Neuropedagogical Guidelines for Translation Studies: Perceiving the Linguistic-Cultural Markers of the Other (Foreign) in Translation

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Abstract: *This article highlights the need for a neuropedagogical approach to exploring the "self-other" category in current translation theories and practices, especially concerning sensitive linguo-cultural elements (e.g., non-equivalent vocabulary, cultural gaps, linguo-cultural semes, concepts and connotations). The relevance of the article stems from the growing accessibility of neuroscientific tools that can address translation and educational challenges characterized by high interlingual entropy, ambiguity, limited intercultural and linguistic awareness, and the issues of bilingualism within the context of post-cultural consciousness. Consequently, the article aims to identify the neuropsychological phenomenon of the "other" and its relation to translation, viewed as a discourse transformation along the self-other (foreign) continuum. The primary goal is to observe future translators' spontaneous reactions to linguistic-cultural units with pronounced "other" semantics and provide neuropedagogical recommendations to manage the educational process and foster future translators' deontological awareness of otherness. The research combines standard methods, such as analysis, comparison and generalization, with semantic analysis, cultural reflection and the recording of facial and emotional responses, interpreted by students and experts. Educational modelling has been the final method in a quasi-experimental study with 78 future translators. The main outcome of the article is a concise summary of typical, potentially destructive neuro-reactions, their impact on the translation process and practical educational insights and advice. The theoretical contribution of the article involves integrating neuropedagogical perspectives into the philosophical and methodical aspects of translation. The article proves that translators' neuro-reactivity is a fundamental challenge in establishing professional ethics, particularly within the cultural and identity-related dimensions that comprise individual and collective consciousness.*

Keywords: *neurosensitivity; response to the other (foreign); destructive consequences; cultural reflection; affective neuromonitoring; instinctive perception; translation.*

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Introduction

The authors strongly believe that the potential of neuroscience for translation studies has reached a critical point of understanding. While translation research deals with cognitive, linguistic and textual aspects, much of this knowledge is not yet applied to understanding translation creation and perception at the level of individual brain function and broader neurophysiology. Interdisciplinary researchers anticipate that neuroscience should play a transformative role in exploring this unexplored area over the next 25 years (Miller et al., 2022). Additionally, educators are beginning to see that incorporating neuroscience insights will deepen academic understanding and impact the well-being of both teachers and students positively (Kosholap et al., 2021).

Indeed, current and future discoveries in neuroscience will increasingly link observable translator behaviour at a macro level to fundamental neural processes at a micro level. In Ukrainian research, there is a sporadic emergence of publications that directly link neuroscience with translation studies. For instance, Tymoczko (2012) addresses translation challenges related to neuroscience findings, such as perception, memory and brain plasticity, that have gained consensus within the field. These insights are expected to have lasting effects on how translation is understood in the future. Addressing the current knowledge gap around the neurological mechanisms of translation, perception and the understanding of the "other" is now more relevant than ever (Tymoczko, 2012). Rapid advances in brain monitoring technologies and specific discoveries in neuroscience are to reshape our comprehension of translation processes soon.

Research relevance

These points of view are quite broad and, therefore, based on recent shifts in translation studies, the humanities and interdisciplinary approaches. However, the current scientific and practical landscape of global translation studies has recently undergone a significant transformation, primarily driven by advances in technology and the increasingly utilitarian orientation of translation discourse (Benmansour & Hdouch, 2023). However, anthropological aspects, especially neurocognitive ones, are often neglected. Meanwhile, neuropedagogy, supported by experimental achievements, is once again engaging with

the educational challenges of today's translation. Traditional training models for translators need to be reassessed and updated to meet market demands, with a focus on the natural sociocultural dynamics during bilingual communication. While translation competence, linguistic knowledge and professional expertise remain core objectives in translation training, the industry also requires attention to the human factor, essential for project management, time management and effective communication (Gumus, 2017). It follows that market expectations for future translators now extend beyond purely linguo-cultural skills, addressed by cognitive linguistics together with neuroscience disciplines. Thus, cross-cultural skills and linguistic knowledge alone are insufficient for effective translation or bilingual communication (Bukhkalo et al., 2023). This underscores the importance of neuroscientific exploration into subtle or unconscious reactions to what is unfamiliar, foreign, unusual, or non-stereotypical.

