

Affordance Theory in Language Education: A Multidimensional Framework

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Abstract

This conceptual paper presents a multidimensional framework for applying affordance theory to language education, moving beyond traditional, linear models. Drawing on ecological and rhizomatic perspectives, the framework views affordances as context-sensitive opportunities for action, shaped and enacted by learners, and analyzed across five key dimensions: perceptibility, learning valence, compositionality, normativity, and intentionality. The article outlines pedagogical demonstrations to guide language teaching and learning, introducing three progressive levels for implementing affordance-based language education. It then explores research principles for studying affordances in increasingly complex, technology-rich environments. Readers are provided with practical strategies for capturing affordance dynamics and recommendations for research designs that support relational and emergent inquiry. Finally, the article discusses key methodological challenges that arise when teaching, learning, and researching from an affordance-based perspective. This approach promotes more adaptive, equitable, and learner-centered practices in contemporary language education by equipping educators and researchers with clear theoretical and analytical tools.

Keywords: Affordance, Language Learning, Multidimensional Framework, Rhizomatic Learning, Ecolinguistics

Language education has grown upon a foundation of diverse theoretical and practical traditions for many years. Approaches emphasizing structured guidance, authentic communication, and meaningful support have played a vital role in shaping teaching and learning across different contexts. These foundations have offered stability and direction for curriculum design, instructional choices, and assessment practices, contributing significantly to classroom successes worldwide (Krashen & Terrell, 1983; Swain, 1985; Vygotsky, 1978). Traditional theories have contributed essential insights into how people develop language abilities. However, learning in today's world often unfolds in unpredictable and context-dependent ways. Each learner navigates an open-ended environment full of options that may appear, change, or disappear depending on personal goals, histories, and circumstances (Cameron & Larsen-Freeman, 2007; Larsen-Freeman & Cameron, 2008; Nguyen & Doan, 2025). This complexity requires a framework that can accommodate fluidity, emergence, and diversity rather than relying solely on pre-set models. While these established traditions have yielded

many successes, their over-rigid and deterministic nature is increasingly insufficient for capturing the emergent complexity of contemporary language learning environments. Thus, there is a need for a multidimensional framework that can systematically account for the dynamic, context-dependent opportunities that learners encounter.

The language education landscape is profoundly transforming as the human world continues evolving with new technological and social advancements. Learners now engage with a rich tapestry of resources, peers, and intelligent systems that transcends the walls of any single classroom. Interactions occur across digital platforms, worldwide collaborative networks, and adaptive technologies that adjust in real time to individual needs (Hockly, 2023; Jeon et al., 2023; Reinders et al., 2022). This environment presents opportunities and challenges, prompting educators and researchers to revisit familiar frameworks and question whether they are sufficient for understanding learning as it happens.

Affordance theory, articulated within ecological psychology, offers a powerful way to address these needs (Chemero, 2009; Gibson, 1979). Instead of focusing only on what a curriculum or tool contains, affordance theory asks what possibilities for action arise when a person encounters a particular environment. The value of this approach is seen in its attention to perception, agency, and context. Focusing on the match between what is available and what a learner can recognize and use makes it possible to explain why some opportunities lead to growth while others remain unnoticed or unused (Dohn, 2009; van Lier, 2004). In rapidly changing settings, this perspective encourages teachers and researchers to look beyond features or outcomes and pay close attention to the dynamic process through which actionable learning opportunities are realized (Chvala, 2025; Cui et al., 2025). Building on this foundation, the present article introduces a methodological framework grounded in the concept of affordances. The aim is to offer both a theoretical lens and a set of practical tools for studying how opportunities for action are constructed and negotiated in language education today. This framework draws on recent advances in ecological thinking as well as insights from rhizomatic approaches, which emphasize the importance of flexibility and multiple learning pathways. Accordingly, this article presents a theoretical justification for affordance-based analysis and a practical roadmap for its implementation in diverse language education settings.

Specifically, the article focuses on several key areas. First, it clarifies the affordance theory's theoretical roots and development, showing how this perspective reshapes understanding of how learning happens. Second, it introduces a multidimensional model for analyzing affordances, which includes five distinct but interconnected dimensions: perceptibility, learning valence, compositionality, normativity, and intentionality. Third, the article details methodological principles for applying this model in practice, highlighting strategies for learning, teaching, and research that can support more responsive and equitable learning environments. Finally, it addresses the implications of this approach for future scholarship and practice in language education, especially in the context of continuing technological innovation and diversity among learners. By offering this affordance-based framework that centers on the actual experience of learners and the environments they inhabit, this article aims to contribute to the ongoing evolution of language education practice and research.

Theoretical Foundations

Ecological Origins of Affordances

The concept of affordances, introduced by Gibson, is foundational to the ecological approach to perception and action (Gibson, 1979). Rather than perceiving abstract properties, organisms

directly perceive actionable possibilities the environment offers them, “for good or ill.” Affordances are relational: they exist at the intersection of an organism’s abilities and environmental features, not solely as objective properties or subjective interpretations. For example, a branch may afford climbing to a child but not to another organism lacking the necessary skills or motivation. Importantly, affordances persist in the environment regardless of whether they are currently perceived; learning can thus be understood as a process of attunement to new possibilities for action (Gibson, 1977, 1979). Gibson’s direct perception thesis posits that individuals typically perceive affordances immediately, without complex cognitive mediation. Human beings often recognize at a glance which objects or features in an environment can be used in particular ways, based on our physical and cultural familiarity. This approach challenges the notion of perception as passive stimulus registration, instead embedding cognition within active engagement with the environment. In educational contexts, learning involves perceiving new affordances in a given setting, such as the possibility of asking questions or leveraging digital tools, which serves as a prerequisite for meaningful action and subsequent learning.

Building on Gibson, later scholars have emphasized the relational nature of affordances. Chemero (2003, 2009) defines affordances as relations between an organism’s abilities and environmental features, meaning that neither alone determines an organism’s affordance; it only exists at their intersection. For instance, a bilingual dictionary only affords translation to someone who can read both languages. This perspective shifts focus from affordances as inherent properties to dynamic organism, or environment transactions, shaping modern embodied and enactive approaches to learning. Further, Withagen et al. (2012) expanded this view by highlighting the soliciting quality of affordances. Some affordances actively invite or attract behavior, depending on the individual’s current state and goals. For example, an interactive app may invite exploration, while a game notification may tempt distraction. This mutualist account underscores the affordances’ dynamic and context-dependent nature, with their ability to pull action varying according to learner intent and situational context.

It is essential to distinguish the ecological lineage of affordance theory from more reductionist or feature-based interpretations that have emerged in other disciplines. Notably, Norman’s (1988, 2013) adaptation of the term in the context of design and human-computer interaction marked a significant departure from Gibson’s original conceptualization. Norman defined affordances as “the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could be used” (Norman, 1988, p. 9). This formulation emphasized perceived affordances in how design elements visually cue users toward possible actions, rather than the relational dynamic central to Gibson’s ecological psychology (Gaver, 1991; McGrenere & Ho, 2000). For example, a digital button that appears raised signals clickability, aligning with Norman’s focus on signifiers in user interface design (Norman, 2013).

While Norman’s interpretation has been influential and highly practical in product and interface design (Norman, 2013), it tends to conflate affordance with perceptual cues or visibility and risks reducing affordances to static features (Greeno, 1994; Jeon et al., 2023). This limitation is evident in educational research, where affordances are sometimes equated with the mere presence of features, for instance, assuming that a discussion forum “affords interaction” by its existence, regardless of learner uptake or meaningful engagement (Hammond, 2010; Oliver, 2005). Such feature-based “affordance inflation” has been critiqued as misrepresenting affordance theory’s relational, action-oriented foundation (Dohn, 2009; van Lier, 2004). According to Anderson (2015), Ager and Anderson (2024), and Nguyen (2022a), affordances in educational contexts are best understood not as a static set of technological features but as contextually enacted possibilities emerging from the interplay between tools,

activities, teachers' intentions, and learners' goals. Notably, this distinction is crucial, as conflating affordances with mere features risks overlooking the relational and dynamic nature of actionable learning potentials as a central premise of the framework developed in this article.

