# Applying TRIZ-Based Pedagogical Strategies to Enhance Vocabulary Acquisition in ESL Classrooms: A Conceptual Framework and Instructional Design

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## ABSTRACT

Vocabulary remains the strongest single constraint on second language communication, yet mainstream ESL vocabulary instruction continues to rely on list-based memorisation that separates words from the communicative problems they exist to solve. This article proposes a systematic alternative by adapting TRIZ, the Theory of Inventive Problem Solving developed in engineering, to tertiary ESL vocabulary pedagogy. Drawing on the structural parallels between inventive problem solving and strategic language use, the article develops a conceptual framework in which communication difficulties are reframed as contradictions between competing speaker goals, and vocabulary items are recast as functional tools selected to resolve those contradictions. Four TRIZ constructs are translated for the language classroom: contradiction analysis, the inventive principles, function analysis, and the multi-function component. These are operationalised in a five-step instructional cycle and demonstrated through a complete instructional design, a tertiary unit on first impressions in which personality adjectives are taught as functional components, collocations as stable assemblies, conversational phrases as feedback signals, and the polysemous word like as a multi-function module. The framework is grounded in vocabulary acquisition research, including the involvement load hypothesis and research on formulaic language, and its cognitive plausibility is examined against load and retrieval accounts of learning. A quasi-experimental evaluation protocol combining vocabulary pre-tests and post-tests, learner journals, and interviews is specified for implementation in Malaysian tertiary classrooms. The article contributes an interdisciplinary bridge between systematic innovation and language education and provides a replicable template for TRIZ-based unit design in ESL contexts.

**Keywords:** TRIZ; vocabulary acquisition; ESL; creative pedagogy; task-based language teaching; instructional design

## INTRODUCTION

Vocabulary knowledge is the strongest single constraint on what a second language learner can do. Coverage studies show that reading comprehension depends on knowing a very high proportion of the running words in a text (Hu & Nation, 2000; Laufer & Ravenhorst-Kalovski, 2010; Schmitt et al., 2011), and estimates of the vocabulary required for comfortable engagement with written English run to thousands of word families (Nation, 2006). Meta-analytic evidence further indicates that vocabulary knowledge is among the strongest correlates of both reading and listening comprehension (Zhang & Zhang, 2022). For learners of English as a second language at the tertiary level, the practical implication is stark: without a large, well-organised, and quickly retrievable vocabulary, neither academic study nor professional communication in English is possible. In Malaysia, where

English functions as the principal language of higher education and employment mobility, limited vocabulary remains a persistent and well-documented obstacle for university students (Misbah et al., 2017; Tan & Goh, 2020), with vocabulary size studies showing that many school leavers fall short of the levels needed for independent reading (Wong et al., 2019).

The dominant instructional response to this problem has changed surprisingly little. Vocabulary is still widely taught as lists: words to be memorised, matched to definitions, and tested in isolation. Decades of research have shown that such decontextualised treatment produces shallow and fragile knowledge, and that durable vocabulary learning requires repeated, meaningful engagement in which learners retrieve, evaluate, and use words for genuine communicative purposes (Nation, 2013; Schmitt, 2008; Webb, 2007). The involvement load hypothesis formalises this insight, predicting that retention grows with the need, search, and evaluation a task induces, a prediction that has received meta-analytic support with the evaluation component emerging as the strongest contributor to learning (Laufer & Hulstijn, 2001; Yanagisawa & Webb, 2021). Repetition matters as well, with a medium overall effect on incidental learning (Uchihara et al., 2019), as do retrieval practice and appropriately spaced encounters (Nakata, 2015; Roediger & Karpicke, 2006). The research base, in short, tells teachers what effective vocabulary work looks like: problem-driven, evaluative, generative, and recurring. What it does not supply is a systematic classroom method for producing tasks with those properties on demand.

TRIZ, the Theory of Inventive Problem Solving developed by Genrich Altshuller from the systematic study of patent literature, provides structured tools for resolving contradictions, situations in which improving one desirable attribute appears to require sacrificing another (Altshuller, 1999). Its instruments, including contradiction analysis, the 40 Inventive Principles, the Contradiction Matrix, and Substance-Field function models, have spread from mechanical engineering into management, design, and services (Chechurin & Borgianni, 2016; Ilevbare et al., 2013; Spreafico & Russo, 2016), and a growing body of work applies TRIZ in educational settings, from engineering curricula to school science and special education (MalAllah et al., 2022; Reyes-Huerta et al., 2023; Saygı & Şahin, 2023). In Malaysia, TRIZ has been introduced into national design and technology curricula (Rahim & Iqbal, 2022) and is actively used in university engineering design projects (Chong et al., 2024).

The structural parallel with language use is direct. A speaker preparing for a job interview faces a genuine contradiction: sound natural, yet be precise; be polite, yet be direct; keep the language simple, yet make a strong impression. These are exactly the paired tensions TRIZ was built to resolve, and the resolution in language, as in engineering, comes from selecting the right tool for the function. On this view, vocabulary is not a word list; it is a toolkit for solving communication problems. A precise personality adjective resolves the natural-versus-precise contradiction that the vague word nice cannot; a fixed collocation resolves the natural-versus-correct tension that free word combination creates; a conversational phrase keeps an interaction running the way a feedback signal keeps a control loop stable. Framing vocabulary this way does more than supply a fresh metaphor: it generates tasks that are inherently high in need and evaluation, precisely the involvement components that best predict retention (Yanagisawa & Webb, 2021).

The study reported here pursues three objectives. The first is to develop a conceptual framework that translates the core TRIZ constructs into constructs usable in ESL vocabulary pedagogy. The second is to operationalise the framework as a five-step instructional cycle and demonstrate it through a complete tertiary teaching unit, First Impressions, designed for ESL classrooms at UNITAR University College Kuala Lumpur (UUCKL). The third is to specify a rigorous quasi-experimental protocol through which the framework's effect on vocabulary acquisition can be evaluated. Because the empirical evaluation is at the protocol stage, this article is explicitly a conceptual and design contribution: it presents the framework, the worked instructional design, and the evaluation plan, and it makes no empirical claims in advance of the data. Three research questions were formulated to guide the larger framework as follows:

1) How can TRIZ constructs, including contradiction analysis, the inventive principles, and function models, be systematically mapped onto the constructs of ESL vocabulary instruction?

2) What does a TRIZ-based vocabulary unit look like in concrete instructional terms, and how does its task design align with established findings in vocabulary acquisition research?

