EuroCALL 2025: Advancing CALL: New research agendas
27-30 August 2025, Università Cattolica del Sacro Cuore, Milan, Italy
DOI: https://doi.org/10.4995/EuroCALL2025.2025.21190

Computer-assisted personalized instruction in Academic Medical English writing: A socio-material view

Carlotta Fiammenghi[a] and Sharon Hartle[b]

[a]Department of Foreign Languages and Literatures, University of Verona, carlotta.fiammenghi@univr.it and [b]Department of Foreign Languages and Literatures, University of Verona, sharon.hartle@univr.it

How to cite: Fiammenghi, C.; Hartle, S. (2025). Computer-assisted personalized instruction in Academic Medical English Writing: A socio-material view. In Y. Choubsaz, P. Díez-Arcón, A. Gimeno-Sanz, V. Morgana, A. C. Murphy & F. L. Seracini (Eds.), *Advancing CALL: New research agendas - EUROCALL 2025 Short Papers.* https://doi.org/10.4995/EuroCALL2025.2025.21190

Abstract

This paper explores the integration of computer-assisted, personalized instruction in the development of Academic Medical English, focusing on a technology-enhanced pedagogical model that combines corpus tools and retrospective reflection sessions. This multi-phase model draws on socio-material theory and involves the annotation of medical research drafts using Markin software, followed by synchronous Zoom-based feedback sessions between language instructors and medical researchers. These sessions incorporate digital tools such as the Oxford English Dictionary (OED) online and Sketch Engine for Language Learning (SkeLL), enabling learners to investigate authentic language use and revise texts collaboratively. Participants also critically reflected on their previous experiences with and assumptions about academic writing. Findings indicate that the interplay between human actors and technological artefacts fosters increased linguistic awareness, disciplinary rhetorical competence, and learner autonomy. Digital tools emerged not merely as resources but as epistemic partners in the co-construction of knowledge. This study demonstrates how digital technologies, when meaningfully embedded in reflective and collaborative learning environments, can significantly enhance ESP competence in high-stakes professional contexts such as medicine.

Keywords: *Computer-Assisted Language Learning; Academic Medical English; Data-Driven Learning; Socio-material pedagogy.*

1. Introduction

Academic writing in English remains a persistent challenge for both non-native and native speakers, who need to learn how to master its disciplinary conventions and stylistic expectations (Swales, 2004; Hartle & Cavalieri, 2024). This is no less true in the field of professional, academic medical writing; and as research output in medicine increasingly relies on publication in English-medium journals, language proficiency becomes inseparable from professional success. This study responds to that need by exploring computer-assisted language learning (CALL), corpus tools, and collaborative reflection, integrating those with a socio-material pedagogical approach to support academic medical writing.

The study presented in this paper is part of a larger collaboration between the Department of Foreign Languages and Literatures, the Department of Medicine, and the Health Innovation Factory at the University of Verona.

This collaboration ultimately aims at enhancing the medical researchers' competencies in Medical and Academic English, and adopts a multi-phase method grounded in CALL and Data-Driven Learning (DDL).

The multi-phase research protocol involves error annotation of medical research articles, structured retrospective reflection sessions between language instructors and medical researchers, and learner corpus compilation. For the present article, our primary focus lies in the retrospective reflection sessions, where linguists and medical researchers collaboratively engage with their annotated drafts using tools such as Markin, the Oxford English Dictionary (OED) online, and Sketch Engine for Language Learning (SkeLL). These sessions are investigated from the perspective of socio-material theory (Johri, 2011), as complex learning environments where knowledge is co-constructed through the interplay of human participants and material artefacts, and where learning emerges from the interaction between human actors and technological tools within a situated environment.

The choice of a socio-material framework to inform this study reflects the evolving nature of digital learning environments, where knowledge construction increasingly depends on dynamic interactions between human actors and technological artefacts, which take on their own agency (Orlikowski & Scott, 2008; Psaros, 2022) in our case the interactions, therefore, between medical professionals and digital resources in particular. Socio-material theory, as formulated by Johri (2011), views learning as an emergent process shaped by the entanglement of social, material, and spatial elements. This perspective is particularly pertinent to contemporary CALL environments, where tools such as corpus platforms and AI-assisted writing applications do more than merely support learning - they participate in it by mediating access to disciplinary knowledge, prompting reflection, and enabling autonomous decision-making.

