Cognitive Approaches to the Acquisition of Sociolinguistic Competence

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Connectionism

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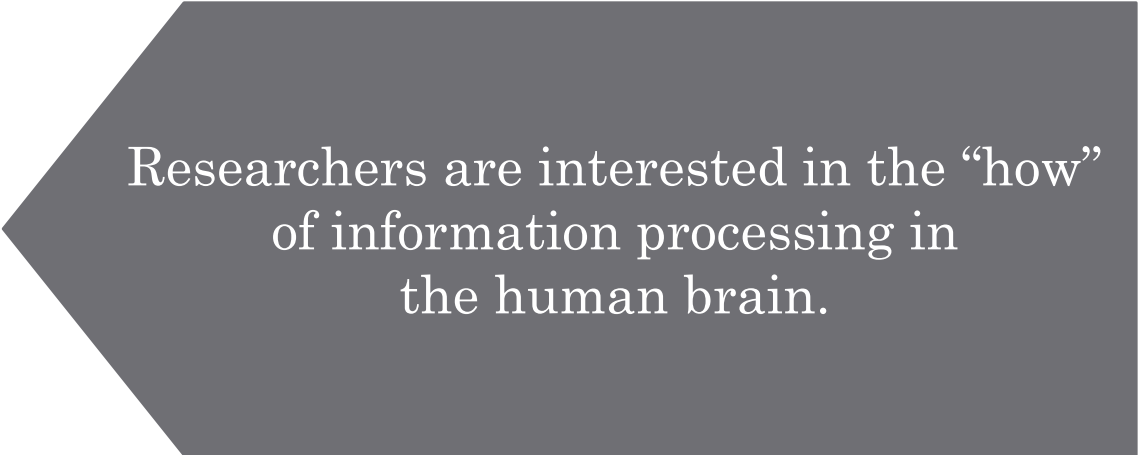**Usage-Based Models**

Systems-Based Theories
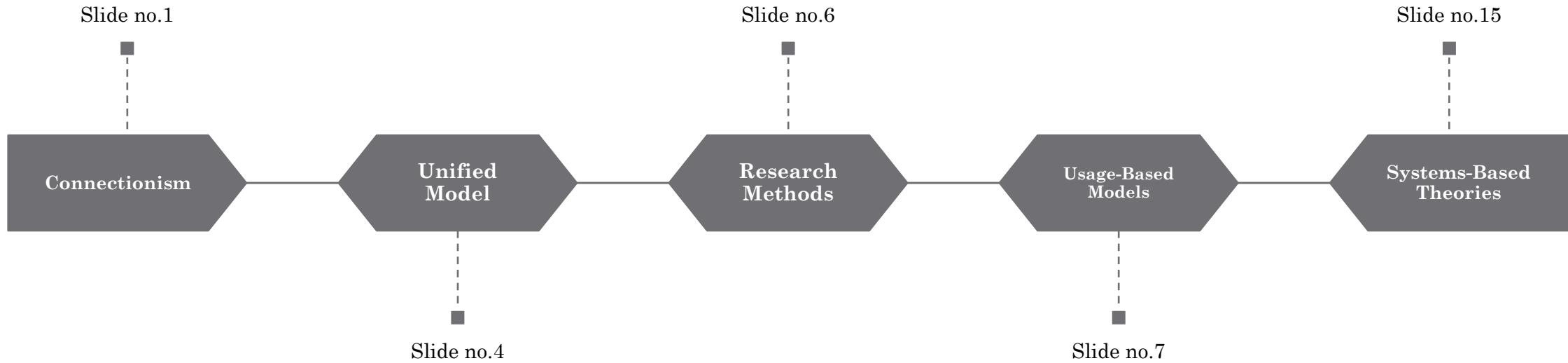
Approaches

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Connectionism:

Includes a set of models:

- Processes

- Perception

- Cognition

- Information storage

- Retrieval

Researchers are interested in the "how" of information processing in the human brain.

✓ **Connectionist models have their origins in cognitive science.**

Connectionism:

- The human brain consists of **nodes** and **links**.