3) How can the framework's effect on vocabulary acquisition, communicative competence, and learner engagement be rigorously evaluated in a tertiary ESL setting?

# LITERATURE REVIEW

## What Makes Vocabulary Instruction Effective

Contemporary vocabulary research converges on a small set of design features that reliably improve learning. First, depth of processing matters. The involvement load hypothesis proposes that tasks inducing greater need, search, and evaluation yield stronger retention (Laufer & Hulstijn, 2001). Yanagisawa and Webb's (2021) meta-analysis of 42 studies confirmed the hypothesis's overall predictive power and identified evaluation, the requirement to judge whether and how a word fits a context, as the component contributing most to learning, with search contributing least. Second, frequency of encounter matters: a meta-analysis of correlational studies found a medium effect of repetition on incidental vocabulary learning, moderated by learner and treatment variables (Uchihara et al., 2019). Third, retrieval matters more than restudy, a robust finding from cognitive psychology (Roediger & Karpicke, 2006) that vocabulary research has operationalised through spaced retrieval schedules (Nakata, 2015). Fourth, knowing a word is multidimensional, spanning form, meaning, and use, and the components of that knowledge develop in a describable order, with form-meaning links preceding productive mastery of use (González-Fernández & Schmitt, 2020; Nation, 2013). Schmitt (2008) synthesises these strands into a single instructional imperative: maximise repeated, engaged encounters in which learners must do something consequential with the word.

A second strand concerns formulaic language. Much of natural English consists not of freely assembled words but of conventionalised multi-word units, and command of such units distinguishes fluent, natural-sounding speakers (Boers et al., 2006). Collocations are notoriously resistant to logic: learners who know make and impression separately still produce do an impression, because the restriction is conventional rather than semantic. Intervention research shows that drawing learners' attention to formulaic sequences, and giving them reasons to notice and manipulate the units, improves both accuracy and perceived fluency (Boers & Lindstromberg, 2012). Incidental routes also contribute, with multi-word and single-word items picked up from reading and viewing under the right frequency conditions (Pellicer-Sánchez & Schmitt, 2010; Peters & Webb, 2018), but classroom time remains the primary site where formulaic accuracy can be deliberately engineered.

## Creativity, Tasks, and the Limits of Current Approaches

Communicative and task-based approaches supply the pedagogical environment in which such engagement can occur. Task-based language teaching organises learning around meaningful outcomes rather than linguistic forms, on the premise that language develops when it is used to accomplish something (Bygate, 2016; Ellis, 2003). Yet task-based frameworks are largely silent on a specific question that vocabulary instruction cannot avoid: how does a teacher systematically generate tasks in which particular target words become genuinely necessary? In practice, vocabulary often enters task-based lessons incidentally, and the deliberate, evaluative engagement that the involvement load research recommends is left to chance.

Creativity research suggests where the missing machinery might come from. Creativity is standardly defined as the production of ideas that are both novel and useful (Runco & Jaeger, 2012), and educational applications emphasise that creative performance can be taught through structured methods rather than awaited as inspiration (Plucker et al., 2004). Crucially, effective creative work involves convergent as well as divergent thinking: the disciplined narrowing from many candidate solutions to the one that best fits the constraints (Cropley, 2006). Word choice is exactly such a convergent act. A speaker generates candidate expressions and must select the one that simultaneously satisfies constraints of meaning, register, collocation, and effect. Evidence that creative instructional formats improve vocabulary retention when the target lexis is deliberately embedded, as in recent work on AI-generated storytelling versus gamified learning, reinforces the promise of structured creativity for lexical goals (Namaziandost & Çakmak, 2025). What ESL pedagogy lacks is a structured method for teaching the selection process itself. TRIZ, whose entire purpose is the structured resolution of competing constraints, is a natural candidate.

## TRIZ: Origins, Tools, and Educational Applications

TRIZ originated in Altshuller's analysis of large numbers of patents, from which he concluded that inventive solutions recur in identifiable patterns and that innovation can therefore be taught as a discipline (Altshuller, 1999). Three of its instruments matter for the present adaptation. The first is contradiction analysis. TRIZ distinguishes technical contradictions, in which improving one parameter worsens another, from physical contradictions, in which a single element must hold opposite properties. The second is the set of 40 Inventive Principles, generalised solution patterns such as segmentation, merging, universality, and prior action, accessed through the Contradiction Matrix, which maps pairs of conflicting parameters to the principles most often used to resolve them. The third is function analysis, including Substance-Field modelling, which describes any system as components performing functions on one another and locates problems as missing, insufficient, or harmful functions. Reviews document the diffusion of these tools well beyond mechanical engineering, into management, product-service systems, and design more broadly, while also noting recurrent challenges of accessibility and the learning burden the classical toolkit imposes (Chechurin & Borgianni, 2016; Ilevbare et al., 2013; Spreafico & Russo, 2016).

Educational applications have multiplied in the past decade. A systematic review of TRIZ as an educational technology finds applications concentrated in engineering and STEM contexts, generally reporting gains in problem-solving and creative thinking but calling for stronger designs and broader disciplinary reach (Reyes-Huerta et al., 2023). Empirical studies illustrate the range: a quasi-experimental study of systematic inventive problem solving in a seventh-grade science classroom found improved problem-solving skills after a four-week intervention (Saygı & Şahin, 2023), and a TRIZ-based programme developed creative thinking among students with mild intellectual disability (MalAllah et al., 2022). In the Malaysian setting, TRIZ has been embedded in the national design and technology curriculum (Rahim & Iqbal, 2022), and university teams routinely deploy it in design projects, including classroom-facing engineering systems (Chong et al., 2024). Two features of this literature stand out for present purposes. First, successful school-level adaptations simplify: they select a handful of principles and translate them into age-appropriate language rather than importing the full classical apparatus. Second, the humanities are almost entirely absent. Applications to language education, and to vocabulary instruction specifically, are effectively unexplored, which is the gap this article addresses.