Recent research in applied linguistics and digital pedagogy underscores this aspect of a growing *agency* of technological tools in shaping cognitive and epistemic processes. Increasingly, it is argued, for instance, that learning technologies should not be considered as neutral instruments but as active constituents in educational assemblages (Gourlay & Oliver, 2018; Tyrrell & Shalavin, 2022). Similarly, Macgilchrist and colleagues (2020) highligh the ways in which AI and algorithmic systems increasingly structure how learners engage with content, with implications for autonomy, identity, and assessment. Within this context, tools like SkeLL and the OED online are not simply reference resources; they become "epistemic partners" (Knox, 2020) that co-construct meaning alongside human users.

By adopting a socio-material framework, this study aims to explore the complexity of these interactions and to foreground the situated, distributed nature of language learning in digitally mediated environments. This framework places an emphasis on the ways in which medical researchers develop academic English competencies not in isolation, but through dialogic engagement with human facilitators and intelligent digital tools embedded in a shared, goal-oriented activity system.

2. Method

2.1. Context and participants

In the multi-phase protocol followed for this study, medical researchers first voluntarily provide drafts of their research papers; these are then annotated by language instructors using the Markin software (Version 4.3.1.1) focusing on genre-specific language issues without overtly correcting errors. Annotations target lexico-grammatical errors, stylistic inconsistencies, and rhetorical mismatches in line with academic medical English norms. Instances of effective language use are also highlighted, identified as appropriate usage of lexico-grammatical features at a C1 competence level. These annotated drafts are then handed to the medical researchers, who read and reflect on the comments and annotations provided. Usually 3-5 days after the researchers received their annotated papers, a Zoom session is scheduled and organized between the language instructor and the authors. The aim of these structured, retrospective reflection sessions is to elicit authors' thoughts, gain insight into their writing and learning processes, as well as to arrive at a final shared draft of their academic research paper. Revised drafts are then re-analysed, and the results are used to create an annotated learner corpus (Bell & Payant, 2020). As a future direction, we aim to create a parallel corpus using examples of

academic papers from top medical journals, chosen by the medical participants themselves based on their publication goals.

The present paper focuses specifically on the structured retrospective reflection sessions.

2.2. Structured restrospective reflection sessions

During these sessions, authors explored the nature of the annotated issues, articulated their understanding of the problems, asked for clarifications, and proposed potential revisions. Linguists facilitated these discussions but usually avoided prescribing solutions, instead encouraging self-discovery and peer reasoning. The sessions included systematic use of external reference tools (such as SkeLL and the OED online) to investigate authentic language use and confirm terminological appropriateness. Participants also discussed their use of AI-powered tools (e.g., ChatGPT, Grammarly), critically assessing their effectiveness and limitations in the context of domain-specific writing.

Detailed notes were taken by the facilitator during the meetings, focusing on what the learners said or asked about the instructor's annotations and remarks, and on how they engaged with the language learning tools which had been presented and provided to them. These notes were then coded using thematic analysis (Braun & Clarke, 2012), guided by Johri's (2011) concept of socio-material learning and principles of Data-Driven Learning. The coded scheme comprised five main dimensions; for more complex dimensions, corresponding sub-dimensions were also identified. Dimensions and sub-dimensions are summarized in Table 1. The thematic analysis was conducted through an iterative process of coding and theme refinement, moving back and forth between the data and emerging patterns until saturation was reached. In line with Braun and Clarke's (2012) guidelines, this involved initial open coding, the clustering of codes into candidate themes, and successive rounds of review and refinement to ensure that the themes were coherent, distinct, and well-grounded in the dataset. Each note from the sessions was repeatedly coded by one investigator for one or more dimensions. The codes were then reviewed by a second investigator to ensure consistency, and then analysed qualitatively. This framework enabled us to examine how the interplay between social actors and material artefacts contributed to language learning and epistemic development.

Table 1. The socio-material coding scheme.

Dimension	Sub-dimensions
Material elements	Interface
	Features
	Technical issues
Social aspects	Beliefs about language
	Prior experiences
Student agency vs. Tool affordances	-
Learning environment	-
Temporal aspects	How understanding develops

3. Results

Five different sessions were held and analyzed. Table 2 summarizes information pertaining to the sessions, namely the number of participants, the focus of the session, its place, and length.