- **Distributed representation** concept

- This entire system of nodes and links is collectively called a **neural network**.
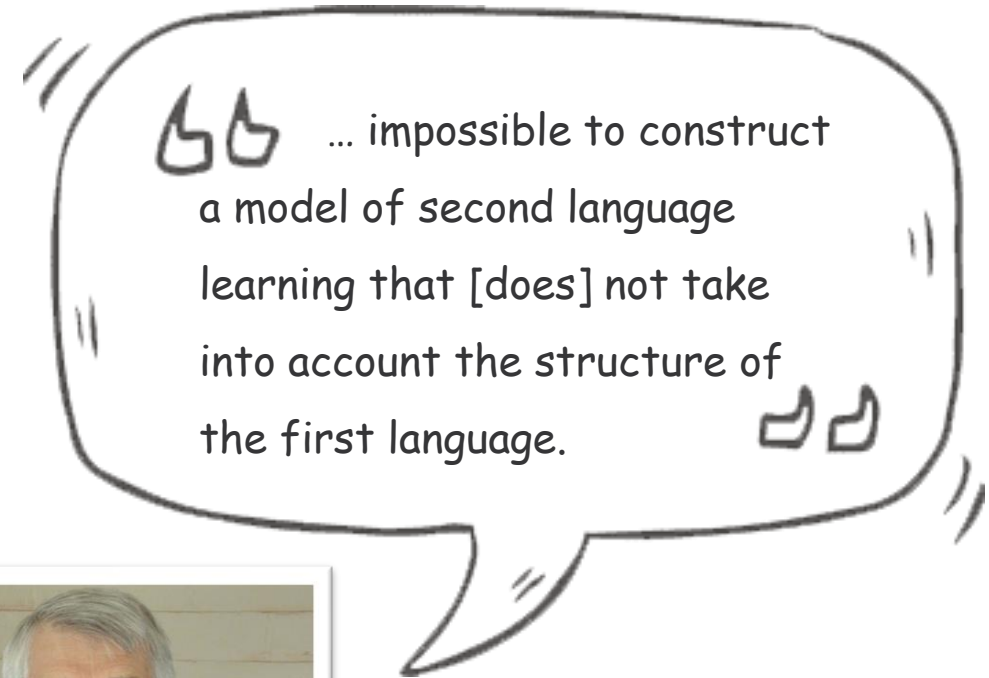
Emergent Modeling Way:

- Adjusting the weight of the connections

- Strength of activation

- Interaction between the <u>environment</u> and <u>general learning capabilities</u>
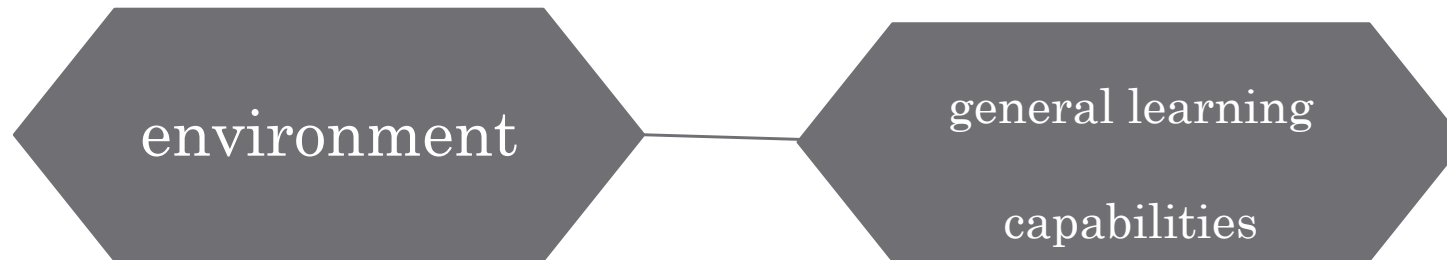
Unified (Competition) Model

- The **influence of the first language** is so strong in learning a second language.

- Like Connectionist models, MacWhinney's model are based on **associative patterns**.

