Buletinul Ştiinţific al Universităţii Politehnica Timişoara
Seria Limbi moderne

Scientific Bulletin of the Politehnica University of Timişoara
Transactions on Modern Languages

Vol. 24, Issue 1 / 2025

Reflective Voices in Specialized Translation: A TAP-Based Study of Student Strategies and AI Evaluation

Daniel DEJICA*, Patricia GRIGORAȘ**

Abstract: This study explores the cognitive strategies employed by Romanian student translators during technical translation tasks involving an iPhone 15 product description. Using Think-Aloud Protocols (TAPs), the research captures real-time decision-making and metacognitive awareness. TAP data, student reflections, and comparative evaluations of AI-generated translations reveal key challenges and problem-solving behaviors. The findings underscore the pedagogical value of TAPs in fostering strategic competence and reflect on the evolving role of human judgment in specialized translation domains. The study contributes to process-oriented research in translation studies and offers implications for translator training.

Keywords: Think-Aloud Protocols, technical translation, translation pedagogy, cognitive strategies, AI comparison, translator training

1. Introduction

In recent decades, translation studies have increasingly embraced process-oriented approaches that emphasize the cognitive dimensions of translation. This paradigm shift has inspired a growing interest in empirical methods capable of revealing the internal mechanisms that govern translators' decision-making. Among these, think-aloud protocols (TAPs) have become a widely adopted tool for accessing the translator's thought process in real time.

This study investigates how TAPs can be used to explore the cognitive behavior of student translators faced with technically challenging texts, with a focus on product specifications from the mobile technology sector. By analyzing students' verbalizations during translation tasks, supplemented by their performance and feedback, the research aims to identify recurring difficulties, cognitive strategies, and perceptions of translation quality and norms.

* Professor, PhD, Department of Communication and Foreign Languages, Faculty of Communication Sciences, *Politehnica* University of Timisoara, Romania. E-mail: daniel.dejica@upt.ro
** Doctoral student, Doctoral School of Humanities, West University of Timișoara, Romania. E-mail: patricia.grigoras@e-uvt.ro

BUPT

The case study was conducted within the Translation and Interpreting program at Babeș-Bolyai University in Cluj-Napoca, Romania, involving a cohort of BA-level students specializing in translation studies. These students were tasked with translating a technical description of the iPhone 15, a text chosen for its terminological density and cross-cultural complexity. The exercise provided fertile ground for examining both linguistic and conceptual challenges, while allowing researchers to observe how future translators reasoned through terminology, formatting, and audience adaptation. The TAP methodology was enriched by individual student reflections and comparative analyses of AI-generated translations, particularly those produced by ChatGPT, which served to deepen their metacognitive awareness and critical engagement with translation quality.

The article proceeds by presenting a theoretical overview of think-aloud protocols within the field of translation studies, highlighting their purpose, methodology, and the major findings of prior research. It then introduces the empirical case study, detailing the experimental task, participant profile, and the findings derived from student verbalizations. Finally, the article concludes with a discussion of the implications of TAPs for translator training, acknowledges the methodological limitations of the study, and offers suggestions for future research in process-oriented translation pedagogy.

Through this study, we aim to contribute to the growing body of cognitive translation research and provide actionable insights for enhancing translator education, especially in specialized technical domains.

2. Think-Aloud Protocols in Cognitive Translation Research

The study of translation as a cognitive activity has gained increasing prominence in recent decades, as scholars have sought to move beyond product-oriented approaches and explore the mental processes that shape translation decisions. Among the empirical methods developed for this purpose, Think-Aloud Protocols (TAPs) have emerged as a particularly effective tool for capturing real-time cognitive behavior. Originating in cognitive psychology, TAPs were formalized by Ericsson and Simon (1980, 1993), who argued that verbal reports could serve as valid data for understanding problem-solving mechanisms. In translation studies, TAPs involve asking translators to articulate their thoughts aloud while performing a task, thereby offering direct access to their reasoning, strategies, and decision-making processes.

TAPs have been widely used to investigate how translators handle ambiguity, negotiate terminology, and monitor their output. They have proven especially useful in distinguishing between novice and expert behavior, revealing how experience influences the degree of automatization and the types of strategies employed. Jakobsen (2002) demonstrated how TAPs expose micro-decisions and self-monitoring behaviors, while Kussmaul (1995), Kussmaul and Tirkkonen-Condit (1995) and Tirkkonen-Condit (2005) emphasized the cognitive load associated with translation tasks and the interplay between conscious control and intuitive processing.