Table 2. Sessions summary.

Participants	Focus of the session	Place	Duration
Language instructor Two authors	Research article	Zoom meeting	1 hour 15 minutes
Language instructor Two authors	Research grant proposal	Zoom meeting	1 hour
Language instructor One author	Research article	Zoom meeting	1 hour
Language instructor Two authors	Research article	Zoom meeting	1 hour 15 minutes
Language instructor Two authors	Research article	Zoom meeting	30 minutes

As shown in the Table, each session was attended by one language instructor and two authors, with the exception of a one-to-one session; each session was devoted to the analysis of one research article, with the exception of one session focusing on a grant research proposal. All authors were medical researchers, specialised in the fields of pancreatic surgery, gastric surgery, and paediatrics. All authors were native speakers of Italian. They each had the chance to read and familiarize themselves with the annotated version of their manuscript in the days before the meeting; most of them said that they found the annotations useful and that they had started to think of possible ways to revise their manuscript, although in two cases they explicitly stated that they needed help understanding some of the comments and annotations.

All meetings were held via Zoom, although whenever two authors were involved, they were together in the same room and they were using only one computer to talk to the language instructor. This allowed them to directly interact with each other and to collaboratively revise their paper, while at the same time interacting with the language instructor online. The average length of the sessions was 1 hour.

The three main themes which emerged from the thematic analysis of the notes taken by the language instructor during the sessions are here presented and discussed.

3.1. Material elements as epistemic partners

As stated in the Methods section, the instructor introduced authors to online resources and materials such as SkeLL and the OED online, both by linking them in the annotation phase, and by showing them on screen during the sessions. In all cases, the authors were unfamiliar with them, but interested in learning more about these tools' characteristics and affordances. In some cases, the authors spontaneously compared the use of these tools with other AI-powered software which they had been using, but which they found inadequate. From the session notes:

- "This [SkeLL] is very interesting, I did not know it. I sometimes use Ludwig to help me with my writing, but I don't expect you to know that, because the results are quite bad …"

Furthermore, these tools do not have explanatory power and appear not to be able to assist learners in their language acquisition process if used without explicit instructions. Again from the session notes:

- "Oh, I am happy you mentioned this "dangling participle" problem, because Grammarly is always signalling that but I have never been able to understand what it means …"

Interestingly, the same author subsequently recognized another dangling participle autonomously, which prompted a reflection into their own writing style: "I seem to be doing this quite a lot".

Indeed, whenever a language issue surfaced repeatedly in the same text, authors seemed to be able to evaluate it, and if necessary correct it, autonomously after having first explored it using SkeLL and the OED dictionary. More specifically, after reading the OED online definitions of the verbs "to enable" and "to allow", and after skimming the examples of the use of these verbs in context through SkeLL, the authors were then able to autonomously decide whether these verbs had been used appropriately in context in the remainder of the paper. Similarly, after reading the OED online definitions of the nouns "reduction", "decrease", and "decline" and after studying their word sketch to understand the objects they most commonly take, the authors were then able to autonomously decide whether they had been used appropriately in context in the remainder of their paper.

Thus, both the OED online and SkeLL appeared not to be merely tools but active participants in the learning process, as authors learnt to cross-reference annotations with corpus data, which informed decision-making and solidified understanding. This exemplifies how material tools, when embedded in meaningful discourse, support action and revision beyond surface correction, and also illustrates a shift from passive acceptance to critical engagement with digital tools, suggesting emergent learner autonomy.

3.2. Instructor-learner interaction

The linguists' role as facilitators was critical, because they posed guiding questions or pointed to corpus data rather than offering corrections. Thus, learners were allowed to reason through choices, and this scaffolding approach seemed to foster a reflective stance toward writing. In particular, passages marked as "vague" prompted longer discussions, which focused first on the reasons for this annotation, then on the importance of clarity in the passage, and finally on more effective rewordings, as in the following exchange (reconstructed based on the session notes):

- Author: "Why is "the introduction of new guidelines marked the beginning of the intervention" annotated as "vague" here?
  Instructor: "Because as it is mentioned in the introduction, it is not clear whether you are referring to existing new guidelines developed elsewhere, or to the desired outcomes of your own study."
  Author: "Oh, no no, it is important for us to make clear that we are talking about our innovative approach. Let's try and reformulate".