> 66   … impossible to construct a model of second language learning that [does] not take into account the structure of the first language.

Unified (Competition) Model

- One productive strand of research in second language acquisition

- Computerized simulations of morphosyntactic acquisition.

- Connectionist networks are able to simulate learning of the particular structure(s).

Second Language Acquisition

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Research Methods and Connectionist Theory

- **Back propagation:** refers to the learning process through which the associative network compares its output with the target output on each learning trial.

✓ If a difference is noted, the network propagates this information back to an intermediate layer, and this is passed along to the input weights, which causes a reduction in future errors.

Three-layer network

Input Layer

Output Layer

Hidden Layer
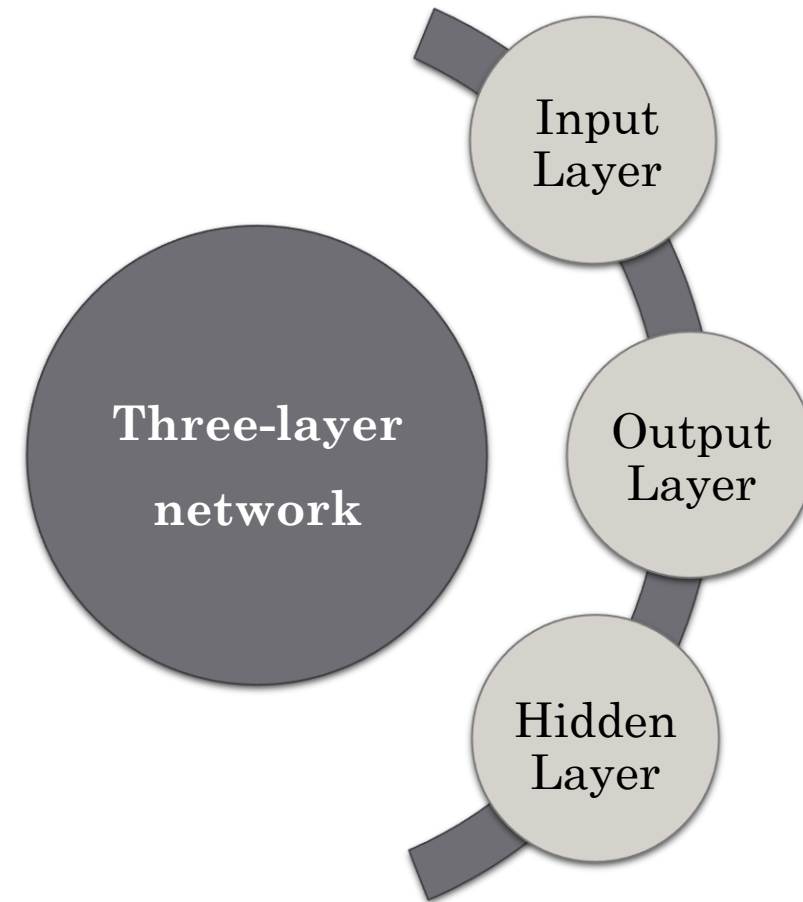
Usage-Based Models

- These models **overlap** to some Connectionist models.

- Usage-based and Connectionist models with other Emergentist models, Functionalism, and Computational Linguistics, all hold that the **linguistic knowledge of speakers is best understood as ever-changing**.

- Language experience influences the manner in which we connect the **sign** with the **signified**.

Characteristics:

- **Usage-based** models of language in particular focus on the influence of language use on its cognitive organization.

- **Constructions** may be individual words, or morphemes, or a string of words (such as idioms or conventional expressions).

- When a construction is encountered through experience with the language, it is stored in memory and is categorized by a process of mapping.

Mechanisms:

- Generalized cognitive mechanisms

- Some of these mechanisms include **entrenchment**, **categorization**, and **schema formation**.

| Entrenchment	Categorization	Schema formation
• Conservation • Repetition of events • Easy to access • Store as a unit	• Capacity to sort • Organize events • Identity • Similarities • Differences	• Abstraction • Emergence of patterns • Similarity inherent • Individual experiences

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Token Frequency and Type Frequency

- The way we store linguistic structure reflects the frequency of occurrence.