BUPT

Toury (1995) advocated for descriptive, process-based data to better understand translation norms, reinforcing the value of TAPs in empirical research.

Methodologically, TAPs typically involve concurrent verbalization, with sessions recorded, transcribed, and analyzed using coding schemes that identify patterns such as hesitation, reformulation, lexical search, and metalinguistic commentary. These protocols are often complemented by retrospective interviews, keystroke logging, or screen recordings to triangulate findings. Despite their utility, TAPs are not without limitations. Critics have noted that not all cognitive processes are verbalizable, and that the act of speaking may interfere with the natural flow of translation. Individual differences in articulation and introspection also affect the richness and reliability of the data (Bernardini, 2002). This aligns with Cozma and Dejica's (2013) research, which provides a psychological approach to translator education and highlights the importance of understanding cognitive processes in training.

These limitations highlight the need to consider complementary cognitive frameworks, such as mental translation, which offers insight into the internalized and often intuitive processes that shape linguistic output. Recent studies by Dejica and Toma (2025) and Toma and Dejica (2023) explore how mental translation contributes to communicative language teaching and strategic competence, reinforcing the pedagogical value of introspective methods like TAPs. Their findings suggest that mental translation can enhance metacognitive awareness and support the development of self-monitoring behaviors—key traits observed in TAP-based research.

In Romania, TAP-based research is still emerging but shows promising developments. Gheorghiță (2012) conducted a pilot study that explored the methodological challenges of TAPs and their pedagogical potential in translator training. Her work emphasized the importance of minimizing social interaction during TAP sessions to preserve data integrity and highlighted the role of individual variation in shaping verbalization outcomes. This study aligns with broader international trends that advocate for process-oriented approaches in translator education.

Globally, TAPs have been applied across diverse linguistic and cultural contexts. Xiao (2025) reviewed 27 studies in China that used TAPs to investigate translation strategies, cognitive load, and post-editing behavior, often in combination with eye-tracking and keystroke logging. Rahemtulla (2019) conducted a TAP-based study in Ukraine focused on strategic competence among translation students, offering detailed insights into how verbal data can be used to assess cognitive behavior and pedagogical outcomes.

Importantly, TAPs have also been used to investigate specialized domains of translation, including legal, medical, and technical texts. Technical translation, in particular, presents unique cognitive challenges due to its reliance on domain-specific terminology, functional clarity, and formatting conventions. Dejica (2016, 2020) has emphasized that technical texts require translators to possess not only linguistic competence but also a deep understanding of subject-matter conventions and

BUPT

communicative intent, as major genre characteristics which differentiate technical genres from other genres used in different types of specialized translation. More recently, together with Grigoraș (Grigoraș and Dejica, 2025), the authors explored how specialized translation tasks can be integrated into translator training programs, highlighting the importance of exposing students to authentic materials and fostering strategic competence.

Taken together, these studies confirm that TAPs are not only methodologically viable but also pedagogically transformative. They offer a unique lens through which to observe the invisible workings of the translator's mind and provide actionable insights for both researchers and educators. As translation studies continue to evolve, TAPs will likely play an increasingly central role in bridging theory and practice, especially in contexts where cognitive transparency and reflective learning are prioritized.

3. Case Study: Cognitive Behavior in Technical Translation Tasks

This case study was conducted within the Translation and Interpreting program at Babeș-Bolyai University in Cluj-Napoca, Romania, as part of a workshop designed to explore how student translators engage cognitively with technical texts. The study focused on the translation of a product description for the iPhone 15, chosen for its terminological complexity and relevance to contemporary consumer technology. The primary aim was to investigate how students negotiate linguistic ambiguity, formatting constraints, and culturally embedded concepts, using Think-Aloud Protocols (TAPs) to capture their real-time reasoning.

A cohort of twenty third-year undergraduate students participated in the experiment. Most had limited prior experience with technical translation, making them an ideal group for observing how novice translators approach specialized tasks. Before the TAP sessions, students received a methodological briefing and were shown examples of effective verbalization strategies. The translation task was completed in a classroom setting designed to minimize external interference, ensuring the authenticity of the cognitive data collected.

