

Integrating AI Tools into Vocational English for Specific Purposes (ESP): A Constructivist Pedagogical Framework

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Abstract: AI tools have spread through vocational English classrooms faster than the teaching theory needed to use them well. In English for Specific Purposes (ESP), where learning the language cannot be separated from real workplace practice, teachers often bolt AI on as a shortcut rather than build it into a coherent design, which invites shallow, tool-led learning. This paper sets out a constructivist framework for bringing AI into vocational ESP. Building on social constructivism, Vygotsky's zone of proximal development, and situated learning, it treats AI as an adjustable scaffold: one that supports learners as they build knowledge in authentic industry settings, and is then gradually taken away. The framework has four parts: design principles that connect constructivist ideas to what AI can do; a typology that sorts AI functions into conceptual, procedural, metacognitive, and strategic scaffolding; an Industry-Embedded Approach that roots ESP tasks in real occupational scenarios and discourse; and a worked instructional sequence and teaching unit that show the framework in action. The argument is straightforward: AI helps vocational ESP most when it deepens situated, collaborative learning instead of bypassing it. The paper closes with what this means for the teacher's role and for future empirical testing.

Keywords: Artificial Intelligence; English for Specific Purposes; Vocational Education; Constructivism; Scaffolding; Situated Learning; Industry-Embedded Approach.

1. Introduction

English for Specific Purposes (ESP) occupies a central place in Chinese vocational education, where English is valued less as an academic subject than as a practical instrument for future work in nursing, tourism, e-commerce, manufacturing, and related fields. Unlike general English, ESP begins from an analysis of learners' target situations and builds language competence around the tasks, genres, and discourse of a particular occupation [1]. This orientation makes authenticity and context not optional enrichments but the very substance of instruction.

Into this setting, artificial intelligence (AI) tools — generative chatbots, automatic speech recognition, machine translation, and intelligent writing assistants — have arrived at speed. Their capacity to generate authentic-looking texts, simulate interlocutors, and deliver instant feedback appears tailor-made for ESP. Yet adoption has largely outrun pedagogy. In many classrooms AI is bolted onto existing routines as a shortcut for producing or correcting text, a practice that can foster dependence and surface-level engagement rather than the deep, transferable competence that vocational graduates need [2]. What is missing is not more tools but a theoretically grounded account of how AI should be woven into ESP instruction.

This paper addresses that gap by proposing a constructivist pedagogical framework for integrating AI into vocational ESP. Constructivism is a fitting foundation because it holds that knowledge is actively built by learners through meaningful, socially mediated, situated activity — precisely the conditions that authentic ESP seeks to create. The paper's purpose is threefold: to articulate design principles that connect

constructivist theory to AI affordances; to specify how AI can serve as scaffolding within authentic, industry-embedded tasks; and to operationalise the framework through a concrete instructional sequence and worked example. As a conceptual contribution, the framework is intended to guide practice and to furnish hypotheses for subsequent empirical testing. To keep the discussion grounded, it is illustrated at several points with short excerpts from a pilot study the authors conducted with vocational EFL teachers; these excerpts are offered as illustrations only, and the paper remains conceptual in aim.

Two questions organise the discussion: (a) How can constructivist principles inform the integration of AI tools into vocational ESP instruction? (b) How can AI function as scaffolding within an Industry-Embedded Approach to situated ESP learning?

2. Background

2.1. ESP in Chinese Vocational Education

ESP developed as a learning-centred response to the observation that different learners need English for different purposes, and that instruction is most effective when it targets those purposes directly [3], [4]. In vocational colleges, this translates into courses such as Nursing English, Tourism English, or Business English, in which language is taught through the communicative demands of the workplace. Effective ESP thus depends on authentic materials, genre awareness, and tasks that rehearse real occupational performance [5]. At the same time, vocational ESP faces familiar constraints: large classes, limited access to authentic workplace interaction, teachers who may not be domain experts, and learners with modest and uneven English

proficiency. These constraints define the practical problem that a well-designed AI integration might help to solve.

2.2. Constructivism, Scaffolding, and Situated Learning

Constructivism holds that learners actively construct knowledge by relating new experience to existing understanding rather than receiving it ready-made. Social constructivism, following Vygotsky [6], emphasises that this construction is mediated by social interaction and cultural tools, and that learning is most productive within the zone of proximal development (ZPD) — the distance between what a learner can do unaided and what they can achieve with support. Scaffolding is the mechanism by which a more capable other provides temporary, calibrated assistance that enables performance within the ZPD and is gradually withdrawn as competence grows [7]. Contemporary syntheses distinguish several scaffolding functions and stress the defining features of contingency, fading, and transfer of responsibility [8], [9].

