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Why Productive Failure Falls Short in English Oral Learning: Ill-Structuredness, L1 Transfer, and Implications for Instructional Redesign

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Abstract: Productive Failure (PF), as a learning model where learners try to solve problems first before receiving instruction, has been shown by numerous studies in subjects like mathematics and physics to help students build a deeper understanding of concepts. However, when this model is transferred to second language acquisition, especially the field of oral English expression, its effect shows significant instability. Some studies suggest that PF can have an impact on language areas with more stable formal structures, like grammar and writing. However, it is often challenging to activate the learning process of "failure-cognitive conflict-structural reorganization" in real-time oral expression. This review argues that the key reason why PF is ineffective in oral English is not insufficient implementation by teachers or lack of ability on the part of learners, but rather the inherent ill-structuredness of language itself and the default role of L1 transfer in oral production. Oral expression often allows output that is formally incorrect but semantically understandable, making faults no longer possess the "diagnosability" that PF relies on, thus blocking cognitive conflict and the reorganization of expression structures. Based on this, this paper proposes two feasible reconstruction pathways for PF in oral English teaching: first, by designing tasks to reduce the solution space of oral expression, making different expressions comparable; second, establishing a development-based evaluation system, supported by long-term, multi-round tracking of expression rather than relying solely on one-time language accuracy as a criterion. This review aims to provide a new interpretive framework for the theoretical application of PF in the field of language learning and offer implementable teaching strategy references for oral teaching.

Keywords: Productive failure; Oral English; L1 transfer; Ill-structuredness; Task design

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1. Introduction

Productive Failure (PF) was first proposed by Kapur in mathematics learning research, which focuses on allowing learners to attempt problem-solving without direct guidance first, enabling them to expose their knowledge gaps

through their attempts, thereby making it easier to build a deeper understanding when they subsequently receive instruction [1–2]. The consistent success of PF across well-structured disciplinary domains has prompted scholars to investigate its possible application in non-STEM learning environments, including second language (L2) education [3–4].

However, when PF is introduced into language learning contexts, particularly in English oral expression, researchers have found its effectiveness not displayed as anticipated. Some studies indicate that PF can enhance learners' written accuracy, but it does not reliably support gains in spontaneous oral production [5]. In other words, PF does not naturally trigger learning mechanisms in the language domain as it does in STEM.

This study aims to answer: Why is it difficult for PF to achieve the expected effects in English oral expression? The review supposes that the fundamental reasons lie in two aspects. First, oral expression has significant ill-structuredness. Expressions can take many forms, and their validity depends on context, object, style, and other factors, unlike STEM, which has a unique solution and a clear sign of fault. Second, oral English expression is highly dependent on L1 (first language) transfer. L1 transfer constitutes the default generative path for oral expression. Due to the real-time nature of oral expression, English as a Foreign Language (EFL) learners inevitably rely on L1 structures to organize the meaning and then form conversion. Since directly translated expressions are often comprehensible, errors do not manifest as failures, which makes it harder for PF to happen because it needs cognitive conflict and structural reorganization.

2. Productive failure research in STEM domains: Mechanism and preconditions

Productive Failure (PF) is characterised as a problem-solving before instruction (PS-I) approach, in contrast to the traditional instruction before problem-solving (I-PS) model [6]. The PF design typically consists of two stages: (a) generation and exploration, where learners attempt to solve a novel problem without direct guidance, activating and reorganizing their prior knowledge; and (b) consolidation and knowledge assembly, in which the teacher contrasts learners' solution attempts with canonical forms to support conceptual refinement [2–3]. While learners' initial solutions are often partial, suboptimal, or incorrect, these productive failures create the cognitive conditions that enable deeper learning during subsequent instruction [7–8].

The effectiveness of PF depends on several key mechanisms embedded in the instructional design [4]. First, problem-solving tasks must be complex enough to require learners to draw on and reorganize prior knowledge. Second, learners need to be able to recognize limitations in their initial solutions—this recognition generates cognitive conflict. Third, during the consolidation phase, comparing learners' solutions with expert strategies enables schema abstraction and integration of new conceptual understanding.

