *photograph* has stress on the first syllable, while *photography* shifts stress to the second syllable. Metrical phonology provides a systematic way to represent and predict these patterns.

Fill in the blank: Metrical phonology represents stress patterns using hierarchical structures called _____.

Word	Syllable Breakdown	Stress Pattern	Primary Stress	Vowel Quality Notes
Photograph	pho-to-graph	S-w-w	1st Syllable	First 'o' is a full diphthong; second is reduced.
Photography	pho-tog-ra-phy	w-S-w-w	2nd Syllable	First 'o' reduces to schwa [ə]; second 'o' is stressed.
Photographic	pho-to-graph-ic	w-w-S-w	3rd Syllable	'Graph' becomes the peak; first 'o' gets secondary stress.

Table 3.3 Examples of stress patterns in English words



3.3.3 Optimality Theory (OT)

Optimality Theory (OT), developed in the 1990s, is a modern framework that explains phonological patterns through constraints rather than rules. In OT, multiple possible outputs are generated, and constraints evaluate them to determine the optimal form. Constraints are ranked hierarchically, meaning that higher-ranked constraints take precedence over lower-ranked ones.

For example, in syllable structure, a language may prefer simple CV syllables. OT explains this preference by ranking constraints that favour simplicity over those that allow complex clusters.

Fill in the blank: In Optimality Theory, phonological patterns are explained through _____ rather than rules.

Model	Mechanism	Metaphor
Generative Phonology	Sequential Rules	A recipe: Step 1, then Step 2.
Optimality Theory	Parallel Constraints	A filter: All options enter, only the best one exits.

Box 3.3 Key principles of Optimality Theory

Pilot questions 3.3

1. What does autosegmental phonology represent on separate tiers?
2. Which framework explains stress and rhythm using metrical trees or grids?
3. Give one example of a stress shift in English words.
4. What is the central principle of Optimality Theory?
5. How does OT determine the optimal output among possible candidates?

3.4 Comparative Evaluation of Approaches

3.4.1 How classical and modern approaches differ

Classical approaches, such as structuralist phonology, emphasised the identification of phonemes and the systematic description of sound contrasts. They treated sounds as static units within a network of oppositions. Modern approaches, on the other hand, introduced dynamic frameworks that account for processes like tone, stress, and constraint ranking. These approaches highlight the flexibility and variability of sound systems, moving beyond simple contrasts to explain complex patterns.

Fill in the blank: Classical approaches treated sounds as _____ units, while modern approaches emphasised dynamic processes.



Feature	Classical (Structuralist)	Modern (Generative/OT)
Primary Goal	Description: Identifying and listing all the phonemes in a language.	Explanation: Modeling the mental rules or constraints that produce sounds.
View of Sound	Static: Sounds are stable units (beads on a string).	Dynamic: Sounds are the result of active mental processes.
Key Unit	The Phoneme: The smallest unit that changes meaning.	Distinctive Features: Sub-atomic traits like [+voiced] or [+nasal].
Relationship	Contrast & Opposition: Focus on how /p/ is <i>not</i> /b/.	Derivation & Ranking: Focus on how /t/ <i>becomes</i> [ɾ] (flapping).
Method	Biuniqueness: Every sound maps to one phoneme, and vice versa.	Levels of Representation: Distinguishes between what we think (Underlying) and say (Surface).
Primary Tool	Minimal Pairs: <i>Pin</i> vs. <i>Bin</i> .	Rules or Tableaux: Equations or constraint-ranking tables.

Table 3.4 Comparison of classical and modern approaches

3.4.2 Contributions to linguistic theory

Both classical and modern approaches have made significant contributions to linguistic theory. Classical approaches provided the foundation by introducing the concept of the phoneme and systematic analysis. Modern frameworks expanded this foundation by offering tools to explain phenomena such as tone, stress, and syllable structure. Together, they illustrate the evolution of phonological theory and its increasing ability to capture the complexity of language.

Fill in the blank: Classical approaches introduced the concept of the _____, while modern frameworks expanded analysis to tone and stress.

Feature	Classical Contribution	Modern Contribution
Focus	Stability and Contrast.	Process and Change.
Sound Units	Individual "beads" (Phonemes).	Independent tiers (Tone, Stress).
Logic	Identification (What is it?).	Prediction (Why does it happen?).
Organization	Linear sequences.	Hierarchical structures (Feet/Prosody).



Box 3.4 Contributions of classical and modern approaches

3.4.3 Applications in contemporary phonological analysis

In contemporary phonological analysis, linguists often draw on both classical and modern approaches. For example, the identification of phonemes remains essential, but frameworks like Optimality Theory provide deeper insights into constraint-based variation. This combination allows researchers to analyse languages more comprehensively, balancing foundational concepts with advanced theoretical tools.

Fill in the blank: Contemporary phonological analysis often combines phoneme identification with _____ frameworks such as Optimality Theory.

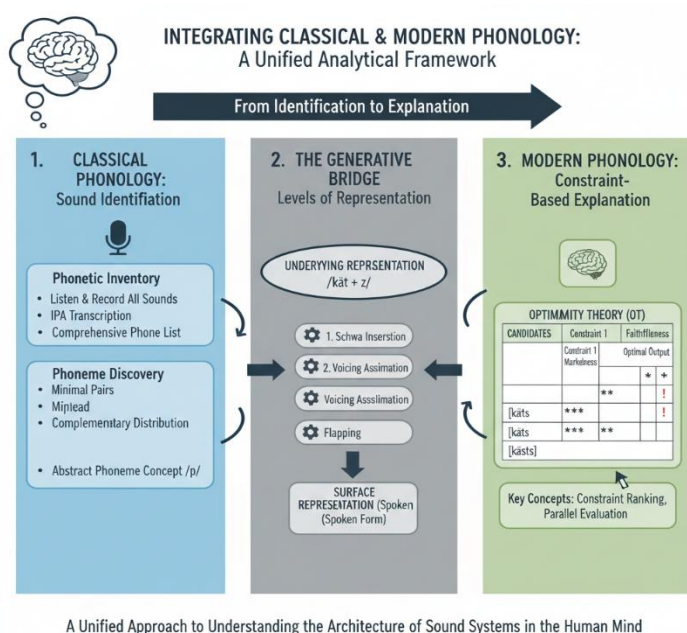


Figure 3.4 Integration of classical and modern approaches

Pilot questions 3.4

1. How do classical and modern approaches to phonology differ?
2. What was the main contribution of classical approaches to linguistic theory?
3. Which phenomena did modern frameworks expand analysis to include?
4. How are classical and modern approaches combined in contemporary phonological analysis?
5. Give one example of a modern framework used in phonological analysis.

3.5 Implications for Linguistic Study and Practice



3.5.1 Pedagogical relevance

Phonological approaches have important implications for teaching and learning. Classical frameworks help learners grasp the basic concept of the **phoneme**, while modern frameworks provide tools to explain more complex phenomena such as tone, stress, and syllable structure. Teachers can use these insights to design effective lessons that clarify why spelling and pronunciation sometimes diverge, and how rules or constraints shape spoken forms.

Fill in the blank: Classical frameworks help learners grasp the basic concept of the _____.

Goal	Primary Approach	Classroom Technique
Correcting a specific vowel sound	Classical	Minimal pair drills and mouth placement charts.
Improving sentence flow/fluency	Modern (Metrical)	"Clapping" the rhythm of a sentence to find the stressed beats.
Decoding irregular spelling	Classical/Historical	Grouping words by shared phonological history (e.g., <i>light</i> , <i>fight</i> , <i>night</i>).
Mastering Tone/Sarcasm	Modern (Autosegmental)	Drawing "pitch contours" over a sentence to show rising and falling intonation.

Box 3.5 Pedagogical relevance of phonological approaches

3.5.2 Research applications

Phonological theories also guide linguistic research. Classical approaches provide systematic methods for identifying phonemes and contrasts, while modern frameworks such as Optimality Theory allow researchers to analyse variation and constraint ranking across languages. These tools are essential for documenting endangered languages, studying sound change, and comparing phonological systems cross-linguistically.

Fill in the blank: Modern frameworks such as Optimality Theory allow researchers to analyse _____ and constraint ranking.

Research Area	Classical Approach (Phonemic)	Modern Approach (Generative/OT)
Field Linguistics	Inventory Mapping: Creating a catalog of all sounds (phones) and finding minimal	Systematic Modeling: Analyzing how tones or stress interact when a new suffix is added to a word.



Research Area	Classical Approach (Phonemic)	Modern Approach (Generative/OT)
	pairs to define the phoneme set.	
Historical Linguistics	Sound Law Discovery: Tracking how individual phonemes changed over centuries (e.g., Grimm's Law).	Constraint Reranking: Explaining history as a shift in "priority"—where a language starts to favor ease of speech over clarity.
Computational AI	Acoustic Modeling: Helping AI recognize different "bits" of sound to turn speech into text.	Predictive Synthesis: Allowing AI to "calculate" natural-sounding stress and intonation for realistic voice generation.
Sociolinguistics	Variable Identification: Identifying which specific sound (like the "r" in New York) marks a person's social class.	Network Analysis: Modeling how complex phonological rules "spread" through a community or across different social tiers.
Psycholinguistics	Categorical Perception: Testing how infants learn to "ignore" sounds that aren't phonemes in their native language.	Processing Load: Measuring the "brain power" required to apply complex rule sequences vs. simple constraint checks.

Table 3.5 Applications of phonological approaches in research

3.5.3 Cross-linguistic insights

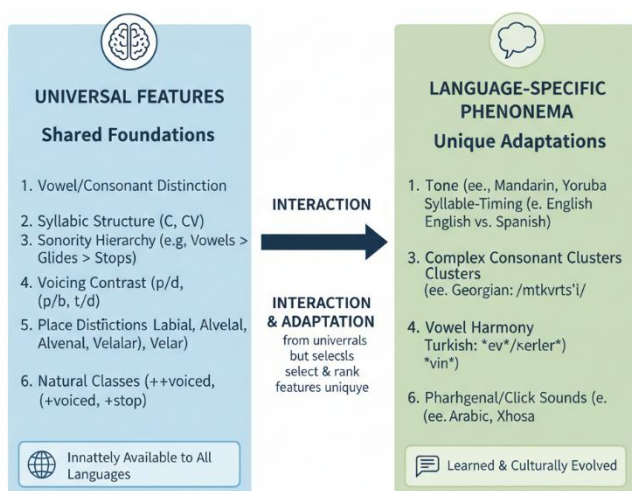
Phonological approaches provide valuable insights when comparing languages. Classical methods highlight universal features such as phonemic contrasts, while modern frameworks explain language-specific phenomena like tone systems or stress assignment. Together, they enable linguists to identify both similarities and differences across languages, contributing to a deeper understanding of human language diversity.

Fill in the blank: Classical methods highlight universal features such as _____ contrasts.



CROSS-LINGUISTIC PHONOLOGY: UNIVERSAL PATTERNS & DIVERSITY

Comparing Sound Systems Across the World



From Shared Cognitive Tools to Diverse Linguistic Expression

Figure 3.5 Cross-linguistic insights from phonological approaches

Pilot questions 3.5

1. What is the pedagogical relevance of phonological approaches?
2. How do modern frameworks such as Optimality Theory support linguistic research?
3. Why are phonological approaches important for documenting endangered languages?
4. What universal features do classical methods highlight?
5. How do phonological approaches contribute to cross-linguistic comparison?

Series Summary

This Series has explored the major theoretical approaches to phonology, showing how the field has developed from classical traditions to modern frameworks. Its purpose has been to highlight the relevance of these approaches to linguistic study and practice, helping you see how foundational concepts such as the phoneme have evolved into more dynamic models that explain tone, stress, and constraint-based variation.

We began with classical approaches, including early descriptive traditions and structuralist phonology, before moving on to generative phonology with its rule-based analysis and formal representations. Subsequently, we examined non-linear and modern frameworks such as autosegmental phonology, metrical phonology, and Optimality Theory. Following that, we compared classical and modern approaches, identifying their differences and contributions to linguistic theory. Finally, we considered their implications for teaching, research, and cross-linguistic analysis. In line with the Series Learning Outcomes, you should now be able to define and explain classical and modern approaches, analyse rule-based and constraint-based processes,



evaluate their strengths and limitations, compare their contributions, and apply these insights to practical contexts in phonology.