## Cognitive Grounding for a TRIZ-Language Bridge

Any imported framework must be scrutinised for cognitive plausibility and three considerations support the bridge have been proposed. First, the contradiction-resolution cycle maps directly onto the task features that predict vocabulary retention. Identifying a communication problem creates need; interrogating the toolkit for the resolving item creates search; judging whether a candidate word satisfies both horns of the contradiction is evaluation in its strongest form. A TRIZ-framed vocabulary task is thus, by construction, a high involvement load task (Laufer & Hulstijn, 2001; Yanagisawa & Webb, 2021). Second, the engineering metaphors at the heart of the adaptation, components, assemblies, feedback loops, and multi-function modules, function as vivid relational schemas. Dual coding theory holds that information encoded both verbally and imaginally is better retained (Clark & Paivio, 1991), and a concrete image of a collocation as a mechanical assembly whose parts cannot be swapped gives learners a memorable, transferable rule where rote correction gives them only an instance. Third, cognitive load theory imposes a discipline on the adaptation itself: the metaphors must reduce, not add, extraneous load (Sweller, 1988; Sweller et al., 2019). This argues for exactly the simplification strategy the educational TRIZ literature recommends, a small set of translated constructs delivered through consistent language, rather than the full classical toolkit. Finally, the framework is congenial to a sociocultural reading: the five-step cycle described below is a scaffold in the Vygotskian sense, a structured mediation that learners internalise until contradiction-spotting and tool-selection become self-directed (Vygotsky, 1978).

## Conceptual Framework: From Inventive Problem Solving to Vocabulary Pedagogy

The framework rests on a single reconceptualization with systematic consequences: vocabulary is a toolkit for solving communication problems. From this premise, each core TRIZ construct acquires a precise pedagogical counterpart. Figure 1 presents the mapping, and Table 1 states it explicitly.

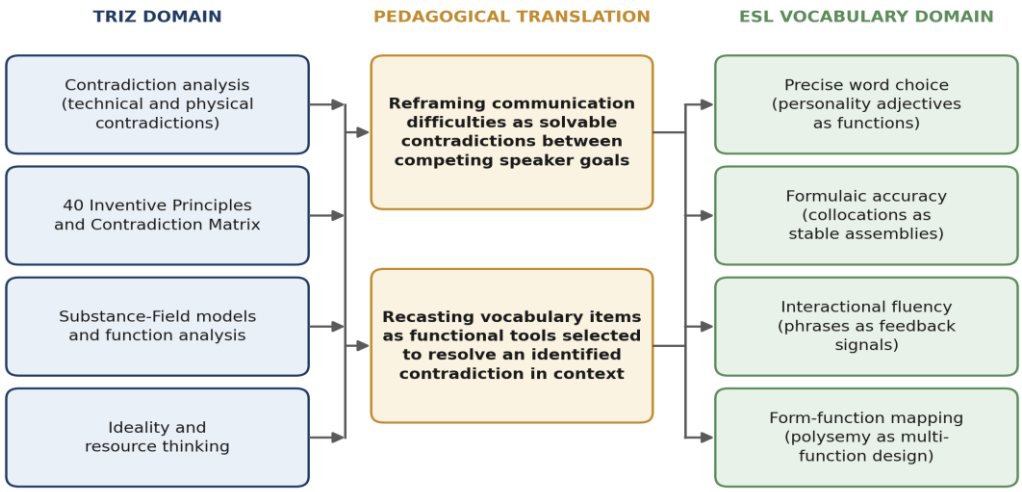


Figure 1: Conceptual framework mapping TRIZ constructs onto ESL vocabulary pedagogy.

Table 1: Core TRIZ constructs and their pedagogical translation.

| **TRIZ construct** | **Engineering meaning** | **Pedagogical translation in vocabulary instruction** |
|---|---|---|
| Contradiction analysis | Improving one parameter worsens another; the contradiction is stated, not evaded | A communication difficulty is restated as two competing speaker goals (e.g., natural versus precise) that the right word must satisfy simultaneously |
| Inventive principles and Contradiction Matrix | Generalised solution patterns matched to recurring contradiction types | Recurring verbal strategies (precision, fixed pairing, signalling, reuse) matched to recurring communication contradictions |
| Function analysis and Substance-Field models | Every component is defined by the function it performs in the system | Every vocabulary item is defined by the communicative function it performs (trust function, connection function, redirect signal) |
| Ideality and resources | The best solution delivers the function at minimal cost using available resources | The best word choice achieves the communicative effect with accessible language the learner already commands |
| Multi-function component | One component designed to perform several functions, reducing system complexity | One polysemous form (e.g., like) performing several grammatical jobs, whose functions must be distinguished and mastered |

Three properties of the mapping deserve emphasis. First, it is generative rather than decorative. The translated constructs do real design work: contradiction analysis tells the teacher where a unit should start (with a felt communication problem, not a word list); function analysis tells the teacher how vocabulary should be presented (by the job each item does, not by alphabetical or thematic accident); ideality disciplines selection toward accessible, high-value items rather than impressive rarities, an orientation consistent with the coverage rationale for prioritising high-frequency vocabulary (Browne, 2014; Browne et al., 2013; Nation, 2006, 2017; Schmitt & Schmitt, 2014). Second, the mapping is selective. Following the simplification strategy that succeeds in school-level TRIZ (Reyes-Huerta et al., 2023; Saygı & Şahin, 2023), the framework imports four constructs and leaves the remainder of the classical apparatus, including the 39-parameter matrix in its full form, outside the classroom. Third, the mapping preserves TRIZ's essential move, which is refusing to trade off. A learner told to simplify

their English is being asked to surrender impressiveness; a learner taught to resolve the simple-versus-impressive contradiction with a well-chosen collocation is being taught invention.

Table 2 illustrates the second construct in operation, adapting ten of the classical inventive principles to vocabulary instruction. The adaptations are functional analogues rather than literal transfers: what is preserved is the solution pattern, restated in verbal terms.

Table 2: Ten inventive principles adapted to vocabulary instruction, with their realisation in the worked unit.

| **Inventive principle (classical)** | **Classical idea** | **Vocabulary-instruction analogue** | **Unit 1 example** |
|---|---|---|---|
| 1. Segmentation | Divide an object into independent parts | Break communication into functional slots, each served by dedicated items | Adjective slots for trust, sociability, ambition |
| 5. Merging | Combine identical or related operations | Teach words in fixed multi-word units rather than in isolation | make a good impression as one unit |
| 6. Universality | One part performs multiple functions | Exploit polysemy deliberately; master all jobs of one form | like as verb, preposition, adjective, conjunction, filler |
| 10. Prior action | Perform required changes in advance | Pre-load rehearsed phrases before high-stakes interaction | Interview toolkit assembled before the task |
| 13. The other way round | Invert the action or perspective | Repair broken output to induce noticing of the correct form | Fix the design task on wrong collocations |
| 15. Dynamics | Make the system adaptable to conditions | Vary register of the same message across contexts | come across as versus strike someone as |
| 23. Feedback | Introduce feedback to improve a process | Teach phrases whose job is to signal reception and steer flow | Really?, I see what you mean, Anyway |
| 24. Intermediary | Use an intermediary carrier or process | Use idioms as packaged carriers of complex meaning | get off on the wrong foot |
| 32. Colour change | Change perceptibility of an object | Make word functions visible through labelling and contrast | Function labels attached to each adjective |
| 35. Parameter change | Change an object's state or properties | Upgrade a vague item to a precise one serving the same slot | nice replaced by reliable in an interview context |