In other words, the post-cultural scientific and even ordinary consciousness is not separate from others as it exists concerning them. However, the issue of "us versus them" arises not only when we prioritize our own experiences and perspectives over those of others, a common practice in translation (Trott et al., 2023). For immature student consciousness, this issue often becomes reflexive: Young people enthusiastically embrace the meanings of their subculture while mocking or dismissing what is foreign, overly traditional, or out of context. This can lead to feelings of artificiality, disconnection and even hostility. An obvious translational approach and compromise in such cases should be to accept the new context as one's own, as postmodern consciousness underscores the importance of recognizing the interconnectedness of all people and how one's experiences and perspectives are shaped by social and cultural contexts (the neurosociety and neuroculture) (Parker, 1998).

The international relevance of the article can be justified by a concise literature review that contextualizes and highlights the relevance of issues at the intersection of translation studies and neuroscience. In recent years, neurocognitive effects, patterns and the impact of the unique linguistic-cultural experiences of translators and native speakers have attracted considerable attention. Scholars recognize a shortage of empirical research in this area; however, there is a wealth of documented evidence regarding the manifestations and consequences of bilingualism at the neurocultural level, which could form the basis for a new didactic approach in translation studies (Ferreira et al., 2020). Moreover,

individual authors are starting to develop educational programmes that need validation. One such initiative is a neurocognitive curriculum designed to enhance students' translational ethical decision-making competence (TEDC). This programme is built on a "dual" intuitive-rational mechanism for making ethical and culturally sensitive translation decisions (Zhou, 2022).

Notable neurocognitive perspectives are emerging in this area. Recently, Chinese neuroscientists have raised concerns regarding the translation of atonal, unrelated languages, particularly the challenges of translating between Chinese dialects and English. They also point out that psycholinguistics and neurolinguistics are still seldom employed to investigate the cultural aspects of language in the context of translation studies (Huang & Agbanyo, 2022). The authors of this article believe that atonality and the absence of linguistic relatedness only serve to intensify the cultural divide and heighten neuro-reactivity. Nevertheless, Huang & Agbanyo (2022) claim that "multicultural neurolinguistics" has the potential to become a unique networked didactic and communicative framework for "bridging" cognitive and cultural diversity in translation education. This approach would modulate the intercultural and multilingual network based on specific circumstances (Huang & Agbanyo, 2022).

New aspects of this problem emerge through the lens of neurosociety, a society shaped by artificial intelligence and neural networks, where communication and social interactions largely rely on digital platforms and algorithms. Additionally, the concept of neuroculture, a cultural layer influenced by technology, encompasses new forms of art, media and communication practices (Maasen, 2020). In these contexts, the distinction between the "self" and "other" becomes more complex due to the unique nature of neural network-based communication.

This article acknowledges these didactically-oriented challenges and opportunities. However, one of the most pressing issues in translation within the current era of social communication is the question of respecting or disregarding cultural context. The neoliberal society is characterized by a rejection of universal truths and an embrace of diversity. This means that different cultures have unique ways of understanding and expressing ideas, yet they hold equal validity in axiological and ontological terms. From a neuro-social perspective, society must cultivate new responses, patterns and behavioural

stereotypes that naturally and seamlessly reflect the equivalence of symbols, objects and contexts, moving away from the traditional "self-other" framework (Irani, 2022). This presents a challenge for young translators, who must accurately convey concepts or linguistic contexts that possess different denotative and connotative meanings across cultures. For example, the English term "freedom" is deeply embedded in well-established democratic values, while in Ukraine, it represents a universal concept whose denotation remains largely unrealized, serving as a significant national aspiration and a primary motivator for participation in the devastating Russia's war against Ukraine. In these contrasting contexts, the term evokes different reactions. Therefore, the core issue in reconciling heterolinguistic concepts and notions is fundamentally emotional, revealing enduring stereotypes about the other.

Consequently, this article aims to identify the primary potentially destructive types of immediate reactions expressed by future translators toward other cultures, especially as expressed linguistically. Another objective is to analyze the patterns of these reactions and offer neuropedagogical recommendations.