The think-aloud sessions were organized around four teams, each comprising five third-year undergraduate students from Babeș-Bolyai University. Each team participated in one TAP session, resulting in four recordings captured collaboratively on computers by team members. Students translated a product description of the iPhone 15 into Romanian while verbalizing their thoughts aloud in a semi-structured group format that allowed for both individual spontaneity and collective reasoning. The recordings were manually transcribed and analyzed using a thematic coding scheme to identify cognitive patterns such as terminological negotiation, structural adaptation, and strategic revision. This data was complemented by written reflections, peer feedback, and comparative evaluations of ChatGPT-generated translations, offering a triangulated and pedagogically rich perspective on student cognition during technical translation tasks.

BUPT

Analysis of the TAPs revealed several recurring patterns. Students frequently paused when encountering unfamiliar or ambiguous terms, such as “baseband,” “cinematic mode,” and “year introduced,” often verbalizing confusion and engaging in spontaneous research. One student remarked, “I think this refers to the launch date… but ‘anul introducerii’ sounds awkward in Romanian,” illustrating the cognitive negotiation required when source-language logic does not map neatly onto the target language.

Self-monitoring and revision behavior were also prominent. Students regularly questioned their own choices, reformulated sentences mid-translation, and reflected on the naturalness of their output. These behaviors align with findings from Jakobsen (2002) and Tirkkonen-Condit (2005), who emphasized the role of metacognitive awareness in translation competence. In several cases, students verbalized their intent to revisit problematic segments later, indicating a strategic approach to managing cognitive load.

Formatting and structural challenges posed additional difficulties. Students struggled to preserve footnotes, layout fidelity, and data tables, often verbalizing uncertainty about how to adapt these elements in the target language. These observations underscore the importance of technical literacy in translation training and suggest that TAPs can help identify specific pedagogical gaps.

A particularly insightful dimension of the study emerged from students' engagement with ChatGPT-generated translations. Many expressed concern over the literalism and structural inconsistency of AI-generated translations. Comments such as “ChatGPT translated word-for-word without considering context” and “Some terms were left untranslated or used unnaturally” point to an emerging critical competence among the students. The comparative exercise highlighted not only the limitations of automated translation tools but also the cognitive advantages of human intervention, including contextual reasoning and semantic adaptation.

The integration of TAPs with AI critique reinforced the pedagogical value of reflective practice. Students were prompted to articulate quality benchmarks, question normative assumptions, and develop a more conscious approach to translation ethics and audience needs. These outcomes resonate with current trends in cognitive translation pedagogy that emphasize strategic reasoning and self-awareness (Rahemtulla, 2019; Xiao, 2025). They also build on Dejica’s (2016) and Grigoraș & Dejica’s (2025) findings regarding the importance of authentic technical materials in translator education.

In conclusion, the case study conducted at Babeș-Bolyai University affirms the utility of TAPs as both a research method and a formative educational tool. The observations point to a high level of cognitive engagement among student translators and underscore the role of TAPs in cultivating professional competencies grounded in reflective analysis, strategic adaptation, and contextual sensitivity.

4. Conclusion

This study set out to investigate the cognitive behavior of student translators when faced with technically demanding texts, using Think-Aloud Protocols (TAPs) as a

BUPT

central methodological tool. Conducted within the Translation and Interpreting program at Babeș-Bolyai University in Cluj-Napoca, Romania, the research involved twenty third-year students translating a product description for the iPhone 15. Through the collection and analysis of TAP data, supplemented by reflective feedback and comparative engagement with AI-generated translations, the study offered valuable insights into how novice translators approach complexity, ambiguity, and translation ethics in real time.

The findings affirm the efficacy of TAPs in capturing cognitive phenomena that traditional product-based assessments tend to overlook. Students demonstrated an active engagement with terminology, strategic revision behavior, metacognitive awareness, and contextual negotiation. Verbalizations revealed how linguistic decisions are shaped by a translator's perception of audience, norms, and the limitations of both their own competence and the tools at their disposal. Notably, the juxtaposition of human TAPs with ChatGPT-generated translations enriched the pedagogical value of the study, prompting students to critically articulate quality criteria and recognize where human insight outperforms algorithmic logic.

However, the study presents certain limitations. The sample size, while reasonable for a classroom-based study, restricts generalizability, and the focus on a single source text may not capture the full spectrum of cognitive behavior across genres. The TAP data, although rich, are shaped by the students' varying ability to articulate their thoughts, and some cognitive processes likely remained unspoken. Additionally, while the integration of AI critique deepened student reflection, further triangulation with objective measures such as keystroke logging or eye-tracking could enhance data validity in future iterations.