Glossary of Terms

- **Autosegmental phonology:** A modern framework that represents features such as tone or vowel harmony on separate tiers, allowing long-distance relationships between sounds to be shown clearly.
- **Generative phonology:** A framework introduced by Chomsky and Halle that uses formal rules to explain how underlying sound forms are transformed into surface pronunciations.
- **Metrical phonology:** A framework that explains stress and rhythm in language using hierarchical structures called metrical trees or grids.
- **Optimality Theory (OT):** A modern phonological framework that explains sound patterns through ranked constraints rather than rules, selecting the most optimal output among possible candidates.
- **Phoneme:** The smallest unit of sound in a language that can change meaning. For example, /p/ and /b/ distinguish *pat* from *bat*.
- **Rule-based analysis:** A method in generative phonology where rules describe how sounds change in specific contexts, such as the plural morpheme in English surfacing as [s], [z], or [ɪz].
- **Structuralist phonology:** A classical approach, associated with the Prague School, that emphasises the identification of phonemes and contrasts, treating sounds as static units within a system of oppositions.
- **Tone:** A feature of language where pitch is used to distinguish meaning, often represented separately in autosegmental phonology.
- **Underlying form:** The abstract representation of a word's sound structure before phonological rules or constraints are applied to produce its spoken form.
- **Surface form:** The actual pronunciation of a word after phonological rules or constraints have been applied to its underlying form.

Concept Check Questions [Series 3]

Objective questions

1. Who introduced generative phonology in *The Sound Pattern of English*? (Linked to SLO 3.3)
2. Structuralist phonology is most associated with the _____ School. (Linked to SLO 3.1)
3. In Optimality Theory, phonological patterns are explained through _____ rather than rules. (Linked to SLO 3.7)
4. Autosegmental phonology represents features such as _____ on separate tiers. (Linked to SLO 3.6)
5. The smallest unit of sound that can change meaning is called a _____. (Linked to SLO 3.1)



Short-answer questions

6. Define rule-based analysis in generative phonology. (Linked to SLO 3.4)
7. Give one example of a stress shift in English words explained by metrical phonology. (Linked to SLO 3.6)
8. Explain one strength of generative phonology. (Linked to SLO 3.5)
9. Compare classical and modern approaches to phonology in one sentence. (Linked to SLO 3.8)
10. State one pedagogical relevance of phonological approaches. (Linked to SLO 3.9)

Long-answer questions

11. Analyse the contributions and limitations of structuralist phonology, using examples to illustrate its impact. (Linked to SLO 3.2)
12. Evaluate the strengths and criticisms of Optimality Theory, highlighting its role in modern phonological analysis. (Linked to SLO 3.7, SLO 3.8)

Answers to Concept Check Questions [Series 3]

Objective questions

1. Chomsky and Halle.
2. Prague.
3. Constraints.
4. Tone.
5. Phoneme.

Short-answer questions

6. Rule-based analysis explains how sounds change in specific contexts through formal phonological rules.
7. *Photograph* (stress on first syllable) vs *photography* (stress on second syllable).
8. It provides a formal framework for representing and predicting complex sound patterns.
9. Classical approaches emphasise phonemes and contrasts, while modern approaches explain dynamic processes like tone and stress.
10. They help teachers explain why spelling and pronunciation diverge and how sound systems operate.

Long-answer questions

11. *Basic response:* Structuralist phonology contributed the concept of the phoneme and systematic analysis of sound contrasts. Its limitation was that it treated sounds as static units and struggled to explain processes like assimilation or stress. *Value-added response:* Beyond English, structuralist methods influenced comparative studies across languages, but their static view limited analysis of dynamic phenomena. Later frameworks built on these foundations to address tone,



intonation, and variability, showing both the enduring value and the constraints of structuralist thought.

12. *Basic response:* Optimality Theory explains phonological patterns through ranked constraints, offering flexibility beyond rules. Its strength lies in capturing variation, but it is criticised for abstractness and difficulty in empirically verifying constraint rankings. *Value-added response:* OT has been applied cross-linguistically to explain syllable structures, stress assignment, and tone systems. While it provides a unifying model, critics argue that constraint rankings can be arbitrary and may not reflect actual cognitive processes. Nonetheless, it remains influential in modern phonology for its ability to model diverse linguistic phenomena.

Answers to Pilot Questions [Series 3]

Part 3.1 Classical approaches to phonology

1. Describing and classifying the sounds of language.
2. The Prague School.
3. Phoneme.
4. /p/ and /b/ in *pat* and *bat*.
5. Explaining processes such as assimilation and intonation.

Part 3.2 Generative phonology

1. Chomsky and Halle in *The Sound Pattern of English*.
2. Rule-based analysis.
3. The English plural morpheme /-z/ surfacing as [s], [z], or [ɪz].
4. It provides a formal framework for representing complex sound patterns.
5. It is criticised for being overly abstract and disconnected from speech data.

Part 3.3 Non-linear and modern frameworks

1. Tone.
2. Metrical phonology.
3. *Photograph* (stress on first syllable) vs *photography* (stress on second syllable).
4. Constraints.
5. By ranking constraints hierarchically to select the optimal output.

Part 3.4 Comparative evaluation of approaches

1. Classical approaches treat sounds as static units, while modern approaches emphasise dynamic processes.
2. The concept of the phoneme.
3. Tone and stress.
4. By combining phoneme identification with modern frameworks such as Optimality Theory.
5. Optimality Theory.



Part 3.5 Implications for linguistic study and practice

1. They help teachers explain pronunciation and spelling differences.
2. They allow researchers to analyse variation and constraint ranking.
3. They provide systematic tools for documenting sound systems accurately.
4. Phonemic contrasts.
5. By identifying similarities and differences across languages, contributing to understanding language diversity.

References and Attributions [Series 3]

The following references and attributions cover all sources, suggested open educational resources (OERs), and illustration prompts used in **Series 3: Approaches to Phonology: Classical and Modern**. Entries are presented in APA style for clarity and consistency.

General references

- Chomsky, N., & Halle, M. (1968). *The sound pattern of English*. New York: Harper & Row.
- Goldsmith, J. (1976). *Autosegmental phonology*. Doctoral dissertation, MIT.
- Hayes, B. (1995). *Metrical stress theory: Principles and case studies*. Chicago: University of Chicago Press.
- Prince, A., & Smolensky, P. (1993/2004). *Optimality Theory: Constraint interaction in generative grammar*. Malden, MA: Blackwell.
- Trubetzkoy, N. S. (1939/1969). *Principles of phonology*. Berkeley: University of California Press.

Illustrations and OER suggestions

- *Figure 3.1 Early descriptive traditions in phonology*
 - AI prompt: “Generate a diagram illustrating early descriptive traditions in phonology, showing sound cataloguing and classification.”
 - Suggested OER search string: “early descriptive traditions phonology diagram OER.”
- *Table 3.1 Key features of structuralist phonology*
 - AI prompt: “Generate a table listing features of structuralist phonology such as phoneme, contrast, and opposition.”
 - Suggested OER search string: “structuralist phonology Prague School table OER.”
- *Box 3.1 Contributions and limitations of classical approaches*
 - AI prompt: “Create a box listing contributions (phoneme concept, systematic analysis) and limitations (complex processes, context sensitivity).”



- Suggested OER search string: “contributions limitations classical phonology OER.”
- *Figure 3.2 Generative phonology and rule application*
 - AI prompt: “Generate a diagram showing underlying phonological forms transformed into surface forms through rules.”
 - Suggested OER search string: “generative phonology rule application diagram OER.”
- *Table 3.2 Examples of rule-based phonological processes*
 - AI prompt: “Generate a table showing examples of phonological rules such as assimilation, deletion, and plural formation.”
 - Suggested OER search string: “phonological rules examples table OER.”
- *Box 3.2 Strengths and criticisms of generative phonology*
 - AI prompt: “Create a box listing strengths (formal representation, predictive power) and criticisms (abstractness, oversimplification).”
 - Suggested OER search string: “strengths criticisms generative phonology OER.”
- *Figure 3.3 Autosegmental representation of tone*
 - AI prompt: “Generate a diagram showing autosegmental phonology with segmental tier and tonal tier linked by association lines.”
 - Suggested OER search string: “autosegmental phonology diagram tone OER.”
- *Table 3.3 Examples of stress patterns in English words*
 - AI prompt: “Generate a table showing stress patterns in words like photograph, photography, and photographic.”
 - Suggested OER search string: “metrical phonology stress patterns table OER.”
- *Box 3.3 Key principles of Optimality Theory*
 - AI prompt: “Create a box listing key principles of OT: constraints, ranking, and optimal output selection.”
 - Suggested OER search string: “Optimality Theory phonology principles OER.”
- *Table 3.4 Comparison of classical and modern approaches*
 - AI prompt: “Generate a table comparing classical phonology (phoneme, contrast, static units) and modern phonology (rules, constraints, dynamic processes).”
 - Suggested OER search string: “classical vs modern phonology comparison table OER.”
- *Box 3.4 Contributions of classical and modern approaches*



- AI prompt: “Create a box listing contributions of classical approaches (phoneme, systematic analysis) and modern approaches (tone, stress, constraints).”
- Suggested OER search string: “contributions classical modern phonology OER.”
- *Figure 3.4 Integration of classical and modern approaches*
 - AI prompt: “Generate a diagram showing integration of classical phoneme identification with modern frameworks like OT.”
 - Suggested OER search string: “integration classical modern phonology diagram OER.”
- *Box 3.5 Pedagogical relevance of phonological approaches*
 - AI prompt: “Create a box listing how classical and modern phonological approaches support teaching pronunciation and spelling.”
 - Suggested OER search string: “phonology teaching pedagogy OER.”
- *Table 3.5 Applications of phonological approaches in research*
 - AI prompt: “Generate a table showing research applications of classical phonology (phoneme identification) and modern phonology (constraint analysis).”
 - Suggested OER search string: “phonology research applications table OER.”
- *Figure 3.5 Cross-linguistic insights from phonological approaches*
 - AI prompt: “Generate a diagram comparing phonological features across languages, showing universal contrasts and language-specific phenomena.”
 - Suggested OER search string: “cross-linguistic phonology comparison diagram OER.”

Course code: LIN 201

Course title: Basic Phonology

Course credit load: 3 Units

Series 1: Foundations of Phonology and Sound Systems

Series 2: Phonetics, Phonology, and Orthography Interactions

Series 3: Classical and Modern Approaches to Phonology

Series 4: Phonological Rules, Processes, and Analytical Methods

Series 5: Applied Phonological Analysis Across Languages

Proposed Outline for Series 4



Part .1 Phonological rules and their representation

- 4.1.1 Definition and characteristics of phonological rules
- 4.1.2 Formal notation of rules
- 4.1.3 Examples of rule application

Part .2 Phonological processes

- 4.2.1 Assimilation
- 4.2.2 Dissimilation
- 4.2.3 Deletion and insertion
- 4.2.4 Metathesis

Part .3 Rule ordering and interaction

- 4.3.1 Feeding and bleeding orders
- 4.3.2 Counterfeeding and counterbleeding
- 4.3.3 Examples across languages

Part .4 Analytical methods in phonology

- 4.4.1 Distributional analysis
- 4.4.2 Distinctive feature analysis
- 4.4.3 Constraint-based analysis (link to OT)

Part .5 Applications of phonological analysis

- 4.5.1 Pedagogical applications
- 4.5.2 Research and documentation
- 4.5.3 Cross-linguistic case studies

Introduction

In the last Series, we examined classical and modern approaches to phonology, tracing how the field has evolved from early descriptive traditions to frameworks such as generative phonology, autosegmental phonology, and Optimality Theory. Building on that foundation, this Series turns to the practical side of phonology, focusing on the rules, processes, and analytical methods that allow linguists to explain how sounds interact and change within languages. This knowledge is essential for understanding the mechanics of phonological systems and for applying theory to real-world linguistic analysis.