The foundational methods included selecting timely and relevant neuro-oriented approaches to explore the psychological phenomenon of "the other" and examining translation as a transformation of discourse between "us" and "them". After the theoretical analysis, the authors integrated elements of a quasi-experimental study, specifically focusing on recording facial and emotional reactions and their internal (student) and external (expert) interpretations (the method of affective neuromonitoring). The final methods involved generalization and the educational modelling of neuropedagogical recommendations.

The authors also used the method of capturing external (primarily facial) reactions to instances of "foreign culture" in a text that closely resembles the recipient's context to identify students' primary reactions, allowing them to interpret these responses freely. At the next stage of the quasi-experiment, it was necessary to analyze these reactions within the framework of neurocognitive patterns for each linguistic type of manifestation of the other. By extrapolating and modelling pedagogical strategies, the authors proposed a series of neuropedagogical recommendations to address the destructive influence of neurocultural and psychological stereotypes, attitudes and patterns in professional training of future translators.

The significance of the proposed topic for the journal "BRAIN. Broad Research in Artificial Intelligence and Neuroscience" is rooted in its direct relation to the fields of neuropedagogy and cognitive psychology. Furthermore, the diverse neuropsychological and neurocultural dimensions of this problem provide opportunities for advanced learning, improvements in machine translation and enhanced educational and translational communication, all of which serve as micro-correlates of broader neuro-social interactions.

Research ethics

The quasi-experimental demonstration study included 78 students from the Institute of Linguistics and Law (Kyiv, Ukraine), all of whom voluntarily agreed to disclose neuro-markers (immediate reactions) to extreme linguistic and cultural stimuli based on texts they were familiar with. Furthermore, the Institute's ethics committee approved this research.

Neuroscientific context of perceiving the self vs. The other in translation studies

Review of Previous Research. When starting to write this article, it initially seemed that the problem of translating lexical or other relatively independent semantic units from one language to another had long been resolved. However, it became clear that natural reflexive mechanisms involved in perceiving foreign discourse are still the focus of intensive examination. Young people, often approaching exoticisms, ethnic phenomena and foreign concepts with an ironic or dismissive mindset, may view them as strange or incomprehensible. In this context, the neuropedagogy of communication and language education increasingly emphasizes the relevance of gestalt-based world representation, namely, figure (an object of perception) and background (the communication context). Two decades ago, Paillard (2002) demonstrated that figures of speech (metaphors and idioms) were not merely decorative elements but fundamental for the deep understanding and use of language. The researcher also discussed the role of context as a background in interpreting linguistic images and their differences across languages and cultures (Paillard, 2002).

At first, the authors of this article decided to examine the neuroscientific context in translation studies as a field of communicative

synergy between one's and foreign languages. It follows that the core philosophical problem of translation has always involved seeking a compromise among the neurolinguistic, psychological, semantic, genetic, cultural, stylistic and other specific aspects of the self and other concepts. It might seem that translation practices have been well-established and generally defined by their type: simultaneous interpretation (accuracy and understanding), business or academic translation (informativeness, category consistency, adherence to international formal standards), literary translation (preservation of style, cultural background and a sense of presence), translation of philosophical and ideological texts (hermeneutics and highly accurate representation). Despite a general understanding of these issues, there remains limited literature dedicated to the specific neuropsychological mechanisms involved in translation (Muñoz et al., 2019).

Meanwhile, the neurophysiological mechanisms have been well-documented. As is known, language translation activates a network of brain areas working together to support the processing and comprehension of multiple languages. Central language regions, such as Broca's and Wernicke's areas, are crucial for language understanding and production. Besides, other regions, including the prefrontal cortex, parietal cortex and basal ganglia, contribute to executive functions, attention control and working memory, all vital for effective translation (Novitskiy et al., 2019). Yet, these studies often overlook the affective aspect of perceiving the unfamiliar by untrained individuals, where the acquired professional (deontological) mechanisms may not always prevail over perceptual responses.

Critical Analysis of Gaps. The overarching issue of perceiving otherness is most distinctly represented in neurophysiology, which, by the early 21st century, had already performed a comprehensive analysis of xenophobia by gathering neurovisual evidence. The primary conclusion is that xenophobia manifests as a form of stereotypical response, triggered by the activation of the limbic system, particularly the amygdala, through established and reflexive neural connections (Haase et al., 2009). The amygdala can be conceptualized as an emotional-attentional filter that instinctively responds defensively to unfamiliar and ambiguous stimuli. Nevertheless, a notable gap in neuropedagogy is the inability to directly diagnose the brain within educational institutions and the lack of immediate influence on the neurocultural manifestations of its functions.