## The TRIZ Vocabulary Instruction Model

### The Five-Step Cycle

The framework is delivered through a five-step instructional cycle that structures every lesson segment, presented to learners in plain language and repeated until it becomes an internalised habit of mind. The cycle is shown in Figure 2. Step 1, Problem, asks what communication difficulty the learner faces. Step 2, Contradiction, restates the difficulty as two goals in apparent conflict. Step 3, Vocabulary Tool, interrogates the toolkit for the word or phrase that resolves the conflict. Step 4, Application, deploys the tool in a realistic context. Step 5, Reflection, evaluates the outcome: did it sound clear, natural, and appropriate? The cycle then re-enters at Step 1 with the next problem.

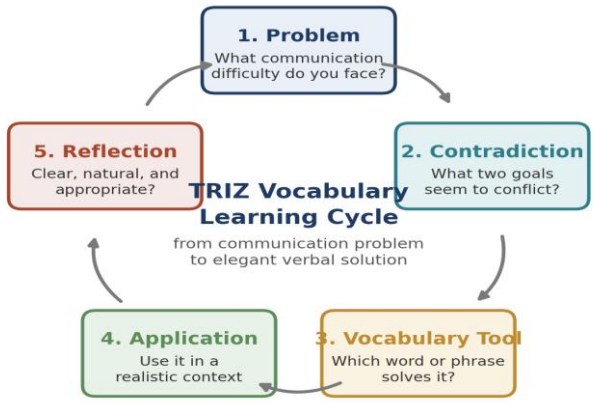


Figure 2: The five-step TRIZ vocabulary learning cycle.

Each step recruits a learning mechanism documented in the vocabulary literature. Steps 1 and 2 create need and orient attention before any target item is introduced, so that when the item arrives it answers a felt question. Step 3 is a structured search through a bounded toolkit, keeping search productive without the unguided dictionary trawling that contributes little to retention (Yanagisawa & Webb, 2021). Step 4 forces generative use, the productive retrieval that strengthens form-meaning-use links (Nation, 2013; Roediger & Karpicke, 2006; Webb, 2007). Step 5 is evaluation, the involvement component with the largest meta-analytic contribution to learning, performed against the twin criteria the contradiction itself supplies. Because every pass through the cycle re-encounters the unit's toolkit, repetition is built in rather than bolted on (Uchihara et al., 2019).

**Contradiction Analysis of the Learner's Communicative Situation**

Unit design begins by identifying the contradictions latent in the unit's communicative territory. For a unit on first impressions, three contradictions organise everything that follows, shown in Figure 3 and Table 3. The natural-versus-precise contradiction opposes fluency and relaxedness to exact word choice. The polite-versus-direct contradiction opposes friendliness and considerateness to clarity and confidence. The simple-versus-impressive contradiction opposes accessible English to strong, lasting effect. Stating the contradictions explicitly does pedagogical work in itself: it names the trade-offs learners already feel, legitimises them as design problems rather than personal failings, and defines the success criteria against which every vocabulary tool in the unit will be evaluated at Step 5.

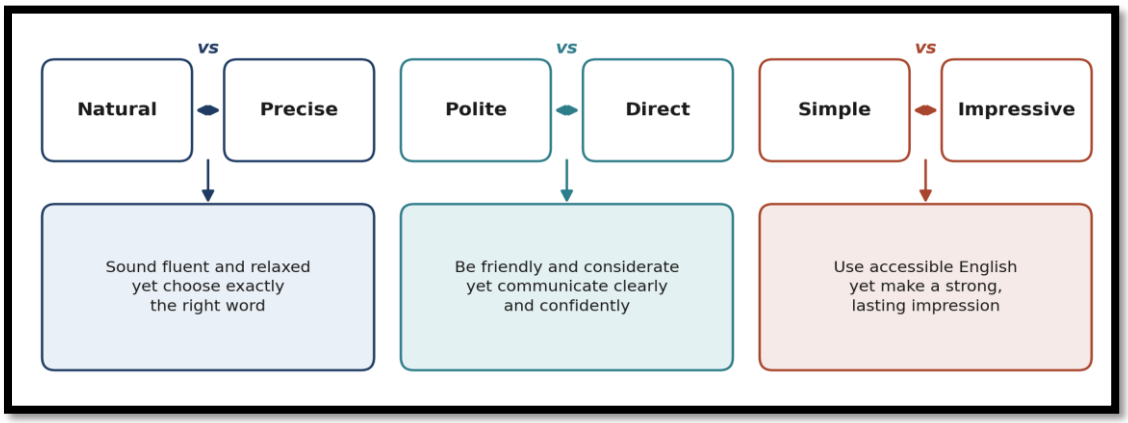


Figure 3: The three core communication contradictions of the worked unit.

Table 3: Contradiction analysis for Unit 1 and the verbal resolution strategies.

| Contradiction | Goal A | Goal B | Verbal resolution strategy |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Natural vs Precise | Sound fluent and relaxed | Choose exactly the right word | Precise adjectives with named functions replace vague all-purpose words |
| Polite vs Direct | Be friendly and considerate | Communicate clearly and confidently | Softening and signalling phrases carry directness without rudeness |
| Simple vs Impressive | Use accessible English | Make a strong, lasting impression | High-frequency collocations and idioms deliver impact from simple parts |

**Ideality and the Curation of the Toolkit**

A final design decision concerns what enters the toolkit at Step 3, and here the ideality construct earns its place in the framework. In TRIZ, the ideal solution delivers the required function at minimal cost using resources already in the system.

Translated, the ideal vocabulary tool achieves the communicative effect using language the learner can actually retrieve under pressure, which argues for a deliberately small, high-frequency, high-value toolkit rather than an impressive but unusable inventory.

This orientation is strongly supported by the vocabulary literature: high-frequency items repay instruction many times over in coverage terms, and the boundary of the high-frequency zone, conventionally drawn around the most frequent two-to-three-thousand-word families, defines the sensible curation limit for a general-purpose unit (Nation, 2006, 2017; Schmitt & Schmitt, 2014).

