Creating Naturalistic Interactions in Language Learning Technologies

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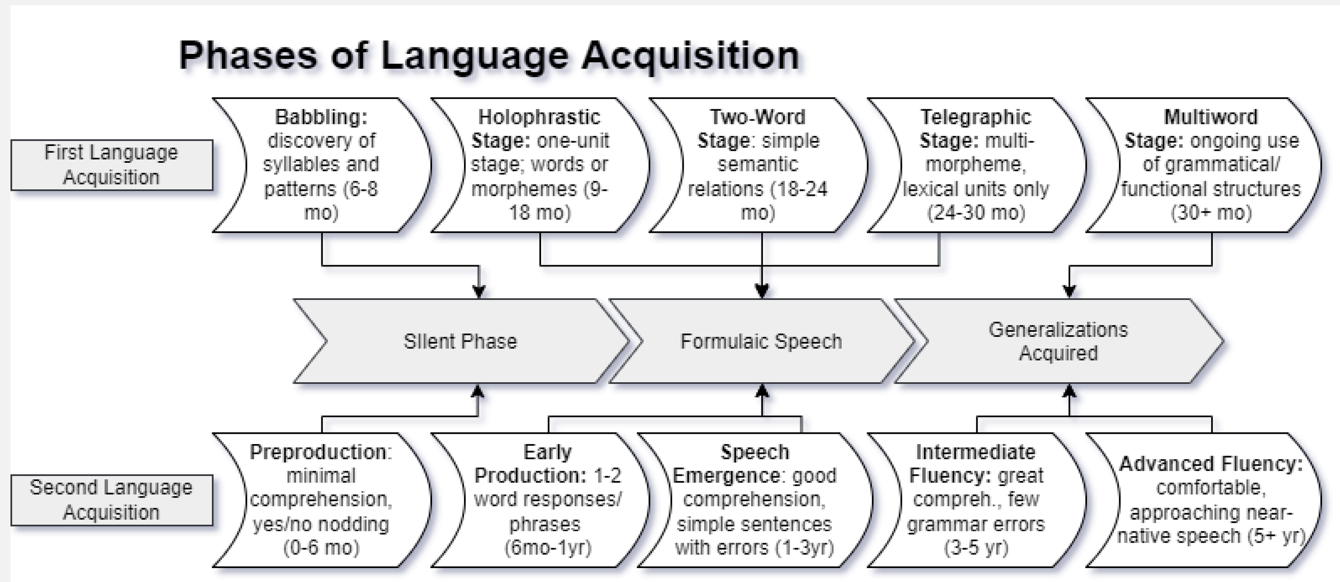
Background

Language pedagogy research tends to ignore many features identified in SLA as factors that determine success, such as stress/fear of failure, *i + 1* input, and communicatively embedded output. If the goal of language is successful communication, we must trigger learners to "notice the gap" in their production during real-time conversations, either in morphosyntactic (form) or semantic/pragmatic (meaning) errors.



Current Issues

Pedagogical Limitations

- The language taught through LLTs can be rigid, awkward, unsuitable for conversational use, and promotes the use of abbreviated forms.

Social Limitations

- LLTs lack an engaging factor, socialization, opportunities to practice in real-life contexts, and a necessary variety of supporting resources (both learning and technology related).
- The feedback provided by LLTs is generic.

While there are currently some examples of LLTs using VR (e.g. Mondly), these programs replicate the negative feedback learning of text-based websites. AR programs use place-based or marker-based methods to teach with real objects but rely on a limited set of known terms to function. Such a rigid structure prevents the user from receiving benefits of immersion. Instead, an immersive LLT must be (1) adaptive, (2) robust, and (3) output-driven.

	Babbel	Rosetta Stone	Duolingo
Real-life conversations*	✓	✓	✓
Vocabulary	✓	✓	✓
Grammar & syntax	✓	✓	✓
Reading	✓	✓	✓
Writing	✓	✓	✓
Listening (native speakers)	✓	✓	✓
Speaking (speech recognition)	✓	✓	
Repetition & Patterns	✓	✓	✓
Instant feedback	✓	✓	✓
Varied exposure to language	✓	✓	✓
Tips & explanations	✓		✓
Personalization of learning difficulty			✓