These limitations open the door to a range of future research possibilities. Expanding TAP studies to include more diverse student profiles, source text genres, and multilingual contexts would help build a more comprehensive model of translation cognition. Combining TAPs with multi-modal process tracking techniques could also yield deeper insights into subconscious decision-making and intuitive translation behavior. Finally, exploring how TAPs function in hybrid translation environments—where human and AI agents collaborate—would further illuminate the evolving landscape of translation competence and professional readiness.

In sum, this study underscores the value of TAPs not only as a tool for cognitive inquiry but also as a formative practice in translator training. By making the invisible visible, TAPs empower students to reflect, revise, and ultimately translate with greater precision and awareness. As translation pedagogy continues to evolve, integrating such methodologies will be essential to preparing future translators for increasingly complex and digitized communication landscapes—where human expertise and artificial intelligence are not in competition, but in collaboration. Building translator resilience, ethical sensitivity, and strategic decision-making will be key as new hybrid workflows emerge, blending intuitive human reasoning with the computational advantages of AI-assisted tools.

BUPT

References

1. Bernardini, S. 2002. 'Think-aloud protocols in translation research: Achievements, limits, future prospects' in *Target*, 13(2), pp. 241–263.
2. Cozma, M. & Dejica, D. 2013. 'A psychological approach to professional translator education' in *Procedia – Social and Behavioral Sciences*, Volume 84, pp. 895–899.
3. Dejica, D. 2016. 'A Standards-Based Contrastive Analysis of Online and Printed Technical Translations in Romanian'. In Dejica, D., G. Hansen, P. Sandrini, I. Para (eds.) *Language in the Digital Era. Challenges and Perspectives*. De Gruyter Open: Warsaw/Berlin, pp. 14-28.
4. Dejica, D. 2020. 'Understanding Technical and Scientific Translation: A Genre-based Approach' in *Scientific Bulletin of the Politehnica University of Timişoara, Transactions on Modern Languages*, Vol. 19, No. 1-2 / 2020, Timișoara: Editura Politehnica, pp. 56-66.
5. Dejica, D. & A. Toma. 2025. 'Exploring the Impact of Mental Translation on Communicative Language Teaching and Learning in Romanian Schools', in *Swedish Journal of Romanian Studies*, vol 8, nr. 1 / 2025, pp. 103-109.
6. Ericsson, K. A. & H. A. Simon. 1980. 'Verbal reports as data' in Psychological Review, 87(3), pp. 215–251.
7. Ericsson, K. A. & H. A. Simon. 1993. Protocol Analysis: Verbal Reports as Data (Rev. ed.). Cambridge, MA: MIT Press.
8. Gheorghiță, E. 2012. 'Using think-aloud protocols to investigate the translation process: Methodological aspects' in *Review of the Air Force Academy - Critical Dialogue Revisited: Challenges and Opportunities*, Vol. XI, No. 3(22), pp. 15-22.
9. Grigoraș, P. & D. Dejica. 2025. 'Bridging Knowledge and Practice: Pedagogical Strategies and Research Directions for Technical Translation in the Digital Age' in *Studii de Ştiinţă şi Cultură*, 3/2025 (in print).
10. Kussmaul, P. 1995. Training the Translator. Amsterdam: John Benjamins.
11. Kussmaul, P. & S. Tirkkonen-Condit. 1995. 'Think-aloud protocol analysis in translation studies' in TTR: Traduction, Terminologie, Rédaction, 8(1), pp. 177–199. https://doi.org/10.7202/037201ar
12. Lykke Jakobsen, A. 2002. 'Translation drafting by professional translators and by translation students' in Copenhagen Studies in Language, (27), pp. 191-204.
13. Rahemtulla, D. 2019. 'The think-aloud method in studying the translation process' in Foreign Languages, 2, pp. 26–38.
14. Tirkkonen-Condit, S. 2005. 'The monitor model revisited: Evidence from process research'. In Lee-Jahnke, H. (ed.) Processus et cheminements en traduction et interprétation. Special issue of Meta. Journal des Traducteurs, Translators' Journal, 50(2), pp. 405–414.
15. Toma, A. & D. Dejica. 2023. 'Mental Translation and its Contribution to Communicative Language Teaching and Learning' in *Professional Communication and Translation Studies,* 16 / 2023, Timisoara: Editura Politehnica, pp. 120-126.
16. Toury, G. 1995. Descriptive Translation Studies and Beyond. Amsterdam: John Benjamins.
17. Xiao, H. 2025. 'Application of the think-aloud protocols in translation studies: Experience, problems and prospects' in ISPCE Bulletin, Vol. 1, Issue 1, pp. 1–14.

BUPT