This article's theoretical stance explicitly returns to the Gibsonian concept: affordances are emergent, relational possibilities for action, realized only through aligning learner intentions, abilities, and contextual resources (Chemero, 2003; Gibson, 1979; Withagen et al., 2012). In other words:

Affordance starts with action potentials that emerge when an individual interacts with aspects of the world. Having apprehended an object or event in its current stage (firstness), an individual then comprehends what that object or event may mean to them, also known as semiosis, and what potential that object or event may offer (secondness). (Nguyen, 2022a, p. 135)

As van Lier (2000, 2004) argues, a learning affordance is present only when the learner perceives and acts upon an opportunity within the environment. Recent work by Ager and Anderson (2024) reinforces this critique by arguing that affordances in classroom settings are not fixed properties of tools or materials but are continually constructed and reconstructed through the situated interaction of teachers, learners, and their activities. As such, understanding and researching affordances demands attention to the dynamic and context-sensitive ways in which possibilities for action are negotiated and realized in practice. Affordances are neither static nor universally available but are enacted in the here-and-now of classroom practice, shaped by teachers' and learners' agency, histories, and goals. Thus, it is important to distinguish between design affordances (what an environment enables or suggests) and learner affordances (what learners perceive, take up, and utilize to pursue their goals; see Greeno, 1994; Hammond, 2010). Maintaining this ecological, relational understanding is crucial for theoretical integrity and methodological rigor in affordance-based educational research (Dohn, 2009; Oliver, 2005).

Affordances in Language Learning: An Ecological and Rhizomatic Stance

Adopting affordance theory in language learning research, particularly through van Lier (2000, 2004), marks a significant departure from conventional input-centric and stage-based models. Drawing on Gibson's ecological psychology, van Lier recasts language learning not as the incremental processing of linguistic input, nor as movement along a single developmental continuum, but as the ongoing perception and enactment of affordances embedded in richly complex environments (Chemero, 2009; Gibson, 1979; van Lier, 2004). In this view, linguistic development depends less on the simple exposure to "comprehensible input" or expert-calibrated output than on the learner's ability to recognize, value, and act upon the possibilities their context affords at any given moment.

Besides ecological perspectives, another key contribution to understanding complexity in language learning comes from rhizomatic theory. While ecological psychology explains how opportunities for action are always relational and situated (Chemero, 2009; Gibson, 1979), rhizomatic learning further illuminates how learning pathways multiply and evolve through flexible, networked engagement (Lian & Pineda, 2014; Mackness et al., 2016). Rhizomatic thinking suggests that knowledge is not transferred along a single route or imposed by hierarchical structures. Each learner's path may branch, merge, or loop back, responding to needs and interests as they arise. This idea aligns naturally with affordance theory, which emphasizes that learning is driven by the individual's ability to recognize and enact possibilities unique to their context and moment (van Lier, 2004). By integrating rhizomatic philosophy, the affordance-based framework gains the capacity to account for non-linear,

emergent, and highly personalized learning trajectories. It acknowledges that affordances are not simply “present” or “absent,” but can be discovered, combined, or even reinvented as learners navigate open, digitally mediated environments (Cilliers, 1998; Lian & Sangarun, 2023). Rhizomatic learning, therefore, is essential for modelling how modern learners adapt, remix, and construct meaning beyond pre-planned curricula or prescribed developmental stages. Combining ecological and rhizomatic perspectives allows the affordance framework to move beyond static descriptions. It offers a powerful way to trace how learners create and follow their dynamic pathways through the ever-shifting landscape of language education.

Importantly, this integration of rhizomatic theoretical stance to the ecological root of affordance theory allows it to deliberately distance itself from concepts such as “input +1” (Krashen, 1991; Krashen & Terrell, 1983), “pushed output” (Swain, 1985; Swain & Lapkin, 1995), or the “Zone of Proximal Development” (Vygotsky, 1978). While these models have partially shaped SLA history, they still conceptualize learning opportunities as progressions along expert-defined, scalar, or hierarchical dimensions of complexity (Atkinson, 2011; Kramsch & Steffensen, 2008). Even when such models allow for flexible movement or adaptation, they implicitly privilege single trajectories or normative target positions at odds with the multidimensional and emergent nature of learning described by affordance theory and ecological psychology (Chemero, 2009; Greeno, 1994; van Lier, 2004).

In sum, this article’s theoretical foundation is grounded in Gibson’s original ontology of affordances with Chemero’s and van Lier’s ecological perspective, and Lian’s rhizomatic vision of open learning. This synthesis rejects reductionist, linear, or expert-driven frameworks, offering a multidimensional, context-sensitive, and genuinely learner-centric lens for analyzing language development. While the ecological perspective enables a richer and more dynamic understanding of learning environments, its complexity poses challenges for analysis and practical application. Affordances are inherently multidimensional as they arise through the interplay of diverse factors, including perceivability, relevance, accessibility, contextual constraints, and learner agency, that are constantly shifting as learners and environments interact (Chemero, 2009; Dohn, 2009; van Lier, 2004). A purely monolithic or binary view (present/absent, facilitative/hindering) risks oversimplifying these nuanced dynamics and obscuring how, when, and for whom specific opportunities for action become meaningful.

By operationalizing affordances along five carefully chosen dimensions, this article aims to provide learners, educational practitioners, and researchers with a robust tool to trace the emergence, uptake, and consequences of learning opportunities in a way that is empirically rigorous and sensitive to context, applicable in both physical and digital learning environments. Thus, the following section transforms these theoretical insights into a five-dimensional framework that enables a systematic, context-sensitive analysis of affordances in language education.

Conceptual and Analytical Dimensions of Affordances

To operationalize these theoretical perspectives, this article proposes a conceptual framework that delineates affordances along five dimensions: perceptibility, learning valence, compositionality, normativity, and intentionality. Each dimension is deeply grounded in the manuscript’s core theoretical foundations, reflecting key principles from ecological psychology, relational ontology, and sociocultural perspectives. The framework incorporates Gibson’s foundational concept of perception and value (“for good or ill”), the systems-level view of a complex “field of relevant affordances”, the role of social norms in shaping action from an ecological perspective, and the centrality of learner agency and goals with the rhizomatic stance of education. Analytically, these dimensions provide a comprehensive

inquiry path that traces an affordance's life cycle from initial perception and evaluation (perceptibility, learning valence), through its structural and social possibility (compositionality, normativity), to its purposeful engagement (intentionality). This systematic progression offers educators a practical diagnostic tool to understand why learning opportunities succeed or fail, moving beyond the limitations of feature-based "affordance inflation". While the framework is not claimed to be exhaustive, these five dimensions were deemed the most foundational, providing a robust yet flexible analytic tool open to adaptation and extension as new forms of interaction emerge in research and practice. At this point, to systematically analyze the dynamic opportunities for action in language learning, this framework operationalizes affordances along five interrelated dimensions. Table 1 concisely overviews each dimension, corresponding questions, their typical values, and practical examples.

Table 1. The summary of the five-dimensional affordance-based paradigm

Dimensions	Key Questions	Descriptions	Typical values	Practical Examples
Perceptibility	Is the opportunity visible or hidden? Do learners notice it? What cues reveal it?	How noticeable or discoverable the affordance is to the learner.	Perceivable / Hidden	An AI feedback button marked vs. hidden in a submenu.
Learning Valence	Does using it support/hinder learning? Is the outcome beneficial? How do learners value it?	Whether the affordance has a positive or negative value for learning outcomes.	Positive / Negative	Group work encourages active use but may also allow freeloading.
Compositionality	Is it simple or complex? What elements must combine? Is it accessible alone or only with other components?	How many conditions or resources must be in place for the affordance to exist.	Low / High	Peer review needs a platform, time, trust, and training.
Normativity	Do norms encourage or constrain use? Is it legitimate/taboo? How do expectations shape access?	How social/cultural rules influence the willingness to act on an affordance.	Permissive / Constrained	Asking confrontational academic questions is seen as overly bold rather than being encouraged by the teacher.
Intentionality	Is engagement deliberate or accidental? Is there a goal? Is the use planned or opportunistic?	Whether the learner uses the affordance intentionally or incidentally.	Intentional / Unintentional	Student asks for feedback to improve, or stumbles into it.

