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FRAME BLENDING AND DOMAIN MAPPING AS DRIVERS OF POLYSEMY IN INTERDISCIPLINARY TERMINOLOGY

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Abstract

Interdisciplinary research often recycles established technical words for novel purposes, generating systematic polysemy that can hinder cross-field comprehension. The present study explains this process through two complementary cognitive operations: frame blending – the on-line fusion of schematic event structures – and domain mapping – cross-domain correspondences inherited from conceptual metaphor theory. By analysing 90 high-frequency terms drawn from publications in biomedicine, data science and environmental economics (2019-2024), we show that blends and mappings account for 81 % of newly attested senses and that their distribution predicts terminological ambiguity across fields. A mixed corpus-driven/experimental method reveals measurable prototype shifts and identifies “semantic chokepoints” where communicative failures arise. The findings refine current models of knowledge transfer and offer actionable guidelines for lexicographers, translators and science communicators.

Keywords: Frame blending, domain mapping, polysemy, interdisciplinary terminology, conceptual metaphor, cognitive linguistics, semantic frames, knowledge transfer.

Introduction

When a vector in virology becomes a vector in machine learning, and a cloud in meteorology evolves into the cloud of cloud-computing, the underlying mechanism is not random lexical drift but a principled cognitive procedure that re-projects existing frames onto new disciplinary territories. Cognitive linguists have described two such procedures in detail: **frame blending** – the integration

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of elements from distinct semantic frames into a single emergent structure (Fauconnier & Turner, 2002) – and **domain mapping**, the systematic alignment of a source-domain schema with a target-domain schema (Lakoff, 1993). Although each mechanism has been studied extensively in general language, their joint contribution to the polysemy of interdisciplinary terminology remains underexplored.

The present article addresses the following research questions:

1. How often do frame blending and domain mapping account for new senses of technical terms in cross-disciplinary communication?
2. What empirical indicators mark the cognitive salience of these mechanisms in professional readers?
3. How can an integrated model of blending + mapping improve the management of terminological resources?

Literature Review

Frame semantics posits that the meaning of a lexical unit is tied to a schematic scene or **frame** (Fillmore, 1985). Polysemy emerges when a word activates multiple related frames (Boas, 2003). Frame blending extends this idea: rather than selecting one frame at a time, speakers fuse partial structures from several frames to yield an emergent, third-space representation (Coulson, 2001). Within terminology studies, frame blending has been shown to underpin complex technical expressions such as harmful algal bloom (Gómez-Moreno et al., 2013). Conceptual Metaphor Theory (CMT) models metaphor as a **cross-domain mapping** that projects topological relations from a concrete source (e.g., containers) to an abstract target (e.g., emotional states) (Lakoff, 1993). Empirical work confirms that domain mappings encode large portions of everyday and scientific vocabulary (Tendahl, 2009). In specialised discourse, metaphoric mappings facilitate rapid coining of new senses but also promote polysemic load (Gom-Buendía & Faber, 2013).

Recent corpus studies document a sharp rise in polysemy where disciplines overlap: machine-learning literature has appropriated training, kernel and drop-out, each with parent-field senses still in circulation (Maharramzada, 2024). Articles from The Lingua Spectrum confirm similar tendencies in Uzbek and Russian academic communities, noting that “terminological polysemy is

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observed in all fields" (Qobilova, 2025, p. 147) and that sector-specific terms like fabric in textiles develop competing interpretations (Yusupova, 2025).

Nonetheless, a gap persists: frame blending and domain mapping are rarely examined together as predictive factors in terminological polysemy, and few studies test their cognitive reality with experimental data.

Methodology

We compiled a 600 000-word trilingual corpus (English, Russian, Uzbek) consisting of peer-reviewed articles (2019-2024) from Nature Biomedical Engineering, ACM Transactions on Data Science, Journal of Environmental Economics, and relevant papers from The Lingua Spectrum (Volumes 1–4, 2024-2025). Ninety recurrent technical nouns were selected – 30 from each discipline – using frequency and keyword-in-context (KWIC) criteria.

Each token of the 90 terms was manually coded for:

- **Mechanism**: Frame Blend (FB), Domain Mapping (DM), or Other.
- **Source frames/domains** involved, following Berkeley FrameNet labels.
- **Semantic distance** from the canonical glossary meaning, operationalised as cosine distance in word2vec vectors trained on the full corpus.

Inter-annotator agreement ($\kappa = 0.83$) validated the scheme.

Thirty-six postgraduate scientists (12 per discipline) performed a timed sense-decision task: given a sentence containing an ambiguous term, participants selected the intended sense from two glosses while reaction times (RT) were logged. Stimuli balanced FB, DM and control items.

Mixed-effects models predicted RT from Mechanism and Semantic Distance, with Participant and Term as random effects ($\alpha = .05$). Chi-square goodness-of-fit tests assessed distribution differences of mechanisms across disciplines.

Results

Across 1 945 annotated tokens, 44 % were classified as FB, 37 % as DM, and 19 % as Other/lexical specialisation. The dominance of FB in environmental economics (market + ecosystem services: carbon offset) and DM in biomedicine (lock-and-key mapping in enzyme discourse) was significant ($\chi^2 = 27.49$, $df = 2$, $p < .001$).

Mean cosine distance from glossary sense was 0.42 for FB tokens and 0.36 for DM tokens – both significantly higher than the control baseline (0.18; $t = 5.63$, p

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< .001). This suggests stronger semantic shift where blending or mapping operates.

Prototype senses yielded the quickest decisions (M = 1 180 ms). FB senses incurred the greatest slowdown (+420 ms, $p < .001$), followed by DM senses (+330 ms, $p < .01$). Semantic Distance remained a robust predictor ($\beta = +390$ ms per 0.1 increment, $p < .001$).

Vector blended the "agent-carrier" frame (virology) with the "direction-magnitude" frame (mathematics) to produce the AI sense "ordered array of features." The article on textile terminology in The Lingua Spectrum illustrates an analogous blend where fabric merges "material" and "symbolic design" frames in branding contexts (Yusupova, 2025).

Discussion

The data confirm that frame blending and domain mapping jointly account for more than four-fifths of newly emergent senses in interdisciplinary settings, supporting the claim that these cognitive operations are primary engines of terminological polysemy. The higher RT cost for FB senses indicates that blending introduces greater conceptual novelty than mapping, a finding consonant with Coulson's (2001) dynamic model.

Terms whose new senses exceed a cosine distance of 0.45 invariably triggered comprehension delays above 1 600 ms – thresholds we label semantic chokepoints. These often appear at policy interfaces (e.g., "market failure" in ecological discourse) and thus merit editorial attention.

Corpus evidence from The Lingua Spectrum shows that Uzbek and Russian authors are already negotiating such chokepoints by inserting parenthetical glosses or footnotes (Qobilova, 2025, p. 149). We propose a blended-mapping annotation layer in discipline-specific lexicons that specifies (i) source frames, (ii) inherited domain mappings, and (iii) recommended disambiguation strategies.

Conclusion

Frame blending and domain mapping are not merely descriptive labels but quantifiable mechanisms that shape the polysemous destinies of terms travelling across disciplinary borders. By combining corpus analytics with psycholinguistic measures, the present study demonstrates their predictive power and outlines practical interventions for mitigating ambiguity. Future research should integrate

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multimodal data (graphs, code repositories) and examine language-specific factors, building on the cross-linguistic polysemy patterns (Saparniyazova, 2024).

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