Situated learning theory extends this social account by arguing that knowledge is inseparable from the context and activity in which it is used; learners come to participate in a community of practice through legitimate peripheral participation, moving from the margins toward fuller, more competent membership [10]. For ESP, situated learning provides a compelling rationale for anchoring instruction in authentic occupational practice: to learn Nursing English is, in part, to learn to participate in the discourse community of nursing. Together, constructivism, scaffolding, and situated learning supply a coherent theoretical basis for designing AI-supported ESP.

2.3. AI in Language Pedagogy

Research on AI in language education documents applications in feedback, tutoring, content generation, and assessment, alongside cautions about accuracy, equity, and over-reliance [2], [11], [12]. More recent syntheses document consistent gains across the four skills alongside marked variation in study design and context [13], and a scoping review of generative-AI writing instruction in EFL maps a fast-growing but conceptually thin evidence base [14]. Much of this work, however, is either tool-centred or outcome-focused and is not explicitly grounded in learning theory. Where theory is invoked, behaviourist assumptions — input, response, correction — often dominate by default, which sits awkwardly with the constructivist, participatory nature of ESP. The present framework responds by making constructivist theory the organising principle and positioning AI within it, rather than the reverse.

3. A Constructivist Framework for AI in Vocational ESP

The proposed framework is organised as five interdependent layers, shown in Figure 1. Theoretical foundations inform a set of design principles; the principles are enacted through AI-enabled scaffolds; the scaffolds operate within industry-embedded ESP tasks; and the whole is oriented toward learning outcomes that combine occupational language competence with self-directed, transferable capability. The layers are read top-down as a design logic and bottom-up as a chain of justification.

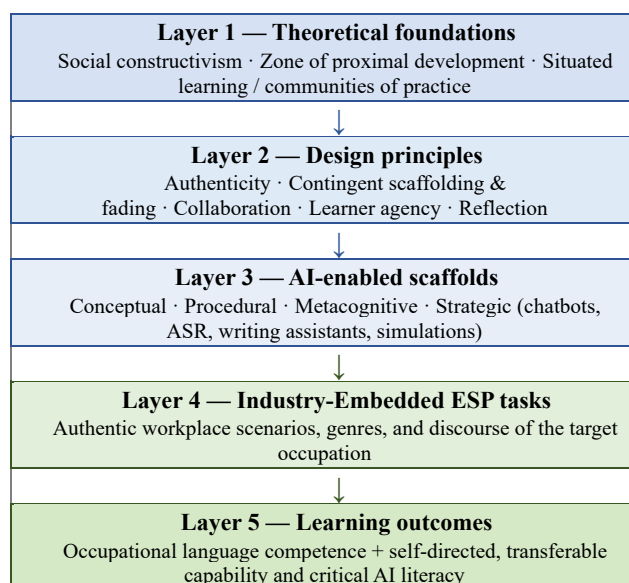


Figure 1. The five-layer constructivist framework for integrating AI into vocational ESP.

3.1. Design Principles

Table 1. Constructivist principles mapped to AI affordances and ESP applications.

Constructivist principle	AI affordance	ESP classroom application
Active construction	Generative dialogue that responds to learner queries and prompts	Learners interrogate a chatbot playing a client or patient to build a needs analysis
Learning in the ZPD	Adjustable difficulty; hints, models, and just-in-time explanation	AI supplies a sentence frame or model, then withdraws it as learners gain fluency
Social mediation	Shared AI output as a common object for group discussion	Groups critique and revise an AI-drafted business email together
Situated authenticity	On-demand generation of workplace scenarios, roles, and genres	Simulated patient handover or check-in rehearsed before real placement
Reflective metacognition	Explanatory feedback that exposes reasoning behind corrections	Learners keep a log comparing their draft with AI feedback and justifying edits

Five principles translate constructivist theory into design commitments. First, authenticity: tasks, texts, and interactions should mirror the target occupation, with AI used to generate and vary authentic-like input rather than to replace engagement with it. Second, contingent scaffolding and fading: AI support should be calibrated to what learners cannot yet do alone and deliberately reduced as competence grows, preserving the transfer of responsibility that defines genuine scaffolding. Third, collaboration: AI should augment, not displace, peer and teacher interaction. In practice this means building in explicit student-to-student work around AI output — for example, having pairs or small groups jointly evaluate an AI-generated workplace document, such as a

business email or a complaint response, debate its accuracy and appropriateness against what they know of the occupation, and negotiate a revised version together. The AI supplies a common object to think with, but the learning happens in the talk among learners as they appraise and rework it. Positioned this way, AI becomes a catalyst for the social, dialogic meaning-making that social constructivism places at the centre of learning rather than a substitute for it. Fourth, learner agency: learners should direct the tool — questioning, evaluating, and revising its output — rather than passively accepting it. Fifth, reflection: activities should require learners to examine both their emerging competence and their use of AI, cultivating metacognition and critical AI literacy. Table 1 links each constructivist tenet to an AI affordance and a concrete ESP application.