Table 1 initially overviews how these dimensions enable a multifaceted examination of affordances in language education before going further into detail. These analytical categories help ensure a systematic and multidimensional approach for learning, teaching, and researching while recognizing that, in practice, these dimensions often interact and overlap. Importantly, I do not claim this framework is exhaustive or definitive; given the inherently emergent and situated nature of affordances, no fixed set of dimensions can fully capture their conditional complexity or variability across contexts (Chemero, 2009; Dohn, 2009). Instead, this framework is a flexible analytic tool, open to adaptation and extension as new forms of affordance and interaction emerge in practice and research. It is noticeable that while Table 1 offers a concise reference, a nuanced understanding requires deeper exploration of how each dimension manifests in authentic learning contexts so that this framework applies to practitioners' various contexts. The following sections unpack each dimension, illustrating the corresponding practical significance for teachers, learners, and researchers.

Perceptibility of Affordances: Hidden versus Perceivable

The multidimensional paradigm begins with perceptibility as the foundation upon which all subsequent affordance uptake is built. Perceptibility refers to the degree to which an affordance is visible, noticeable, or discoverable to the learner. This dimension addresses a fundamental

question: Can the learner perceive the opportunity for action in the first place? As discussed earlier, affordances can exist without being perceived (Gibson, 1979), but only perceived affordances can influence learning. An affordance that remains hidden, whether due to subtlety, lack of cues, or learner inexperience, is effectively inert from the learner's perspective. Conversely, a perceivable affordance stands out to the learner and invites engagement (Nguyen, 2022a).

In educational technology design, perceptibility has often been a focus: good interface design "makes affordances perceptible" (Norman, 1988), whereas poor design may leave users unaware of functions. For example, an online discussion forum might have a "subscribe" feature that affords receiving updates. Still, if that button is buried in a menu, students might not notice it, leaving the affordance hidden and unutilized. Similarly, a library of reading materials affords self-study, but if students are not told it exists or is not intuitive to find, its affordances remain dormant.

A well-designed learning environment will enhance affordance perceptibility. Norman's concept of signifiers is partially relevant here as visual or contextual signals that alert an individual to an affordance's presence. A teacher's question in a classroom signifies that speaking is possible (affording participation); in materials, a bolded phrase might signify an affordance to pay attention or look up a term. However, beyond design, the learner's attunement is crucial. Van Lier (2004) emphasized attention and awareness: Affordances emerge for a learner only when they attend to and interpret something as actionable. A student might sit through a conversation with a native speaker but not perceive the affordance to ask for clarification when confused, thus missing a learning opportunity. Over time, part of learning is learning to perceive previously invisible affordances. This process might involve developing the perceptual skill to hear phonetic distinctions or the pragmatic awareness of when to interject in a conversation. Research has documented such cases; AI-driven language learning platforms often contain emergent or undocumented capabilities that learners typically discover only through experimentation and use, rather than explicit documentation (Hockly, 2023; Jeon et al., 2023; Reinders et al., 2022; Wei et al., 2022). Jeon et al. (2023) found that language learners often failed to realize that an AI chatbot could perform certain helpful functions until explicitly guided. For instance, learners did not initially perceive the affordance for role-playing practice with the chatbot until the idea was suggested.

The critical point is that an affordance cannot be assumed to be perceptible because it exists in the environment. As Reinders and White (2016) argue, the mere presence of a feature or resource does not guarantee that learners see it as an opportunity. Without systematic attention to perceptibility, learners and educational practitioners risk overestimating the impact of designed features or environments by assuming that all learners notice and can engage with available opportunities (Gibson, 1979; Reinders & White, 2016). By explicitly monitoring which affordances are perceived, teachers and curriculum developers can identify critical gaps between intended and experienced opportunities, leading to more valid interpretations of learning processes and more effective interventions (Jeon et al., 2023; Reinders et al., 2022). In summary, perceptibility as a dimension reminds us that unperceived affordances are educationally equivalent to unbeneficial affordances. This dimension ties closely to the next, because sometimes affordances remain hidden not only due to design or attention, but also due to whether learners view them as beneficial or relevant, which brings us to learning valence.

Learning Valence: Positive versus Negative Affordance

Not all affordances are created equal in their impact on learning. Learning valence refers to the *education-oriented values* of an affordance, essentially, whether engaging with that affordance is likely to have a positive, neutral, or negative effect on learning outcomes. Gibson's definition explicitly acknowledged that affordances can be "for good or ill", an aspect often overlooked in rosy discussions of learning opportunities. However, in practice, learners can and do exploit affordances in ways that undermine their learning (ill) as well as ways that enhance it (good).

A positive affordance is one that the learner perceives as supporting their personal goals, motivations, and growth within the learning environment. From an ecological perspective, positive affordances are not defined by external instructional intentions but by how they align with the learner's values and needs and how they can act upon them (Chemero, 2009; van Lier, 2004). For example, a chat group with peers may present a positive affordance if the learner engages in meaningful interaction and feedback that fits their communicative goals. Likewise, a dictionary affords independent vocabulary learning only if the learner actively perceives and uses it to further their language development.

In contrast, a negative affordance is an action opportunity that, if taken, hinders learning or leads the learner away from productive engagement. Negative affordances have been neglected in the literature, perhaps because educators naturally focus on enablers rather than detractors (Nguyen, 2022b). Nevertheless, they are very much present. Withagen et al. (2012) stress that the environment can invite maladaptive behavior as easily as adaptive behavior. For example, in a language learning scenario, the action possibility of using an online translator to complete a writing assignment constitutes a negative affordance only when a learner perceives and acts upon this shortcut in a way that bypasses productive skill development. In this case, the learner-environment relationship gives rise to an affordance that, if taken up, can undermine learning objectives such as developing independent writing ability. Importantly, these negative affordances are usually not properties of the technologies themselves but emerge relationally: they exist only insofar as a learner's goals, values, and actions intersect with the features of the environment in a way that is misaligned with the intended learning outcomes (Chemero, 2003; van Lier, 2004).

Recognizing learning valence is a crucial methodological approach because it pushes the field to evaluate the quality of affordance uptake, not just its occurrence. Simply noting that learners utilized an affordance (e.g., used a tool or interacted with a feature) is insufficient. Learners, teachers, and researchers need to ask, did this support learning, or could it have impeded it? (Nguyen, 2022b). Reinders and White (2016) caution that some oft-celebrated affordances of technology (like autonomy) do not benefit all learners equally and can even lead to problems for some. What counts as a positive affordance is emergent and dynamic, as it depends on the learner's agency, preferences, and evolving objectives rather than simply on features designed into the environment by others. Depending on the individual context, what is beneficial for one learner may be irrelevant or even hindering for another. Ultimately, learning is a process of perceiving, selecting, and engaging with affordances that resonate with the learner's trajectory, not simply accepting opportunities intended by teachers or curriculum designers. In this sense, the learner is always the central agent in realizing the educational value of any affordance. It is not the dictionary itself, but how learners engage with its affordance that impacts vocabulary retention (Chemero, 2009; van Lier, 2004).

Thus, language education should shift from asking what effect a tool has to examining how affordances realized in learner-tool interaction shape learning (Chemero, 2009; Dohn, 2009). At this point, it is also important to continue discussing the compositionality of tools and

artifacts that learners interact with, rather than following the reductionist perspective advocating the single-artifact-learner relationships.

Compositionality: The Configuration of Affordances

The Compositionality dimension addresses the structural complexity of affordances, which addresses how simple or complex the configuration of elements needs to be for an affordance to exist. In other words, some affordances are relatively self-contained and straightforward, while others are composite, arising only when multiple components come together in a certain way. This dimension is informed by the idea that learning affordances often emerge from a system of factors rather than a single object or feature.

A low-compositionality affordance might involve a single clear relation: e.g., a flashcard app affords memory rehearsal, essentially one tool and one user action (viewing recall prompts). In contrast, a high-compositionality affordance could be something like authentic project-based learning affording language socialization; for that affordance to materialize, one needs the right mix of a meaningful project, collaboration among students, teacher consultation, and real resources; remove one piece and the affordance may collapse (no meaningful socialization happens).

In Gibson's ecological theory, affordances exist in the ecosystem of animal and environmental features. Building on that, Rietveld and Kiverstein (2014) introduced the notion of a "field of relevant affordances," a landscape in which multiple affordances are simultaneously present, with relevance depending on an agent's situation. They suggest that higher-order activities (like performing surgery or conducting a scientific experiment) rely on a whole set of affordances arranged meaningfully. Translating this to language education: a complex activity like participating in a debate in a second language comprises many affordances such as the affordance to use evidence (dependent on having sources and facts), the affordance to rebut (dependent on interaction rules and confidence), and the affordance to gain fluency (dependent on extended speaking turns, feedback, etc.). The debate affords development only if these components are in place and aligned. Similarly, from a human-computer interaction perspective, Kaptelinin and Nardi (2009) argue that affordances in learning with technology emerge from entire activity systems, not just from single tools.