The aim of this Series is to introduce you to the major phonological rules and processes, and to equip you with analytical methods that will enable you to describe, interpret, and apply phonological patterns across different languages.



We shall commence this Series by exploring phonological rules and their representation, including how they are defined, notated, and applied. Next, we will examine phonological processes such as assimilation, dissimilation, deletion, insertion, and metathesis. Following that, we will study rule ordering and interaction, considering feeding, bleeding, counterfeeding, and counterbleeding. Afterwards, we will continue with analytical methods in phonology, including distributional analysis, distinctive feature analysis, and constraint-based approaches. Finally, we will wrap up by looking at applications of phonological analysis in teaching, research, and cross-linguistic case studies, bringing the Series to a close with practical insights.

Series Learning Outcomes

Upon completing this Series, you should be able to:

- **SLO 4.1** define the characteristics of phonological rules and explain how they are formally represented,
- **SLO 4.2** demonstrate the application of phonological rules to underlying forms,
- **SLO 4.3** describe major phonological processes such as assimilation, dissimilation, deletion, insertion, and metathesis,
- **SLO 4.4** analyse how rule ordering and interaction (feeding, bleeding, counterfeeding, counterbleeding) affect phonological outcomes,
- **SLO 4.5** apply analytical methods such as distributional analysis, distinctive feature analysis, and constraint-based analysis to phonological data, and
- **SLO 4.6** evaluate the pedagogical, research, and cross-linguistic applications of phonological analysis.

4.1 Phonological Rules and Their Representation

4.1.1 Definition and characteristics of phonological rules

A **phonological rule** is a formal statement that describes how sounds change in specific contexts within a language. It explains the relationship between an **underlying form** (the abstract representation of a word's sound structure) and its **surface form** (the actual pronunciation). Phonological rules are systematic, predictable, and language-specific, meaning they capture patterns that speakers unconsciously follow when producing speech.

For example, in English, the plural morpheme /-z/ surfaces as [s], [z], or [ɪz] depending on the preceding sound. This variation is not random but governed by rules that account for voicing and syllable structure.

Fill in the blank: A phonological rule explains the relationship between an _____ form and its surface form.



ENGLISH PLURA FORMATION:

From Underlying to Surface Forms

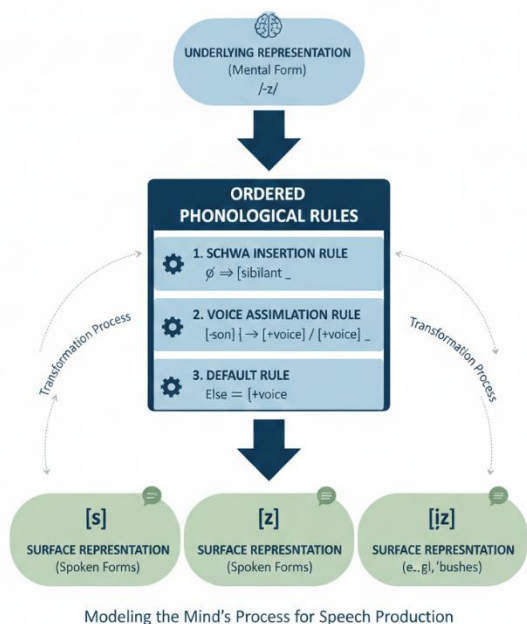


Figure 4.1 Relationship between underlying and surface forms

4.1.2 Formal notation of rules

Phonological rules are often written in a formal notation that specifies the sound change, the environment in which it occurs, and any conditions that apply. The general format is:

$A \rightarrow B / X _ Y$

This means “sound A changes to sound B when it occurs between X and Y.” For instance, the English rule that voices the plural morpheme after voiced consonants can be written as:

$[-\text{voice}] \rightarrow [+voice] / [+voice] _$

This notation shows that a voiceless sound becomes voiced when it follows another voiced sound.

Fill in the blank: The general format of a phonological rule is written as _____.

Rule Type	Formal Notation	Descriptive Translation	Example
Total Assimilation	$\$C \rightarrow C_i / _ C_i \$$	A consonant becomes identical	Latin <i>in-luminare</i> $\rightarrow$ <i>illuminare</i>



Rule Type	Formal Notation	Descriptive Translation	Example
		to the consonant following it.	
Nasal Assimilation	$[+nasal] \rightarrow [\alpha \text{ \textit{place}}] / _ \begin{matrix} C \\ \alpha \end{matrix} \text{ \textit{place}} \end{matrix}$	A nasal sound matches the "place of articulation" of the next consonant.	<i>un-believable</i> \$ \rightarrow \$ [ʊnbɪ'li:vəbl]
Deletion	$A \rightarrow \emptyset / B _ C$	Sound A is deleted (becomes "null") between B and C.	<i>fifth</i> \$ \rightarrow \$ [fɪf] (in some dialects)
Aspiration	$\begin{matrix} -voice \\ +stop \end{matrix} \rightarrow [+spread \text{ glottis}] / \# _$	Voiceless stops become aspirated when they are at the beginning of a word.	/p/ \$ \rightarrow \$ [pʰ] in <i>pot</i>
Vowel Nasalization	$V \rightarrow [+nasal] / _ [+nasal]$	A vowel becomes nasalized when followed by a nasal consonant.	<i>can't</i> \$ \rightarrow \$ [kʰænt̚]

Table 4.1 Examples of phonological rule notation

4.1.3 Examples of rule application

Phonological rules can be applied to explain everyday sound changes. Consider the following examples:

- **Assimilation:** In English, the prefix *in-* becomes *im-* before bilabial sounds (e.g., *impossible*).
- **Deletion:** In casual speech, the /t/ in *next day* may be deleted, producing [nɛks deɪ].
- **Insertion:** Some speakers insert a glottal stop before a vowel-initial word, as in [ʔapple].

These examples show how rules operate systematically to produce natural speech patterns.

Fill in the blank: In English, the prefix *in-* becomes _____ before bilabial sounds.



Rule Type	Mental Form (Underlying)	Spoken Form (Surface)	The Change
Assimilation	/ɪn/ + /pʊt/	['ɪmpʊt]	\$n \rightarrow m\$
Deletion	/kæst/ + /lɪz/	['kæslɪz]	\$t \rightarrow \emptyset\$
Insertion	/dæns/ + /əɪ/	['dæntsəɪ]	\$\emptyset \rightarrow t\$
Flapping	/bʌt/ + /əɪ/	['bʌrəɪ]	\$t \rightarrow r\$

Box 4.1 Examples of phonological rule application

Pilot questions 4.1

1. What is a phonological rule?
2. What is the difference between underlying and surface forms?
3. Write the general format of a phonological rule.
4. Give one example of assimilation in English.
5. Mention one example of deletion in casual speech.

4.2 Phonological Processes

4.2.1 Assimilation

Assimilation is a phonological process where one sound becomes more similar to a neighbouring sound. It often occurs to make speech easier and faster. For example, in English the prefix *in-* changes to *im-* before bilabial sounds, as in *impossible*. Assimilation can affect features such as voicing, place of articulation, or manner of articulation.

Fill in the blank: Assimilation is a process where one sound becomes more _____ to a neighbouring sound.



ENGLISH PHONOLOGICAL ASSIMILATION: Nasal Place Assimilation

/n/ becomes /m/ before Bilabial Sounds

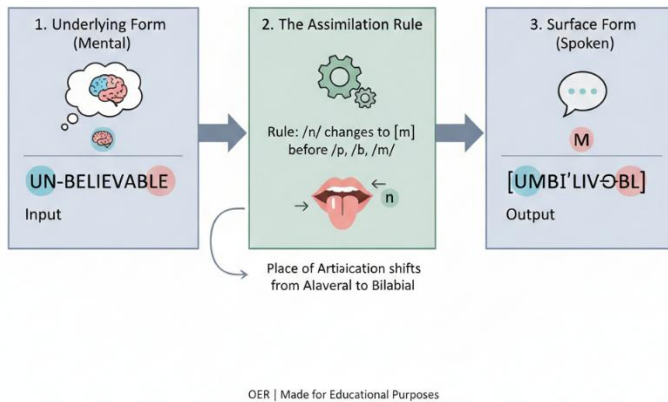


Figure 4.2 Assimilation in English prefix *in-*

4.2.2 Dissimilation

Dissimilation is the opposite of assimilation. It occurs when two similar sounds in a word become less alike to make pronunciation clearer. For example, the Latin word *peregrinus* became *pilgrim* in English, with the /t/ changing to /l/ to avoid repetition of similar sounds.

Fill in the blank: Dissimilation occurs when two similar sounds become _____ alike.

[Insert box here] Box 4.2 Example of dissimilation in language change AI prompt suggestion: “Create a box showing examples of dissimilation, such as Latin *peregrinus* → English *pilgrim*.” Search string: “dissimilation phonology examples OER”

4.2.3 Deletion and insertion

Deletion is a process where a sound is omitted in certain contexts, often in casual or rapid speech. For instance, the /t/ in *next day* may be deleted, producing [nɛks deɪ]. **Insertion** (also called epenthesis) is the addition of a sound to ease pronunciation. For example, some speakers insert a glottal stop before a vowel-initial word, as in [ʔapple].

Fill in the blank: Deletion involves omitting a sound, while insertion involves _____ a sound.



Process	Example (Underlying → Surface)	Type of Change	Explanation
Deletion	<i>next day</i> \$\\rightarrow\$ [nɛks deɪ]	Consonant Loss	The final /t/ in "next" is dropped to avoid a difficult three-consonant cluster [kst d].
Deletion	<i>memory</i> \$\\rightarrow\$ ['memɪ]	Vowel Loss (Syncope)	The unstressed middle vowel is deleted in casual speech, reducing the word from three syllables to two.
Insertion	<i>apple</i> \$\\rightarrow\$ [ʔæpl]	Glottal Stop Insertion	In many English dialects, a glottal stop [ʔ] is inserted before a word-initial vowel to provide a "hard" start.
Insertion	<i>draw-ing</i> \$\\rightarrow\$ ['drɔ:ɪŋ]	"Intrusive R"	Some British dialects insert an [ɪ] between two vowels to prevent them from crashing into each other (hiatus).
Insertion	<i>warmth</i> \$\\rightarrow\$ [wɔ:mpθ]	Stop Insertion	A [p] is often physically created as the mouth moves from the voiced /m/ to the voiceless /θ/.

Table 4.2 Examples of deletion and insertion in English

4.2.4 Metathesis

Metathesis is a process where sounds switch places within a word. It can occur historically or in casual speech. For example, the Old English word *brid* became *bird* in Modern English. In casual speech, some speakers pronounce *ask* as [æks].

Fill in the blank: Metathesis is a process where sounds _____ places within a word.



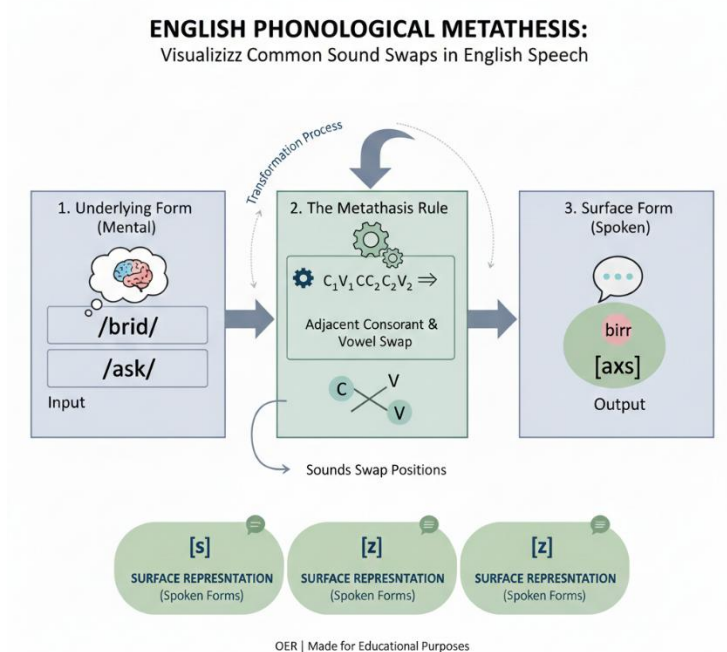


Figure 4.3 Metathesis in English

Pilot questions 4.2

1. What is assimilation?
2. Give one example of assimilation in English.
3. What is dissimilation?
4. Provide one example of deletion in casual speech.
5. What is metathesis?