- Distinction between token frequency and type frequency

- **Token frequency** refers to the number of times a given element appears.

- **Type frequency** refers to the number of times a certain pattern appears.

Effects of token frequency

• Three effects of token frequency have been detailed and examined in **usage-based** research.
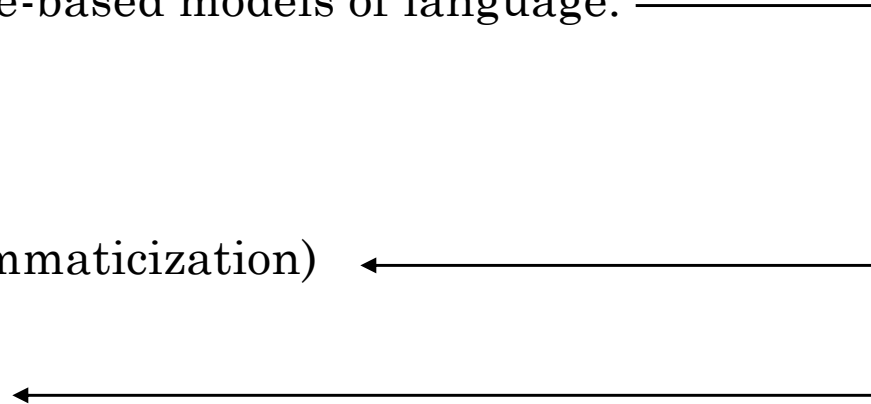
Conserving effect

First effect

Second effect

Autonomy

Reducing effect

Final effect
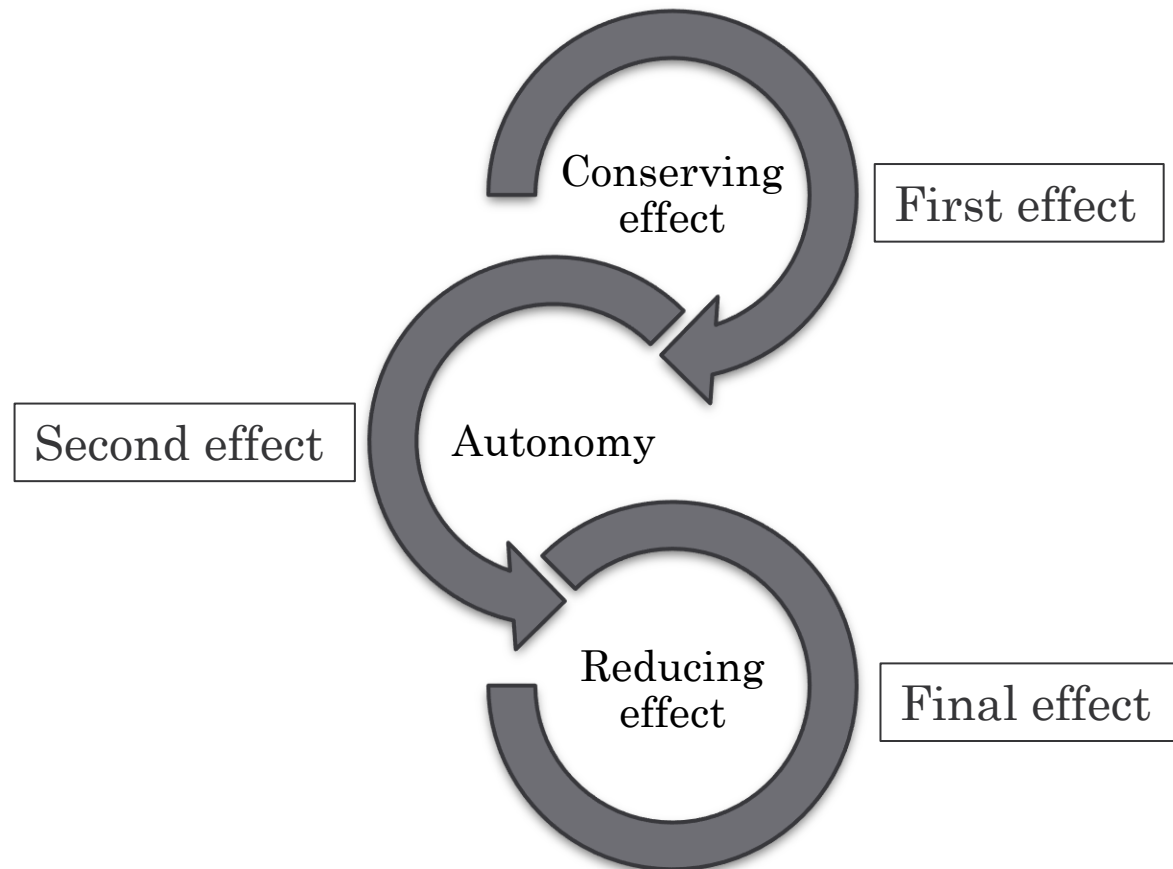
Grammaticalization and prefabs