Returning to the neuropsychological aspects of perceiving the "other", research on small social groups and non-human primates (such as monkeys) reveals that xenophobia (fear or aversion toward strangers or foreigners) and xenophilia (attraction or affinity toward strangers) are primary reactions to unfamiliar individuals (Harris et al., 2015). These studies highlight the importance of communicative and cognitive-behavioural differences in group interactions, suggesting these responses are cultural universals among social animals, including humans. Such findings could guide the development of next-generation neuroscientific technologies, with the potential to facilitate comparisons across human cultural contexts and species within ecologically valid, unrestricted neuro-social environments. However, the methodological framework for this research topic remains underdeveloped, with preliminary studies starting to emerge (Ione, 2024).

Furthermore, neurocultural issues in translation are increasingly related to speakers' cognitive characteristics, especially through the understanding and exploration of neurodivergent cultures (Hillary, 2020). Individuals from these cultures require specialized communication that considers ethical, lexical and non-verbal aspects, as well as their comprehension, interpretation and translation.

Traditionally, neuroscientific research on the perception of the "other" has focused on how individuals perceive unfamiliar people and form impressions. Within this framework, psychologists or curators frequently ask participants to observe and evaluate strangers as stimuli that can affect their state in the "here and now". This methodology has led to a specialized area of research examining the brain's capacity to understand and interpret interactions and relationships based on limited visual information (Quadflieg & Koldewyn, 2017). This article embraces this concept while adapting it to anthropomorphic phenomena, particularly in the field of cultural-linguistic elements.

In today's neuroscientific frameworks addressing the challenges of the "other" in translation, practical communication and everyday interactions, popular psychological practices hold significant importance (Keysers et al., 2010). However, researchers agree that two critical personal constructs requiring development are acceptance and empathy. Empathy is especially vital as it allows individuals to share and comprehend the emotional states of others, predict their actions and promote prosocial behaviour. Neuroscience reveals that key mediators of empathy include neuropeptides (e.g., oxytocin) (Gonzalez-Liencres et

al., 2013). These stable neurochemical environments shape one's social interactions and responses. Moreover, the phylogenetic precursors or physiological principles of empathy involve mimicry and emotional contagion, nurtured in familial (personal) relationships through care, attachment and love. The authors of this article believe that it is important to develop contextually controlled interaction factors for the external management of neurotransmitters (for instance, in education) in both normal and pathological psychology.

There are differing approaches that prioritize the cultural aspect over neurophysiological and reactive elements, with the perception of cultural otherness grounded in collective patterns of post-cultural awareness. These approaches rely on personal interpretation, a construct that is much deeper than mere neural reactivity. Scholars argue that such approaches to translation originated long before postmodernism as a cultural epoch. Chen (2019) observes that Nietzsche's philosophy (1997) can be seen as a forerunner to the postmodern shift in translation studies. The main thesis suggests that Nietzsche (1997) saw language and truth as interpretative constructs, indicating that translation can never be fully accurate and exists as a performative act within the context of the "eternal recurrence" of meanings. However, personal performance is not solely a cultural phenomenon; it is fundamentally psychological. This state manifests as a neurohumoral "cocktail" that transforms into culturally meaningful behaviour during intense emotional experiences or affective reactions. This conflicting perspective needs to be methodically resolved and integrated into professional training of future translators and other facilitators of intercultural communication.

Translation and the perception of the "other" linguistic culture can also be regarded as manifestations of a neurophysiological mechanism driven by the pursuit of novelty (the cognitive instinct). Parham (2015) analyzes translation issues within the framework of postmodernism as a means of personal understanding and cultural transformation. Postmodern translation practices frequently use techniques such as fragmentation, intertextuality and linguistic play, which challenge traditional concepts of linearity and equivalence. However, these practices align closely with cognitive-behavioural, emotional-intellectual and other neuroscientific perspectives on cultural activity.

