

INVESTIGATING THE METACOGNITIVE STRATEGIES DURING POST-EDITING TRANSLATION PROCESS: AN APPLICATION OF THINK-ALoud PROTOCOLS (TAP)

Dwi Indarti

Faculty of Communication and Language, Bina Sarana Informatika University, Indonesia

Corresponding Author Email: dwi.diw@bsi.ac.id

Article Info

Article History

Received: December 2023

Revised: February 2024

Published: April 2024

Keywords

Metacognitive strategies;

Post-editing;

Think-aloud protocols;

Abstract

Metacognition, the reflection on thinking processes, plays a crucial role in cognitive activities. This study delves into metacognitive strategies employed during post-editing in the translation process, particularly focusing on English-Indonesian translation through the application of think-aloud protocols (TAP). The investigation encompasses planning, monitoring, and evaluation as interconnected phases of metacognitive strategies. A qualitative case study method is employed, with a university student as the participant. Data analysis involves coding and categorizing using a thematic analysis approach, based on the metacognitive strategies framework. The findings show that the participant employs the components of planning such as evaluate the necessity of post-editing, applied knowledge on the specific post-editing cases, and identified the goal and the necessity for having specific post-editing, the components of monitoring such as using facts and instruction learned previously, making changes for a better translation product, and self-monitoring of progress, and elements of evaluating, such as deep level revising to produce better post-editing, and taking action to collect extra information. Pedagogical implications highlight the potential for enhancing learning experiences and improving translation skills through explicit instruction, modeling and systemic strategy training. The study concludes by emphasizing the importance of metacognitive flexibility, cultural influences, and adaptive strategic behavior in post-editing, shaping a roadmap for learners to navigate challenges and continually refine their approach.

How to cite: Indarti, D. (2024). Investigating the Metacognitive Strategies During Post-Editing Translation Process: An Application of Think-Aloud Protocols (TAP). *JOLLT Journal of Languages and Language Teaching*. 12(2), pp. 765-778. DOI: [https://doi.org/ 10.33394/jollt.v%vi%i.10297](https://doi.org/10.33394/jollt.v%vi%i.10297)

INTRODUCTION

Metacognition involves reflecting on your own thinking processes, by which “meta” denotes beyond and “cognition” refers to thinking. According to Oz (2005), metacognition is viewed as a complex process involving understanding the domain of cognition and its regulation, which encompasses mental activities related to thinking, knowing, and remembering. Hamiddin & Saukah (2020) describe three categories of metacognition, namely person, task, and strategy. The person category refers to one’s beliefs about intra-individual, inter-individual, and universal aspects. In the task category, learners develop an awareness of the specific tasks’ characteristics and how to manage and comprehend it. This category is further classified based on task purpose, task type, and task demands. The strategy category involves learners’ awareness of applying metacognitive strategies while engaging in a task. Metacognitive strategies are considered as advanced executive skills that involve understanding cognitive processes and aim to self-regulate learning through planning, monitoring and evaluating. It requires cognitive effort, encompassing both understanding and

control cognitive functions (Muhid, et al., 2020). Hu, et al., (2020) coin the term ‘metacognition’ as ‘cognition about ‘cognitive phenomena’ or ‘knowledge about knowing’.

Yilmaz & Baydas (2017) explain that metacognitive strategies encompass techniques that empower students to articulate the mental activities employed in the learning process, assess their distinctive thinking processes or learning strategies, and enable them to identify arrangements that enhance the quality of their learning based on these assessments. These strategies can be categorized into three main phases: planning, monitoring, and evaluation. Planning strategies involve selecting suitable methods, determining effective thinking approaches, and deciding on resource allocation. Monitoring strategies entail being aware of task comprehension, verifying task information for comprehension validation, prioritizing ideas for attention, and filtering out informational ambiguities. Lastly, evaluation strategies encompass scrutinizing and rectifying one’s cognitive process, assessing reasoning, goals, and conclusions, and making necessary revisions.