The unit toolkit presented in Section 5 observes this discipline: its adjectives, collocations, and phrases are all high-frequency items whose value lies not in rarity but in precise functional fit.

Curation by ‘ideality’ also resolves a tension in whom teachers often feel between accessibility and ambition. The simple-versus-impressive contradiction is not ‘eliminated’ by importing rare words; it is resolved by combining accessible parts into effective wholes, a collocation such as make a good impression being simultaneously simple in its components and impressive in its effect.

In this respect the framework aligns with the coverage rationale of modern general service lists, which demonstrate how much communicative territory a compact, well-chosen inventory commands (Browne, 2014; Browne et al., 2013).

**Worked Instructional Design: Unit 1 - First Impressions**

The framework is demonstrated through a complete tertiary unit designed for ESL classrooms at UUCKL. The unit's communicative territory, making first impressions in social and professional encounters, was chosen because it is authentic to tertiary learners approaching internships and interviews, and because its contradictions are felt rather than hypothetical.

The unit comprises four modules, each pairing one vocabulary system with one engineering metaphor, followed by an integrative challenge. Figure 4 gives the architecture and Table 4 the overview. Idioms about first impressions, listed in Table 8, thread through the unit as warm-up and enrichment material, functioning as packaged carriers of complex meaning in line with the intermediary principle of Table 2.

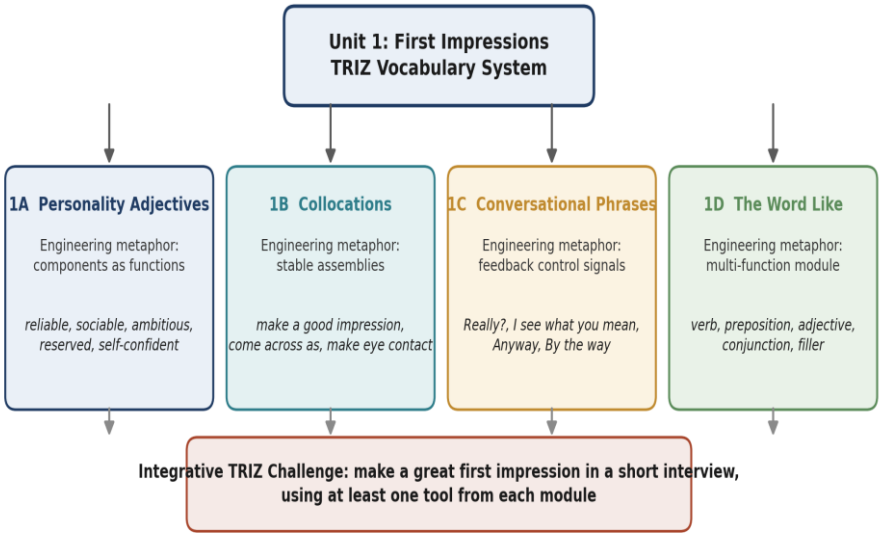


Figure 4: Architecture of the worked unit: four modules and the integrative challenge.

Table 4: Overview of the worked unit.

| Module | Vocabulary system | Engineering metaphor | Core task |
|---|---|---|---|
| 1A | Personality adjectives | Components defined by function | Task A: rewrite weak descriptions with precise adjectives |
| 1B | First-impression collocations | Stable assemblies of parts | Task B: repair broken collocations |
| 1C | Conversational phrases | Feedback control signals | Task C: complete dialogues with the right signal |
| 1D | The word like | Multi-function module | Task D: label the grammatical function |
| Challenge | Whole toolkit | Full problem-solving cycle | Interview simulation using one tool from each module |

**Module 1A: Personality Adjectives as Functions**

The module opens with a TRIZ question: how can I describe someone accurately without using simple words like nice? The engineering insight supplies the reframe. In a designed system, each component performs one clear function; the same discipline applies to adjectives. Reliable performs the trust function, sociable the connection function, ambitious the goal function. Nice performs no specific function and therefore tells the listener almost nothing. Presenting adjectives with explicit function labels, as in Table 5, converts a memorisation list into a parts catalogue organised by what each part does, an application of function analysis and of the segmentation and colour-change principles. Task A then presents weak descriptions in stated contexts, a job interview, a group project, a career discussion, and requires learners to select the adjective whose function the context demands. The task's prompt, consider the function the adjective must perform, makes the evaluation criterion explicit.

Table 5: Module 1A toolkit: Personality adjectives with function labels.

| Adjective | Communicative function | Typical deployment context |
|---|---|---|
| reliable | Trust function | Job interviews, references, teamwork |

| | | |
|---|---|---|
| sociable | Social connection function | Group work, networking, first meetings |
| ambitious | Goal and achievement function | Career discussions, aspirations |
| reserved | Emotion-stability function | Balanced description of quieter persons |
| self-confident | Self-assurance function | Presentations, interviews |
| generous | Warmth and giving function | Personal character description |
| moody | Emotional variability function | Honest appraisal, cautions |
| independent | Autonomy function | Work-style description |

**Module 1B: Collocations as Stable Assemblies**

The module's TRIZ question is how to sound natural and professional at the same time, and its contradiction is the learner's desire to combine words freely against English's expectation of fixed, stable pairings. The engineering idea makes the restriction intelligible: some word combinations work like stable mechanical parts in an assembly, and swapping one component breaks the whole structure. Do a good impression breaks the assembly; make a good impression is the stable form. The metaphor carries a serious linguistic truth, since collocational restrictions are conventional and cannot be derived by logic alone, which is precisely why formulaic sequences must be learned as units (Boers & Lindstromberg, 2012; Boers et al., 2006). Task B, Fix the Design, hands learners broken assemblies, do a good impression, touch eyes with the audience, seems as confident, and requires repair to the stable forms, an inversion task that induces noticing through error. Table 6 presents the module's toolkit alongside the conversational phrases of Module 1C.

**Module 1C: Conversational Phrases as Feedback Systems**

The third module addresses interactional fluency. Its TRIZ question is how to keep a conversation moving smoothly without awkward silences or misunderstandings, and its engineering idea is that conversation works like a feedback control system in which each phrase sends a signal that keeps the loop running. Really? performs signal checking, confirming that the message was received and inviting elaboration; I see what you mean confirms understanding so the loop continues; Anyway redirects the flow toward a new topic; By the way inserts new information without derailing the exchange. Without such signals the loop breaks and the conversation stalls. Task C, Dialogue Repair, presents exchanges in which Speaker B's turn is missing and specifies the signal needed, surprise, agreement, or polite disagreement, so that selection is governed by function rather than by rote. The feedback principle of Table 2 is here applied literally.