Whenever two authors attended the session, attempts at reformulations and rewordings occurred first among them and then involved the language instructor's expert opinion and assistance, in a process of co-construction where peer reflection was encouraged.

Instances of negotiation also happened, as the dialogic nature of the sessions allowed participants to articulate their uncertainties and sometimes defend their linguistic choices. This also made them more alert as to the meaning and register differences between General English and English for Specific Purposes. This happened, for example, during one session in which the verb "to demonstrate" was discussed twice with opposite results. In both cases, it had been marked as a hedging issue by the language instructor who explained, also with the help of examples from SkeLL, that it risked being criticized by prospective reviewers as a very strong and possibly unjustified statement. In the first instance, where the verb had been used in the introduction, the authors decided

to substitute it with the near-synonym "to evidence", while they defended their choice of using it in the discussion to state that their experiment had indeed demonstrated increased effectiveness.

Thus, negotiation also became a fundamental stage in the learning process (Cross 1977), and appeared to be facilitated by interaction, both with the language instructor and with material tools.

3.3. Emergent expertise and linguistic sensitivity

Participants increasingly displayed awareness of linguistic nuance and rhetorical appropriateness. They also became aware of their language learning process and spontaneously mentioned previous learning experiences. This happened particularly when asking the language instructor for grammar explanations, as in:

- "Oh, I have never learnt how to correctly use articles in English …"

At times, grammar explanations merged with reflections on genre and register appropriateness, as in the following exchange (reconstructed based on the session notes):

- Author: "Why is this passage annotated as "voice"? "The referral statistician suggested" …"
  Instructor: "Because passive instead of active voice is usually preferred in academic writing".
  Author: "So as not to draw too much attention on the person, and highlight the process instead?"
  Instructor: "Yes, that's right".

The instructor then proceeded to show to the author a sample of concordances of the word form "suggested" from the Directory of Open Access Journals – DOAJ English corpus (also available on Sketch Engine) to clarify this. The authors seemed particularly interested in the possibility to consult a corpus of published research articles as a controlled and representative database, noting that often they were unsure as to the appropriateness of the language used in the scientific articles they encountered, because "they may be written by non-native speakers of English, or by non-proficient language users, and it really depends on the standards of the journal you are reading".

4. Discussion

The findings underscore the importance of viewing academic language development as a socio-material practice. As Johri (2011) posits, learning is not merely situated in a social context but is co-constructed through engagement with artefacts, technologies, and human interlocutors. The reflection sessions described here exemplify how such an environment fosters linguistic awareness, genre knowledge, and critical tool use.

In this context, tools such as Markin, SkeLL, and the OED online did not serve as neutral or peripheral supports; rather, they emerged as *epistemic partners* – artefacts that participated actively in meaning-making and decision-making. Learners not only engaged with these tools to revise their texts but also began to interpret them critically, applying concordance evidence and dictionary data to justify language choices and negotiate disciplinary norms. This resonates with Orlikowski and Scott's (2008) account of sociomaterial entanglement, in which technologies are not separate from human action but constitutive of it.

This view is further supported by recent work in digital education that conceptualizes learning technologies as integral to complex assemblages. Gourlay and Oliver (2018) emphasize that digital tools participate in student engagement and agency as co-actors within sociomaterial networks. Similarly, Psaros (2022) argues that technologies should be seen as co-participants in the formation of learning practices, while Tyrrell and Shalavin, (2022) describe them as "lively actants" that shape epistemic experiences in digital environments. The shift observed in our participants – from passively relying on AI tools like Grammarly to actively interrogating language use via SkeLL – illustrates this very dynamic.

Furthermore, this reconceptualization of digital artefacts as actors in the learning process highlights how learners increasingly developed autonomy and rhetorical sensitivity. Their progression toward self-regulation and critical

reflection was not simply a result of instructor scaffolding but emerged through a situated engagement with both human and material elements. The interactions within the reflection sessions formed part of an evolving assemblage of practices, in which feedback, digital tools, disciplinary expectations, and collaborative dialogue coalesced into a complex but generative learning environment.