In the field of translation studies, there has been a growing attention on the significance of metacognition. Translation involves various complex cognitive-sub processes, including reading, text comprehension, semantic transfer, and writing in the target language, in which proficient performance relies on advanced levels of metacognition (Shreve, 2009). Research on translation emphasizes on investigating the translation process to reveal the “behind the scene” of translation. Aripin & Rahmat (2019) investigate the metacognitive writing approaches employed by students enrolled in an English course, particularly the Integrated Language Skill (writing) program. Three students, categorized by gender, were selected from a public university in Johor, Malaysia. By employing a qualitative approach, this study uses the Think Aloud Protocol (TAP) as the primary method for data collection. The findings indicated that both male and female English as Second Language (ESL) writers utilized a range of metacognitive writing strategies during their writing processes. The female writer employed a greater variety of strategies compared to the male. The results of this study have valuable implications for the teaching and learning of ESL academic writing. Huang & Zhang (2022) conduct an empirical study to investigate changes in L2 writer’s perceived use of metacognitive strategies after undergoing process-genre writing instruction. The study took place in two intact College English classes at a university in China, involving 72 first-year undergraduate students. The study utilized a Likert-scale questionnaire to assess changes in students conceptualized metacognitive strategies. Think-aloud protocols were also employed to gain a comprehensive understanding of students’ application of metacognitive strategies and genre knowledge in writing tasks. A detailed analysis of think-aloud protocols revealed that participants incorporated acquired metacognitive strategies and genre knowledge in completing writing tasks. Students’ metacognitive monitoring shifted from surface-level lexical and grammar regulation to discourse-level text control. Meanwhile, Jincheng & Rahmat (2022) examine and compare the metacognitive strategy application of a high-achieving reader and a low-achieving reader. The selection of these two EFL readers was purposeful, aligning with specific criteria derived from scores on a university English Test for EFL learners. Both participants were assigned a reading comprehension exercise as part of the test, and simultaneously, they engage in the think-aloud protocol (TAP) by verbalizing their thoughts while working through the tasks. The results indicate that the high achiever employs a more global approach to reading comprehension strategies, while the achiever tends to concentrate on minute details.

Think-aloud is a voluntary practice where learners, given a specific task, express their thoughts verbally as they navigate through the task. A think-aloud protocol refers to the recording or documentation of this verbal reporting, captured in real-time. This method has proven valuable in providing insights into the short-term activities within the learner’s working memory (Cowan, 2019).

Furthermore, Cowan (2019) argues that think-aloud protocol serves a purpose in offering understandings, like assessing if a learner engaged in problem-solving is aligning the current problem's pattern with previous solutions or is employing sequential reasoning. It can also pinpoint elements of the learning experience that evoke strong emotions. It is significant to differentiate the concurrent think-aloud process from retrospective verbalization, commonly known as talk-aloud protocols, where the individual talks about the cognitive process after the event.

Think-aloud protocols have been used and implemented in translation research, such as Handayani (2019) who conducts a study to uncover the strategies, methods, and procedures employed by EFL students in translating prepositions, such as *in*, *on*, and *at*. The research applies both quantitative and qualitative approaches; with think-aloud protocol data collection techniques being employed to identify students' strategies, methods and procedures in translating prepositions. The analysis examines transcriptions and translations from three students. The results reveal that students employ a variety of strategies, methods, and procedures in tackling this translation task. Mei & Chen (2022) explore the viability of obtaining diagnostic insights into students' translation proficiency by merging China's Standards of English (CSE) with cognitive diagnostic assessment (CDA) approaches. Within the descriptive parameters set by CSE translation scales, an attribute pool was formulated, leading to the identification of seven attributes through students and experts' think-aloud protocols. After assessing the diagnostic performance of four commonly used cognitive diagnostic models (CDMs), the linear logistic model (LLM) emerged as the optimal choice for generating detailed information about students' strengths and weaknesses in translation.

Significant achievements have been made by machine translation (MT) technology; however, the quality of MT output still does not match the human translation (HT). Therefore, the outputs of MT should undergo post-editing by human translators, a process known as post editing machine translation (PEMT). Post-editing refers to a process aimed at editing, modifying, and correcting texts that have been translated by the MT system (Li & Lu, 2021). The post-editing machine translation (PEMT) process seeks to achieve the specified qualities of the target texts by analyzing errors found in MT outputs. PEMT is oriented towards achieving "Accurate, faithful, grammatical, idiomatic, and informative texts" by addressing various errors, including linguistic, referential, stylistic, syntactical, terminological and typological errors" (Harto, et al., 2022, p. 697). Post-editing involves refining machine translation (MT) results, including cleaning up the initial output, fixing mistakes, revising and re-translating, making adjustments to texts that have undergone MT translation process. Following the completion, the MT process and the assessment of its results, the next step involves post-editing. In this phase, a human translator is essential to guarantee that the source and target texts communicate similar information and the translation tone aligns with the tone of the original document (Adawiyah, et al., 2013). The growing adoption of Machine Translation Post Editing (MTPE) in the Language Service Provider (LSP) field can be attributed to the benefits it brings to the translation production process. These advantages manifest in terms of both processing speed and the quality of the output. While productivity may not show significant differences, it has been noted that the end result achieved through MTPE can often surpass that of human translation, enhancing the overall quality (Latorraca, 2023).