4.3 Rule Ordering and Interaction

4.3.1 Feeding and bleeding orders

Phonological rules often interact with one another, and the order in which they apply can affect the final output. **Feeding order** occurs when the application of one rule creates the environment for another rule to apply. For example, if Rule A changes a sound in such a way that Rule B can then operate, Rule A is said to feed Rule B. **Bleeding order** occurs when the application of one rule removes the environment for another rule to apply. In this case, Rule A prevents Rule B from operating by altering the conditions needed for Rule B.

Fill in the blank: When one rule creates the environment for another to apply, this is called _____ order.



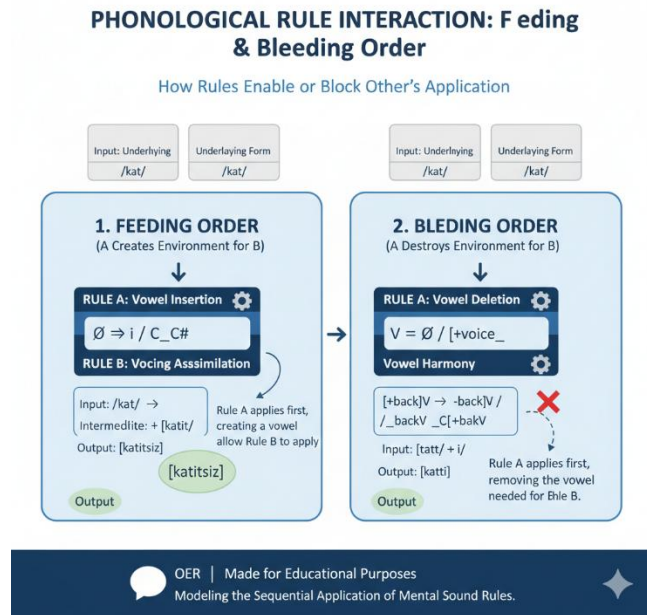


Figure 4.4 Feeding and bleeding orders in phonology

4.3.2 Counterfeeding and counterbleeding

Sometimes rules interact in less straightforward ways. **Counterfeeding order** occurs when a rule fails to apply because another rule did not create the necessary environment in time. This results in a form that looks irregular compared to expected outcomes. **Counterbleeding order** occurs when a rule fails to prevent another rule from applying, even though it could have. This leads to outputs that appear more complex or less predictable.

Fill in the blank: When a rule fails to apply because another rule did not create the environment, this is called _____ order.

Interaction	Relationship	Logic
Feeding	A creates for B	Transparent (A helps B)
Bleeding	A destroys for B	Transparent (A kills B)
Counterfeeding	B creates for A	Opaque (A is "blind" to B)
Counterbleeding	B destroys for A	Opaque (A happens before it's "killed")

Box 4.3 Counterfeeding and counterbleeding explained

4.3.3 Examples across languages



Rule ordering and interaction are not unique to English. Many languages show feeding, bleeding, counterfeeding, and counterbleeding effects. For instance, in French, vowel deletion and schwa insertion interact in ways that depend on rule order. Similarly, in Yoruba, tone rules interact with vowel harmony processes, producing different outcomes depending on the sequence of application. These examples highlight the importance of analysing rule order when studying phonological systems.

Fill in the blank: In French, vowel deletion and _____ insertion interact depending on rule order.

Language	Interaction Type	The Rules	Logic
English	Feeding	1. Epenthesis (Insert [ə]) 2. Voicing Assimilation	In <i>bus-es</i> , the inserted vowel feeds the voicing rule, allowing the plural /-z/ to stay voiced.
French	Bleeding	1. Final Consonant Deletion 2. Liaison	In <i>petit ami</i> vs <i>petit</i> , deleting the final /t/ usually occurs, but the presence of a vowel bleeds (prevents) deletion, keeping the /t/ alive.
Yoruba	Feeding	1. Vowel Deletion 2. Tone Spreading	When two vowels meet at a word boundary, one is deleted, which feeds the tone of the deleted vowel onto the survivor.



Language	Interaction Type	The Rules	Logic
English	Bleeding	1. Trisyllabic Laxing 2. Vowel Shift	In <i>divine</i> $\rightarrow$ <i>divinity</i> , the shortening of the vowel bleeds the Great Vowel Shift, keeping the "i" sound short rather than a diphthong.

Table 4.3 Examples of rule ordering across languages

Pilot questions 4.3

1. What is feeding order in phonology?
2. What is bleeding order in phonology?
3. Define counterfeeding order.
4. Define counterbleeding order.
5. Give one example of rule ordering interaction from a language other than English.

4.4 Analytical Methods in Phonology

4.4.1 Distributional analysis

Distributional analysis is a method used to determine whether two sounds are separate phonemes or variants of the same phoneme. It involves examining the environments in which sounds occur. If two sounds never appear in the same environment, they are said to be in **complementary distribution** and are likely allophones of the same phoneme. If they can occur in the same environment and change meaning, they are considered separate phonemes.

For example, in English, [p] and [p^h] are in complementary distribution: [p^h] occurs at the beginning of words (e.g., *pin*), while [p] occurs after /s/ (e.g., *spin*).

Fill in the blank: When two sounds never occur in the same environment, they are said to be in _____ distribution.

Sound (Allophone)	Environment	Example (Word)	Phonetic Transcription
Aspirated [p ^h]	Word-initial or at the start of a stressed syllable.	<i>Pot</i>	[p ^h ˈtɒt]



Sound (Allophone)	Environment	Example (Word)	Phonetic Transcription
Unaspirated \$[p]\$	After an \$/s/\$ in a cluster.	<i>Spot</i>	\$[\text{spɒt}]\$
Unaspirated \$[p]\$	At the end of a word (often unreleased).	<i>Stop</i>	\$[\text{stɒp}]\$
Aspirated \$[p^h]\$	Start of a stressed internal syllable.	<i>Appear</i>	\$[\text{ə}^h\text{p}^h\text{ɪə}]\$

Table 4.4 Examples of distributional analysis in English

4.4.2 Distinctive feature analysis

Distinctive feature analysis breaks down sounds into bundles of features such as [+voice], [-nasal], or [+labial]. This method helps linguists explain why certain sounds pattern together and how rules apply to groups of sounds rather than individual ones.

For example, assimilation rules often target features like voicing or place of articulation. By representing sounds as sets of features, we can capture generalisations across multiple sounds.

Fill in the blank: Distinctive feature analysis represents sounds as bundles of _____.

Sound	Voice	Nasal	Labial	Continuant
/b/	+	-	+	-
/m/	+	+	+	-
/s/	-	-	-	+

Box 4.4 Common distinctive features in phonology

4.4.3 Constraint-based analysis (link to OT)

Constraint-based analysis, associated with Optimality Theory (OT), evaluates possible sound outputs against a hierarchy of constraints. Instead of rules, OT assumes that multiple candidate outputs are generated, and constraints determine which one is optimal.



For example, in syllable structure, a language may prefer simple CV syllables. Constraints penalise complex clusters, and the optimal output is the one that best satisfies the highest-ranked constraints.

Fill in the blank: In Optimality Theory, the optimal output is chosen based on the ranking of _____.

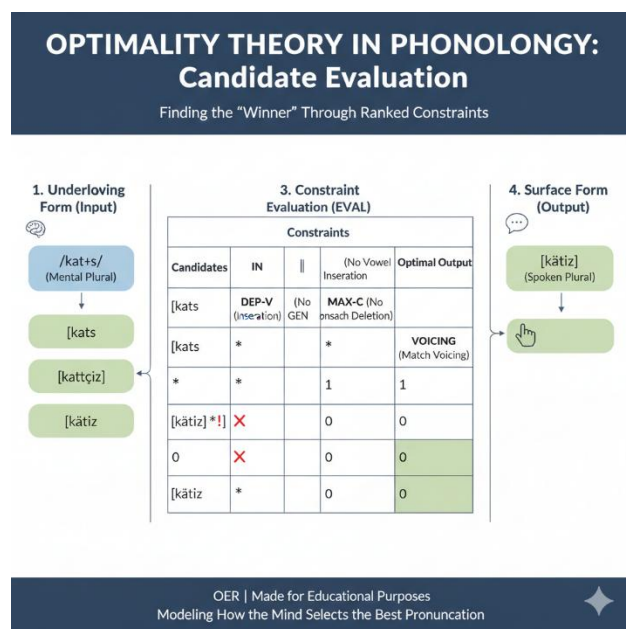


Figure 4.5 Constraint-based analysis in Optimality Theory

Pilot questions 4.4

1. What is distributional analysis used for in phonology?
2. Give one example of complementary distribution in English.
3. What does distinctive feature analysis represent sounds as?
4. How does constraint-based analysis differ from rule-based analysis?
5. In Optimality Theory, what determines the optimal output?

4.5 Applications of Phonological Analysis

4.5.1 Pedagogical applications

Phonological analysis has clear value in teaching and learning. By identifying how rules and processes shape pronunciation, teachers can help learners understand why spelling and spoken forms sometimes differ. For example, explaining assimilation or deletion can make learners more confident in both reading and speaking. This approach also supports second language acquisition, where learners often struggle with unfamiliar sound patterns.



Fill in the blank: Phonological analysis helps teachers explain why _____ and spoken forms sometimes differ.

Phonological Concept	Classroom Problem	Practical Solution
Phonotactics	Student adds vowels to the ends of words.	Teach syllable structure constraints of the target language.
Distinctive Features	Student confuses /b/ and /v/.	Use "minimal pair" drills focusing on the [+/- continuant] feature.
Neutralization	Student can't hear the difference in <i>writer</i> vs. <i>rider</i> .	Explain Flapping and how vowels lengthen before voiced consonants.

Box 4.5 Pedagogical applications of phonological analysis

4.5.2 Research and documentation

Phonological analysis is essential in linguistic research, especially for documenting endangered languages. By systematically identifying phonemes, rules, and processes, researchers can preserve sound systems that might otherwise be lost. Analytical methods such as distributional and feature analysis provide tools for comparing languages and tracing historical sound changes.

Fill in the blank: Phonological analysis is essential in documenting _____ languages.

Research Area	Application in Documentation	Application in Historical Studies
Orthography Design	Creating a writing system based on phonemes rather than every single sound variation.	Reconstructing the spelling of proto-languages (ancestor languages) based on modern sound laws.
Language Vitality	Tracking "phonological attrition"—when speakers begin to lose rare sounds due to pressure from a dominant language.	Identifying phonological innovations that prove two languages belong to the same family tree.
Comparative Method	Establishing a baseline of sounds to compare with neighboring dialects.	Creating Correspondence Sets to prove that words like English <i>father</i> and Latin <i>pater</i> share a common root.



Research Area	Application in Documentation	Application in Historical Studies
Loanword Analysis	Documenting how a language adapts foreign sounds to fit its own phonotactic constraints .	Tracing ancient trade routes by analyzing how "technological" words were phonologically altered as they moved across borders.
Dialectology	Mapping "isoglosses"—the geographic boundaries where one pronunciation rule ends and another begins.	Tracking the Great Vowel Shift or other massive "chain shifts" that redefined entire language families.

Table 4.5 Applications of phonological analysis in research

4.5.3 Cross-linguistic case studies

Phonological analysis also provides insights across languages. Classical methods highlight universal features such as phonemic contrasts, while modern frameworks explain language-specific phenomena like tone systems or stress assignment. Case studies comparing English, French, Yoruba, or Mandarin show how rules and processes vary, yet follow systematic principles.

Fill in the blank: Classical methods highlight universal features such as _____ contrasts.