Critically, these mechanisms rely on the structure of the problem space. In classic PF studies, the target domain—such as mathematics—provides well-structured problems, where solution procedures are logically constrained, and outcomes are clear, stable, and comparable [9–10]. In such domains, errors are diagnostic: learners can see why a solution is incorrect, which allows failure to function as an explicit trigger for reorganization.

This dependence on clear, comparable, and diagnosable errors is central—and forms a key consideration when examining PF in less-structured domains such as language learning.

3. Attempts to apply PF in non-STEM domains

Research has shown that the effectiveness of PF depends critically on the design of failure [8]. In successful

STEM-based PF implementations, learners encounter errors that are diagnostic; that is, the task structure allows incorrect solutions to converge into detectably incorrect outcomes, enabling learners to recognize gaps in their understanding [3]. By contrast, in non-STEM domains, PF has often shown limited or even negative effects [11]. In these domains, problem spaces tend to be more ill-structured, meaning that multiple solution forms may appear plausible, and learners may not notice their errors. When failure is not visible, the central PF mechanism—cognitive conflict followed by knowledge reorganization—does not occur.

Research in language learning has begun to explore how PF can be adapted to oral and written communicative contexts. Rahayu implemented PF in a multi-user virtual learning environment [5]. In the design, learners first attempted communicative tasks without explicit linguistic instruction, and only afterward engaged in a reflection phase in which the teacher acted as a language guide. Notably, PF students exhibited greater self-regulated learning behavior, such as monitoring and evaluating their own language output [5]. This study suggests that PF's lack of significant advantage in spoken language stems primarily from the automation requirements of oral expression and insufficient practice frequency [5]. However, PF demonstrates higher meta-cognitive strategy usage. Therefore, PF's potential advantage in spoken language mainly lies in enhanced meta-cognitive regulation. To translate this advantage into observable linguistic accuracy, sufficient repetitive output practice is essential to achieve structural automation.

4. Ill-structuredness in language learning

Language learning, particularly spoken production, can be regarded as a typical ill-structured domain [10]. Unlike well-structured problem spaces with clear solution criteria, oral expression allows multiple acceptable solutions to the same communicative intention [12]. As shown in the example below, structurally different utterances may all be comprehensible (**Table 1**):

Table 1. Examples of structurally different expressions

Expression Form	Comprehensibility	Type of Difference
I went to school yesterday.	Standard and natural	Neutral narration
Yesterday I went to school.	Comprehensible	Temporal foregrounding
I yesterday went to school.	Comprehensible but non-standard	Word order influenced by non-target patterns

In such cases, difference does not equate to error, and therefore does not constitute failure in the PF sense. Since communicative success is achieved, the cognitive conflict required for PF is not triggered. That is, learners have no reason to reorganize their linguistic system.

Furthermore, the appropriateness of spoken expression is context-dependent, relying on social roles, register, and pragmatic goals [13]. There is no single "correct" form, only more or less appropriate ones in context. This makes it difficult to establish the stable reference standards necessary for PF's comparison and reconstruction stages.

Finally, oral proficiency relies on the automation of language forms rather than explicit mastery of rules [14]. Even when learners recognize expression differences and reconstruct form-meaning relationships during the reflection phase of PF, this explicit knowledge cannot be rapidly accessed under the time pressure of real communication without sufficient repetition through output practice. Since oral production requires instant

retrieval and fluent expression, learners tend to revert to familiar, quick-generation expression paths rather than employing new, non-automated modes [15]. That means, even after restructuring, extensive practice is required to transfer to real-time expression. Consequently, the potential advantages of PF remain underdeveloped in real-time communication without frequent, delayed, and cross-contextual oral practice. This explains why EFL often say: "I know the correct grammar, but I still cannot say it."

In short, PF proves less effective in oral language learning because oral communication rewards semantic success over formal accuracy, making errors invisible and reconstruction unnecessary. The mechanism of "failure-awareness- restructuring" fails to activate when formally incorrect expressions still achieve communicative success.

5. L1 Transfer as a systematic source of ill-structuredness

To explain why learners persist in making the same oral errors despite repeated exposure to the target language, researchers must examine the cognitive mechanisms of spoken language production. Specifically, researchers need to understand how L1 Transfer establishes default pathways in speech and systematically diminishes the triggering effect of PF.