Scholars have conducted plethora studies of MTPE, such as Harto, et al. (2022) who delve into the experiences of students as they engage with Post-Editing of Machine Translation (PEMT) in a Theoretical Foundation of Translating and Interpreting (TFTI) course. The study provides practical insights into how students initiate their translation practices through PEMT in their daily activities. The qualitative case study involved fifty-eight English students from an undergraduate program at a public university in Indonesia. Data collection methods included focused-group

discussions, survey questionnaires, in-depth interviews, and analysis of students' documents, all scrutinized through thematic analysis. The findings revealed that the post-editing process equips students with valuable experiences in enhancing their text knowledge, fostering awareness and critical thinking to academic texts. Furthermore, the exploration of students' experiences in PEMT practices involved the application of translation methods and techniques, aiming to cultivate their awareness of language structure and function. These insights offer empirical inputs for lecturers to design relevant tasks and incorporate diverse translating practices, contributing to a more meaningful learning experience for students. Latorraca (2023) writes an exploratory paper focusing on understanding translation trainees' perspectives on their translation versus post-editing performance. The study aims to reveal their attitudes towards MTPE and their confidence in undertaking MTPE tasks. The finding indicates that, despite having confidence in traditional translation due to the extensive training, the absence of specific and dedicated MTPE training not only impacted trainees' task execution but also burdened their ability to critically analyze and self-evaluate their performance. Meanwhile, Briva-Inglesias, et al. (2023) outlines a user study involving 15 professional translators working with English-Spanish translation. The focus is on introducing the concept of Machine Translation User Experience (MTUX) and comparing the impacts of traditional post-editing (TPE) and interactive post-editing (IPE) on MTUX, translation quality and productivity. The findings indicate a preference among translators for IPE over TPE. Moreover, productivity results suggest that IPE could be a compelling alternative to TPE, as translators worked more efficiently in IPE, even with no prior experience in this post-editing modality, while already being used to TPE.

In the complex realm of translation studies, the research of cognitive and meta-cognitive activities during the post-editing translation process is viewed as an interesting subject for investigation. Despite the growing body of research on metacognitive strategies in writing, there exists a notable research gap in metacognitive strategies during the post-editing translation process. Given the context provided above, the writer investigates and analyzes the metacognitive strategies during post-editing of English – Indonesian translation process by applying think-aloud protocols (TAP) method. In particular, this study aims to answer the following questions:

1. What are the metacognitive strategies employed during the post-editing translation process?
2. What are the pedagogical implications of metacognition strategies during post-editing translation process?

This study offers the novelty to the translation studies field by focusing on the often-overlooked area of metacognitive strategies during the post-editing translation process. Moreover, this study addresses the research gap in metacognitive strategies in the context of post-editing translation, adding valuable insights to the existing body of literature. Lastly, the application of the think-aloud protocols (TAP) method in studying metacognitive processes during post-editing adds a novel methodological approach to the research in translation studies.

RESEARCH METHOD

Research Design

This study uses a qualitative case study method to explore cognitive and metacognitive strategies of post-editing translation processes. Qualitative research aims to delve into and understand the beliefs of individuals or groups regarding social or human matters. This approach is employed to uncover the causes and various ways of social phenomena's occurrence (Cresswell & Cresswell, 2018). To select the participants, this research employs purposive sampling techniques, which are frequently used in qualitative research. This technique stands out as the practical and

effective strategy for identifying and choosing participants, especially in situations of limited resources (Patton, 2015).

Research Participant

The participants in this study were undergraduate students enrolled at Bina Sarana Informatika University, Jakarta, specializing in English letters. Specifically, the study focused on students in their fifth semester who were currently undertaking a translation course as part of their curriculum. The translation subject was integrated into their ongoing semester's coursework, providing the context for conducting the post-editing tasks as part of their class activities. The post-editing tasks were administered within the framework of the English-Indonesian translation course, which was facilitated by the author serving as the lecturer for the said course. As the instructor, the author played a pivotal role in overseeing and guiding students through the post-editing exercises, ensuring adherence to established methodologies and standards within the translation domain. By leveraging the classroom setting of the translation course, the study afforded an opportunity to observe students' post-editing performance in a naturalistic learning environment. This contextualized approach not only facilitated the collection of relevant data but also allowed for the exploration of students' translation competencies within the authentic educational setting. As such, the integration of post-editing tasks into the course curriculum served as a valuable means of assessing and refining students' translation skills while providing practical insights into the pedagogical implications of post-editing in translator training programs.

Instrument

Data for this study consisted of audio-visual recordings capturing think-aloud protocol activities during post-editing tasks of English to Indonesian Google translation products, recorded by using a video-communication service, Zoom. The participant was given instructions and directions before completing the assignments, as follows: (1) The assignment involves the post-editing Google Translate output for an English-Indonesian. The text is the English children fairy tale story, namely *The Three Little Pigs*. (2) Both source text and its GT output are provided by the author and shared in Google document files. (3) Prior to starting the task, the participants are allowed to open online dictionaries, thesauruses, Google Translate, and any other relevant sources in new tabs. (4) The participant should complete the post-editing within the designated column in not more than 30 minutes. (5) The participant was asked to share their thoughts, opinions, decisions, likes and dislikes verbally throughout the entire task, maintaining a continuous stream of verbalization from the start to the finish. The study employs the Think-aloud Protocol (TAP) as its primary instrument. The purpose of incorporating TAP is to urge the participants to express their thoughts and reflections throughout the post-editing process. The audio-visual recordings and its transcriptions follow document approaches for think-aloud activities during the post-editing task, translating from English to Indonesian using Google Translate