- Two concepts that are central to usage-based models of language:

Grammaticalization (also called grammaticization)

Prefabs (or prefabricated sequences)

Summary of learner challenges in Bybee (2008)

Challenge	Description
Repetition	Repetition of forms guarantees more exposure to them. This is particularly helpful for high frequency irregular forms, but not low frequency irregular forms, which are likely to be regularized by learners. Repetition also yields chunking, which is unfavorable if incorrect forms are strengthened in learners' cognitive representations (similar to fossilization).
Autonomous constructions	To the extent that second language learners have knowledge of the communicative intent of autonomous constructions, these high frequency items can facilitate communication at earlier stages of learning.
Reduction	Difficulties in comprehension and production of spoken language may stem in part from effects of reduction. Learners with less experience in the second language may find highly frequent, reduced constructions not only difficult to parse for comprehension, but also difficult to produce if the resulting sequences are phonotactically infrequent or illicit in their respective first languages.

| Challenge	Description
Knowledge of patterns	Knowledge of patterns in the second language can facilitate the learning and production of new, but related, forms. That said, learners must be exposed to a variety of items exhibiting a given pattern to be able to apply it productively or innovatively in future second language use.
Biased input	Like native speakers, learners can benefit from the "biased" input to which they are exposed. For paradigm-based learning, high frequency forms can serve as a reference point for low frequency forms.

Systems-Based Theories

Dynamic Systems Theory

Complexity Theory

Systems-Based Theories

Dynamic Systems Theory:

It has its origins in mathematics and emphasizes the examination of behavior and change in systems over time. An important aspect of this theory is the notion of nested systems. This concept captures the idea that every system is, in fact, part of another system.