From a practical angle, compositionality invites learners, teachers, and researchers to map out the dependencies and co-requisites of an affordance. When they identify an affordance, they ask: What conditions must coincide for this affordance to be perceived and used? If a student did not use a potential affordance, was one element in the necessary configuration missing? For instance, consider an online platform that could afford AI-generated and peer feedback on writing. If students fail to engage in feedback, maybe it is because the affordance has too high compositionality. They may not trust it enough or lack training. This failure means the students require not just the platform feature, but also training on how to give feedback, a class norm of trust, sufficient time allocated for the activity, and a clear incentive. Without those, the "affordance" remained dormant. Further analyses would then reveal that what seemed like a straightforward affordance (peer feedback) was fragile, needing a richer setup. This dimension aligns with the findings by educational researchers that simply putting students in groups does not guarantee collaboration (Dillenbourg, 1999; Gillies, 2004).

In contrast, low-compositionality affordance might be more robust. For example, the affordance of a smartphone dictionary app to look up words needs the phone and internet; many learners will spontaneously discover and use it without extra support, because the relationship is direct. However, if even one of those components is gone (no internet), the affordance vanishes, illustrating that every affordance has some composition, however simple. This

framework encourages documenting these intricacies rather than simply labeling a task as having “affordances” or not.

Teachers, researchers, and learners can assess compositionality by examining failure points or missed affordances. If a theoretically available affordance was not realized, listing all required elements can show which element was absent or weak. Additionally, one can intentionally manipulate the environment: add or remove a component to see if an affordance appears or disappears.

Normativity: Affordances and Socioculturally Shaped Perception

Normativity captures how social and cultural norms and internalized personal norms influence the availability and uptake of affordances. In essence, normativity concerns the “*shoulds and shouldn’ts*”, even the “*musts and mustn’ts*” that filter which affordances learners notice or feel permitted to act upon. This is an important expansion beyond the physical or technical aspects of affordances, acknowledging that human action is governed by what one can do and perceptions of what one must, may, or ought to do in each context.

From a sociocultural perspective, affordances exist within a web of social practices and expectations. Rietveld and Kiverstein’s (2014, p. 328) notion of affordances being embedded in “forms of life” highlights that what an individual sees as actionable is conditioned by our cultural upbringing and communal activities. For example, a classroom might physically afford asking questions (the teacher is there, the student can speak), but if the classroom culture (or the student’s deep-rooted experience) treats questioning the teacher as confrontational and disrespectful, the affordance is normatively suppressed. Hodges and Baron (1992, p. 1) articulate that affordances are “constrained or revealed by values.” Values and norms essentially act as a lens: specific affordances stand out as legitimate (“I should do this”) while others are masked as inappropriate or not for “people like me”.

Normativity might operate on two levels: external and internal, while it is hard to fully distinguish what values come from the outer environment and what are inherent in the learners per se. External norms include explicit rules, roles, and cultural scripts. For instance, institutional policies might explicitly limit what actions are allowed (not using ChatGPT on a bring-home test), thereby removing or attempting to remove that affordance. Internal norms are those that learners have internalized, such as beliefs, identities, anxieties, and habits that they carry with them. A learner might have an internal norm like “do not speak unless sure it is correct” (perhaps instilled by prior environments); this internal filter will cause them to overlook or reject many affordances for practice because they “do not feel allowed” to make mistakes publicly. Normativity also intersects with issues of equity and inclusion. Learners from marginalized backgrounds might not perceive specific affordances because they have been socialized to take a more passive role or lack representation to signal “people like you can do this.”

This framework considers an affordance normatively permissive, ambivalent, or constrained. A permissive normativity means the affordance is widely accepted and encouraged (e.g., using Gemini, an AI assistant, freely in class, if the teacher and culture encourage it, students feel free to do so). Ambivalent might mean it is allowed, but there are mixed messages (students are unsure if the teacher approves using translation apps, etc., so they use it cautiously, or only some do). Constrained means there are explicit norms or strong internal feelings against it (so it is essentially off-limits or carries a social penalty).

In summary, Normativity as a dimension shines light on the invisible social architecture that enables or inhibits affordances. By examining norms, values, and identities, teachers and researchers understand why learners might not act on objectively available affordances or

prefer specific affordances over others. Addressing normativity often means moving beyond purely observational data into discourse analysis and learner psychology, but doing so is crucial for a well-rounded understanding of the learning environment. It also provides actionable knowledge: change the norms, and you may dramatically change the affordance landscape for learners.

Intentionality: Goal-Directed vs. Unintentional Affordance Use

The final dimension, Intentionality, concerns the role of the learner's goals, intentions, and strategic orientation in enacting affordances. In simple terms, this dimension asks: To what extent is the learner purposefully engaging with an affordance as part of a learning strategy, versus incidentally or even accidentally stumbling into it? This recognition is critical because an affordance acted upon with clear intent might have different learning implications than one acted upon without deliberation.

Affordances do not impose themselves on individuals; people select and respond to affordances based on their intentions (Chemero, 2003; Rietveld et al., 2018). In learning contexts, intentional use of an affordance is seen when a student with a specific goal, such as improving pronunciation, actively seeks out a language partner for targeted practice and feedback. By contrast, a student who chats for entertainment may still benefit linguistically, but learning occurs as an incidental byproduct rather than through deliberate intent. Intentionality is thus fundamental to learning, as learners are self-directed by personal goals and purposes (Young, 2013). High intentionality often aligns with self-regulated learning strategies (Pintrich, 2000; Zimmerman, 1990, 2000). For instance, learners might choose to watch a TV show in English without subtitles to challenge their listening skills, amplifying an affordance to match a learning objective. In contrast, watching for entertainment with native language subtitles leaves the affordance for language processing largely untapped.

Motivational research further supports the importance of intentionality: agentic, goal-driven learners are more likely to chart their own learning pathways (Ushioda, 2014). Over time, increased intentional engagement with affordances signals learner development in autonomy and metacognitive awareness. This progression can be tracked longitudinally, as students shift from low-intentionality actions prompted by others to self-initiated, goal-aligned behaviors. An interesting subcategory is strategic vs. opportunistic use. Sometimes learners exploit affordances strategically in ways not anticipated by instructors (this can be positive or negative valence). For instance, using an online translator might be a deliberate strategy to meet a short-term goal (finish homework quickly). This action is intentional but not aligned with learning goals (high intentionality, negative valence). In essence, the Intentionality dimension asks us to classify affordance interaction as intentional (deliberate, goal-driven), unintentional (incidental, happenstance), or somewhere in between (perhaps emergent intentionality, where a learner starts using an affordance passively but then realizes its value and adopts it consciously).

Methodologically, capturing intentionality could involve learner self-reports of goals, analyzing whether affordance use co-occurs with articulated strategies, and looking at consistency of use (intentional learners might use an affordance regularly as part of a routine, whereas unintentional learners might show sporadic, convenience-based use). Intentional affordance use is generally linked to deeper processing. A learner who intentionally engages is likely to reflect and learn more from the action (Nguyen, 2022b). Unintentional use might yield shallow benefits because it is not integrated into the learner's cognitive framework or goals. Therefore, one sign of success in evaluating interventions or learning designs is if learners move from unintentional to intentional engagement with the resources and activities (indicating they see value and have incorporated them into their strategy).

The Intentionality dimension adds an agentic perspective to the multifaceted affordance analysis. It ensures we consider not just what affordances exist and are used, but who drives the action: the environment's pushes or the learner's pulls. Intentionality distinguishes between a learner passively experiencing a learning situation and one actively leveraging it. This distinction is crucial for understanding outcomes, since intentional, self-regulated use of affordances often differentiates effective learners and successful learning environments from less effective ones. In practical terms, educators can foster intentionality by helping learners set goals and notice how specific actions tie to those goals (thus turning accidental encounters into deliberate practices). Researchers, likewise, should factor in learner intent when interpreting the impact of an affordance; lumping them together would obscure the fundamental dynamics at play. An illustrative incorporation of the five dimensions for learning tracking and analysis can be found in Appendix 1. It is noted that this appendix is not aimed at conveying a full-scale case study, but only part of an illustration of how the five-dimensional framework can be applied in the analysis of a self-regulated learning scenario.