Data analysis

The data analysis in this study adopts a systematic approach, utilizing coding and categorization techniques within the framework of thematic analysis. Drawing from the theoretical framework established by Aripin & Rahmat (2019), the study focuses on the components of metacognitive strategies to guide the analytical process. The analysis unfolds through a series of four distinct steps. Initially, the process commences with observation, wherein the researchers review the recorded data to assess its suitability for the study's objectives. During this preliminary review,

attention is directed towards identifying instances where cognitive and metacognitive processes intersect within the discourse. Subsequently, the identification phase ensues, wherein metacognitive strategies are discerned and isolated from the observed data. This step involves a meticulous examination of the recorded material to pinpoint specific instances where metacognitive processes manifest. Following identification, the classification stage comes into play, wherein the identified metacognitive strategies are systematically categorized. This categorization process involves sorting the observed metacognitive behaviors into distinct classifications, with a particular focus on delineating between planning, monitoring, and evaluation strategies. By adhering to these structured analytical steps, the study endeavors to unravel the intricacies of metacognitive engagement within the context of language learning. Through the application of thematic analysis and the theoretical lens provided by Aripin & Rahmat (2019), the research aims to illuminate the role of metacognitive strategies in shaping language acquisition processes. Such insights hold promise for informing pedagogical practices aimed at fostering metacognitive awareness and enhancing language learning outcomes.

RESULT FINDINGS AND DISCUSSIONS

Research Findings

In this section, the results are divided into two main sections corresponding to the research questions stated in introduction section

RQ 1: What are metacognitive strategies employed during the post-editing translation process

Table 1
Metacognitive Strategies

Strategies	Components of strategies
Planning	<ol style="list-style-type: none"> 1. Evaluate the necessity of post-editing 2. Applied knowledge on the specific post-editing cases 3. Identified the goal and the necessity for having specific post-editing
Monitoring	<ol style="list-style-type: none"> 1. Using facts and instruction learned previously 2. Making changes for a better translation product 3. Self-monitoring of progress
Evaluating	<ol style="list-style-type: none"> 1. Deep level revising to produce better post-editing 2. Taking action to collect extra information

Planning

Planning, as a metacognitive strategy, refers to the ability to create a systemic and organized approach to a task or a problem. In the context of metacognition, which involves thinking about one's thinking processes, planning is higher-order cognitive skill that individuals use to set goals, outline steps, and allocate to achieve an outcome (Zhang, et al., 2022). In this initial stage, the student prepares and organizes themselves before starting the post-editing process. This study finds several components of planning strategies, such as evaluate the necessity of post-editing, apply knowledge on the specific post-editing cases, and identify the goal and the necessity for having specific post-editing.

Evaluate the necessity of post-editing

Post-editing is the process of reviewing and refining machine-generated content produced by automated systems, such as machine translation or text generation models. Evaluating the necessity

of post-editing is essential to optimize the performance of language processing systems and enhance the quality of output. This could be inferred from the following excerpt:

Excerpt 1.

[00:28 – 00:40] – *Sebenarnya*, supposed to be *untuk si sow-nya ini adalah tidak diartikan secara literary ya ... (Actually, supposed to be for the word sow is not interpreted literary...)*

From excerpt 1 we can infer that the participant evaluates the necessity of post-editing. The participant realizes that the sentence is indicating that the word ‘Sow’ should be understood in a non-literal sense, and there might have been confusion or misconceptions about its intended meaning.

Applied knowledge in the specific post-editing

Excerpt 2

[00:40 – 00:51] ... *karena sow ini dia ditulisnya dalam huruf besar, jadi it should be a name and should not be translated into this one, penabur (... since sow is written in uppercase, so it should be a name and should not be translated into this one, penabur)*

In the field of post-editing, particularly in the context of language or translation editing, the application of knowledge goes beyond literal interpretations. The sentence suggests that in the process of post-editing, there may have been an expectation or intention associated with the term “sow”, but this expectation is not to be taken literary. The participant as a post-editor need to possess a comprehensive understanding of the context, cultural connotations, and idiomatic expressions in order to accurately and effectively edit content. Applied knowledge in post-editing involves not only linguistic proficiency, but also a nuanced grasp of the intended meanings, cultural subtleties and contextual implications. The participant goes beyond a surface-level interpretation and consider the broader context to ensure that the edited content is not only grammatically correct but also contextually appropriate and accurately conveys the intended message.