Table 6: Modules 1B and 1C toolkit: collocations and conversational phrases.

| **Module** | **Item** | **Function or note** |
|---|---|---|
| 1B | make a good impression | Core collocation; the verb is always make, never do or create |
| 1B | give the impression of | Describing how someone appears to others, followed by a noun |
| 1B | come across as | The impression someone projects: she comes across as confident |
| 1B | create an atmosphere of | For settings and environments: create an atmosphere of trust |
| 1B | have a reputation for | Established character attributed by others |
| 1B | make eye contact | Non-verbal communication; fixed verb-noun pairing |
| 1C | Really? / Seriously? | Surprise signal; confirms reception, invites elaboration |

| | | |
|---|---|---|
| 1C | That sounds great. | Agreement and enthusiasm signal |
| 1C | I see what you mean. | Understanding confirmed; loop continues |
| 1C | I'm not sure about that. | Polite disagreement; directness without rudeness |
| 1C | Anyway | Redirect signal; steers toward a new topic |
| 1C | By the way | Insertion signal; adds information without derailing |

**Module 1D: Like as a Multi-Function Module**

The final module confronts polysemy through the universality principle: in engineering, a single component can be designed to perform multiple functions, reducing complexity and adding versatility, and the word like does exactly this in English. Five jobs are distinguished and exemplified: verb (I like jazz), preposition (It looks like rain), adjective (of like mind), conjunction (Like I said), and filler (I was, like, tired). Task D asks learners to label the function of like in fresh sentences, an analysis task that builds the form-function mapping which multidimensional accounts identify as central to word knowledge (González-Fernández & Schmitt, 2020; Nation, 2013). Table 7 summarises the module. The filler use is presented descriptively, with register guidance: pervasive in informal speech, to be avoided in interviews, which itself instantiates the dynamics principle of adapting language to conditions.

Table 7: Module 1D: the five grammatical functions of like.

| **Grammatical function** | **Example** | **Register guidance** |
|---|---|---|
| Verb | I like jazz. | Neutral; all contexts |
| Preposition | It looks like rain. | Neutral; all contexts |
| Adjective | They are of like mind. | Formal; written and careful speech |
| Conjunction | Like I said, the plan works. | Informal; conversational |
| Filler | I was, like, really tired. | Very informal; avoid in interviews |

**The Integrative Challenge and the Idiom Thread**

The unit culminates in a challenge that reassembles the toolkit under the full five-step cycle. The problem is authentic: make a good impression in a short interview using accessible English. The contradiction is stated: sound natural, precise, and confident, all at the same time. The solution constraint operationalises transfer: learners must deploy at least one tool from each module, for example reliable, make a good impression, and a correct, register-appropriate use of like, and must identify their contradiction before choosing their tools. The prior-action principle governs preparation, with the toolkit rehearsed in advance of the simulated interview. Assessment at Step 5 applies the contradiction's own criteria where it is clear, natural, appropriate.

Threaded through the unit are ten idioms of first impression, introduced as a warm-up and recycled as enrichment. Idioms are treated under the intermediary principle as packaged carriers: get off on the wrong foot transports a complex interpersonal meaning in one prefabricated unit. Table 8 lists the set with meanings and examples as presented to learners.

Table 8: The idiom thread: ten first-impression idioms recycled across the unit.

| **Idiom** | **Meaning** | **Classroom example** |
|---|---|---|
| First impressions last | Initial judgments tend to stick | Be polite at the interview; first impressions last. |
| Put your best foot forward | Show your best qualities from the start | She put her best foot forward on day one. |
| At first glance | Based on an immediate look | At first glance, he seemed very confident. |
| Judge a book by its cover | Form an opinion from appearance alone | You shouldn't judge a book by its cover. |
| Make a good/bad impression | Create a positive or negative perception | He made a great impression on his boss. |
| Get off on the right/wrong foot | Start a relationship well or poorly | Their conversation got off on the wrong foot. |
| Leave a mark / an impression | Have a lasting impact | Her confidence really left an impression. |
| Hit it off | Immediately get along well | They hit it off the moment they met. |
| Strike someone as | Give a particular first impression | He struck me as very intelligent. |
| Make an entrance | Arrive in a noticeable way | She made quite an entrance at the party. |

**Alignment with Vocabulary Acquisition Research**

The design can now be reviewed against the evidence reviewed in Section 2. Involvement load is engineered deliberately: every task states a need, bounds the search, and requires evaluation against explicit criteria, the configuration meta-analysis identifies as optimal (Laufer & Hulstijn, 2001; Yanagisawa & Webb, 2021). Repetition is structural, with each toolkit item encountered at introduction, in its module task, in the idiom thread where applicable, and again in the integrative challenge, satisfying the frequency condition for durable learning (Uchihara et al., 2019). Retrieval and generation are demanded by Tasks A through D and the challenge, all of which require production rather than recognition (Roediger & Karpicke, 2006; Webb, 2007). Formulaic accuracy receives dedicated treatment through the assembly metaphor and the repair task (Boers & Lindstromberg, 2012). Item selection observes ideality: the toolkit consists of high-frequency, high-value items of the kind prioritised by general service lists rather than rare vocabulary (Browne et al., 2013; Nation, 2006). Finally, the consistent metaphor system and the fixed five-step routine manage cognitive load by giving every lesson the same skeleton (Sweller et al., 2019), while the routine itself functions as a scaffold to be internalised (Vygotsky, 1978).

**Proposed Evaluation Protocol**

The framework's effect on vocabulary acquisition is an empirical question, and this section specifies the protocol through which it will be answered. The design is quasi-experimental with intact classes, the standard arrangement where random assignment of individual students is institutionally impossible, and it follows the pre-test, intervention, post-test logic used in comparable TRIZ classroom studies (Saygı & Şahin, 2023). Figure 5 summarises the design and Table 9 the instrumentation.