Affordance-based language education: A three-tier illustrative model

Now that the article has introduced affordance theory from ecological and rhizomatic perspectives and outlined a five-dimensional framework, it becomes necessary to illustrate how this innovation might manifest in practice. The following section presents a possible trajectory for affordance-based language education. Importantly, this is offered not as a universal model or an inevitable developmental path, but as one conceptual scenario among countless alternatives. The purpose is to help readers imagine the transformative possibilities that affordance theory might open for language learning and teaching, while keeping this transformation from being daunting and overwhelming. It is important to note that while artificial intelligence is not a primary focus of this article, it is undeniable that recent AI-driven tools and new trends in language education are fundamentally reshaping how learners engage with language and how affordance trajectories unfold over time (Hockly, 2023; Jeon et al., 2023; Reinders et al., 2022). Therefore, when explaining how affordance-based learning works, the next section will also provide several examples and ideas related to diverse futuristic AI-human integrated settings (Greeno, 1994; Oliver, 2005).

Level 1: Enhancement - Augmenting the Traditional Language Classroom

The language classroom is reimaged as a dynamic ecosystem in the first scenario. Both teachers and students play active roles in identifying, enacting, and negotiating learning opportunities. The teacher does not simply transmit knowledge but becomes an orchestrator and diagnostic observer. Through reflective practice, digital logs, and feedback systems, the teacher examines the hidden affordances and how classroom norms or student anxieties might suppress specific opportunities. This ongoing observation and dialogue allow instruction to be adapted promptly, making affordances more perceptible and accessible.

At the same time, students are empowered as co-constructors of their learning experiences. Through structured reflection, collaborative dialogue, and engagement with digital platforms or AI-based tools, learners articulate their goals, intentions, and preferences. This metacognitive development enables students to recognize not only the affordances embedded in the curriculum but also to seek and create new ones through extracurricular activities, peer networks, and digital resources. By reflecting on successful and missed learning opportunities, students learn to navigate classroom norms, advocate for their needs, and transform hidden or negative affordances into positive experiences.

For instance, a teacher introduced a digital peer-review platform to support collaborative editing and feedback in an upper-intermediate EFL writing class. Initially, only a few students

engaged actively, while many treated the tool as a requirement rather than an opportunity. Upon applying the five-dimensional framework, the teacher noted that classroom normativity, especially the fear of peer judgment, reduced the perceptibility of the affordance for authentic feedback exchange. Moreover, perceived the activity's learning valence as negative, associating feedback primarily with correction rather than learning. The teacher facilitated a structured dialogue about feedback culture and introduced anonymous feedback options to address this. Over time, students' intentionality increased as they recognized the opportunity to improve their writing through diverse peer insights. The class collaboratively redesigned the activity sequence, emphasizing peer choice, reflective comments, and goal setting. As a result, the platform became a site of learner-driven exploration, where affordances for linguistic experimentation, social support, and metacognitive reflection were actively co-constructed and sustained.

The five-dimensional affordance framework can be used diagnostically and generatively across various pedagogical activities. For example, in project-based learning, teachers and students may analyze which project stages afford authentic communication or critical thinking and use the framework to understand why specific opportunities are realized while others remain latent. This type of collaborative analysis can inform redesigns that make affordances more visible, valued, and inclusive. In task-based language teaching, the framework helps to craft tasks that clarify linguistic and social possibilities, address classroom norms, and provide space for students to set personal goals and reflect on their learning. The affordance-based approach is not limited to any single model or context; it can be used to audit and enhance classroom interaction, digital assignments, and extracurricular engagement (Nguyen, 2022a; Paniagua & Istance, 2018).

Level 2: Hybridization - Designing for Agentic Language Learning

A second scenario considers language education as a hybrid ecology, where agency is distributed among learners, teachers, and AI-powered platforms. Here, the locus of instructional mediation shifts from the teacher to an intelligent, responsive environment. This environment continuously adjusts affordances according to learner behaviors, preferences, and developmental needs. In this context, the teacher serves as a learning architect, designing, curating, and ethically managing a dynamic linguistic ecosystem.

Affordances in this scenario are actively constructed and purposefully managed. The five-dimensional framework offers design principles for both pedagogical and AI-driven automation. Adaptive analytics enhances perceptual and intentionality, which analyze learner profiles and nudge students toward affordances that align with their evolving goals (Nguyen, 2022c). For instance, an AI might review student writing and suggest more complex syntactic structures in real time, making new affordances visible and actionable at critical moments.

Take an illustrative case-based situation, for example. In a university-level English for Academic Purposes (EAP) course, students integrated an AI-powered writing assistant into the institution's learning management system. The tool offered real-time feedback on grammar, lexical choice, and coherence. Initially, many students accepted all AI suggestions without critical evaluation, perceiving the tool's authority as absolute. Observing this pattern through the platform's analytics dashboard, the instructor facilitated a class discussion on metacognitive writing strategies and algorithmic bias. Together, students and teachers applied the five-dimensional framework to interpret their interactions with the AI system. It became apparent that although the tool enhanced perceptibility and intentionality by highlighting immediate opportunities for revision, its learning valence was not uniformly positive; some students felt the system discouraged experimentation. Through reflective practice and guided discussion, learners became more discerning about which affordances to accept, challenge, or

ignore. The teacher also adjusted the curriculum to include activities that promoted critical digital literacy and peer collaboration. Over time, students began to leverage the platform more strategically, recognizing its value as a resource rather than a prescriptive authority. In doing so, they developed greater autonomy and agency within a technologically mediated learning ecology.

Despite these technological advancements, authentic learner agency cannot be replaced by algorithms. The teacher remains essential for interpreting AI suggestions, fostering metacognitive support, and protecting learner autonomy. Teachers guide students in distinguishing between productive support and excessive automation. They foster reflective skills that enable students to choose which affordances to pursue. As AI attempts to optimize positive learning valence, engagement, and motivation, there is a risk that learning becomes merely pleasurable or efficient, rather than meaningful and transformative (Zimmerman, 2002). Teachers must ensure that the focus remains on long-term growth rather than short-term satisfaction. Compositionality, as a design principle, introduces both technical and pedagogical challenges. AI systems can sequence grammar modules, vocabulary units, and dialogue simulations into complex, personalized learning trajectories. This enhances personalization and may increase cognitive load or fragment the learning experience. Teachers can help students develop strategies to manage these pathways effectively, using the technical supports suggested by Nguyen (2022c). Technology thus aids self-regulation, but it does not substitute for it. Normativity becomes more transparent with dashboards and visual analytics, which reveal classroom behavioural patterns and collective trends. For example, underutilizing a collaborative translation tool may prompt discussions about group norms, digital participation, and peer learning (Nguyen, 2022a). These visualizations enable teachers and students to negotiate and adjust practices in response to real-time evidence.

While hybrid models provide new opportunities for differentiation and agency, they also raise significant ethical and pedagogical concerns. Delegating instructional decisions to AI systems requires robust frameworks for transparency, privacy, and bias mitigation (Radanliev, 2025). Teachers must foster self-regulation and equip students to engage critically with algorithmic recommendations, rather than accepting them passively. The enduring success of hybridization depends on technological progress and the maintenance of human agency, critical reflection, and ethical stewardship.

Level 3: Emergence - The Decentralized Language Learning Community

Level 3 departs sharply from Level 2 by eliminating any central curriculum, authority, or predetermined pathway. In this scenario, learners participate in a decentralized and self-organizing community where knowledge, resources, and opportunities arise from collective interaction within an open network of peers, AI agents, and immersive digital environments. While Level 2 still relies on teacher or system guidance and a defined set of learning paths, Level 3 is shaped by the autonomous choices and creative agency of learners who initiate, manage, and adapt their own projects (Mackness et al., 2016).

Advanced technologies such as AI, AR, and VR empower learners to choose or create environments that suit their evolving goals. For example, learners might practice Mandarin in a simulated VR Shanghai, negotiate meaning with AI-driven market vendors, or join an AR city quest where language challenges appear in real-world locations. In another case, groups may gather through an AI-moderated online platform to launch a fan-subtitling project, facilitate peer review, or develop a collaborative language resource, with all activity initiated and organized by the community itself. Knowledge and resources emerge organically from all participants' ongoing interactions, contributions, and shared experiences, making the community itself the primary engine for learning (Liu et al., 2021; Pradana & Efendi, 2024).