Identified the goal and the necessity for having specific post editing

Excerpt 3

[00:51 – 01:01] *Jadi saya memilih untuk untuk once upon a time itu adalah kayak ‘pada suatu hari’, sebenarnya sih sama saja dengan pada suatu ketika, tapi lebih mudah dibacanya dari sisi orang-orang Indonesia ya, jadi saya pilihnya sebagai pada suatu hari (So, I choose to translate ‘once upon a time’ into pada suatu hari (on a certain day). Actually, it is the same as pada suatu ketika (at a certain time), but it is easier to read from the perspective of Indonesians, so I choose it as pada suatu hari (on a certain day)*

The identified goal appears to be achieving a culturally and linguistically appropriate translation or adaptation. The necessity for specific post-editing arises from the recognition that a straightforward word-for-word translation might not capture the nuances or readability required for the target reader. The choice of “once upon a time” and the explanation regarding its adaptation into “*pada suatu hari*” illustrate the meticulous of post-editing process. It’s not just about literal translation but about making thoughtful linguistic choices that resonate with the cultural and linguistic sensibilities of the audience.

Monitoring

In the context of post-editing, monitoring is a metacognitive strategy that involves being aware of and regulating one’s own cognitive processes while reviewing and revising written content.

Monitoring plays a crucial role in the post-editing phase of writing, specifically in the context of language translation and post-editing (Guner & Erbay, 2021). In this stage, the participant engages in self-awareness and self-regulation to assess his understanding and progress in post-editing process. The monitoring stage is an ongoing and dynamic process where the participant actively regulates and adjusts his cognitive processes based on his self-assessment. This study indicates the components of monitoring strategy, such as using facts and instruction learned previously, making changes for a better translation product, and self-monitoring progress.

Using facts and instruction learned previously

Excerpt 4

[01:12 – 01:24] ... tapi selama ini yang saya diajarkan mungkin agak sedikit literal terkait dengan *there was a mother sow-nya*. Karena kalau di Google Translate itu diartikannya sebagai *hiduplah seorang ibu...* (... but so far, what I have been taught may be a bit literal in associated with the sentence “there was a mother sow”. Because if on Google Translate, it is interpreted as the life of a mother)

The sentences suggest a reflection on the information or teachings the participant has received, particularly in relation to a specific sentence: “there was a mother sow”. The mention of Google Translate implies an attempt to verify or understand the meaning of the sentence in a different context or language. The participant reflects a thoughtful consideration of previous learnings, a desire for accuracy in interpretation, and an engagement with external resources to ensure a comprehensive understanding.

Making changes for a better translation product

Excerpt 5

[01:34 – 01:45] *Because this is a pig, animal, so it should be seekor induk babi bernama Sow*

From excerpt 5, we can infer that the participant intends to focus on improving the translation product by making adjustments for accuracy and linguistic nuances. The participant expresses a concern about the choice of words in the translation, specifically in differentiating between “*seekor*” (a classifier for animals) and “*seorang*” (a classifier for humans). The mention of “because this is a pig, animal” indicates an awareness of the context and the need for making changes to produce a better translation product. The participant emphasizes that the appropriate term for the translation should be “*seekor*” when referring to a pig, as it is an animal. This demonstrates an accurate approach to language and a desire for a better translation that accurately reflects the intended meaning.

Self-monitoring progress

Excerpt 6

[01:45 – 01:57] *Nah, it should be making more sense yaa...*

Excerpt 6 indicates that the participant is assessing his own understanding or skills, and he anticipates that with time or effort, the subject matter will become clearer or more comprehensible to them. It reflects a proactive approach to self-awareness and improvement, aligning with the concept of monitoring and adjusting one’s own progress towards a goal or increased understanding.

Evaluating

Self-evaluating involves reviewing results, assessing accomplishments and gauging the effectiveness of one's own learning. In the context of post-editing, evaluating is a metacognitive strategy that involves critically assessing and reflecting upon the effectiveness of one's editing process and the quality of edited content (Cao & Lin, 2020). This study reveals some components of evaluating, such as deep level revising to produce better post-editing and taking action to collect extra information.

Deep level revising to produce better post editing

Excerpt 7

[03:00 – 03:13] *Di dalam Google Translate sebagai ketiga babi kecilnya. Sementara di sini saya menulisnya sebagai ketiga anak babi-nya. Ini lebih menjelaskan bahwa si little pig ini adalah memang anak dari si mother sow-nya* (Google translate translates with its three little pigs. While I am here revising it to the three piglets. This further explains that these little pigs are indeed the offspring of the pig named Sow)

Excerpt 7 implies a process of deep-level revising to enhance the quality of translation, specifically in the context of post-editing. The initial mention of Google Translate and its translation of “three little pigs” indicates the use of automated translation. The additional information about the piglets being the offspring of a pig named Sow suggests a thorough review of the content, adding a layer or detail that enhances the overall quality of the translation. This process reflects a commitment to refining the translation beyond surface-level corrections, demonstrating a deeper-level of engagement in the post-editing phase to ensure a more accurate and contextually appropriate final result.

Taking action to collect extra information

Excerpt 8

[06:07 – 06:18] *Sementara kalau misalnya dalam dunia hewan itu, lebih kepada si induknya itu harusnya mengajarkan anak-anaknya atau bahkan membiarkan anak-anaknya untuk mencari makan sendiri atau berusaha bertahan hidup sendiri di alam liarnya. Jadi fortunes ini bukan sebagai peruntungan tapi lebih ke bagaimana mereka bertahan hidup.* (In the animal world, the parent teaches its offspring or even allows them to find food on their own or strive to survive in their natural environment. So, these “fortunes” are not about luck but more about how the offspring can survive).