One significant challenge for neuropedagogy and translation education is that neuroscience has integrated into translation studies not primarily through educational aspects but rather through the neurotechnological advancements associated with machine translation. Its relevance to education mainly relates to current and future trends in teaching translation technology, while the human aspect is vital for post-editing machine-generated translations and managing terminology (Austermühl, 2013). In this regard, training artificial intelligence for bidirectional machine translation does not include a neurocultural framework; instead, it concentrates on precise terminology and the production of texts with complex syntactic structures and word orders (Zhou et al., 2019). Consequently, the anthropomorphic affective dimension of reflexively perceiving the "other" is frequently neglected in these new trends.

Furthermore, the importance of this article is highlighted by recent research on neologisms, performatives and keywords in translation, which act as both neuropsychological drivers of bilingual discourse and its semantic framework (Muminova, 2022). Therefore, human neuro-sensitivity and the lexical or linguocultural activities of translators are vital resources for developing new cross-cultural interactions.

Methodology for neuropedagogical observations of how future translators perceive the self vs. The other

While the authors of this article do not conduct neurovisual measurements, they have developed a methodology for assessing and correcting the perception of the "us" versus "them" (the other) concept among future translators (students) in the context of neuropedagogy. These young individuals often possess immature social attitudes and deontological positions, leading them to react impulsively to pronounced expressions of other cultures found in relevant texts and discourses. This can be easily measured even without neurovisual devices.

The methodological *assumption* of this research stage is the potential for a quasi-experimental assessment of future translators' typical immediate reactions to linguistic expressions of foreign cultures that may interfere with their professional activities. Based on their own experiences and translation practices, the authors of this article have determined the most sensitive aspects for future translators that can trigger emotional-cognitive dissonance in their perceptions. These

include non-equivalent vocabulary (linguistic lacunae), barbarisms (terms transferred without translation), linguistic-cultural connotations, semi-concepts and foreign etiquette as a whole. This aligns with the perspectives of psycholinguists regarding the most common markers of foreign lexicon and language in general (Boltayevna, 2022).

The culmination of this research stage was the hypothesis that the identified elements could act as neuropsychological stimuli for the unprofessional interpretation of cultural-linguistic signals by future translators, leading to sudden, uncontrolled, or poorly regulated reactions. During the pre-experimental stage, some authors of this article, who are faculty members in humanities divisions, noted that linguistic phenomena with a pronounced foreign or "other" quality elicit involuntary responses in unprepared and inexperienced students. These responses are protective and can be classified as conditionally positive (such as smiles and irony) or conditionally negative (including cognitive delays and avoidance). However, the authors gained a clearer insight into the reflective neuro-markers associated with the immediate (rapid and unexpected) perception of foreign linguistic elements in the context of a familiar background through a small, non-selective quasi-experiment.

Criteria for Selecting Participants. The research sample is both adequately representative and uncomplicated. The authors grounded their selection in the assumption that each student training to be a translator has already completed the necessary selection process and reflects an appropriate population. As a result, 78 students from the Institute of Linguistics and Law (Kyiv, Ukraine) took part in the data collection, including 41 first-year students and 37 second-year students. The authors justified this age selection by highlighting the potentially greater reactivity of less experienced novice professionals, which would allow for clearer identification of negative neuro-markers in the perception of the linguistic-cultural "other".

The boundaries of this research were shaped by the available resources and the authors' geographical context. Consequently, the research sample consisted of students from the central region of Ukraine (Kyiv) who are training to become translators of Germanic and Romance languages. This cohort provides a generalized representation of the neurocultural youth landscape in Ukraine. It is important to note that the quasi-experimental stage took place during a complex educational, cultural and socio-political climate in Ukraine during the 2022-2023 academic years.

Data Collection Methods. To identify uncontrolled or poorly regulated instant reactions of students to linguistic and cultural manifestations of the "other", the authors employed a neuropedagogical methodology that combines technologies for observing emotional and cognitive responses with methods of affective neuromonitoring (Luckiewicz et al., 2024). This approach enables the detection of students' internal emotional and cognitive reactions to the linguistic and cultural "other", such as new or unfamiliar cultural elements, symbols, or linguistic units. Recognizing these reactions is essential since they may indicate underlying biases, anxiety, or cultural shock that could impede effective intercultural communication and, consequently, the acquisition of expected translation competencies.