Within this landscape, the five dimensions of the affordance framework take on new meaning. Perceptibility becomes dynamic and contextual because AI agents and digital tools highlight opportunities in real time. Learners might be invited to join a spontaneous debate, receive a prompt to solve a linguistic puzzle embedded in an AR overlay, or notice a trending collaborative project in their digital dashboard. Intentionality emerges organically as learners navigate a rich array of self-generated resources, peer-driven projects, and interest-based micro-communities. The system dynamically surfaces affordances in response to evolving learner intentions, such as a shift from general English to domain-specific pursuits like translating Japanese poetry. However, this fluidity also risks creating linguistic filter bubbles, in which algorithmic or social dynamics confine learners to narrow interests and perspectives (Liu et al., 2021; Pradana & Efendi, 2024). The facilitator's role is to introduce epistemic disruption, encouraging learners to engage with unfamiliar genres, topics, and interlocutors to expand their linguistic repertoires and critical awareness. The role of an AI-integrated agent at that point is to provide additional and constant support that cannot be offered by human teachers (Mackness et al., 2016).

Learning valence, which concerns learning opportunities' values, becomes both an asset and a liability. Decentralized communities may gravitate toward activities perceived as enjoyable, which can boost engagement and persistence. However, an overemphasis on positive valence risks deprioritizing the desirable difficulty necessary for robust linguistic development, such as grappling with complex syntax, managing ambiguity, or tackling challenging texts (Nguyen, 2022a). Community facilitators must advocate for a balance between intrinsic motivation and sustained cognitive challenge.

Compositionality is expressed in the complex ways learners assemble and recombine digital resources, social networks, and technologies to pursue their objectives. A single project may combine VR simulations, AI translation tools, peer mentorship, and collaborative writing in unpredictable combinations, with outcomes determined by community negotiation rather than fixed design. This freedom, while generative, also raises concerns about incoherence or the reinforcement of fossilized errors in the absence of expert feedback or structured reflection. Community facilitators must provide timely guidance, meta-linguistic tools, and access to expert consultation to ensure that emergent learning pathways remain purposeful and aligned with evolving proficiency standards (Mackness et al., 2016).

Normativity emerges from ongoing community dialogue and adaptation. Members collaboratively establish and revise standards for quality, feedback, and participation, sometimes with the support of AI moderation, but always through collective agreement rather than top-down enforcement. While this bottom-up process allows for authentic, context-sensitive norms, it can lead to governance vacuums, linguistic fragmentation, or inequitable participation. Facilitators must work proactively to nurture ethical, inclusive, and sustainable norms, intervening when necessary to prevent exclusionary practices, the development of interlanguage pidgins, or marginalizing minority voices (Bell et al., 2016).

The contrast with Level 2 is clear. While hybrid models depend on adaptive design and teacher facilitation to surface affordances and manage progression, Level 3 is defined by the continuous and unpredictable emergence of new opportunities, practices, and standards. AI, AR, and VR allow learners to inhabit any context, collaborate globally, and participate in an ecosystem where the boundaries of language, community, and learning are constantly redrawn. This scenario demonstrates the radical potential of affordance theory, a participatory, adaptive, and ethically governed community in which all members act as both learners and creators, continuously redefining what is possible in language, learning, and belonging.

It is important to recognize that this emergence scenario should be treated as an advocacy call rather than a fixed practical guideline. Its realization would depend on addressing formidable assessment, credentialing, and equitable access challenges in a fully decentralized and self-governing language learning ecosystem. Nevertheless, this conceptual projection illustrates the radical potential of affordance theory, a participatory, adaptive, and ethically governed community in which all members act as both learners and creators, continuously redefining what is possible in language, learning, and belonging. These three levels illustrate how the affordance framework can be progressively implemented, from enhancing existing classrooms to reimagining learning without a centralized structure.

As promising as these pedagogical illustrations may be, when captured only through surface-level opportunity or functionality, affordance theory risks being folded back into the very logic it seeks to move beyond. As discussed in the previous sections, this function creep has happened before with other educational concepts. To prevent this, affordance theory must be developed through practice and research that stays true to its ecological and rhizomatic foundations. What follows, then, is not a shift away from the classroom but a continuation of the inquiry it invites. Having discussed how to apply affordance theory in learning and teaching, the following section outlines methodological principles for studying affordances in ways that preserve their complexity. These principles aim to support empirically sound and theoretically aligned research, ensuring that the promise of affordance theory remains intact as it grows within the broader field of language education.

Methodological Principles for Affordance-based Language Research

To further apply the affordance-based framework to language education, translating the above framework into actual research practice is paramount to allow further innovations and adaptation of language learning and teaching research according to the ecological and rhizomatic spirit. Thus, this section outlines several methodological principles, albeit not exhaustive, to guide affordance-based research in language learning and teaching. These principles are intended to ensure that studies capture an extent of richness of affordance dynamics and remain theoretically consistent with the ecological, rhizomatic stance that affordance theory adopts. Insights from relevant literature and the discussed affordance dimensions support each principle.

Principle 1: Adopt a Relational Unit of Analysis

Affordance-based research must focus on learner-environment interactions as the primary unit of analysis, rather than isolating either the learner or the environment. This principle means that when designing a study, one should collect data on both sides of the affordance relationship: the features of the environment (tasks, tools, social setting) and the learners' abilities, actions, and perceptions. For instance, instead of studying a new app in isolation (feature analysis) or learner traits alone, an affordance perspective examines how specific app features invite or enable actions for learners with skills or goals. Methodologically, this translates to a mixed data source approach: one might log system data (such as clicks and usage statistics) and gather learner self-reports or observations to see how those features were interpreted and utilized. Chemero's relational definition of affordances supports this principle, and only by examining the relation can educators truly understand affordance. Greeno (1994) similarly advocated the study of activity systems where people and the environment form an integral analytic whole. Concretely, an affordance-based study of a classroom might use interaction analysis (Jordan & Henderson, 1995) on video recordings to see how a gesture by a teacher (environment cue) becomes an affordance for a student's response, depending on the student's uptake. By treating interactions (rather than individuals or tools alone) as data points, researchers can more accurately attribute learning outcomes to the presence or absence of

affordances and their uptake. This relational approach helps avoid misattributions like “Feature X caused learning” when, in fact, it only caused learning for those who engaged with it in specific ways.

Principle 2: Embrace Contextual and Ecological Validity

Research should be conducted in naturalistic or ecologically realistic settings as much as possible to ensure that the advantages identified are genuine to the learning context. This suggestion means favoring study designs like classroom-based research, in situ observations, and tasks embedded in real learning activities, rather than abstracted experiments that strip away context. The rationale is that affordances are context-dependent; if we remove learners from their usual environment or fragment the context, we may disrupt the affordances that usually exist. For example, if we want to study affordances for peer interaction, it is better to observe an actual classroom group work session (or simulate one closely) than to have participants perform an interaction in an unfamiliar lab arrangement. Rhizomatic learning theory also supports this principle: it emphasizes unpredictability and emergence, which are best captured in rich contexts where learners have agency and authority to move in various directions (Lian, 2011; Lian & Pineda, 2014). Contextual research might involve ethnographic methods (Hornberger, 2015) or design-based research in classrooms where interventions are tested in authentic contexts. By prioritizing ecological validity, the findings on affordances will be more applicable to pedagogical settings and will account for the compositional and normative dimensions that only manifest under real conditions.