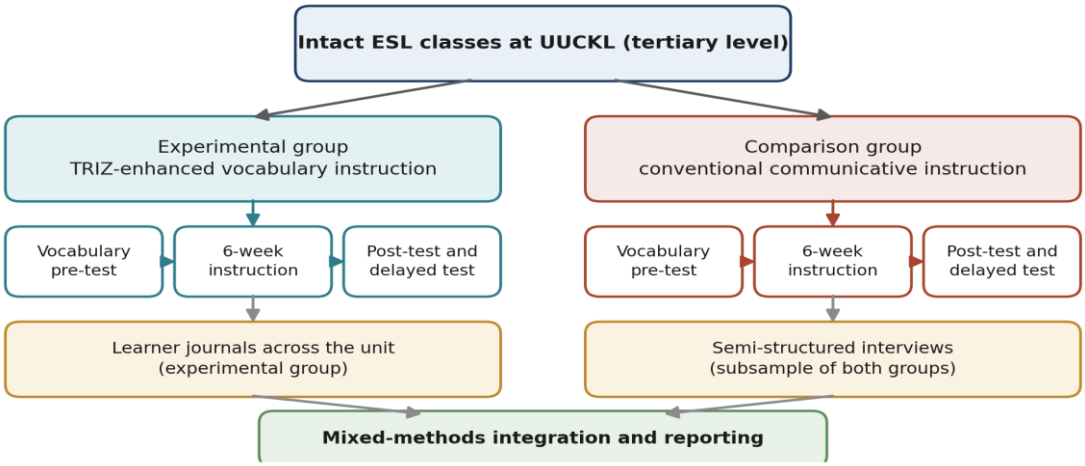


Figure 5: Proposed quasi-experimental design for evaluating TRIZ-enhanced vocabulary instruction.

Participants will be tertiary ESL learners enrolled in English language classes at UUCKL, drawn from intact classes of comparable proficiency as established by institutional placement. One or more classes will be assigned to the experimental condition and matched classes to the comparison condition. Sample size will be determined by enrolment, with a target sufficient for the planned analyses; baseline equivalence will be examined on the pre-test and, where groups differ, controlled analytically. The experimental condition receives the TRIZ-enhanced unit described in Section 5 across a six-week instructional block, delivered through the five-step cycle. The comparison condition receives conventional communicative instruction covering the same target vocabulary, the same texts, and the same total instructional time, differing only in the absence of the TRIZ framing, contradiction analysis, and engineering metaphors. Holding target items and time constant isolates the framing as the manipulated variable. Three instruments triangulate the outcomes. First, a vocabulary test administered as pre-test, immediate post-test, and delayed post-test measures knowledge of the unit's target items at both recognition and production levels, with the delayed administration included because immediate gains routinely overstate durable learning (Nakata, 2015; Uchihara et al., 2019). Second, learner journals kept across the unit by the experimental group capture the process: which contradictions learners identify, which tools they select, and how they evaluate their own solutions. Third, semi-structured interviews with a subsample of both groups explore perceived usefulness, engagement, and the intelligibility of the engineering metaphors.

Retention is captured by the immediate and delayed vocabulary tests already specified, since durable gains, not momentary ones, are the outcome of interest (Nakata, 2015; Uchihara et al., 2019). Communicative competence is measured directly through a short oral production task administered at pre-test and delayed post-test, in which learners handle a first-impressions scenario of the kind the unit rehearses; performances are rated for appropriate and accurate use of the target functions rather than for isolated word knowledge, which keeps the measure faithful to the task-based premise that language is learned in use (Bygate, 2016; Ellis, 2003) and to the multidimensional view in which productive use is the demanding end of word knowledge (Gonzalez-Fernandez & Schmitt, 2020). Learner engagement is assessed through a brief engagement measure completed after key lessons and triangulated with the journals and interviews, so that the involvement the framework is designed to induce is observed as reported experience and not merely inferred from task structure (Laufer & Hulstijn, 2001; Yanagisawa & Webb, 2021). Recent evidence that engagement and retention move together when target lexis is deliberately embedded makes this triangulation particularly informative (Namaziandost & Cakmak, 2025). Table 9 is extended accordingly to list the oral communicative task and the engagement measure alongside the existing instruments.

Table 9: Instrumentation and analysis plan for the proposed evaluation.

| Instrument | Timing | Data yielded | Analysis |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Vocabulary test (recognition and production sections) | Pre, immediate post, delayed post | Item-level scores on target vocabulary | Gain-score comparison between groups with baseline control; descriptive effect sizes |
| Learner journals | Weekly across the unit | Written records of contradiction identification, tool selection, self-evaluation | Thematic analysis mapped to the five-step cycle |
| Semi-structured interviews | After the delayed post-test | Learner perceptions of the approach and metaphors | Thematic analysis; triangulation with journals and test outcomes |

Both groups complete the pre-test in week one, receive their respective instruction across weeks one to six, complete the immediate post-test in week six, and the delayed post-test after an interval. Journals are collected weekly; interviews follow the delayed post-test. Participation in the research instruments will be voluntary with informed consent, data will be anonymised, and institutional ethical approval will be obtained before data collection. Because instruction itself is part of normal teaching, no student will be denied the standard curriculum. Results will be reported in a subsequent article regardless of direction, and the protocol is stated here in advance precisely so that the later report can be evaluated against it.

### Teacher Perceptions, Feasibility, and Professional Development

An intervention succeeds in the classroom only to the extent that teachers can understand it, believe in it, and deliver it, and the evaluation therefore includes a teacher-facing strand alongside the learner-facing one. Three questions structure this strand. The first concerns perception, namely whether teachers find the reframing of vocabulary as a problem-solving toolkit persuasive and usable, gathered through interviews and a short questionnaire administered after they have taught the unit. The second concerns feasibility, namely whether the five-step cycle, the contradiction analysis, and the engineering metaphors can be planned and delivered within ordinary timetables and preparation loads, since a method that works only under ideal conditions will not survive contact with routine teaching. The third concerns professional development, namely what preparation teachers need to deliver the approach confidently, given that the classical TRIZ toolkit is known to carry a real learning burden and accessibility challenge for newcomers (Chechurin & Borgianni, 2016; Ilevbare et al., 2013; Spreafico & Russo, 2016).

The framework's deliberate simplification, four translated constructs delivered through consistent language, is intended precisely to lower that burden, and the teacher strand tests whether the simplification succeeds where the full apparatus would not (Reyes-Huerta et al., 2023). Because TRIZ already has a foothold in Malaysian education policy and engineering curricula, a modest and well-designed professional development package is a realistic route to adoption rather than an aspiration (Rahim & Iqbal, 2022), and the same cognitive load principles that shape the classroom materials also inform the design of that teacher preparation (Sweller et al., 2019).