Small changes or "disturbances" in the system can greatly influence the trajectory of their development. This notion is commonly referred to as the **butterfly effect.**
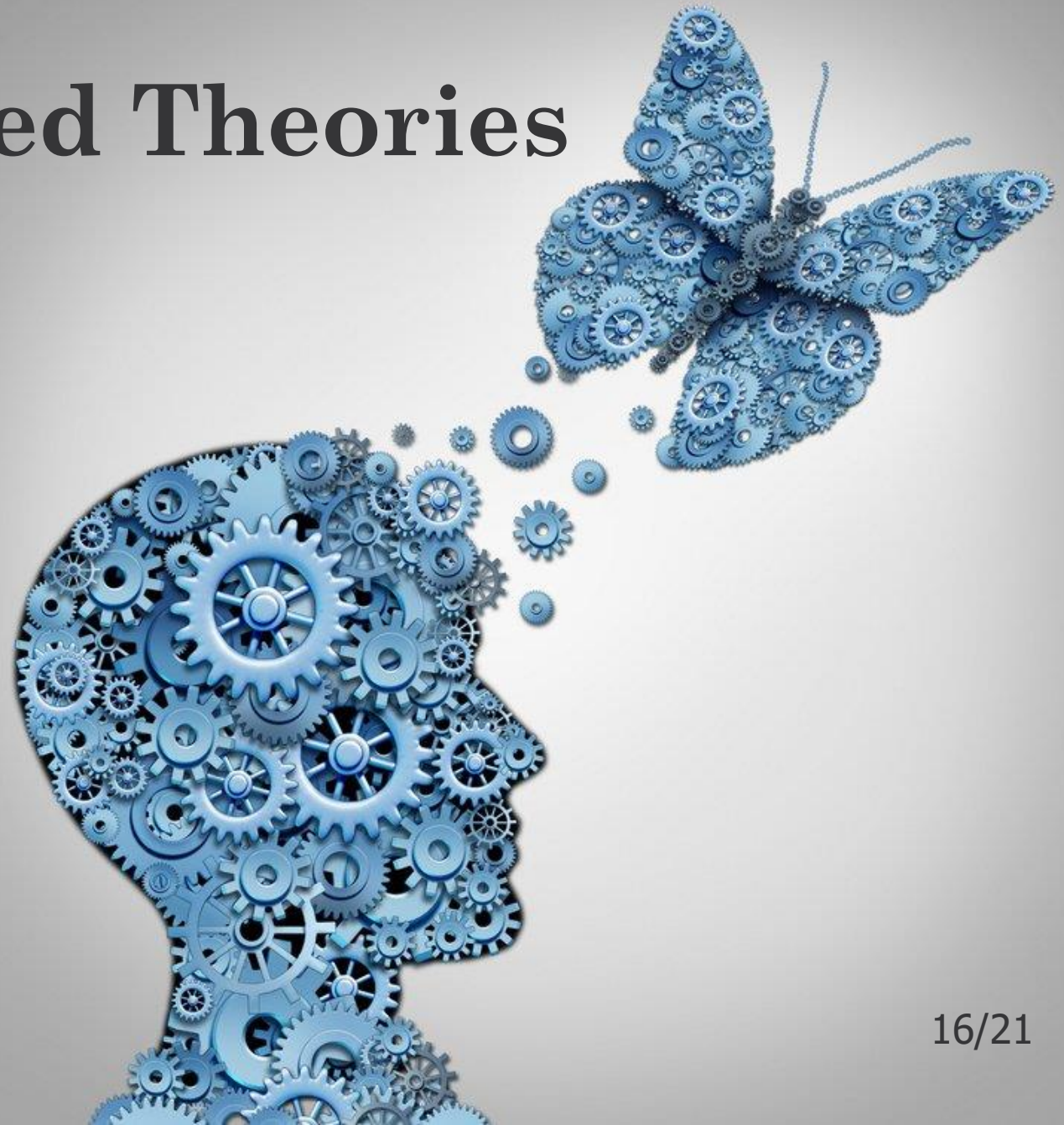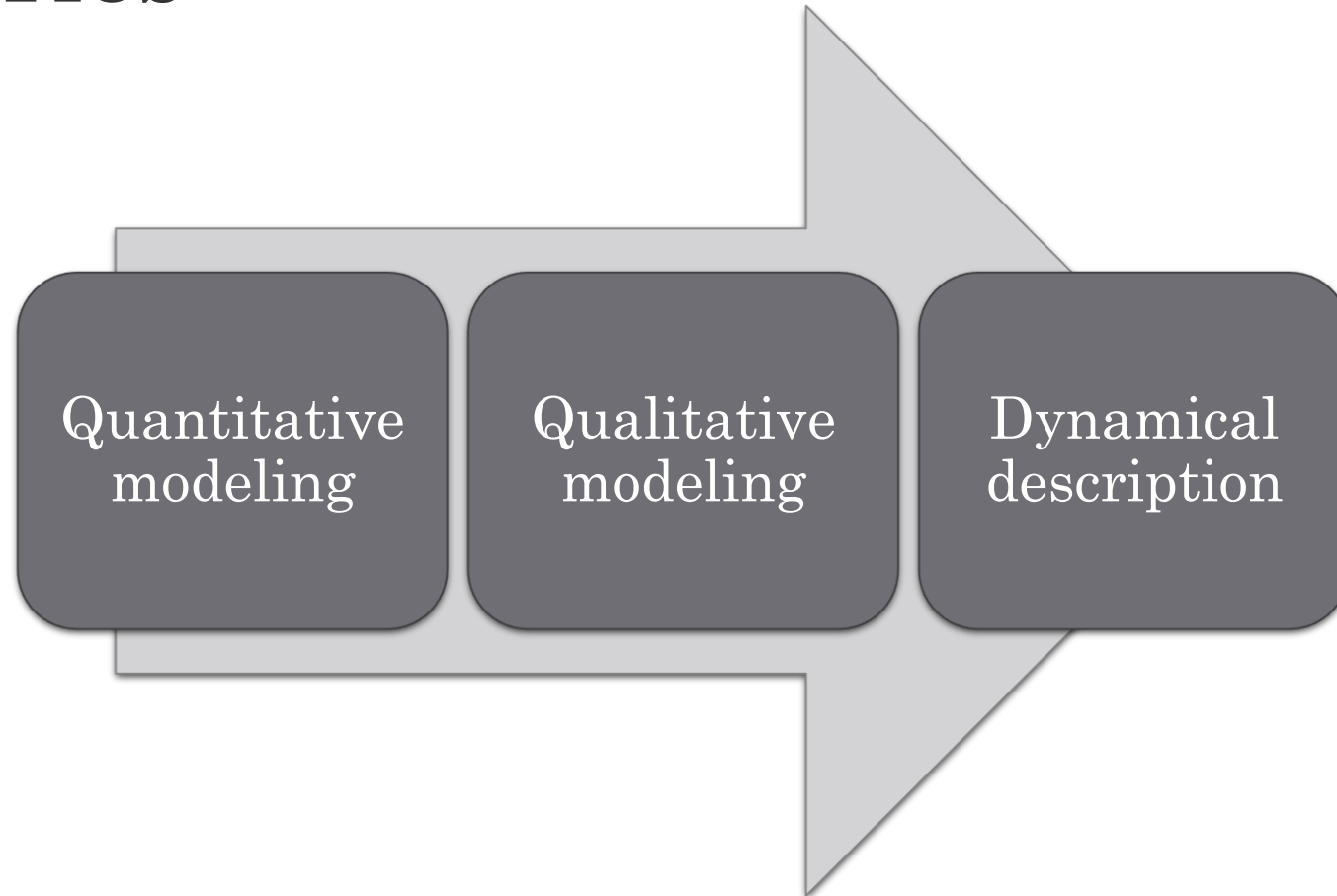
Systems-Based Theories