Figure 4.6 Cross-linguistic case studies in phonology



Pilot questions 4.5

1. How does phonological analysis support teaching and learning?
2. Why is phonological analysis important in documenting endangered languages?
3. Which analytical methods help researchers compare languages?
4. What universal features do classical methods highlight?
5. Give one example of a cross-linguistic phonological case study.

Series Summary

This Series has focused on the practical side of phonology, showing how rules and processes shape the way sounds are produced and understood in language. Its purpose has been to equip you with the tools to recognise, represent, and analyse phonological patterns, making clear their relevance to teaching, research, and cross-linguistic study.

We began by examining phonological rules and their formal representation, before moving on to key processes such as assimilation, dissimilation, deletion, insertion, and metathesis. We then explored how rules interact through feeding, bleeding, counterfeeding, and counterbleeding orders. Following that, we studied analytical methods including distributional analysis, distinctive feature analysis, and constraint-based approaches. Finally, we considered applications of phonological analysis in pedagogy, research, and comparative case studies. In line with the Series Learning Outcomes, you should now be able to define and demonstrate phonological rules, describe and analyse processes, explain rule ordering, apply analytical methods, and evaluate the wider applications of phonological analysis.

Glossary of Terms

- **Allophone:** A variant pronunciation of a phoneme that does not change meaning, often occurring in specific contexts.
- **Assimilation:** A phonological process where one sound becomes more similar to a neighbouring sound, making speech easier.
- **Bleeding order:** A type of rule interaction where the application of one rule removes the environment needed for another rule to apply.
- **Complementary distribution:** A situation where two sounds never occur in the same environment, indicating they are allophones of the same phoneme.
- **Constraint-based analysis:** An approach, linked to Optimality Theory, where possible sound outputs are evaluated against ranked constraints to determine the optimal form.
- **Counterbleeding order:** A rule interaction where one rule fails to prevent another from applying, resulting in more complex outputs.
- **Counterfeeding order:** A rule interaction where a rule fails to apply because another rule did not create the necessary environment in time.
- **Deletion:** A phonological process where a sound is omitted, often in casual or rapid speech.
- **Dissimilation:** A phonological process where two similar sounds become less alike to make pronunciation clearer.



- **Distinctive feature analysis:** A method that represents sounds as bundles of features such as [+voice] or [-nasal], helping to explain sound patterns.
- **Distributional analysis:** A method used to determine whether sounds are separate phonemes or allophones by examining their environments.
- **Feeding order:** A type of rule interaction where the application of one rule creates the environment for another rule to apply.
- **Insertion (epenthesis):** A phonological process where a sound is added to ease pronunciation, such as inserting a glottal stop before a vowel.
- **Metathesis:** A phonological process where sounds switch places within a word, either historically or in casual speech.
- **Phoneme:** The smallest unit of sound in a language that can change meaning, such as /p/ and /b/ in *pat* and *bat*.
- **Phonological rule:** A formal statement describing how sounds change in specific contexts, linking underlying forms to surface forms.
- **Surface form:** The actual pronunciation of a word after phonological rules or constraints have been applied.
- **Underlying form:** The abstract representation of a word's sound structure before phonological rules or constraints are applied.

Concept Check Questions [Series 4]

Objective questions

1. Who introduced the concept of phonological rules in formal notation? (Linked to SLO 4.1)
2. The general format of a phonological rule is written as _____. (Linked to SLO 4.1)
3. Assimilation is a process where one sound becomes more _____ to a neighbouring sound. (Linked to SLO 4.3)
4. When one rule creates the environment for another to apply, this is called _____ order. (Linked to SLO 4.4)
5. In Optimality Theory, the optimal output is chosen based on the ranking of _____. (Linked to SLO 4.5)

Short-answer questions

6. Define a phonological rule and explain its purpose. (Linked to SLO 4.1)
7. Give one example of assimilation in English. (Linked to SLO 4.3)
8. What is the difference between feeding and bleeding orders? (Linked to SLO 4.4)
9. State one advantage of using distinctive feature analysis in phonology. (Linked to SLO 4.5)
10. Mention one pedagogical application of phonological analysis. (Linked to SLO 4.6)

Long-answer questions

11. Analyse the role of deletion and insertion processes in everyday speech, providing examples. (Linked to SLO 4.3)



12. Evaluate the strengths and limitations of distributional analysis as a method for identifying phonemes. (Linked to SLO 4.5)
13. Discuss the importance of phonological analysis in documenting endangered languages, with reference to its wider applications. (Linked to SLO 4.6)

Answers to Concept Check Questions [Series 4]

Objective questions

1. Chomsky and Halle.
2. $A \rightarrow B / X _ Y$.
3. Similar.
4. Feeding.
5. Constraints.

Short-answer questions

6. A phonological rule is a formal statement that describes how sounds change in specific contexts, linking underlying forms to surface forms. Its purpose is to explain systematic sound patterns in a language.
7. The prefix *in-* becomes *im-* before bilabial sounds, as in *impossible*.
8. Feeding order occurs when one rule creates the environment for another to apply, while bleeding order occurs when one rule removes the environment needed for another rule to apply.
9. Distinctive feature analysis allows linguists to capture generalisations across groups of sounds rather than treating each sound individually.
10. It helps teachers explain why spelling and pronunciation differ, supporting learners in mastering spoken forms.

Long-answer questions

11. *Basic response:* Deletion involves omitting sounds, such as dropping /t/ in *next day* → [neks deɪ]. Insertion involves adding sounds, such as inserting a glottal stop before a vowel-initial word [ʔapple]. These processes make speech faster and easier. *Value-added response:* Beyond English, deletion and insertion are common cross-linguistically. For example, in Japanese, vowels may be inserted to break up consonant clusters, while in French, schwa deletion occurs in casual speech. These processes highlight universal tendencies in speech simplification.
12. *Basic response:* Distributional analysis identifies whether sounds are phonemes or allophones by examining their environments. It is useful for distinguishing complementary distribution from contrastive distribution. *Value-added response:* While effective, distributional analysis can be limited because it relies heavily on observed data and may overlook subtle phonetic distinctions. Combining it with acoustic analysis or feature-based approaches provides a more comprehensive understanding of phoneme systems.
13. *Basic response:* Phonological analysis helps document endangered languages by systematically identifying phonemes, rules, and processes, preserving sound systems for future study. *Value-added response:* In addition to preservation, phonological analysis supports revitalisation efforts, comparative studies, and historical linguistics. It provides insights into



language diversity and change, making it a crucial tool for both academic research and community-based language projects.

Answers to Pilot Questions [Series 4]

Part 4.1 Phonological rules and their representation

1. A phonological rule is a formal statement that describes how sounds change in specific contexts.
2. The underlying form is the abstract representation of a word's sound structure, while the surface form is its actual pronunciation.
3. $A \rightarrow B / X _ Y$.
4. *im-* (as in *impossible*).
5. The /t/ in *next day* may be deleted, producing [nɛks deɪ].

Part 4.2 Phonological processes

1. Assimilation is a process where one sound becomes more similar to a neighbouring sound.
2. The prefix *in-* becomes *im-* before bilabial sounds.
3. Dissimilation is when two similar sounds become less alike to make pronunciation clearer.
4. The /t/ in *next day* may be deleted in casual speech.
5. Metathesis is when sounds switch places within a word.

Part 4.3 Rule ordering and interaction

1. Feeding order.
2. Bleeding order.
3. Counterfeeding order.
4. Counterbleeding order.
5. In French, vowel deletion and schwa insertion interact depending on rule order.

Part 4.4 Analytical methods in phonology

1. Distributional analysis is used to determine whether sounds are separate phonemes or allophones.
2. [p] and [p^h] in English are in complementary distribution.
3. Distinctive feature analysis represents sounds as bundles of features.
4. Constraint-based analysis evaluates candidate outputs against ranked constraints, unlike rule-based analysis which applies ordered rules.
5. The ranking of constraints.

Part 4.5 Applications of phonological analysis

1. It helps teachers explain differences between spelling and pronunciation.
2. It is important for documenting endangered languages.
3. Distributional and distinctive feature analysis.



4. Phonemic contrasts.
5. Comparing phonological processes across languages such as English, French, Yoruba, or Mandarin.

References and Attributions [Series 4]

The following references and attributions cover all sources, suggested open educational resources (OERs), and illustration prompts used in **Series 4: Phonological Rules, Processes, and Analytical Methods**. Entries are presented in APA style for clarity and consistency.

General references

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Illustrations and OER suggestions

- *Figure 4.1 Relationship between underlying and surface forms*
 - AI prompt: “Generate a diagram showing underlying form /-z/ transforming into surface forms [s], [z], [ɪz] through phonological rules.”
 - Suggested OER search string: “phonological rules underlying surface forms diagram OER.”
- *Table 4.1 Examples of phonological rule notation*
 - AI prompt: “Generate a table showing examples of phonological rules in formal notation, including assimilation and deletion.”
 - Suggested OER search string: “phonological rule notation examples table OER.”
- *Box 4.1 Examples of phonological rule application*
 - AI prompt: “Create a box listing examples of phonological rules such as assimilation, deletion, and insertion with English examples.”
 - Suggested OER search string: “phonological rule application examples OER.”
- *Figure 4.2 Assimilation in English prefix in-*
 - AI prompt: “Generate a diagram showing assimilation of /n/ to /m/ before bilabial sounds in English.”



- Suggested OER search string: “assimilation phonology diagram OER.”
- *Box 4.2 Example of dissimilation in language change*
 - AI prompt: “Create a box showing examples of dissimilation, such as Latin peregrinus → English pilgrim.”
 - Suggested OER search string: “dissimilation phonology examples OER.”
- *Table 4.2 Examples of deletion and insertion in English*
 - AI prompt: “Generate a table showing examples of deletion (next day → [nɛks deɪ]) and insertion ([?apple]).”
 - Suggested OER search string: “phonological deletion insertion examples table OER.”
- *Figure 4.3 Metathesis in English*
 - AI prompt: “Generate a diagram showing metathesis examples in English, such as brid → bird and ask → aks.”
 - Suggested OER search string: “metathesis phonology examples diagram OER.”
- *Figure 4.4 Feeding and bleeding orders in phonology*
 - AI prompt: “Generate a diagram showing feeding order (Rule A enables Rule B) and bleeding order (Rule A blocks Rule B).”
 - Suggested OER search string: “phonology feeding bleeding order diagram OER.”
- *Box 4.3 Counterfeeding and counterbleeding explained*
 - AI prompt: “Create a box explaining counterfeeding and counterbleeding with simple examples in phonology.”
 - Suggested OER search string: “counterfeeding counterbleeding phonology examples OER.”
- *Table 4.3 Examples of rule ordering across languages*
 - AI prompt: “Generate a table showing examples of rule ordering in English, French, and Yoruba with feeding and bleeding interactions.”
 - Suggested OER search string: “phonology rule ordering examples languages table OER.”
- *Table 4.4 Examples of distributional analysis in English*
 - AI prompt: “Generate a table showing complementary distribution of [p] and [pʰ] in English with examples.”
 - Suggested OER search string: “distributional analysis phonology complementary distribution examples table OER.”
- *Box 4.4 Common distinctive features in phonology*



- AI prompt: “Create a box listing common distinctive features such as [+voice], [-nasal], [+labial].”
- Suggested OER search string: “distinctive features phonology examples OER.”
- *Figure 4.5 Constraint-based analysis in Optimality Theory*
 - AI prompt: “Generate a diagram showing candidate outputs evaluated by ranked constraints in Optimality Theory.”
 - Suggested OER search string: “Optimality Theory phonology constraint-based analysis diagram OER.”
- *Box 4.5 Pedagogical applications of phonological analysis*
 - AI prompt: “Create a box listing how phonological analysis supports teaching pronunciation, spelling, and second language learning.”
 - Suggested OER search string: “phonology teaching applications OER.”
- *Table 4.5 Applications of phonological analysis in research*
 - AI prompt: “Generate a table showing research applications of phonological analysis in language documentation and historical studies.”
 - Suggested OER search string: “phonology research documentation applications table OER.”
- *Figure 4.6 Cross-linguistic case studies in phonology*
 - AI prompt: “Generate a diagram comparing phonological processes across languages such as English, French, Yoruba, and Mandarin.”
 - Suggested OER search string: “cross-linguistic phonology case study diagram OER.”