In the first stage, a group of experts among the authors prepared multisensory multilingual stimuli: a) video or audio clips featuring elements from languages, dialects, or cultures different from the students' own; b) texts containing cultural or linguistic concepts that are unfamiliar to them; c) visual images incorporating different cultural codes (such as symbols, gestures from other cultures). Afterwards, students were informed that they would participate in a study examining their reactions to various linguistic and cultural materials. However, the authors did not disclose which specific aspects of their behaviour would be analyzed to prevent any conscious alteration of their responses.

The methodology for recording neuro-reactions included the following techniques available during the experiment: a) *facial micro-expression monitoring* (specialized programmes for facial analysis (FACS) detected immediate emotional reactions such as fear, curiosity, rejection, or surprise); b) *eye tracking* (this method captured eye movements and responses to cultural or linguistic stimuli, particularly those that attracted attention or caused discomfort; it also measured the duration of focus on specific parts of the image or text); c) *facial action coding* system (FACS) (using a specialized camera synchronized with a computer, this system analyzed students' facial micro-expressions to reveal subconscious emotional reactions).

Data Processing Methods. The collected data were analyzed using a statistical ranking approach, which involved a) filtering out sporadic and random reactions (3-5 across the entire population) and b) arranging the most common reactions in descending order of their frequency of occurrence (see Table 1).

Table 1. Measuring students' neuro-reactivity to linguistic and cultural expressions of the "other"

Linguistic manifestation of the "other"	The most typical neuro-reaction	Destructive consequences for translation
1. Barbarisms	1. Confusion, surprise, pun associations.	1. Violation of language etiquette and operational delay in translation.
2. Non-equivalent vocabulary	2. Delay in perception/understanding (pause), confusion.	2. Delay in oral translation, deontological reaction of confusion.
3. Foreign speech etiquett	3. Rejection, irony, opportunism.	3. General unpreparedness for cross-cultural translation.
4. Linguocultural connotations (exoticisms)	4. Smile, joy, curiosity.	4. Breach of etiquette, expression of disloyalty in discourse.
5. Linguocultural semes (linguocultural units)	5. Interest, admiration, facial reaction of satisfaction.	5. Inaccuracy in translation, avoidance of specific cultural semantics.
6. Linguistic-cultural concept	6. Negation, rejection, dissonance.	6. Overall unpreparedness for cross-cultural translation, disloyalty to diversity.

Source: the table was compiled by the authors of the article following a quasi-experimental measurement and interpretation of the results

As shown in Table 1, the authors have organized linguistic manifestations of the "other" according to their increasing complexity and systematicity. This arrangement correlates with more delayed and remote responses from students, as well as more systematic implications for the practical process of translation.

Further methods of data analysis include neurocultural and neurolinguistic interpretation (extrapolating the obtained data onto neurocultural and neurolinguistic mechanisms; incorporating interpreted data into educational modelling). This facilitated discussions on specific linguistic-cultural units and helped formulate neuropedagogical recommendations for future translators, as well as optimizing educational management aspects (see the next section).

The depth of data collection and analysis for this section reflects the adequacy and richness of information needed for a comprehensive understanding and interpretation of the mechanisms underlying these categories in future translators. In this context, full saturation should encompass the gathering of objective neurovisual (EEG (electroencephalography) and fMRI (functional magnetic resonance imaging)) and subjective data (neuropsychological assessments, psychometric tests, personality questionnaires) to ensure maximum completeness and validity of the conclusions. Furthermore, it is recognized that the saturation of data collection and analysis in neuropedagogical observations for similar research topics should provide a holistic approach (Elouafi et al., 2021).

Given that the authors used affective neuromonitoring of responses without neurovisualization tools, one can conclude that the data saturation is moderate. Therefore, to fully explore the topic and enhance the reliability of the obtained results, further research should continue with more objective instruments and multifactorial data (ranging from expert supervision to the recording of brain reactions).

Practical implications for the translator's personality and learning management: discussions and recommendations

In light of the earlier measurements and theoretical insights, one can now discuss each sensitive type of linguistic-cultural unit. The concept of the "other" is most literally reflected in its extreme ontological manifestation, namely, the absence, represented by the concept of the "absent". This philosophical extremity is evident in the practice of translating lacunae and non-equivalent vocabulary. It follows that postmodern, and now post-cultural, consciousness perceives non-equivalent lexicon as a product of how language and discourse shape one's understanding of reality. In the context of translation studies, neuropedagogy should use these vocabulary differences as reminders of the importance of respecting and valuing diversity, as well as an opportunity to expand the existing understanding of the world through various perspectives and modes of interpretation.