Excerpt 8 highlights the theme of taking action to collect extra information, particularly in the context of the animal world and survival strategies. The focus is on the parent-offspring dynamic, where parent actively teaches and empowers the offspring to acquire essential skills. The participant of this study seems to collect extra information while doing post-editing by explaining the process involving allowing the young ones to find food independently and navigate their natural environment, emphasizing the importance of proactive learning and self-sufficiency.

RQ 2: What are pedagogical implications of metacognition strategies during post-editing translation process.

The use of metacognitive strategies during post-editing in the translation process particularly through the application of think-aloud protocols (TAP), has several pedagogical implications. Metacognition refers to the ability to think about one's own thinking processes, and metacognitive strategies involve consciously planning, monitoring, and evaluating one's cognitive activities. In the

context of translation and post-editing, metacognitive strategies can enhance the learning experience and improve translation skills. Here are some pedagogical implications: (1) Increased awareness of cognitive processes. Applying think-aloud protocols encourages translators to articulate their thought processes aloud during post-editing. This helps them become more aware of their cognitive activities, including decision-making, problem-solving, and language-related choices. (2) Explicit instruction and modeling. TAP provides a method for explicit instruction and modeling of effective metacognitive strategies. In a pedagogical setting, instructors can demonstrate the use of think-aloud protocols, making the cognitive processes visible to students. This modeling helps students understand how to approach translation tasks strategically. (3). Metacognitive strategies can be explicitly taught and practiced. For example, instructors can guide students on how to set goals before starting the post-editing process, monitor their comprehension and translation choices during editing, and evaluate the effectiveness of their revisions. This strategy training helps students develop a more systematic and reflective approach to translation. (4). Feedback and reflection. Think-aloud protocols provide valuable data for instructors to offer targeted feedback. By analyzing the verbalized cognitive processes, instructors can identify areas of strength and weakness in students' translation strategies. This feedback enables learners to reflect on their performance, understand their decision-making and make informed adjustments in subsequent tasks. (5) Enhanced problem-solving skills. Metacognitive strategies, when applied during post-editing, contribute to the development of problem-solving skills. Translators learn to identify challenges, consider alternative solutions, and make conscious decisions based on their understanding of the source text, target language and translation norms. (6). Transferability of skills. The metacognitive skills developed through think-aloud protocols in post-editing are transferable to other translation tasks and contexts. Students can apply these skills when faced with different genres, language pairs, or specialized domains, promoting adaptability and flexibility in their translation practice. (7). Encouraging metacognitive strategies fosters a sense of autonomy in learners. As students become more proficient in monitoring and regulating their cognitive processes, they are better equipped to take control of their own learning and continuously improve their translation skills independently. In summary, integrating metacognitive strategies, particularly through the use of think-aloud protocols during post-editing, has significant pedagogical implications. It not only enhances the quality of translation but also cultivates a reflective and strategic approach to learning, contributing to the development of skilled and autonomous translators.

Discussion

The findings of this study shed light on the metacognitive strategies employed during the post-editing translation process, answering the research questions outlined in the introduction. The identification of planning strategies, such as evaluating the necessity of post-editing, applying knowledge in specific cases, and setting goals for post-editing, reveals the complexity of the cognitive processes involved in translation. The participants demonstrate a thoughtful approach to the translation task, considering not only linguistic aspects, but also cultural nuances and contextual relevance. This aligns with existing literature that emphasizes the importance of planning as a higher order cognitive skill in metacognition (Zhang, et al., 2022). Meanwhile, the monitoring strategies observed, including using previously learned facts and instructions, making changes for a better translation product, and self-monitoring progress, underscore the dynamic nature of the post-editing phase.

The participant in the study exhibits active cognitive regulation, demonstrating a propensity to continually monitor and adjust their cognitive processes. This adaptive approach is characterized by the utilization of external knowledge and the ongoing self-assessment of their translation endeavors.

Such observations align closely with Guner & Erbay's (2021) assertion regarding the pivotal role of monitoring in the post-editing process, particularly within the domain of language translation. Moreover, the participant's engagement in evaluating their translations underscores the importance of critical reflection in post-editing practices. This evaluative component involves deep-level revising aimed at enhancing the quality of post-edited texts, as well as proactive measures to gather additional information as needed. The emphasis on thorough evaluation reflects a commitment to achieving comprehensive improvements in the translated content, moving beyond surface-level corrections. This perspective resonates with the notion of evaluation as a metacognitive strategy in post-editing, as posited by Cao & Lin (2020). By incorporating these metacognitive strategies into their post-editing endeavors, participants demonstrate a conscientious approach to refining their translations. This deep-level analysis not only enhances the accuracy and coherence of the translated texts but also fosters a heightened awareness of the cognitive processes underlying the post-editing task. Such insights gleaned from the study contribute to a deeper understanding of the metacognitive dimensions of post-editing practices, offering valuable implications for translator training and professional development initiatives.