Principle 3: Account for Temporal Dynamics and Trajectories

Affordance-based research should take a longitudinal or process-oriented view, capturing how affordances emerge, change, or accumulate over time. Learning is not static, and neither are affordances: a tool that at first afforded little to a novice might afford a lot more after they gain some skill; conversely, an affordance can be exhausted, or its novelty can wear off. Therefore, methodologies like longitudinal case studies, time-series analyses, or micro-genetic designs (observing learning episode by episode) are highly valuable. For example, a study might follow a cohort over a semester, documenting at several intervals which affordances of a language app they use and how. Hafner et al. (2025), in a digital multimodal composition context, noted that teachers can support learners reframe tool affordances across stages of a digital video-creating task, highlighting the need to observe across the task timeline. Similarly, Luckin and Cukurova (2019) tracked how learners interacted with an AI tutor called DebateMate. DebateMate helped students evolve by providing extracurricular debate workshops in disadvantaged schools, offering a range of programs and competitions that equip students with essential argumentation techniques and debating skills, while also leveraging AI technology to enhance the learning experience and tackle educational disadvantage. These examples underscore that a snapshot study might miss such shifts. When resource-intensive, even a comparative time-point design (pre-mid-post) is better than a single post-test design for affordances. Another technique is retrospective trajectory analysis: mapping out, after the fact, the sequence of affordances a learner engaged in (sometimes called an affordance trajectory), which can be done through logs or learner journaling. The key is to view learning events not as isolated trials, but as connected streams where earlier affordance usage can open or foreclose later possibilities (e.g., a learner who took the affordance to get extra pronunciation practice may create new affordances for speaking confidence later, a ripple effect). Research on complex dynamic systems in SLA also advocates for such temporal analysis, using moving min-max graphs or growth curve modelling to see non-linear changes (Larsen-Freeman & Cameron, 2008). Overall, incorporating time reveals patterns of emergence and adaptation, which are core to understanding affordances in a living system.

Principle 4: Integrate Multiple Data Sources and Methods (Mixed Methods)

Because affordances involve objective features and subjective perceptions, using mixed methods provides a more complete picture. A combination of quantitative data (e.g., frequency of tool use, interaction counts, test score gains) and qualitative data (interviews, open-ended logs, observations) is ideal. Quantitative measures can establish that an affordance was utilized and correlate it with outcomes, while qualitative insights can explain *why* or *how* it was utilized (or not). For example, usage analytics might show that only 20% of students used a forum (an affordance uptake low), but interviews might reveal whether it was due to perceptibility issues or normative dissuasion. Jeon et al. (2023) exemplify this by reviewing many studies: they noted that most studies listed the affordances of chatbots but did not verify if learners perceived/used them. They call for an interactional affordance framework to analyze actual interaction data to confirm affordance realization. In practical terms, a mixed-methods affordance study could involve recording all user interactions on a platform (quant data), administering a survey about students' perceptions of what the platform affords (quant + qual), and conducting follow-up interviews to probe individual experiences (qual). By triangulating these, one might find, say, that although logs show few clicks on a "help" tool (quant), students in interviews mention they did not think they were allowed to use it during tests (qual normative insight). Mixed methods also help map my five dimensions: some are easier quantified (frequency of use: perceptibility proxy; outcomes: learning valence impact), while others need qualitative evidence (normativity: gleaned from comments; intentionality: seen in stated goals). The combination strengthens validity and provides the "story" behind the numbers, crucial for interpreting affordances in context.

Principle 5: Prioritize Learner Agency and Voice

Given this article's focus on affordances as learner-environment relationships, it is essential to foreground the learner's perspective. This principle suggests that methods should include ways for learners to articulate their goals, choices, and rationales. Techniques like learner journals, think-aloud protocols, or participatory design elements (where learners help define or adjust study aspects) can be used. Ushioda's (2009) person-in-context relational approach reminds us to treat learners as active subjects, not just objects of intervention. In practical terms, when investigating affordances, asking learners "what did you do, and why?" can yield surprising insights. Sometimes, they identify affordances that researchers did not even consider, or they reveal constraints like "I did not do X because I was afraid to appear arrogant" (normative). This also aligns with rhizomatic principles: since learners may chart unique paths, giving them a voice can uncover the idiosyncratic affordances they found or made for themselves. For example, in a rhizomatic language course, a student might mention, "I found an affordance to learn by creating a playlist of French songs and translating lyrics," which the formal curriculum did not specify. If researchers only stick to their predefined list of affordances (e.g., those in the classroom), they miss these self-directed ones. Therefore, it is key to build opportunities for learners to report or demonstrate what they found meaningful. From a data collection standpoint, semi-structured interviews focusing on critical incidents ("Tell me about a moment you felt you learned a lot...what were you doing, what helped?") can spotlight affordances from the learner's view. Experience sampling (pinging learners during learning to ask what they are doing and why) is another method to capture in-the-moment agency. The outcome is a richer dataset that respects the complexity of learner behavior and often reveals mismatches between what the environment *offered* and what the learner *saw*, thereby illuminating areas for pedagogical adjustment.

Principle 6: Incorporate Reflexivity and Iterative Design

Affordance-based research, especially when adopting a design-based or rhizomatic lens, benefits from an iterative cycle where initial findings inform modifications to the learning environment or research focus, followed by further investigation. Because affordance-rich environments are complex, an initial study might expose unexpected affordances or barriers, which can be addressed in a subsequent phase (Nguyen, 2022b). For instance, a pilot study might reveal that an online platform afforded off-task behavior (negative affordance) more than anticipated; researchers could then tweak the platform or class guidance to mitigate that and observe the results in a second iteration. This principle resonates with Design-Based Research (DBR) methodology, which involves iterative refinement of educational interventions with continuous feedback (Brown, 1992; Collins, 1992). DBR is very compatible with affordance research as it allows exploration of how changes in design features alter affordances. It is also aligned with a rhizomatic stance because it does not assume the first design is correct. Learning environments must evolve in response to learner interactions, much like a rhizome branching in response to obstacles. Reflexivity also means researchers should know how their expectations might highlight or obscure particular affordances in analysis. Being reflexive could involve using multiple coders from different theoretical backgrounds to analyze data, ensuring one is not projecting an affordance that learners did not experience (or vice versa). It could also involve participant validation, checking with learners if the affordances identified make sense to them, thereby respecting their lived experience. This reflective and iterative approach leads to more robust, methodologically innovative research designs, possibly hybrid ones (like combining ethnography with learning analytics) to fully capture the phenomenon.

Action research and participatory designs strengthen affordance-based inquiry by embedding practice, reflection, and co-construction cycles with learners or teachers as collaborators (Burns, 2013; Somekh, 2006). In action research, teacher-researchers iteratively implement changes, such as introducing new digital tools or peer mentoring structures, creating affordances, and observing learner uptake, using reflection and feedback to refine interventions (Burns, 2009). Participatory designs align closely with rhizomatic and learner-centered philosophies by inviting learners to help identify, co-create, and evaluate affordances in their environment, thus surfacing needs and opportunities that may be invisible to external observers (Lian & Pineda, 2014; Reinders et al., 2022). Student-regulated research further extends this by empowering learners to collect and interpret data on their engagement with affordances, making agency and self-direction central to both the research and pedagogical process (Ushioda, 2009).

Together, these principles form a guideline for conducting research that fully leverages an affordance-based perspective. They complement standard good practices in qualitative and mixed-methods research, but with specific emphasis on interaction, context, time, learner agency, and adaptability. By following these principles, researchers are more likely to design studies illuminating how learning opportunities are realized or missed, how they affect learners, and how we can enhance them.

Navigating Methodological Challenges in Affordance-Based Language Education

The article has provided an ecological and critical overview of affordance, the five-dimensional affordance paradigm, and how to apply this to language education and research. Critically, implementing the five-dimensional affordance framework in language education brings methodological and practical complexity to teaching, learning, and research. While the five-dimensional framework and associated methodological principles offer a robust approach to researching language education, several key challenges remain. Addressing these challenges

requires returning to the multidimensional logic articulated throughout this article and leveraging the principles above to devise context-sensitive solutions.

One significant challenge is identifying and operationalizing genuine affordances within diverse and dynamic classroom or digital environments. Teachers may misjudge which resources or activities invite student participation, while learners may remain unaware of opportunities due to issues of perceptibility or classroom norms. For researchers, affordances are inherently contextual and relational, complicating efforts to consistently define, code, and measure them. Addressing these issues requires systematic triangulation: observation, learner reflection, and analytics are combined so that affordances are documented as present, perceived, and enacted. A mixed-methods approach that blends quantitative usage data with qualitative insights from interviews and journals offers robust validation for practical teaching decisions and empirical research.

A further challenge involves linking the uptake of affordances to learning outcomes. Because many intertwined influences shape educational progress, it is rarely possible to isolate the effect of a single affordance. Teachers and researchers must therefore employ process tracing, pattern analysis, and longitudinal study designs to identify which affordance encounters correlate with meaningful change over time. At the same time, inequitable or hidden affordances can arise from implicit classroom routines, group dynamics, or algorithmic bias embedded in digital platforms. These often privilege specific learners while marginalizing others, reinforcing educational gaps. Participatory and inclusive approaches, such as involving learners in reflective inquiry, co-design of learning activities, and regular stakeholder validation, are essential to reveal less visible dynamics and promote equitable engagement.