Course code: LIN 201

Course title: Basic Phonology

Course credit load: 3 Units

Series 1: Foundations of Phonology and Sound Systems

Series 2: Phonetics, Phonology, and Orthography Interactions

Series 3: Classical and Modern Approaches to Phonology

Series 4: Phonological Rules, Processes, and Analytical Methods

Series 5: Applied Phonological Analysis Across Languages



Proposed Outline for Series 5

Part .1 Cross-linguistic phonological contrasts

- 5.1.1 Phonemic inventories across languages
- 5.1.2 Tone and stress systems
- 5.1.3 Segmental and suprasegmental features

Part .2 Case studies of phonological processes

- 5.2.1 Assimilation and dissimilation across languages
- 5.2.2 Deletion, insertion, and metathesis in different contexts
- 5.2.3 Language-specific examples (English, French, Yoruba, Mandarin)

Part .3 Comparative rule ordering and interaction

- 5.3.1 Feeding and bleeding in cross-linguistic perspective
- 5.3.2 Counterfeeding and counterbleeding examples
- 5.3.3 Implications for phonological theory

Part .4 Analytical frameworks in applied contexts

- 5.4.1 Distributional and feature analysis across languages
- 5.4.2 Constraint-based analysis in Optimality Theory
- 5.4.3 Evaluating cross-linguistic data with multiple methods

Part .5 Applications of applied phonology

- 5.5.1 Pedagogical applications in multilingual classrooms
- 5.5.2 Language documentation and revitalization
- 5.5.3 Insights for comparative and historical linguistics

Introduction

In the last Series, we explored phonological rules, processes, and analytical methods, gaining insight into how sound systems are structured and interpreted within individual languages. Building on that foundation, this Series shifts the focus to applied phonological analysis across languages. By comparing phonological systems and examining cross-linguistic case studies, you will see how theoretical concepts are used in practice to explain similarities and differences among languages. This perspective is vital for learners who wish to connect phonological theory with real-world linguistic diversity.

The aim of this Series is to equip you with the skills to apply phonological analysis across multiple languages, enabling you to identify contrasts, examine processes, evaluate rule interactions, and



appreciate the broader applications of phonology in teaching, research, and language documentation.

We shall commence this Series by exploring cross-linguistic phonological contrasts, including phonemic inventories, tone, stress, and suprasegmental features. Next, we will examine case studies of phonological processes such as assimilation, dissimilation, deletion, insertion, and metathesis across different languages. Following that, we will study comparative rule ordering and interaction, considering feeding, bleeding, counterfeeding, and counterbleeding in a cross-linguistic perspective. Afterwards, we will continue with analytical frameworks in applied contexts, including distributional analysis, feature analysis, and constraint-based approaches. Finally, we will wrap up by considering applications of applied phonology in multilingual classrooms, language documentation, and comparative or historical linguistics, bringing the Series to a close with practical insights.

Series Learning Outcomes

Upon completing this Series, you should be able to:

- **SLO 5.1** describe cross-linguistic phonological contrasts including phonemic inventories, tone, stress, and suprasegmental features,
- **SLO 5.2** analyse case studies of phonological processes such as assimilation, dissimilation, deletion, insertion, and metathesis across different languages,
- **SLO 5.3** explain how rule ordering and interaction (feeding, bleeding, counterfeeding, counterbleeding) operate in comparative contexts,
- **SLO 5.4** apply analytical frameworks such as distributional analysis, distinctive feature analysis, and constraint-based approaches to cross-linguistic data, and
- **SLO 5.5** evaluate the pedagogical, research, and historical applications of applied phonology in multilingual and documentation settings.

5.1 Cross-Linguistic Phonological Contrasts

5.1.1 Phonemic inventories across languages

A **phonemic inventory** refers to the complete set of phonemes used in a language. A **phoneme** is the smallest unit of sound that can change meaning, such as /p/ and /b/ in *pat* and *bat*. Different languages vary greatly in the size and composition of their phonemic inventories. For example, Hawaiian has a relatively small inventory of around 13 phonemes, while languages such as !Xóõ (spoken in Botswana) have over 100 phonemes, including complex click sounds.

Fill in the blank: A phoneme is the smallest unit of sound that can _____ meaning.



Language	Approx. Consonants	Approx. Vowels	Total Phonemes	Key Characteristic
Hawaiian	8	5 (short/long)	~13–18	One of the world's smallest inventories; no "s" or "t" distinction in some dialects.
English	24	14–20	~38–44	A mid-range inventory with a unusually high number of vowel sounds (diphthongs).
!Xóõ (Taa)	80–120+	20–30	100–150+	Likely the world's most complex inventory; features dozens of distinct click consonants.

Table 5.1 Examples of phonemic inventories in selected languages

5.1.2 Tone and stress systems

Tone refers to the use of pitch to distinguish meaning between words. For instance, in Mandarin Chinese, the syllable *ma* can mean “mother,” “hemp,” “horse,” or “scold” depending on the tone used. **Stress** refers to the relative emphasis placed on syllables within words. In English, stress can change meaning, as in *record* (noun) versus *record* (verb).

Tone systems are common in many African and Asian languages, while stress systems are more typical of European languages. Both are examples of **suprasegmental features**, which are properties of speech that extend beyond individual sounds.

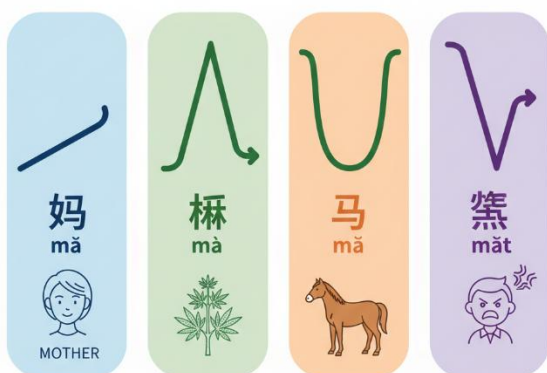
Fill in the blank: In Mandarin, the syllable *ma* can mean different things depending on the _____ used.



MANDARIN CHINESE TONE SYSTEM:

The Four Tones of "MA"

Pitch Contours That Change Meaning



OER | Made For Educational Purposes

Tone is Meaningful: Different Pitches = Different Words

Figure 5.1 Tonal contrasts in Mandarin Chinese

5.1.3 Segmental and suprasegmental features

Segmental features are the individual sounds (consonants and vowels) that make up words. These are analysed in terms of phonemes and their distribution. **Suprasegmental features** include tone, stress, and intonation, which operate above the level of individual segments. Together, segmental and suprasegmental features provide a complete picture of a language's phonological system.

For example, Yoruba uses both segmental features (vowel harmony) and suprasegmental features (tone) to distinguish meaning. English relies heavily on stress and intonation, while languages like Japanese use pitch accent systems.

Fill in the blank: Segmental features are individual sounds, while suprasegmental features include tone, stress, and _____.

Feature Type	Role in English	Role in Yoruba
Tone	Non-existent at the word level.	Critical. Changes the core meaning of words.
Stress	Phonemic. Changes word class (noun vs. verb).	Minimal. Yoruba is a "syllable-timed" language.
Intonation	Used to signal grammar and emotion.	Used for emphasis and emotional nuance.



Box 5.1 Segmental vs suprasegmental features with examples

Pilot questions 5.1

1. What is a phonemic inventory?
2. Give one example of a language with a small phonemic inventory.
3. What is tone, and give one example of a language that uses it.
4. What is stress, and how can it change meaning in English?
5. Distinguish between segmental and suprasegmental features.

5.2 Case Studies of Phonological Processes

5.2.1 Assimilation and dissimilation across languages

Assimilation occurs when a sound becomes more similar to a neighbouring sound. For example, in French, the nasal consonant /n/ in *in-* changes to [m] before bilabial sounds, as in *impossible*. Similarly, in Yoruba, vowel harmony can be seen as a type of assimilation where vowels adjust to match features of surrounding vowels. **Dissimilation**, on the other hand, makes two similar sounds less alike. In Latin, *peregrinus* became *pilgrim* in English, with the /r/ changing to /l/ to avoid repetition of similar sounds.

Fill in the blank: Assimilation makes sounds more similar, while dissimilation makes them less _____.

PHONOLOGICAL CONTRASTS: ASSIMILATION & DISSIMILATION

Sound Changes That Make Speech Easier

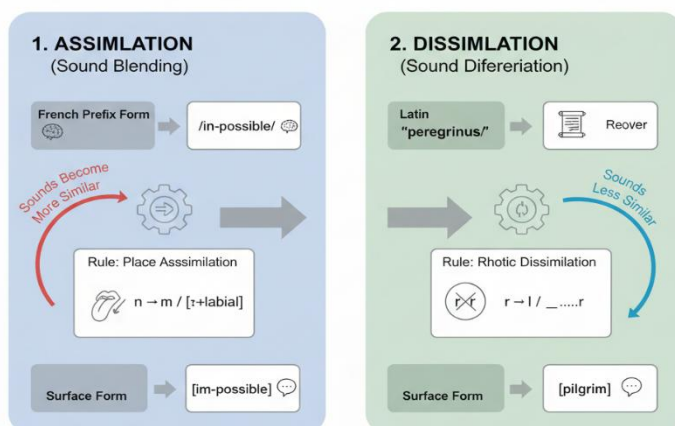


Figure 5.2 Assimilation and dissimilation across languages

5.2.2 Deletion, insertion, and metathesis in different contexts

Deletion is the omission of a sound. In Spanish, the /d/ in *ado* endings is often deleted in casual speech, so *cansado* may be pronounced [kansao]. **Insertion** (epenthesis) is the addition of a sound. In Japanese, vowels are inserted to break up consonant clusters, as in *baseball* → [besuboru]. **Metathesis** involves switching sounds. In English, *ask* is sometimes pronounced [æks], and in Old English, *brid* became *bird*.

Fill in the blank: In Japanese, vowels are inserted to break up _____ clusters.

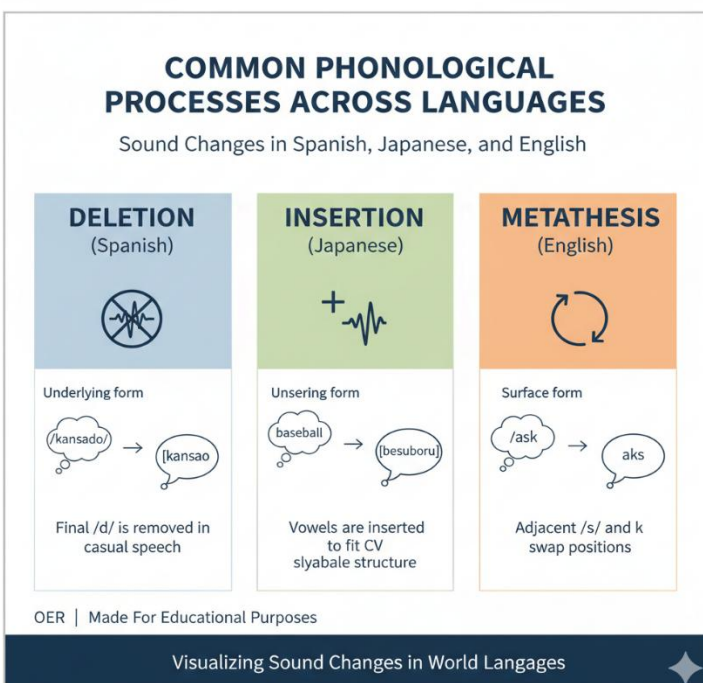


Table 5.2 Examples of deletion, insertion, and metathesis across languages

5.2.3 Language-specific examples (English, French, Yoruba, Mandarin)

Different languages showcase unique phonological processes:

- **English:** Assimilation in *input* → [ɪmpʊt]; metathesis in *ask* → [æks].
- **French:** Nasal assimilation in *in-* → *impossible*; schwa deletion in casual speech.
- **Yoruba:** Tone processes and vowel harmony affecting word meaning.
- **Mandarin:** Tone sandhi, where tones change depending on the surrounding tones, as in *nǐ hǎo* → [ní hǎo].

