

## The Significances of Recursion in Early Language Learning: The Study of Psycholinguistics

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### Abstrak

Belajar bahasa pada tahap awal tidaklah mudah karena proses mental siswa belum siap. Saat ini, para siswa datang ke kelas tanpa meninjau yang telah mereka pelajari. Penelitian ini untuk mengetahui signifikansi rekursi dalam pembelajaran bahasa awal. Penelitian ini merupakan penelitian kualitatif dengan menggunakan pendekatan studi kasus deskriptif. Studi ini menjelaskan secara rinci pentingnya rekursi pada awal akuisisi bahasa. Peserta penelitian ini berjumlah 44 partisipan. Observasi dan wawancara dilakukan untuk mendapatkan data signifikansi rekursi dalam perkembangan bahasa awal. Pengkodean, pengurangan, tampilan, dan membuat kesimpulan adalah cara untuk menganalisis data. Selanjutnya, unsur-unsur penyelidikan memeriksa bagaimana rekursi mempengaruhi kapasitas mereka untuk menawarkan umpan balik. Hasil penelitian menunjukkan bahwa rekursi penting untuk mengatasi kemiskinan stimulus dalam bahasa kedua dan menghasilkan kalimat. Menurut 16 (36%) dari peserta, gagasan rekursi dapat mengatasi kurangnya rangsangan dalam penguasaan bahasa. Sedangkan 28 (64%) peserta mengaku dapat menghasilkan kalimat karena dosennya menerapkan ide rekursi. Ini digunakan untuk mengebor dan memperkuat input yang disediakan. Siswa dapat menggunakan pengetahuan mereka yang ada untuk mengatasi tantangan belajar bahasa karena guru telah berulang kali menawarkan prosedur. Tersirat bahwa guru harus menyediakan lingkungan *bahasa* yang bermanfaat untuk meningkatkan proses mental siswa untuk mendapatkan masukan yang berarti.

**Kata kunci:** Rekursi; Dini; Bahasa; Belajar

### Abstract

Learning a language in early stage is not easy since the mental process of the students is not ready yet. Nowadays, the students are coming to the class without reviewing they have learned. This study is to finding out the significances of recursion in early language learning. This study is a qualitative research by using descriptive case study approach. This study describes in details the significances of recursion in early on language acquisition. The participants of this study are 44 participants. Observation and interview are conducted to get the data of the significance of recursion in early language development. Coding, reducing, displaying, and making the conclusion are the ways to analyze the data. Furthermore, the elements of the inquiry examine how recursion affects their capacity to offer feedback. The results show that recursion is important for overcoming stimulus poverty in a second language and producing sentences. According to 16 (36%) of the participants, the recursion notion can address the lack of stimuli in language acquisition. Whereas 28 (64%) of participants claim they can produce sentences because their lecturers apply recursion ideas. It is used to drill and reinforce the supplied input. Students can use their existing knowledge to address language learning challenges since teachers have repeatedly offered a procedure. It is implied that the teachers should provide a beneficial

language environment to improve the mental process of the students to get meaningful input.

**Keywords:** *Recursion; Early; Language; Learning*

## INTRODUCTION

Recursion is commonly characterized as embedding one sentence within another; however this definition is not universally accepted. When the term refers to language, the initial usage of recursion in mathematics, formal logic, and computer science presents a definitional challenge (Johnson-Laird et al., 2022). In these disciplines, recursion refers to any instruction that invokes another instruction of the same kind and has a terminating condition. It functions like an instruction to call another instance of itself, but lacks a termination condition to avoid infinite loops. To be clear, there is no commonly recognized definition of recursion. The concept varies across fields, including mathematics, logic, computer science, and linguistics. It also differs within these disciplines, especially in linguistics. For example, center embedding recursive structures appear to entail a complicated interaction of numerous symbolic rules that must be in place at the same time for the system to function at all, therefore it is unclear how the mechanism may gradually emerge.

A recursive function is one that calls itself while running. The recursive function must include at least two terms: basic and recursive cases (Paap & Partridge, 2014). A base case is an input for which the function yields a finite output. It is analogous to the loop's end condition. When the recursive call reaches the base case, the function's repeated calling is terminated. The recursive example is which means that the function calls itself. The recursive function with no base case is equivalent to an infinite loop.

Recursion is the process by which a function calls itself directly or indirectly, and the associated function is known as a recursive function (Paap & Partridge, 2014). Recursion is a fantastic approach that allows us to shorten our code and make it easier to understand and write (Levinson, 2013). It offers a number of advantages over the iteration strategy, which will be explained more below. Recursion is one of the finest solutions for a job that may be defined by its comparable subtask (Li et al., 2020).