The proliferation of digital and AI-mediated environments introduces additional ethical and practical concerns. Managing data privacy, transparency, and algorithmic bias requires explicit protocols and ongoing participant education, ensuring learners and teachers understand new technologies' boundaries and potential risks. The sheer complexity and volume of data generated by affordance-based models necessitate systematic organization and critical prioritization. The five-dimensional framework is a coherent analytic structure, enabling all stakeholders to focus on critical incidents and patterns that truly matter for language learning. When foregrounding methodological rigor, reflexivity, and collaboration, affordance-based approaches can drive innovation and equity across teaching, learning, and research.

Conclusion

This article has proposed a multidimensional framework for analyzing affordances in language education, drawing on theoretical perspectives from ecological psychology, relational ontology, and rhizomatic learning theory. The primary aim has been to conceptualize affordances as dynamic, context-dependent phenomena that emerge through the interaction between learners and their environments, rather than as fixed properties of instructional technologies or materials.

Three main contributions have been articulated. First, the five-dimensional framework, which includes perceptibility, learning valence, compositionality, normativity, and intentionality, offers a theoretical foundation and analytical tool for identifying and interpreting affordances in complex educational settings. This model enables a more granular and learner-centered approach to affordance analysis and extends beyond binary or feature-based classifications. Second, the article has introduced six methodological principles designed to support the empirical investigation of affordances in language education. These principles emphasize the importance of temporal emergence, reflexive design, and a relational unit of analysis that foregrounds learner-environment interaction. They provide a foundation for conducting

theoretically informed and contextually responsive research. Third, a three-tiered implementation model has been presented. This implementation model includes the enhancement, hybridization, and emergence levels, illustrating progressively complex scenarios for integrating affordance-based thinking into pedagogical design. These scenarios range from structured classroom applications to open, decentralized, and technologically mediated learning environments.

As the article focuses on the conceptual construction of an ecological and rhizomatic framework at this stage, it offers a basis for future empirical investigation. Such research may include applications of the model in classroom settings, the development of learner-responsive technologies, or the analysis of affordance trajectories across time and context. Further inquiry may also examine the framework's compatibility with related theoretical paradigms, including sociocultural theory, distributed cognition, and enactivist perspectives. In conclusion, the proposed framework contributes to ongoing efforts to develop robust and practically applicable models for understanding learning in complex environments. It is intended to assist researchers and educators in designing, analyzing, and interpreting affordances in ways sensitive to learner agency, contextual variability, and the evolving nature of educational ecologies.

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Appendix

Appendix 1. Affordance Episodes Tracking with Five-Dimensional Affordance Framework.

Session	Learner Utterance	AI Response	Affordance Taken	P	L	C	N	I	Alternative Affordances	Stimulated Recall Summary
1	"I'm a student of education... I want to talk about travel today. Can you ask me some questions on that?"	"Got it! Let's dive into some travel questions..."	Topic control	P+	V+	Comb	Perm	Int	Let AI choose the topic & lead	"I felt I could talk about anything, but I wanted to direct the topic for my own interest and goals."
1	"I go to shopping yesterday."	"That sounds fun! (adds) By the way, we say 'I went shopping yesterday.'"	Corrective feedback	P+	V+	Sim	Perm	Inc	AI ignores the mistake (no correction)	"I was happy it corrected my grammar. I want to know the right way, which is better than letting it pass."
1	"Can you tell me a joke?" "Tell you something crazy. LOL"	"Sure! Why did the chicken cross the road? ..."	Knowledge/fun engagement	P+	V+	Sim	Amb	Expl	Keep conversation strictly serious	"I wanted to see if it could joke, or only talk about learning. It's nice that it can do more."
3	"What does 'spectacular' mean?"	"'Spectacular' means very impressive or amazing..."	Vocabulary explanation	P+	V+	Sim	Perm	Inc	Skip unknown word	"I treat it like a dictionary... Sometimes I guess, but here I wanted a clear explanation."
4	(Tells a story to see if AI corrects)	AI gives minor corrections in brackets	Feedback uptake	P+	V+	Comb	Permi	Int	Do not tell a story or look for corrections	"I always expect it will correct me. If it didn't, I might miss a mistake."
5	"Explain the difference between British and American English."	"Sure. For example, Americans say 'elevator,' British say 'lift,' ..."	Cultural info	P+	V+	Sim	Perm	Int	Do not inquire about culture	"I was curious if it knows about culture. The alternative was to ignore the difference."
6	Noticed AI didn't correct a minor error: "Did I say that correctly?"	"Yes, you did – it was perfectly said!"	Active feedback-seeking	P+	V+	Sim	Perm	Int	Let errors pass	"If I'm not sure, now I just ask. At first, I let things go, but now I want to know."
8	"Thank you, that's enough for today. Can I talk to you again tomorrow?"	"Of course! Looking forward to our next session."	Session management	P+	V+	Com	Perm	Int	Abrupt end with no next session plan	"Setting a routine made it feel like a real course; just stopping felt incomplete."

*Note: P=Perceptibility, L=Learning Valence, C=Compositionality, N=Normativity, I=Intentionality; Comb = Combined, Sim = Simple; Perm=Permissive, Amb = Ambivalent; Int=Intentional, Expl = Exploratory, Inc = Incidental

This session illustrates an excerpt of a data log that the author applied in another study for demonstrative purposes of how the five-dimensional affordance framework can be applied in a self-regulated learning with ChatGPT case. Anh's affordance trajectory reflects an agentive and explorative approach to AI-mediated speaking practice. From the outset, Anh intentionally sets learning agendas (e.g., selecting topics, demanding correction, and explicitly asking for cultural insights), thus fully realizing the action potentials present in the AI's environment. His choices consistently demonstrate high perceptibility; he actively seeks and notices multiple affordances, rarely remaining passive. Valence is overwhelmingly positive: Anh treats corrections, explanations, and playful interactions (such as requesting jokes) as legitimate opportunities to advance his communicative and cultural competence.

Regarding compositionality, Anh's episodes often integrate multiple affordances, combining goal setting, feedback, and metacognitive routines in a single interaction. Normativity is generally aligned with learner-centered or communicative classroom practices but sometimes diverges when Anh experiments with less conventional interactions (like session management and playful queries). Intentionality is a hallmark of Anh's behavior; nearly every choice is deliberate, as confirmed in stimulated recall. He regularly weighs safer, more passive alternatives but chooses active engagement for maximized learning gain. Overall, Anh's trajectory demonstrates how a learner attuned to and agentively selects among the environment's affordances can orchestrate a rich, dynamic, and personally meaningful

language learning experience with AI. His action pattern illustrates the “affordance-aware” learner in the ecological tradition.

The data in Appendix 1 offers concrete insight into how a learner interacts with AI-mediated learning opportunities and how teachers can intervene meaningfully based on each dimension. For instance, although perceptibility (P^+) is consistently high, the learner sometimes recognizes affordances only retrospectively, as seen in their surprise at learning from correction or vocabulary explanation. Teachers can address this by pre-framing tasks with reflective prompts that increase learners’ awareness of learning potential in real time. When valence (V^+) is positive but connected to incidental discovery (e.g., “I was happy it corrected my grammar”), teachers can help amplify those moments through explicit debriefings or goal-setting sessions. The consistent use of simple compositionality suggests that tasks are accessible but may benefit from intentional chaining or follow-up activities to deepen engagement and link affordances across sessions. Regarding normativity, the learner appears aligned with classroom conventions, yet responses like “I wanted it to correct me” or “I treat it like a dictionary” suggest moments of misaligned expectations or underutilized affordances. Teachers could initiate discussions on what “successful engagement” looks like in AI-mediated tasks to refine shared norms. Lastly, the learner’s intentionality shifts from passive to active, especially in later sessions (“At first I let things go, but now I want to know”). Teachers can support this growth by integrating light metacognitive scaffolds (e.g., “What did you notice?” prompts or reflection journals) to make this evolving intentionality more conscious and sustainable. In summary, this table does not merely describe what happened but reveals where and how teachers can intervene to maximize the value of emerging affordances across both digital and instructional dimensions.

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