By framing CALL-based instruction within a socio-material perspective, this study contributes to a richer understanding of how domain-specific language learning – especially in high-stakes contexts like medicine – can be enhanced through thoughtfully integrated technological mediation. Rather than seeing tools as add-ons, they should be considered active constituents of the pedagogical space, capable of shaping not just performance but also epistemic development and disciplinary enculturation.

5. Conclusions

This study has shown that academic language development can be fruitfully understood as a socio-material practice, where technologies, human interlocutors, and disciplinary expectations coalesce into dynamic learning environments. The reflection sessions revealed that learners developed greater linguistic awareness, rhetorical sensitivity, and autonomy by engaging critically with digital tools. Rather than functioning as mere supports, artefacts such as concordancers and dictionaries acted as epistemic partners that shaped meaning-making and decision-making processes when used under the language instructor's expert supervision. This reconceptualisation underscores the value of treating technologies as active constituents of pedagogical practice, capable of influencing both linguistic performance and professional development.

Building on these insights, this study offers a replicable model for integrating socio-material learning into EAP instruction for disciplinary writers. By framing digital tools not as ancillary supports but as epistemic partners, the model demonstrates how technologies can be woven into pedagogical practices to foster autonomy, critical reflection, and disciplinary awareness. Expanding the annotated learner corpus and creating a parallel corpus, as planned, may further support independent learning and curriculum development. Future directions of the present research also include the recording of the sessions and their multi-modal annotation and analysis.

Future research could also investigate the longitudinal impacts of such integration, for example on learners' publication success, or test its adaptability across domains beyond medicine. In addition, given the increasing presence of AI in academic writing, future work should examine how emerging AI-based tools can be incorporated into socio-material frameworks, not simply as aids to efficiency, but as participants in meaning-making and rhetorical decision-making. Such inquiries may help ensure that AI is engaged critically and productively in disciplinary language development, thus contributing to evolving understandings of how human and non-human actors co-construct learning.

Acknowledgements

We would like to thank the HIF – Health Innovation Factory at the University of Verona for supporting the study.

References

Bell, P., & Payant, C. (2020). Designing learner corpora: Collection, transcription, and annotation. In N. Tracy-Ventura, & M. Paquot, (Eds.), *The Routledge handbook of second language acquisition and corpora* (pp. 53-67). Routledge.

Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), *APA Handbook of research methods in psychology, Vol. 2: Research designs: quantitative, qualitative, neuropsychological, and biological* (pp. 57-71). American Psychological Association.

Cross, J. C. (1977). Negotiation as a learning process. *Journal of Conflict Resolution*, *21*(4), 581–606. https://doi.org/10.1177/002200277702100403

Gourlay, L., & Oliver, M. (2018). *Student Engagement in the Digital University: Sociomaterial Assemblages.* Routledge. https://doi.org/10.4324/9781315647524

Hartle, S. & Cavalieri, S. (2024). Exploring pedagogical approaches in EAP teaching. In B. R. Morrison, C. MacDiarmid, A. Williams, & I. Haghi, (Eds.), *Proceedings of the 2021 BALEAP Conference* (pp. 209-216). Garnet Publishing.

Johri, A. (2011). The socio-materiality of learning practices and implications for the field of learning technology. *Research in Learning Technology*, *19*(3), 207-217. https://doi.org/10.3402/rlt.v19i3.17110

Macgilchrist, F., Allert, H., & Bruch, A. (2019). Students and society in the 2020s. Three future 'histories' of education and technology. *Learning, Media and Technology*, *45*(1), 76–89. https://doi.org/10.1080/17439884.2019.1656235

Psaros, H. (2022). *Learning, digital technologies, and sociomaterial approaches: A critical reflection from the perspective of materialist dialectics*. *Theory & Psychology, 32*(6), 827–847. https://doi.org/10.1177/09593543221129235

Orlikowski, W. J., & Scott, S. V. (2008). Sociomateriality: Challenging the separation of technology, work and organization. *The Academy of Management Annals, 2*(1), 433–474. https://doi.org/10.1080/19416520802211644

Swales, J. M. (2004). *Research genres: Explorations and applications*. Cambridge University Press.

Tyrrell, J., & Shalavin, C. (2022). A sociomaterial lens on crowdsourcing for learning. *Postdigital Science and Education* 4, 729–752. https://doi.org/10.1007/s42438-022-00313-4