Furthermore, a narratological analysis of texts containing non-equivalent vocabulary reveals that such words generate an emotionally expressive subtext within statements or texts, maintaining unity with their ideational and ethnic meanings. Fundamentally, these words can be regarded as "original foreign artefacts" that serve as linguistic referents

to the tangible world, necessitating explanation rather than translation. In this regard, otherness invokes a sense of exoticism, highlighting what is absent from the perceiver's experience. Both functions, developing subtext and evoking connotations of exoticism, are particularly relevant to postmodern consciousness, which is sensitive to the peripheral semantics of any idea.

The linguistic-cultural concept is regarded by some scholars as the fundamental unit of study in linguistic-cultural studies. It acts as a conditional mental unit of language designed for comprehensive analysis, helping to establish a network of neural connections focused on processing culturally similar signals. This concept emerges at the intersection of language, consciousness and culture, existing simultaneously in one's mind, being expressed through language and serving as a mental representation of cultural elements (Shtepulyak, 2016).

Even though some researchers identify a distinct notion of cultural concept, it is more fitting to align it with the linguistic-cultural concept. This alignment is justified by its ability to be articulated in different forms while incorporating both linguistic (speech-related) and cultural elements, thus establishing it as inherently linguistic-cultural (Rustamov, 2022). At the same time, the distinctions within the concept, particularly its non-conceptual, peripheral and linguistically representative aspects, stimulate post-cultural consciousness to naturally assimilate the "other" as a cohesive system. This phenomenon occurs because the perception of other (foreign) cultures highlights the "pure cultural codes" of the ethnic group whose language is being interpreted. As a result, the perceiver may not fully comprehend the described referent but can still sense its cultural connotation, which will be elaborated on further. At this point, it is essential to explore the interplay between pedagogy and neurocultural advancements.

Linguistic-cultural semes (or linguistic-cultural units) consist of the various forms of linguistic signs, their semantic meanings and their cultural significances. Unlike a simple word or lexical variant, a linguistic-cultural unit encompasses not only segments of language and their meanings but also cultural, extralinguistic content. This makes it a broader concept than the two previously discussed phenomena. Postmodern consciousness instinctively perceives linguistic-cultural semantics as an immediate component of the concept and the foreign

worldview, aligning with current understandings of otherness while fostering inclusivity, diversity and equality.

Linguistic-cultural connotations represent a more subtle area in terms of neuro-sensitivity. In academic literature, this phenomenon is frequently defined as a specific aspect of a word's meaning that reflects how semantics are influenced by particular linguistic-cultural environments. It manifests in a diverse range of folk expressions, cultural realities, idioms and established phraseological constructs. From this viewpoint, connotations can be considered the foundational linguistic unit of linguistic-cultural competence (Rustamov, 2022). It is clear that young people, representing postmodern consciousness, are especially sensitive to connotativity as a natural and open way of "organizing reality", whereas those with post-cultural consciousness are sensitive to value relativism. However, ethnocultural or exotic connotations are subtle instruments that can potentially violate the basic rights of ethnic groups through marginalizing stereotypes. Thus, future translators must steer clear of stereotypes and avoid perpetuating negative views about particular cultures or ethnic identities. Furthermore, translators should be aware of their target audience and its cultural context.

Neuroscience offers various recommendations for avoiding extreme reactions to the phenomenon of the "other", including racism, familiarity, denial and xenophobia in general (Haase et al., 2009). However, there is a lack of specific guidance for future translators, prompting the authors to provide their insights. Drawing on neuropedagogy and the educational goals of translation studies, it is now possible to outline specific neuro-didactic observations and recommendations.