In addressing the second research question pertaining to the pedagogical implications of metacognitive strategies in the post-editing translation process, it becomes apparent that these strategies hold considerable promise for informing translator education and training practices. One noteworthy pedagogical approach that emerges is the utilization of think-aloud protocols (TAP), which serves as a potent tool for enhancing translators' awareness of their cognitive processes. By verbalizing their thoughts and decision-making processes during post-editing tasks, translators are prompted to adopt a more deliberate and strategic approach to their work. The implementation of TAP in translator training not only fosters a deeper understanding of the intricacies involved in the translation process but also cultivates higher-order thinking skills among participants. As articulated by Amaliah (2023), the act of articulating thought processes during post-editing encourages translators to engage in metacognitive reflection, enabling them to evaluate and refine their strategies for approaching translation tasks. By integrating TAP into translator education programs, educators can effectively scaffold learners' metacognitive development, fostering a more nuanced understanding of the cognitive strategies underpinning translation activities. This heightened awareness empowers translators to make informed decisions and employ adaptive strategies to address translation challenges effectively. Ultimately, the pedagogical implications of metacognitive strategies in post-editing underscore the transformative potential of integrating reflective practices into translator training initiatives, ultimately enhancing the quality and efficacy of translation outcomes.

TAP provides a structured method for explicit instruction and modeling of effective metacognitive strategies. Instructors can utilize this approach to make cognitive processes visible, helping students understand and internalize the strategies employed by experienced translators (Khurram, 2023). This modeling contributes to the development of strategic competence in translation. The use of TAP generates valuable data for instructors to provide targeted feedback. Analyzing verbalized cognitive processes allows instructors to identify specific areas of strength and weakness in students' translation strategies. This feedback loop enhances students' reflective abilities, fostering continuous improvement in subsequent tasks (Blummer & Kenton, 2015).

Metacognitive strategies can be explicitly taught and practiced in the classroom. Instructors can guide students on goal-setting, comprehension monitoring, and self-evaluation during the post-editing process. The systematic strategy training equips students with the skills necessary for a reflective and effective approach to translation (Bakar & Ismail, 2020). Metacognitive strategies

contribute to the development of problem-solving skills among translators. By actively engaging with challenges, considering alternative solutions, and making conscious decisions, translators become adept at navigating complex translation scenarios. This aligns with the evolving nature of translation as a problem-solving activity (Nurhayati & Eppang, 2023). The metacognitive skills cultivated through TAP in post-editing are transferable to diverse translation tasks and contexts. This adaptability promotes flexibility in translation practice, preparing students to tackle various genres, language pairs, and specialized domains with confidence (Amaliah, 2023). Encouraging metacognitive strategies fosters a sense of autonomy in learners. As students become proficient in monitoring and regulating their cognitive processes, they gain the confidence to take control of their learning journey. This autonomy is a key attribute for the development of skilled and independent translators.

CONCLUSION

In conclusion, this study underscores the importance of metacognitive strategies in the post-editing process, shedding light on the interconnected phases of planning, monitoring, and evaluation. Effective post-editing begins with planning, where learners make decisions, set goals, and outline a structured approach. The emphasis on clear goals and good plans highlights the foundational role of planning in navigating the post-editing landscape. The monitoring phase acts as a regulatory mechanism, allowing learners to exercise control over content, organization, grammar and structure. The continuous scrutiny and verification of elements ensure that the translation product aligns with predetermined standards, showcasing the adaptability of strategies throughout the post-editing journey. Metacognitive strategies, such as previewing, activating prior knowledge, and making predictions, serve as dynamic tools in shaping decision-making during post-editing. The study highlights the need for learners to adapt these strategies based on ongoing monitoring judgments, showcasing the metacognitive flexibility required for optimal post-editing outcomes.

The evaluation phase serves as a reflective lens, allowing learners to identify necessary changes, refine cognitive processes, and appraise overall performance. The study acknowledges the challenges in this phase and underscores the importance of adaptive strategic behavior based on critical self-reflection. The integration of online tools like Merriam Webster dictionary and thesaurus amplifies the planning phase, raising questions about the potential impact of technology on enhancing metacognitive strategies. Additionally, cultural and contextual factors are acknowledged as influential elements, inviting further exploration into how they shape the choice and effectiveness of these strategies. The mastery of metacognitive strategies emerges as an essential in the post-editing process, offering learners a roadmap to navigate challenges, adapt to evolving needs, and continually refine their approach. As the field of post-editing evolves, further research and exploration of technology integration, cultural considerations, and the long-term impact of metacognitive practices will undoubtedly enrich the understanding and application of these cognitive tools in the dynamic landscape of language editing.