Example

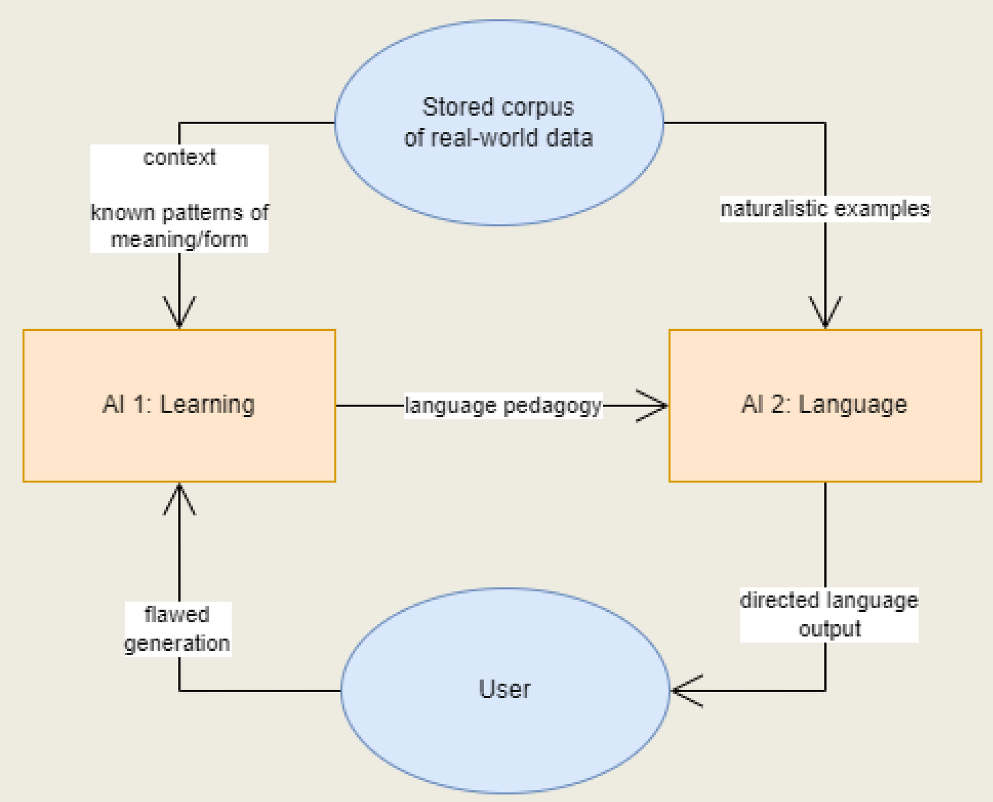
PREFUNCTION: Situation 1.a (Coffee shop. Ordering a drink)
(Italian): "***Vorresti qualcosa da bere***?" ("Do you want something to drink?")

Error of Meaning

- AI 1:
  - Input: "*Vorrei un cane.*" ("*I want dog.*")
    - [<1st.sing> Request <animal>]
  - Process: Identify error of meaning
    - ["*cane*" = <animal> when expecting <drink>; SEMANTIC]
  - Output: GOAL to use type expected.
    - [Request <drink> SEMANTIC]
- AI 2:
  - Input: GOAL = SEMANTIC <drink>
  - Process: Identify probable alternative [<drink> -> *caffè*]
  - Output: "*Vorresti un caffè o un cane*?" (*"Do you want à coffee or à dog?"*)

Error of Form

- AI 1:
  - Input: "*Vorresti un caffè."* ("You want coffee.")
    - [<2nd.sing> Request <drink>]
  - Process: Identify error of form
    - ["vorresti" = <2nd.sing> when expecting <1st.sing>; FORM]
  - Output: GOAL to use form expected.
    - [Request <1st.sing> FORM]
- AI 2:
  - Input: GOAL = FORM <1st.sing>
  - Process: Identify probable structure [<1st.sing> -> *vorrei*]
  - Output: "*Vuoi dire <<vorrei un cane>>?*" (*"Did you mean <<I want coffee>>?"*)



Proposal

To better simulate natural interactions, we propose a system of AI-generated language interactions coupled with VR/AR. By creating a goal-directed situation and a visible interlocutor, we artificially activate the necessary precursors to allow for language acquisition under Social Interactionist Theory (Gass, Mackey, & Pica 1998): goal-oriented communication, situations lacking in stress or anxiety, and dynamic conversation.

- We rely on **real-world data** of catalogued interactions sorted by **contexts** (e.g. coffee shop, library, transportation) and **conversations** (e.g. ordering coffee, asking for the restroom, mistaken order).
- We then use statistical models to predict expected responses in two ways: **forms** identified via n-gram models matched to predictable patterns of syntax/morphology; **meaning** semantic categories and approximate alternatives.

AI 1 identifies any errors in speech and determines a pedagogical goal which AI 2 realizes.

AI 1: Learning
Input: User speech (non-prosodic ASR)
Process: intelligibility rating; expected meaning/form (statistical corpus data)
Output: Goal (user to generate)

AI 2: Language
Input: Goal (error type + expectation
Process: Probable correction, naturalistic responses (statistical corpus data)
Output: Directed language

This process cycles throughout the conversation until the contextual goal is achieved.

Discussion

- The context-centric design allows for inductive learning through a combination of story-telling and direct engagement.
- This framework is theoretical; implementation requires a great deal more research on computational plausibility.
- Many LLTs show bias towards non-Romance languages with structures, pronunciations, and cultural properties (e.g. honorifics or registers) being difficult to encode. The proposal must be designed with the language's demands in mind to predict forms/meaning that are useful and important.
- The model assumes a simple process for speech-to-text recognition for linguistic processing, but this issue is confounded by dialect differences of input training and the non-native productions of users.

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