Recursion has been acknowledged as a basic aspect of human language throughout the history of Generative Grammar. Indeed, according to (Lobina, 2007) in a recent paper, recursion is what differentiates human language from nonhuman animal communication systems. The Recursion Constraint would thus apply everywhere, except when evidence to the contrary is provided by the child's language input. The limitation predicts things that go beyond root compounding. As a potential deep principle of grammar, it provides a lens through which to evaluate all recursive structures.

Although the capacity to create recursive structures is very certainly natural, languages differ in the domain of recursion, which must be learnt through language-specific experience. Recursion in language has historically been defined as the self-embedding of a linguistic object. For example, the man's neighbor can be stated by a rewriting rule NPNP's NP, where the first NP self-embeds another NP to derive the man's neighbor's book. Similarly, the complement phrase (CP) recursion is represented as CPNP VP and VPV CP, which embeds one clause inside another. When a rule like NPNP's NP becomes accessible, infinite embedding follows instantly. The challenge for the learner is determining how recursive rules become part of their language. (Poletiek et al., 2018) in their study "Under What Conditions Can Recursion Be Learned?" "The Effects of Starting Small in Artificial Grammar Learning of Center-Embedded Structure" asserts that language requires recursion to represent recursive reasoning. The cognitive act of recursion entails recalling the link between two things or concepts and recognizing how each affects the other. Recursive syntactic patterns in language express complex thought while displaying combinatorial strength, a key component of recursion.

Language simply has to be recursive since its job is to express recursive concepts. Different fields define recursion differently. It even within the same discipline, it might signify multiple things. Biologists use the phrase to describe self-referential formulations, such as in order to simulate plant development. It is used by psychologists to refer to thinking about thinking, mental time travel, and children's theory of mind.

## METHOD

The study was qualitative, with a case study technique. This research looked closely at hypothetical events that happen but cannot be controlled or influenced (Darlington & Scott, 2020). During observation and interviews, respondents are asked how teachers manage the teaching process, engage with students, ask questions, request student feedback, and utilize suitable approaches. In addition, they must address how students respond correctly to teachers. The study looks at how the teaching and learning process works in terms of delivering input to students. The questions also discuss the role of recursion in early language development. Furthermore, the inquiry components investigate how recursion impacts their ability to provide feedback.

The study's participants included both students and educators. They are made up of students in their first semester. There were 34 students and 10 English Department instructors. They are the subjects of this research. Because of the participants' availability of time, persuade sampling is employed as a sampling approach. Saturation determines the number of students that participate. The research included 44 participants. The data was acquired through observation and interviews, with documentation as a backup. This study uses asking and observation to discover how teachers deliver feedback to their pupils. The documentation's goal is to discover and record information on instructors' and students' teaching and learning habits. After data collection, the approach moves on to data simplification, verification, and conclusion. Inductive data analysis is used to investigate the data in this study (Watson, 2015). This study was inviting the participants of the study to participate in the research following the ethical consideration such as protecting the rights, enhancing research validity, and maintaining academic integrity of the participants.