Complexity Theory:

- Complex systems consist of multiple, interacting agents.

- Complex systems are open and can receive energy from outside the system.

- Because the parts of a complex system are constantly changing, the system as a whole is continually changing as well.

Research Methods and Systems-Based Theories

Research Methods and Systems-Based Theories

- **Quantitative modeling:** involves numbers and uses mathematics

- **Qualitative modeling:** more suitable alternative to the study of human complex systems

- **Dynamical description:** a means of conceptualizing certain aspects

Overview of cognitive approaches to the acquisition of a second language

Model/theory/ approach	Second language learning	"Cognitive" aspects considered	Sociolinguistic competence examined?
Optimality Theory	Change ranking of constraints to best match constraint ranking of second language	Components of mental grammars, including GEN, EVAL, CON, and the mental lexicon	Yes
Connectionism	Adjustment of connection weights between units in a distributed, neural network (already finely tuned for the first language); process-oriented	Patterns of connectivity between units in a neural network; associative learning mechanisms	No relevant research to date

Model/theory/ approach	Second language learning	Cognitive aspects considered	Sociolinguistic competence examined?
Usage-based models	Language experience and use impacts cognitive representation of second language, which is emergent	Repetition of linguistic forms and its effect on experience in the second language	Yes
Systems-based theories (Dynamic Systems Theory, Complexity Theory)	Emergent stabilities in a complex system; dynamic and nonlinear	Variability; dynamic and nonlinear nature of variables studied	No relevant research to date

The End