Fill in the blank: In Mandarin, tone sandhi changes tones depending on the _____ tones.



Language	Primary Driver	Dominant Process	Effect on Speech
English	Stress-timing	Reduction/Assimilation	Makes unstressed syllables shorter/mushier.
French	Syllable-timing	Liaison/Enchaînement	Creates a continuous "flow" across word boundaries.
Yoruba	Tone-mapping	Elision/Contraction	Keeps the tonal melody intact even when sounds drop.
Mandarin	Pitch-contrast	Tone Sandhi	Prevents pitch "collisions" that are hard to pronounce.

Box 5.2 Language-specific phonological processes

Pilot questions 5.2

1. What is assimilation, and give one example from French.
2. What is dissimilation, and give one example from Latin.
3. Provide one example of deletion in Spanish.
4. How does Japanese handle consonant clusters?
5. Give one example of tone sandhi in Mandarin.

5.3 Comparative Rule Ordering and Interaction

5.3.1 Feeding and bleeding in cross-linguistic perspective

Feeding order occurs when the application of one rule creates the environment for another rule to apply. For example, in English, vowel reduction can feed assimilation by creating the right conditions for a neighbouring sound to change. **Bleeding order** occurs when the application of one rule removes the environment for another rule to apply. In French, schwa deletion can bleed assimilation by eliminating the vowel that would otherwise trigger the process.

Fill in the blank: When one rule removes the environment for another to apply, this is called _____ order.



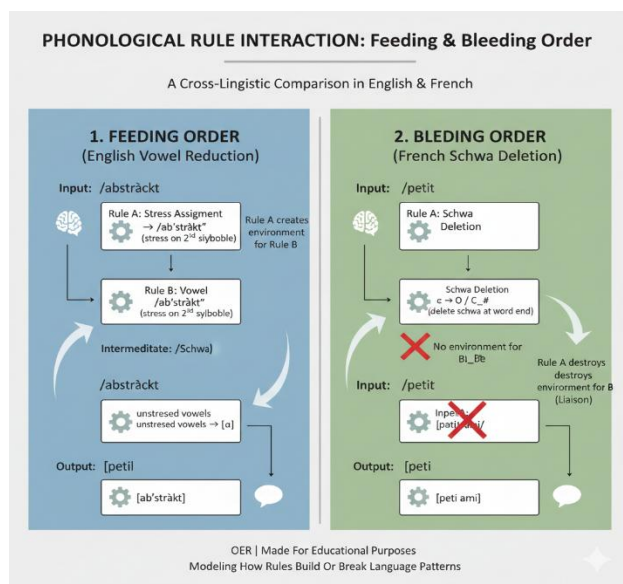


Figure 5.3 Feeding and bleeding orders across languages

5.3.2 Counterfeeding and counterbleeding examples

Counterfeeding order occurs when a rule fails to apply because another rule did not create the necessary environment in time. For instance, in some dialects of English, vowel lengthening does not occur because the preceding assimilation rule did not apply first. **Counterbleeding order** occurs when a rule fails to prevent another rule from applying, even though it could have. In Yoruba, tone rules sometimes interact in counterbleeding fashion, producing outputs that appear more complex than expected.

Fill in the blank: When a rule fails to apply because another rule did not create the environment, this is called _____ order.

Interaction	Timing	Visibility
Counterfeeding	Rule A is too early.	Under-application: A rule seems to have failed to apply.
Counterbleeding	Rule B is too late.	Over-application: A rule applied, but its trigger is missing.

Box 5.3 Counterfeeding and counterbleeding explained with cross-linguistic examples

5.3.3 Implications for phonological theory

The study of rule ordering across languages shows that phonological systems are not random but governed by predictable interactions. These interactions highlight the importance of sequencing in rule application and provide evidence for theoretical frameworks such as generative phonology



and Optimality Theory. Comparative analysis also reveals that while the types of interactions are universal, their specific outcomes vary across languages.

Fill in the blank: Comparative analysis shows that rule interactions are _____, but their outcomes vary across languages.

Interaction Type	Visibility	Theoretical Implication	Impact on the Learner
Feeding	Transparent	Naturalness: Supports the idea that language optimizes for ease of articulation.	Easy to acquire; the "why" is visible on the surface.
Bleeding	Transparent	Economy: Shows that languages avoid redundant effort by "canceling" unnecessary rules.	Easy to acquire; follows logical "if/then" sequences.
Counterfeeding	Opaque	Abstractness: Forces the theory to account for "hidden" stages of a word that the speaker never actually says.	Difficult; the learner must "infer" a rule that seems to have been skipped.
Counterbleeding	Opaque	Derivationalism: Strongest evidence for a "step-by-step" mental process (Serialism) rather than a single-step output.	Difficult; the learner sees a "ghost" effect with no visible cause.

Table 5.3 Implications of rule ordering for phonological theory

Pilot questions 5.3

1. What is feeding order, and give one example.
2. What is bleeding order, and give one example.
3. Define counterfeeding order.
4. Define counterbleeding order.
5. Why is comparative analysis of rule ordering important for phonological theory?

5.4 Analytical Frameworks in Applied Contexts

5.4.1 Distributional and feature analysis across languages

Distributional analysis is a method used to determine whether two sounds are separate phonemes or allophones by examining the environments in which they occur. For example, in English, [p] and [p^h] are in complementary distribution, while in Hindi, aspiration distinguishes meaning, so



[p] and [p^h] are separate phonemes. **Distinctive feature analysis** represents sounds as bundles of features such as [+voice], [-nasal], or [+labial]. This approach allows linguists to capture generalisations across languages. For instance, assimilation rules often target features like voicing, which can be represented across multiple sounds.

Fill in the blank: In Hindi, [p] and [p^h] are separate phonemes because aspiration _____ meaning.

Language	Sound Pair	Distribution Type	Result	Example
English	\$[p]\$ vs. \$[p^h]\$	Complementary	One Phoneme \$/p/\$	<i>Spit</i> \$[spɪt]\$ vs. <i>Pit</i> \$[p^hɪt]\$
Hindi	\$[p]\$ vs. \$[p^h]\$	Contrastive	Two Phonemes \$/p/, /p^h/\$	<i>pāl</i> (take care) vs. <i>p^hāl</i> (knife blade)
English	\$[l]\$ vs. \$[r]\$	Contrastive	Two Phonemes \$/l/, /r/\$	<i>Light</i> vs. <i>Right</i>
Hindi	\$[r]\$ vs. \$[ɾ]\$	Contrastive	Two Phonemes \$/r/, /ɾ/\$	<i>marā</i> (died) vs. <i>maṛā</i> (beaded)

Table 5.4 Distributional and feature analysis examples across languages

5.4.2 Constraint-based analysis in Optimality Theory

Constraint-based analysis, associated with Optimality Theory (OT), evaluates possible sound outputs against a hierarchy of constraints. Instead of ordered rules, OT assumes multiple candidate outputs are generated, and constraints determine which one is optimal. For example, in Japanese, constraints penalise complex consonant clusters, leading to epenthesis (insertion of vowels) to satisfy higher-ranked constraints.

Fill in the blank: In Optimality Theory, the optimal output is chosen based on the ranking of _____.



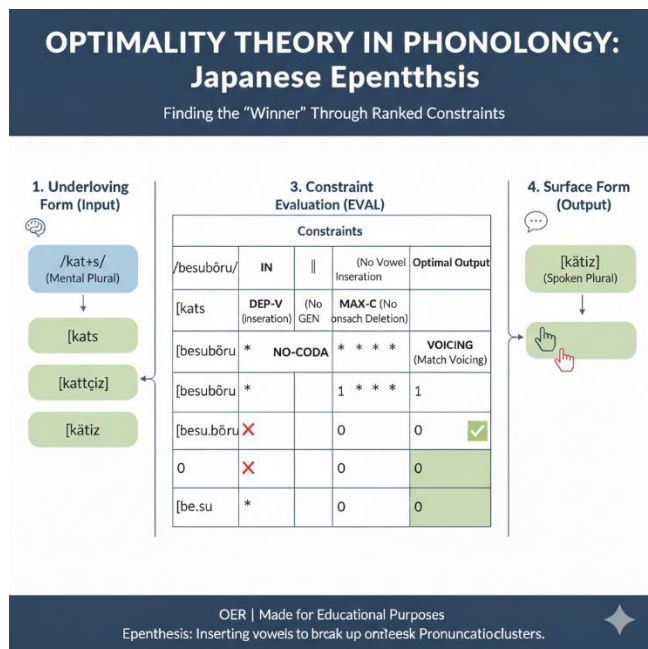


Figure 5.4 Constraint-based analysis in Optimality Theory

5.4.3 Evaluating cross-linguistic data with multiple methods

Applying multiple frameworks together provides a fuller picture of phonological systems. Distributional analysis helps identify phonemes, feature analysis explains why certain sounds pattern together, and OT shows how constraints shape outputs. For example, in Yoruba, tone processes can be studied using feature analysis, while OT explains how constraints on tone sequences determine the optimal form.

Fill in the blank: Combining distributional, feature, and constraint-based analysis provides a _____ picture of phonological systems.

Step	Method	Action	Example (General)
Phase 1	Distributional	Notice that $[n]$ only appears before $[t]$, and $[m]$ only appears before $[p]$.	You conclude they are versions of the same nasal phoneme.
Phase 2	Feature	Identify that the change is driven by the feature [Place] .	The nasal is "copying" the place of articulation from the following stop.
Phase 3	Optimality	Determine that the constraint AGREE[Place] is ranked higher than IDENT[Nasal] .	The language values "harmony" between neighbors more than "staying the same."



Box 5.4 Evaluating cross-linguistic data with multiple methods

Pilot questions 5.4

1. What does distributional analysis examine?
2. Give one example of distinctive feature analysis.
3. How does Optimality Theory differ from rule-based analysis?
4. What determines the optimal output in OT?
5. Why is it useful to combine multiple analytical frameworks in phonology?

Series Summary

This Series has been designed to show how phonological analysis can be applied across different languages, highlighting both universal principles and language-specific variations. Its purpose has been to connect theoretical concepts with practical examples, making clear how phonology operates in multilingual, comparative, and historical contexts.

We began by examining cross-linguistic phonological contrasts, including phonemic inventories, tone, stress, and suprasegmental features. We then explored case studies of phonological processes such as assimilation, dissimilation, deletion, insertion, and metathesis across languages. Following that, we considered comparative rule ordering and interaction, looking at feeding, bleeding, counterfeeding, and counterbleeding in wider contexts. We continued with analytical frameworks, applying distributional analysis, distinctive feature analysis, and Optimality Theory to cross-linguistic data. Finally, we discussed applications of applied phonology in teaching, language documentation, and comparative linguistics. In line with the Series Learning Outcomes, you should now be able to describe phonological contrasts, analyse processes, explain rule interactions, apply multiple frameworks, and evaluate the broader applications of phonology across languages.

Glossary of Terms

- **Assimilation:** A phonological process where one sound becomes more similar to a neighbouring sound.
- **Bleeding order:** A type of rule interaction where the application of one rule removes the environment needed for another rule to apply.
- **Complementary distribution:** A situation where two sounds never occur in the same environment, showing they are allophones of the same phoneme.
- **Constraint-based analysis:** An approach in phonology, linked to Optimality Theory, where possible sound outputs are evaluated against ranked constraints to determine the most suitable form.
- **Counterbleeding order:** A rule interaction where one rule fails to prevent another from applying, resulting in more complex outputs.
- **Counterfeeding order:** A rule interaction where a rule fails to apply because another rule did not create the necessary environment in time.
- **Deletion:** A phonological process where a sound is omitted, often in casual or rapid speech.