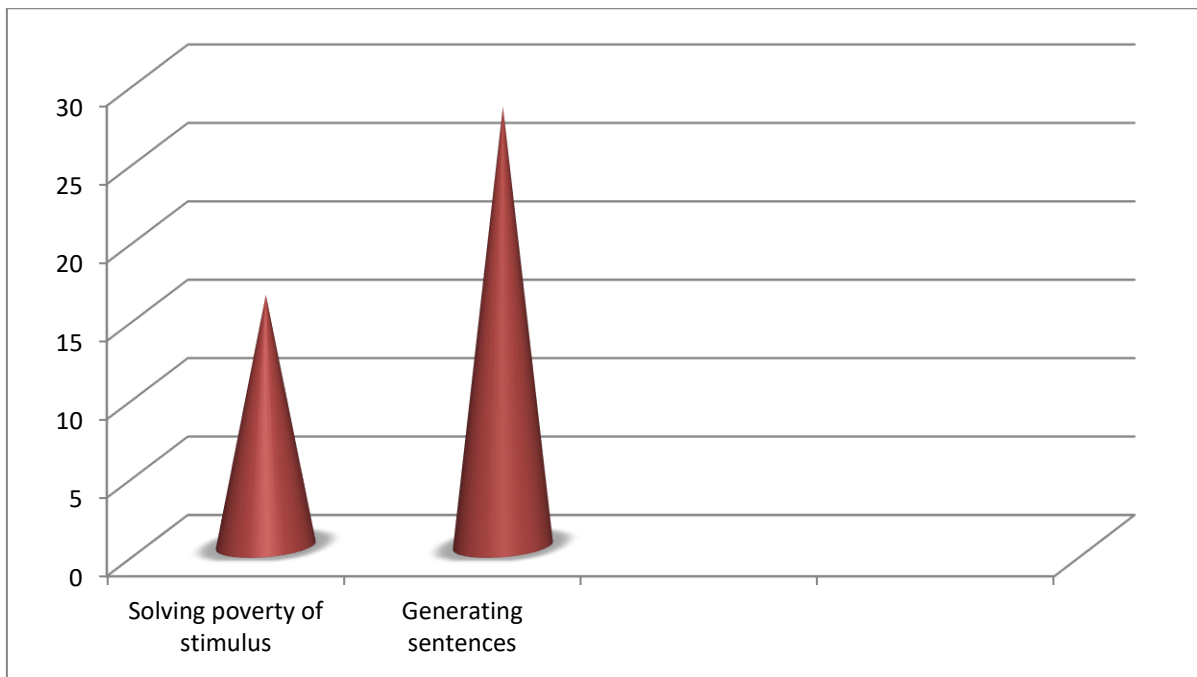
## RESULTS AND DISCUSSION

### Results

In the early stage of language learning, recursion is important to solve the poverty of stimulus and to generate sentences. Those are describing in the following table.

**Table 1.** The Significances of Recursion

		Frequency	Percent	Valid Percent
Valid	Solving the poverty of stimulus	16	36	36
	Generating sentences	28	64	64
	Total	44	100.0	100.0



**Figure 1.** The Significances of Recursion

Table 1 and Figure 1 demonstrate the importance of recursion in language acquisition. Solving poverty of stimulus and generating sentences are the significances of recursion. 16 (36%) participants assert that recursion concept in language learning facilitates the students in solving the poverty of stimulus; 28 (64%) of them state that the students are able to generate sentences.

- R : OK, now what is the important of a recursion in language learning?  
P : It aids the students who have a lack of input and difficulties grasping the topic.

Based on the findings of observations, namely watching the situation and the learning process at the same time and asking various questions of the first participant, the instructor conducts a number of activities that might help to create a positive linguistic environment. Based on the information provided by the participant, the recursion is able to excite and motivate pupils to contribute. It helps pupils who struggle to learn a language.

The second participant made a similar point about the importance of recursion. Before beginning learning activities such as writing or completing projects, the instructor takes student attendance one at a time. This is done to provide a pleasant environment in which the teacher may encourage pupils to learn and speak English. Teachers begin learning activities by reviewing the students' previous knowledge of the content. Teachers use the same materials but with various activities to reinforce and strengthen students' learning. It increases pupils' sense of belonging in the classroom since they believe they can produce phrases. Furthermore, it marks the beginning of contact with pupils. The following is an excerpt from the observations collected after asking the third participant various questions.

- R : Okay,... when your English teacher teaches, how does the teacher maintain the understanding of the students?
- P : The teachers explain again several times, sir as well as they use different activities with the same topic.
- R : Then? What is the significances of it.
- P : The exercises increase the pupils' motivation to speak out and develop English phrases, clauses and sentences.

The students' statements were also supported by the statements of their English teacher. He stated that in order to develop and maintain the understanding and motivates the students in producing phrases, clauses, and sentences both in spoken and written, it is crucial to develop activities stimulating the students' mind to generate sentences. The students have the opportunities to always interact and exchange opinions with English teachers. Teachers build empathy with students.

### **Discussion**

Based on the research results recursion is useful for overcoming stimulus poverty in a second language and forming sentences. According to 16 (36%) of the participants, the recursion concept can help with the absence of stimulus in language acquisition. Whereas 28 (64%) of participants think they can form sentences because their lecturers employ recursion theories. Its purpose is to drill and reinforce the provided input. Students can utilize their prior knowledge to handle language learning. This study has similarity to the study of (James & Bona, 2012) discussing the recursion in cognition arguing that recursion are able to supply input for the students in the teaching learning process. and (Li et al., 2020) in their research of acquisition of recursion in child Mandarin supported that the recursion is efficiently affect on the students to identify sentences. It is also parallel to the study (James & Bona, 2012) related to Recursion in Cognition : A Computational Investigation into the Representation and Processing of Language Department of Psychology University Rovira i Virgili saying that solving the poverty of stimulus and generating sentences are stronger when the recursion happened in the early age. This research linier to another previous study of (Li & Schuler, 2023) discussing acquiring recursive structures through distributional learning asserting that the students are able to study language though distribution learning, a framework in computational learning. The recursive learning helps the students who have the poverty of stimulus