REFERENCES

- Adawiyah, A. R., Baharuddin, & Wardana, L. A. (2013). Comparing post-editing translations by Google NMT and Yandex NMT. *TEKNOSASTIK*, 21(1), 23–34.
- Amaliah. (2023). Identifying the cognitive and metacognitive approaches using post-editing techniques toward English-Indonesian and Indonesian-English text. *International Journal of Science and Society*, 5(5), 151–160.
- Aripin, N., & Rahmat, N. H. (2019). Exploring metacognitive writing strategies in the writing process using think aloud protocol: A study across gender. *American Journal of Social Sciences and Humanities*, 4(1), 178–187.
- Bakar, M. A. A., & Ismail, N. (2020). Metacognitive learning strategies in Mathematics classroom intervention: A review of implementation and operational design aspect. *International Electronic Journal of Mathematics Education*, 15(1), 1–9.
- Blummer, B., & Kenton, J. M. (2015). Methodology: The think-aloud problem-solving activity and post-activity interview. *Improving Student Information Search*, 113–123.
- Briva-Inglesias, V., O'Brien, S., & Cowan, B. R. (2023). The impact of traditional and interactive post-editing on machine translation user experience, quality and productivity. *Translaiton, Cognition & Behavior*, 6(1), 60–86.
- Cao, Z., & Lin, Y. (2020). A study on metacognitive strategy use in listening comprehension by vocational college students. *English Language Teaching*, 13(4), 127–139.
- Cowan, J. (2019). The potential of cognitive think-aloud protocols for educational action-research. *Active Learning in Higher Education*, 20(3), 219–232.
- Cresswell, J. W., & Cresswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th Ed). SAGE Publications.
- Guner, P., & Erbay, H. N. (2021). Metacognitive skills and problem-solving. *International Journal of Research in Education and Science (IJRES)*, 7(3), 715–734.
- Hamiddin & Saukah, A. (2020). Investigating metacognitive knowledge in reading comprehension: The case of Indonesian undergraduate students. *Indonesian Journal of Applied Linguistics*, 9(3), 608–615.
- Handayani, W. (2019). An analysis EFL students translation of preposition IN, ON and AT: A think-aloud protocol study. *LiNGUA*, 15(1), 1–15.
- Harto, S., Hamied, F. A., Musthafa, B., & Setyarini, S. (2022). Exploring undergraduate students' experiences in dealing with post-editing of machine translation. *Indonesian Journal of Applied Linguistics*, 11(3), 696–707.
- Hu, X., Zheng, B., & Wang, X. (2020). The impact of a metacognitive self-regulation inventory in translator self-training: a pre-post study with English-Chinese translation students. *The Interpreter and Translator Trainer*, 1–10.
- Huang, Y., & Zhang, L. J. (2022). Facilitating L2 writers' metacognitive strategy use in argumentative writing using a process-genre approach. *Frontiers in Psychology*, 13.
- Jincheng, Z., & Rahmat, N. H. (2022). Investigating the use of metacognitive reading strategies using think aloud protocol. *International Journal of Academic Research in Business and Social Sciences*, 12(10), 772–784.
- Khurram, B. A. (2023). The impact of metacognitive instruction in ESL university level students' awareness and use of the reading strategies. *Sage Open*, 13(2).
- Latorraca, R. (2023). Lost in post-editing. An exploratory study on translation trainees' perceived EN>IT post-editing vs. translation performance. *Ampersand*, 11.
- Li, Y., & Lu, X. (2021). Study on post-editing for machine translation of railway engineering texts.

SHS Web of Conferences, 96.

- Mei, H., & Chen, H. (2022). Assessing students' translation competence: Integrating China's standards of English with cognitive diagnostic assessment approaches. *Original Research*, 13, 1–13.
- Muhid, A., Amalia, E. R., Hilaliyah, H., Budiana, N., & Wajdi, M. B. B. (2020). The effect of metacognitive strategies implementation on students' reading comprehension achievement. *International Journal of Instruction*, 13(2), 847–862.
- Nurhayati., & Eppang, E. M. (2023). The correlation between metacognitive strategies and listening comprehension. *Journal on Education*, 05(02), 4448–4461.
- Oz, H. (2005). Metacognition in foreign/second language learning and teaching. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 29(1), 147–156.
- Patton, M. Q. (2015). *Qualitative research & evaluation methods: Integrating theory and practice* (4th Ed). SAGE Publications.
- Shreve, G. M. (2009). Recipient-Oriented and Metacognition in the Translation Process. In R. Dimitriu and M. Shlesinger (Ed.), *Translators and Their Receivers* (pp. 255–270). Les Editions du Hazard.
- Yilmaz, R. M., & Baydas, O. (2017). An examination of undergraduates' metacognitive strategies in pre-class asynchronous activity in a flipped classroom. *Educational Technology Research and Development*, 65(6), 1547–1567.
- Zhang, W., Zhao, M., & Zhu, Y. (2022). Understanding individual differences in metacognitive strategy use, task demand, and performance in integrated L2 speaking assessment tasks. *Original Research*, 13.