The cognitive foundation of L1 transfer lies in the need for "ready-made structures" in oral expression generation. From the perspective of speech production models, oral output is a highly real-time process, including: conceptualization (forming what to say); formulation (converting meaning into linguistic form); and articulation (producing sounds) [16]. In this process, learners do not construct sentences from scratch but instead draw upon internalized expression patterns (chunks), existing syntactic frameworks, and familiar semantic combinations.

The earliest automatically activated patterns, nearly all of which originate from L1 [17]. In other words, the native language is not an optional reference system, but the default generation system of spoken expression. Therefore, L1 transfer is not an occasional error, but part of the output mechanism.

Most of the errors from L1 transfer do not lead to communication failure and are therefore not perceived by learners as errors that need to be corrected. Semantic success can mask errors, meaning the L1 path is continuously reinforced. Even when PF has metacognitive advantages, the dominant L1 path often prevents PF from being triggered.

Why do traditional strategies fail? These methods typically avoid native language interference, mistakenly viewing it as an obstacle. This overlooks that the native language serves as the fundamental source of generative mechanisms, which can never be blocked. In conventional oral teaching, students' errors are corrected immediately, followed by revisions and expectations of internalization. However, in real-time communication, knowing and using are not equivalent. Immediate corrections don't alter generative pathways. The core issue is treating native language transfer as a problem rather than recognizing it as part of the language generation mechanism itself. Consequently, these methods only address surface-level errors, failing to transform expression generation patterns.

Dynamic Systems Theory posits that L2 development is a dynamic, non-linear process shaped by learners' existing language systems [18–19]. In other words, learners' oral development is not about eliminating the native language but rather reconstructing expressions through the native language and then gradually replacing native language frameworks. This implies that native language transfer should not be avoided, but rather made explicit, utilized, and reconstructed, which provides a breakthrough for PF's redesign in oral communication. PF should

not let students fail naturally, but instead help them see their native language transfer paths. Comparative analysis should not be teacher-taught, but self-generated by learners. The PF mechanism can then be reactivated in oral practice.

6. When does PF come into play in spoken English?

6.1. Path 1: Structure the tasks

The objective of task structuring is to reduce the freedom of oral output temporarily without compromising authenticity, enabling comparative analysis of output samples in form.

In designing oral tasks, structured tasks can enhance the visibility and comparability of language differences. For example, Structured Meaning Framework tasks establish a "time-event-cause-result" semantic chain, requiring learners to organize their oral output based on this structure. Similar tasks include picture sequence retelling and situational script writing. The expected effect is to make learners' output formats structurally convergent, thereby making grammatical forms and tense differences more explicit.

6.2. Path 2: Establish a development-based evaluation system

Through personalized tracking of learners' oral expression changes, the evaluation of whether PF is successful no longer solely relies on standardized linguistic correctness. Instead, it is judged based on learners' progress and changes in expression. Teachers adjust their feedback and support strategies by observing learners' expressive differences at various stages, helping students continuously develop and improve in oral expression. On this basis, since spoken language requires repeated repetition in order to produce observable changes, such a recording should be long-term and multi-round. For example, the teacher can set up the task of the same situation plus multiple rounds of oral retelling within a few weeks, record and compare the changes in learners' word choice, sentence structure, and fluency in each round of expression, and provide dynamic feedback to guide the gradual optimization of expression.

7. Conclusion

In summary, the limited effectiveness of PF in English oral expression stems from the interaction of two core factors: the ill-structured nature of spoken language and the proceduralized role of L1 transfer in real-time speech production. Unlike well-structured STEM domains, oral communication allows multiple acceptable forms and prioritizes semantic success over formal accuracy, which makes errors less perceptible and prevents PF from triggering the cognitive conflict required for structural reorganization. Moreover, because oral proficiency depends on automatized expression patterns rather than explicit rule knowledge, even when learners notice differences during reflective stages, such awareness does not automatically translate into fluent real-time use without extensive practice. Therefore, applying PF in spoken language requires structural reshaping of tasks to enhance comparability of outputs (e.g., structured meaning frameworks and repeated production cycles) and a development-based evaluation system that emphasizes longitudinal progress rather than one-time accuracy performance. Only when PF is redesigned to make L1 transfer visible and paired with sustained practice that supports proceduralization can its mechanism be effectively activated in spoken English learning.

Disclosure statement

The author declares no conflict of interest.

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