When students receive enough input for language acquisition, they may produce language and interact in the target language with their professors and classmates in a variety of contexts (Amiruddin et al., 2023). They can engage in routine social conversation in a limited number of professions, participate in formal and informal conversations with correct grammar and vocabulary about practical, social, and professional issues, and use the target language fluently and accurately at all levels of professional context (Amiruddin & Jannah, 2022). To provide an overview, the concept of recursion was developed to address the problem of stimulus poverty (Johnson-Laird et al., 2022) and (Poletiek et al., 2018). The Problem of stimulus poverty is that the students can produce phrases that they have never heard before and hence do not originate from their external input (Johnson-Laird et al., 2022) and (Shen et al., 2002). Given that language knowledge is supposed to be tacit and partially innate/internal, it refers as 'I(internal/innate)-language'. This I language adheres to the recursion principle by employing recursive rules to construct an array of infinite structures conveying an endless array of meanings.

It demonstrated that human learners are sensitive to the recursive structure that lies behind a succession of box positions (Watumull et al., 2014). Participants taught on low embedding levels were able to acquire a higher level faster than those trained on a non-recursive pattern. The notion of recursion is crucial, yet it is frequently misinterpreted. It may terrify the naive while also increasing the mystery for the initiated (Shen et al., 2002). Recursion is a type of computation that embeds elements or structures of the same type within those of the same kind (Cho et al., 2016). That is somewhat correct, because recursion can be easier in many situations (Smith et al., 2013) and (Cho et al., 2016). As a result, we intend to deconstruct the notion and get to its heart. Recursion and programs have a close relationship, where a program is a finite collection of instructions for carrying out a calculation that results in an output (Roeper & Snyder, 2005). Formal programs are written in a language that can be translated into a set of instructions that can be executed by a computer (Aliurridha, 2019).

Recursion is at the heart of linguistic ability. Every language demonstrates recursion from the initial stage of productive two-word utterances because basic merge necessitates recursion (Parker & Alfaro, 2022). Recursion is a mathematical phenomena applied to linguistics in which a grammatical structure is repeatedly repeated inside itself (Ilyas, 2022). Simply put, linguistic recursion is the capacity to embed a grammatical unit within another of the same type.

Recursion is one of those intrinsic abilities, and it is exactly what allows human language to produce infinite meaning (Maican & Cocoradă, 2021) and (Collen, 2021). The power to produce an unlimited number of sentences and meaningful utterances is the core of language. Because of recursion, there is no limit to the amount of things we may say, even inside a single phrase (Johnson-Laird et al., 2022).

A recursive function's range can be limitless, as with the arithmetic rule (Maican & Cocoradă, 2021). The calculation can continue indefinitely, but its rules are finitely stated, and at any point in the computation, only a finite quantity of tape has been processed (Parker & Alfaro, 2022). The machine's finiteness is fundamental: the set of theorems or data derivable or predictable in a consistent system or theory is non-arbitrary, such that an extensional definition (a list of theorems/data) cannot suffice; a list does not derive and thus delimit (and thus explain) the set. As a result, it is important to define the set intentionally using a finite technique (a rule) to deduce or forecast what items fulfill the requirements to be subsumed in the set, or to create the set.

Because recursion is at least one of the distinctive features of human language, demonstrating that any nonhuman creatures are capable of constructing or processing recursive sequences is a difficulty. A recursive process is one that calls itself or another procedure of the same kind (RCSLT, 2022). To establish real center-embedding, one must demonstrate not only that center-embedded sequences can be distinguished from those that do not follow the rule, but also that the pairs are matched from the outside pairs inward (Strategies et al., 2021). To put it another way, if the sequences are to be regarded as constituents nested in constituents, the constituents must have some integrity.

## CONCLUSION

The study's findings and interpretations indicate that recursion is essential for overcoming stimulus poverty in a second language and forming sentences. According to 16 (36%) of the participants, the recursion concept can solve a shortage of stimulus in language acquisition. In contrast, 28 (64%) of participants think they can generate sentences because their lecturers employ recursion theories. Teachers can drill and reinforce the offered material. Because instructors have consistently presented a technique, it is assumed that they can leverage students' previous knowledge to overcome language acquisition issues. It indicates that instructors and members of academic society should give students with a proper linguistic environment in order to create optimal

classroom settings for students to obtain relevant input and social interaction in order to increase students' comprehension of their society.

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