3.2. AI as Scaffolding: A Typology

Scaffolding is the pivot of the framework, and AI can enact several of its recognised types. Conceptual scaffolding helps learners decide what to consider: an AI tool can supply the key moves of a workplace genre, such as the stages of a service complaint response. Procedural scaffolding helps learners use resources and tools: an assistant can walk a learner through drafting a report step by step. Metacognitive scaffolding guides how learners think about the task: reflective prompts and explanatory feedback invite learners to monitor and evaluate their own performance. Strategic scaffolding offers alternative approaches: an AI partner can propose different ways to phrase a negotiation or handle a difficult caller. Crucially, each form of support must satisfy the defining features of scaffolding — contingency, fading, and transfer of responsibility [8]. Figure 2 depicts this fading across four stages, as AI support is progressively reduced and learner autonomy correspondingly rises.

Stage	AI scaffolding	Learner autonomy
I. Model	high	low
II. Guide		
III. Prompt		
IV. Fade	low	high

Figure 2. The scaffolding-fade principle: AI support (blue) decreases as learner autonomy (green) increases across four stages.

3.3. The Industry-Embedded Approach

The framework's distinctive component is the Industry-Embedded Approach, which operationalises situated learning by anchoring every ESP task in the authentic practice of a specific occupation. Rather than teaching generic English and later applying it, the approach begins from a real workplace scenario — a nursing handover, a hotel check-in, a customer complaint, a maintenance briefing — and treats the associated language, genres, and interactional norms as the object of learning. AI serves this approach in three ways: it generates and varies authentic-like scenarios and interlocutors that would otherwise be inaccessible in a classroom; it scaffolds learners' rehearsal of workplace performance; and it provides immediate, situated feedback framed in the terms of the occupation. In this way AI helps bring the community of practice into the classroom, supporting a form of legitimate peripheral participation [10] before learners enter the workplace themselves.

This need is recognised by practitioners themselves. In the pilot study, teachers noted that generic AI output failed their students precisely where authenticity mattered most:

Its examples are too generic and do not match real business practice; I would use it much more if it produced genuinely professional material that fits industry practice. [Teacher, business English]

This is precisely the problem the Industry-Embedded Approach is designed to address, by making the authentic discourse of a specific occupation — rather than generic English — the object of AI-supported learning. Table 2 illustrates the approach across representative vocational domains.

Table 2. The industry-Embedded Approach across representative vocational domains.

Vocational domain	Authentic industry task	AI tool and scaffolding role
Nursing	Conduct a shift handover and reassure a patient	Chatbot role-plays patient/colleague (conceptual + strategic scaffolding); ASR checks intelligibility
Tourism	Handle a hotel check-in and resolve a guest complaint	AI generates varied guest scenarios (situated authenticity); prompts alternative phrasings (strategic)
E-commerce	Write a product description and reply to an overseas buyer	Writing assistant models the genre then fades to feedback (procedural + metacognitive)
Automotive	Explain a repair and read a technical manual excerpt	AI glosses technical terms and simplifies input in the ZPD (conceptual scaffolding)
Business	Negotiate terms and draft a follow-up email	Chatbot as negotiation partner; group critiques AI-drafted email (social mediation)

4. Operationalising the Framework

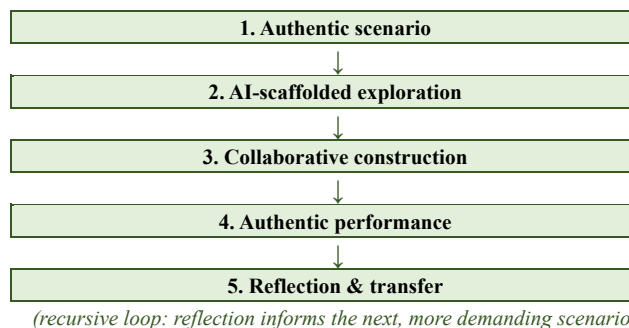


Figure 3. The five-phase situated-learning cycle for AI-supported vocational ESP.

The framework is enacted through a five-phase situated-learning cycle (Figure 3). Instruction begins with an authentic industry scenario that establishes purpose and engages prior experience. Learners then explore the language and genre with AI scaffolding calibrated to their ZPD. Next, working in

groups, they construct knowledge collaboratively, using AI output as a shared object to critique and revise rather than a finished answer to accept. They then perform the target task authentically — ideally with scaffolding faded — and finally reflect on both their competence and their use of AI, consolidating learning and preparing for transfer to the real workplace. The cycle is recursive: reflection feeds the design of the next, more demanding scenario.