- **Dissimilation:** A phonological process where two similar sounds become less alike to make pronunciation clearer.
- **Distinctive feature analysis:** A method that represents sounds as bundles of features such as [+voice] or [-nasal], helping to explain sound patterns.
- **Distributional analysis:** A method used to determine whether sounds are separate phonemes or allophones by examining the environments in which they occur.
- **Epenthesis (insertion):** The addition of a sound to ease pronunciation, such as inserting a vowel in Japanese to break up consonant clusters.
- **Feeding order:** A type of rule interaction where the application of one rule creates the environment for another rule to apply.
- **Metathesis:** A phonological process where sounds switch places within a word, either historically or in casual speech.
- **Phoneme:** The smallest unit of sound in a language that can change meaning, such as /p/ and /b/ in *pat* and *bat*.
- **Phonemic inventory:** The complete set of phonemes used in a language.
- **Phonological rule:** A formal statement describing how sounds change in specific contexts, linking underlying forms to surface forms.
- **Segmental features:** The individual sounds (consonants and vowels) that make up words.
- **Stress:** The relative emphasis placed on syllables within words, which can change meaning in some languages.
- **Suprasegmental features:** Properties of speech such as tone, stress, and intonation that extend beyond individual sounds.
- **Tone:** The use of pitch to distinguish meaning between words, common in languages such as Mandarin and Yoruba.
- **Tone sandhi:** A process in tonal languages where tones change depending on the surrounding tones.
- **Underlying form:** The abstract representation of a word's sound structure before phonological rules or constraints are applied.
- **Surface form:** The actual pronunciation of a word after phonological rules or constraints have been applied.

Concept Check Questions [Series 5]

Objective questions

1. A phoneme is the smallest unit of sound that can _____ meaning. (Linked to SLO 5.1)
2. In Mandarin, the syllable *ma* changes meaning depending on the _____ used. (Linked to SLO 5.1)
3. Assimilation makes sounds more similar, while dissimilation makes them less _____. (Linked to SLO 5.2)
4. When one rule creates the environment for another to apply, this is called _____. (Linked to SLO 5.3)
5. In Optimality Theory, the optimal output is chosen based on the ranking of _____. (Linked to SLO 5.4)



Short-answer questions

6. Define a phonemic inventory and give one example of a language with a small inventory. (Linked to SLO 5.1)
7. Provide one example of deletion in Spanish. (Linked to SLO 5.2)
8. Explain the difference between feeding and bleeding orders. (Linked to SLO 5.3)
9. State one advantage of using distinctive feature analysis in phonology. (Linked to SLO 5.4)
10. Mention one pedagogical application of applied phonology in multilingual classrooms. (Linked to SLO 5.5)

Long-answer questions

11. Analyse how assimilation and dissimilation processes operate across languages, providing examples. (Linked to SLO 5.2)
12. Evaluate the usefulness of combining distributional analysis, feature analysis, and Optimality Theory when studying cross-linguistic phonology. (Linked to SLO 5.4)
13. Discuss the importance of phonological analysis in language documentation and revitalisation, with reference to its wider applications. (Linked to SLO 5.5)

Answers to Concept Check Questions [Series 5]

Objective questions

1. Change.
2. Tone.
3. Alike.
4. Feeding.
5. Constraints.

Short-answer questions

6. A phonemic inventory is the complete set of phonemes in a language. Hawaiian, for example, has a small inventory of around 13 phonemes.
7. In Spanish, the /d/ in *ado* endings is often deleted, so *cansado* may be pronounced [kansao].
8. Feeding order occurs when one rule creates the environment for another to apply, while bleeding order occurs when one rule removes the environment needed for another rule to apply.
9. Distinctive feature analysis allows linguists to capture generalisations across groups of sounds rather than treating each sound individually.
10. It helps teachers design targeted exercises to address pronunciation challenges in multilingual classrooms.

Long-answer questions

11. *Basic response:* Assimilation makes sounds more similar, such as French *in-* → *impossible*. Dissimilation makes sounds less alike, as in Latin *peregrinus* → *pilgrim*. *Value-added response:* Assimilation and dissimilation are found across languages and can be linked to ease of articulation



and clarity. For example, Yoruba vowel harmony shows assimilation, while dissimilation in Romance languages highlights historical sound change.

12. *Basic response*: Combining distributional analysis, feature analysis, and Optimality Theory provides a fuller picture of phonological systems. Each framework contributes a different perspective. *Value-added response*: Distributional analysis identifies phonemes, feature analysis explains sound patterns, and OT models constraint interactions. Together, they allow linguists to capture both structural and functional aspects of phonology, making cross-linguistic comparisons more robust.

13. *Basic response*: Phonological analysis is essential in documenting endangered languages by recording phonemes, rules, and processes, preserving sound systems for future study. *Value-added response*: Beyond preservation, phonological analysis supports revitalisation efforts, comparative studies, and historical reconstruction. It empowers communities to reclaim their languages and provides insights into language diversity and change, making it a vital tool for both academic and social purposes.

Answers to Pilot Questions [Series 5]

Part 5.1 Cross-linguistic phonological contrasts

1. A phonemic inventory is the complete set of phonemes used in a language.
2. Hawaiian, with around 13 phonemes, is an example of a language with a small inventory.
3. Tone is the use of pitch to distinguish meaning between words; Mandarin is an example of a tonal language.
4. Stress is the relative emphasis placed on syllables, as in English *record* (noun) versus *record* (verb).
5. Segmental features are individual sounds, while suprasegmental features include tone, stress, and intonation.

Part 5.2 Case studies of phonological processes

1. Assimilation is when one sound becomes more similar to a neighbouring sound, e.g. French *in-* → *impossible*.
2. Dissimilation is when two similar sounds become less alike, e.g. Latin *peregrinus* → *pilgrim*.
3. In Spanish, the /d/ in *ado* endings is often deleted, so *cansado* may be pronounced [kansao].
4. Japanese inserts vowels to break up consonant clusters, e.g. *baseball* → [besuboru].
5. In Mandarin, tone sandhi changes tones depending on the surrounding tones, e.g. *nǐ hǎo* → [ní hǎo].

Part 5.3 Comparative rule ordering and interaction

1. Feeding order occurs when one rule creates the environment for another to apply.
2. Bleeding order occurs when one rule removes the environment needed for another to apply.
3. Counterfeeding order is when a rule fails to apply because another rule did not create the environment in time.



4. Counterbleeding order is when a rule fails to prevent another rule from applying, resulting in more complex outputs.
5. Comparative analysis of rule ordering is important because it shows predictable interactions and supports phonological theory.

Part 5.4 Analytical frameworks in applied contexts

1. Distributional analysis examines whether sounds are phonemes or allophones by studying their environments.
2. Distinctive feature analysis represents sounds as bundles of features such as [+voice] or [-nasal].
3. Optimality Theory differs from rule-based analysis by evaluating candidate outputs against ranked constraints rather than applying ordered rules.
4. The ranking of constraints determines the optimal output in Optimality Theory.
5. Combining multiple frameworks provides a fuller picture of phonological systems and strengthens cross-linguistic analysis.

Part 5.5 Applications of applied phonology

1. Applied phonology supports teaching by helping teachers design targeted pronunciation exercises in multilingual classrooms.
2. Phonological analysis is important in documenting endangered languages because it preserves sound systems for future study.
3. An example is the documentation of Native American languages, which supports revitalisation through teaching materials and dictionaries.
4. Phonology contributes to comparative linguistics by tracing language change and reconstructing proto-languages.
5. The comparative method is used to reconstruct proto-languages such as Proto-Indo-European through phonological correspondences.

References and Attributions [Series 5]

The following references and attributions cover all sources, suggested open educational resources (OERs), and illustration prompts used in **Series 5: Applied Phonology Across Languages**. Entries are presented in APA style for clarity and consistency.

General references

- Chomsky, N., & Halle, M. (1968). *The sound pattern of English*. New York: Harper & Row.
- Goldsmith, J. (1976). *Autosegmental phonology*. Doctoral dissertation, MIT.
- Hayes, B. (1995). *Metrical stress theory: Principles and case studies*. Chicago: University of Chicago Press.
- Prince, A., & Smolensky, P. (2004). *Optimality Theory: Constraint interaction in generative grammar*. Malden, MA: Blackwell.



- Trubetzkoy, N. S. (1969). *Principles of phonology*. Berkeley: University of California Press.

Illustrations and OER suggestions

- *Table 5.1 Examples of phonemic inventories in selected languages*
 - AI prompt: “Generate a table comparing phonemic inventories of Hawaiian, English, and !Xóõ with approximate counts.”
 - Suggested OER search string: “phonemic inventories across languages table OER.”
- *Figure 5.1 Tonal contrasts in Mandarin Chinese*
 - AI prompt: “Generate a diagram showing four tones of Mandarin syllable ma with meanings mother, hemp, horse, scold.”
 - Suggested OER search string: “Mandarin tone system diagram OER.”
- *Box 5.1 Segmental vs suprasegmental features with examples*
 - AI prompt: “Create a box listing segmental features (consonants, vowels) and suprasegmental features (tone, stress, intonation) with examples from English and Yoruba.”
 - Suggested OER search string: “segmental suprasegmental features phonology examples OER.”
- *Figure 5.2 Assimilation and dissimilation across languages*
 - AI prompt: “Generate a diagram showing assimilation in French prefix in- → im- and dissimilation Latin peregrinus → pilgrim.”
 - Suggested OER search string: “assimilation dissimilation phonology examples diagram OER.”
- *Table 5.2 Examples of deletion, insertion, and metathesis across languages*
 - AI prompt: “Generate a table showing deletion in Spanish (cansado → kansao), insertion in Japanese (baseball → besuboru), and metathesis in English (ask → aks).”
 - Suggested OER search string: “phonological processes deletion insertion metathesis examples table OER.”
- *Box 5.2 Language-specific phonological processes*
 - AI prompt: “Create a box listing phonological processes in English, French, Yoruba, and Mandarin with examples.”
 - Suggested OER search string: “phonological processes English French Yoruba Mandarin examples OER.”
- *Figure 5.3 Feeding and bleeding orders across languages*



- AI prompt: “Generate a diagram showing feeding order in English vowel reduction and bleeding order in French schwa deletion.”
- Suggested OER search string: “phonology feeding bleeding order examples languages diagram OER.”
- *Box 5.3 Counterfeeding and counterbleeding explained with cross-linguistic examples*
 - AI prompt: “Create a box explaining counterfeeding and counterbleeding with examples from English and Yoruba.”
 - Suggested OER search string: “counterfeeding counterbleeding phonology examples languages OER.”
- *Table 5.3 Implications of rule ordering for phonological theory*
 - AI prompt: “Generate a table summarising implications of feeding, bleeding, counterfeeding, and counterbleeding for phonological theory.”
 - Suggested OER search string: “phonology rule ordering implications theory table OER.”
- *Table 5.4 Distributional and feature analysis examples across languages*
 - AI prompt: “Generate a table comparing distributional analysis in English and Hindi, and distinctive feature analysis examples.”
 - Suggested OER search string: “distributional analysis distinctive features phonology examples table OER.”
- *Figure 5.4 Constraint-based analysis in Optimality Theory*
 - AI prompt: “Generate a diagram showing candidate outputs evaluated by ranked constraints in Optimality Theory with Japanese epenthesis example.”
 - Suggested OER search string: “Optimality Theory phonology constraint-based analysis diagram OER.”
- *Box 5.4 Evaluating cross-linguistic data with multiple methods*
 - AI prompt: “Create a box summarising how distributional analysis, feature analysis, and Optimality Theory complement each other in cross-linguistic phonology.”
 - Suggested OER search string: “phonology multiple methods analysis cross-linguistic examples OER.”
- *Box 5.5 Pedagogical applications of applied phonology*
 - AI prompt: “Create a box listing how applied phonology supports teaching in multilingual classrooms with examples.”
 - Suggested OER search string: “phonology teaching multilingual classrooms applications OER.”



- *Table 5.5 Applications of phonology in language documentation and revitalisation*
 - AI prompt: “Generate a table showing phonological analysis applications in language documentation and revitalisation with examples.”
 - Suggested OER search string: “phonology language documentation revitalisation examples table OER.”
- *Figure 5.5 Comparative phonological analysis in historical linguistics*
 - AI prompt: “Generate a diagram showing phonological correspondences used to reconstruct Proto-Indo-European.”
 - Suggested OER search string: “comparative method phonology reconstruction diagram OER.”