## DISCUSSION

### What the Framework Adds

The contribution of the framework is best seen against the gap identified in Section 2.2: task-based and communicative pedagogy supplies the environment for meaningful vocabulary use but no systematic machinery for generating tasks in which particular items become necessary. TRIZ supplies that machinery. Contradiction analysis is a task generator: any communicative territory, complaints, negotiations, presentations, small talk, yields its contradictions on inspection, and each contradiction defines a problem whose solution is a vocabulary tool. The five-step cycle then converts the problem into a complete task with built-in need, bounded search, generative application, and criterion-referenced evaluation. In involvement load terms, the framework is a recipe for high-load tasks, and in that sense, it does not compete with existing vocabulary research but operationalises it (Laufer & Hulstijn, 2001; Yanagisawa & Webb, 2021).

The framework also offers a distinctive answer to the creativity question in language education. Rather than treating creativity as free divergence, it teaches the convergent discipline that creativity research identifies as equally essential (Cropley, 2006; Runco & Jaeger, 2012): generating candidate expressions and selecting the one that satisfies competing constraints. For tertiary learners in engineering-adjacent institutions, the borrowed vocabulary of components, assemblies, and feedback loops is not an ornament but a cognitive home advantage, connecting new linguistic knowledge to schemas they already command (Clark & Paivio, 1991).

**Boundary Conditions and Risks**

Honest appraisal requires stating where the metaphor could mislead. Engineering contradictions are resolved once; communicative contradictions recur with every audience and register shift, so the framework must teach re-application, not solutions to memorise. The metaphor system, if multiplied carelessly, could itself become extraneous load, which is why the design restricts each module to a single metaphor and keeps the cycle constant (Sweller et al., 2019). There is also a register risk: learners might over-apply precision, producing speech that is accurate but stilted. The reflection step exists precisely to catch this, since natural is one of the evaluation criteria the contradictions impose. Finally, the framework's benefits plausibly interact with learner background: students without technical schemas may find the metaphors less transparent, a moderation question the interview data in the proposed evaluation are designed to illuminate, as discussed in Section 6.1.

**Relation to Prior TRIZ-in-Education Work**

The adaptation strategy adopted here mirrors what succeeds in the school-level TRIZ literature: a reduced construct set, translated terminology, and concrete tasks, rather than the full classical apparatus (MalAllah et al., 2022; Reyes-Huerta et al., 2023; Saygı & Şahin, 2023). Where the present work departs from that literature is domain. Existing applications treat TRIZ as content or as a general thinking course; here TRIZ functions as an instructional design theory for a specific linguistic outcome, vocabulary acquisition, with the mapping between frameworks made explicit and auditable. If the evaluation supports the approach, the same mapping generalises: grammar contradictions (concise versus explicit), pragmatics contradictions (honest versus face-saving), and writing contradictions (formal versus readable) are all within reach of the same machinery.

**Limitations and Future Research**

Four limitations bound the present contribution. First, it is conceptual: the framework and unit are fully specified, but their effect on learning awaits the evaluation whose protocol Section 6 states, and no empirical claim is made in advance of those data. Second, the worked design covers one unit in one communicative territory; demonstrating that the contradiction-analysis method generates equally coherent units elsewhere is a design-research task in its own right. Third, the framework is developed for tertiary Malaysian classrooms, and its metaphors presume some familiarity with technical ways of speaking; transfer to school-age learners or to contexts without that background will require further translation. Fourth, the evaluation protocol, while rigorous for its setting, is quasi-experimental with intact classes, and its causal inferences will carry the usual caveats of that design.

The immediate priority is executing the protocol and reporting the quasi-experimental results with both immediate and delayed outcomes. Beyond it, three lines suggest themselves: design replication across communicative territories and proficiency levels; component analysis to identify which elements of the framework, the contradiction framing, the function labels, or the cycle, carry the effect; and cross-domain extension of the mapping to grammar and pragmatics instruction, where the contradiction structure is equally visible.

A framework demonstrated in one unit, at one proficiency band, in one national setting, earns wider trust only by travelling, and the generalisability agenda the reviewer identifies is built into the design rather than left to hope. Across proficiency levels, the ideality construct supplies the adjustment mechanism, since the toolkit is curated to the frequency zone appropriate to the learners: lower-proficiency classes work with the most frequent items, while higher-proficiency classes extend into mid-frequency and more idiomatic material, with the CEFR

vocabulary-range descriptors offering a ready scaffold for setting those targets by level (Council of Europe, 2020; Nation, 2006, 2017; Schmitt & Schmitt, 2014).

Across educational contexts, the contradiction-analysis method is content-neutral, because any communicative territory yields its own tensions on inspection, so the machinery that generated a first-impressions unit for tertiary learners can generate units for school-age, vocational, or professional cohorts once the metaphors are translated to their experience, a translation the educational TRIZ literature shows to be both necessary and achievable (MalAllah et al., 2022; Reyes-Huerta et al., 2023).

Across languages, the premise that vocabulary is a toolkit for resolving communicative contradictions is not specific to English, and replication in other target languages would test whether the framework captures something general about strategic word choice or something particular to English lexis. Establishing external validity along these three axes is the natural sequel to the single-context evaluation of Section 6, and the framework is deliberately specified so that each extension changes the materials without disturbing the underlying logic.

## CONCLUSION

This article set out to bring the systematic creativity of TRIZ into the ESL vocabulary classroom. It developed a conceptual framework in which communication difficulties are reframed as contradictions between competing speaker goals and vocabulary items are recast as functional tools that resolve them; it operationalised the framework as a five-step instructional cycle; it demonstrated the whole through a complete tertiary unit in which personality adjectives are taught as functions, collocations as stable assemblies, conversational phrases as feedback signals, and the word like as a multi-function module; and it specified the quasi-experimental protocol through which the approach will be evaluated in Malaysian tertiary classrooms.

The deeper claim is simple. Vocabulary is not a word list; it is a toolkit for solving communication problems, and learners deserve to be taught not only the tools but the problem-solving discipline that selects among them. TRIZ, refined over decades precisely to teach that discipline, translates into language education with unexpected fidelity, and in doing so it aligns naturally with what vocabulary acquisition research already recommends: tasks high in need and evaluation, rich in retrieval, recurrent by design. Whether the translation delivers measurable gains is now an empirical question with a stated protocol. What this article establishes is that the question is well-posed, the framework coherent, and the classroom materials ready.

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The authors declare no potential conflicts of interest with respect to the research, authorship, or publication of this article.

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