4.1. An Illustrative Teaching Unit

Table 3 sketches how the cycle might unfold in a Nursing English unit on a patient handover. The example is a proposed illustration of the framework in use, not reported classroom data; it should be adapted to local conditions and to the specific formulation of the Industry-Embedded Approach adopted in the larger study.

Table 3. Illustrative Nursing English teaching unit (proposed example, not classroom data).

Phase	Activity	Role of AI	Scaffolding type
1. Scenario	Watch/read a shift-handover scenario; identify the communicative goal	Generates a realistic handover dialogue and context	Situated authenticity
2. Exploration	Elicit key terms, the SBAR structure, and useful phrases	Explains terms and models the genre on demand	Conceptual
3. Construction	In pairs, draft a handover script; critique an AI draft together	Provides a draft as a shared object to revise	Procedural / social
4. Performance	Role-play the handover unaided; AI plays the incoming nurse	Scaffolding faded; ASR checks intelligibility only	Strategic (faded)
5. Reflection	Log what was learned and how AI was used; set the next goal	Prompts self-evaluation and critical use of AI	Metacognitive

A structurally similar sequence appeared in the authors' pilot study. To teach complaint-letter writing, one teacher had a generative AI produce a deliberately "poor" and a "good" version of the letter; students first identified the weaknesses of the poor version, then distilled the strengths of the good one, wrote their own letter, checked it with an AI grammar tool, and revised before submitting. The AI supplied contrasting models and formative feedback (vicarious and procedural scaffolding), but the analytic and compositional work — and the final judgement of quality — remained the students'. Offered here only as an illustration, the episode shows the framework's logic already emerging in practice.

The worked unit also makes the fade concrete, phase by phase. AI presence is highest in Phases 1 and 2, where it supplies the scenario and models the genre while the teacher stays in the background. It falls in Phase 3, where the teacher steps forward to orchestrate pair work and AI is demoted to a

draft to be criticised. By Phase 4 the teacher withdraws to the role of observer and AI is reduced to an intelligibility check, so that the performance is genuinely the students' own. In Phase 5 both step back and the learner takes over, judging their own work and their use of AI. Read down the table, teacher guidance and learner autonomy rise as AI scaffolding falls — the transfer of responsibility that defines genuine scaffolding.

5. Implementation Considerations

Adopting the framework reshapes the teacher's role from transmitter of language to designer of situated tasks and orchestrator of scaffolding. Teachers decide which scenarios matter, calibrate AI support to the ZPD, and, critically, manage the fading of that support so that responsibility passes to learners. This demands new competencies: familiarity with the target industry's discourse, the judgement to evaluate AI output for accuracy and appropriateness, and the pedagogical skill to turn a tool into a scaffold. Several risks require active management. Uncritical acceptance of AI output can entrench error and dependence; the framework counters this through collaborative critique and mandatory reflection. Authenticity can be compromised if AI-generated scenarios drift from real workplace practice; partnerships with industry and validation of materials by domain experts help preserve fidelity. Finally, equity of access to devices and tools must be considered so that AI integration does not widen existing gaps. None of these challenges is trivial, but each is addressable within the design principles set out above.

Experienced teachers already enact this boundary intuitively. In the authors' pilot study, several deliberately withheld AI from the most interpersonal or high-stakes tasks, reserving them for real human interaction and independent effort:

I don't use AI for speaking discussion — real interpersonal communication cannot be replaced; and I don't allow it in final-exam revision, to avoid giving students a false sense of security. [Teacher, general English, pilot study]

Such judgements exemplify the framework's central commitment: AI augments, and is faded from, learner-led practice rather than replacing the human interaction at the heart of situated ESP.

As a conceptual contribution, the framework awaits systematic empirical validation; the pilot excerpts cited above are illustrative rather than a formal test of it. Future research could implement the situated-learning cycle in vocational ESP classrooms and examine its effects on occupational language competence, learner autonomy, and the quality of situated participation, as well as document how teachers enact and adapt the scaffolding-fade principle in practice. Design-based research, in which the framework is iteratively refined through cycles of classroom implementation, would be especially well suited to this task.

6. Conclusion

AI tools are already changing vocational English classrooms, but what they are worth depends less on how advanced they are than on how teachers use them. This paper has argued that constructivism gives that use a solid footing in ESP, and it has offered a five-layer framework in which AI works as an adjustable scaffold, faded over time, inside authentic industry tasks. Taken together, the design principles,

the scaffolding typology, the Industry-Embedded Approach, and the situated-learning cycle move AI from a shortcut around learning to a support for it. The claim comes with a condition: AI helps vocational ESP most when it draws learners further into real occupational practice, not when it lets them skip past it. Testing that claim is the next job, both for researchers and for teachers willing to build scaffolds and then step away from them.

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