Table 2. Comprehensive neuropedagogical recommendations

Recommendations for teachers and students	The didactic essence
Shaping cultural neuro-sensitivity	It is essential to help students understand the importance of cultural sensitivity and awareness in the field of translation. Future translators should be able to grasp the diversity of cultures and languages, as well as the significance of respecting and valuing the linguistic expressions of the "other".
Encouraging openness and empathy	It is important to promote an open attitude among students toward the linguistic manifestations of the "other" with curiosity and empathy. They should emotionally comprehend that different linguistic expressions and concepts can be equally valid and meaningful within their respective cultural contexts.
Intercultural learning and communication	Intercultural training should be incorporated into the curriculum, introducing future translators to various cultures and their linguistic expressions. This training can include the study of cultural practices, traditions, history and values, as well as the languages themselves.
Training reactive control	Frequent exposure and interaction with linguistic and human manifestations of otherness should reduce potential negative reactions.
Fostering critical thinking and self-control	Future translators should be encouraged to engage in critical thinking when dealing with linguistic expressions of the "other". They should be taught to question assumptions and challenge stereotypes.
Continuous learning and reflection	Teachers should encourage future translators to participate in continuous learning and self-reflection throughout their careers. Language and culture evolve, and it is important for translators to stay informed about current developments, challenge their own assumptions and reflect on their reactions to linguistic expressions of diversity.

Source: the authors' own conception

The authors of this article consider permanence and reflectiveness as the primary guiding principles in this context. This continuous process of learning and self-reflection should enable future translators to adapt and cultivate professional ethics. By using neuropedagogical insights, teachers can help future translators foster a positive and respectful attitude toward linguistic expressions of the "other" (foreign), thus enhancing cultural sensitivity and promoting effective, inclusive translation practices. The main educational goal in this context is to decrease neurocultural reactivity, thereby fostering proactivity, professional tact and the overall quality of translation.

In reflecting on the conclusions and results obtained, one can examine their didactic and practical managerial significance, which could impact education in light of research findings. The first aspect relates to the theoretical framework of education for future cross-cultural translators. The fundamental concepts and phenomena updated in this article, such as non-equivalent vocabulary, linguistic-cultural signs, connotations and concepts, should be academically contextualized within the frameworks of postculture and crossculture. This approach will shift the values and neuro-social focus, potentially reshaping the philosophy of translation in the 21st century. It will also complement the growing prominence of irrational neuro-didactic methods (Lucas-Oliva et al., 2022). The second aspect is methodological. In the future, one can incorporate a broader range of specific cultural and cross-cultural phenomena (such as concepts, myths, and narratives), applying the neuro-cognitive reflection of "us-them" to address specific translation challenges (Navarro Rincón et al., 2022). The authors hope that the partial results presented in this article, along with the outlined perspectives, will contribute to the development of effective strategies and technologies for training the next generation of translators.

To effectively manage the educational process (including self-directed learning) for future translators, the insights from this research can be used to strengthen the neurophysiological principles of perception, memory, emotional flexibility, reactivity and social interaction among students and external individuals. Key transformative practices may include 1) *activating multimodal learning*, which promotes the simultaneous use of various perception channels (such as visual and auditory), thus strengthening neural connections and facilitating the understanding of cultural differences; 2) *reflective practices* designed to cultivate emotional intelligence and self-regulation, teaching students to

manage their reactions to the "other", which is essential for intercultural empathy and neuroplasticity; 3) *neurocultural and neurosocial interaction* through methods such as group discussions, simulations and spontaneous communication, which activate social neurons (mirror neurons) and enhance empathy and adaptive thinking skills.

These practices should help address the longstanding culture-specific translation challenges, clearly identified as early as the late 20th century, when neurolinguistic knowledge had not yet been widely integrated into intercultural communication practices (Aixelá, 1996).

Conclusions

A detailed analysis of relevant literature highlights the significant diversity and inconsistency within the scientific discourse. While considerable progress has been made in understanding the neurophysiological mechanisms involved in language translation in recent years, there is a clear need to consider the affective dimensions of perception, particularly when dealing with unfamiliar concepts or cultural-linguistic differences. Compassion and acceptance are critical in bridging the gaps between languages and cultures, with neurophysiology identifying the role of neuropeptides, such as oxytocin, in fostering empathy.

Additionally, the cultural and postmodern dimensions of translation are increasingly acknowledged, where personal interpretation and performance shape the understanding and representation of translated texts. Even though machine translation is advancing rapidly, it often prioritizes technical aspects over the emotional and anthropomorphic aspects of perception. Overall, this article emphasizes the ongoing significance of studying the intersection of neurophysiology, culture and language translation to enhance one's understanding and practice in this area. The authors of this article believe that a key unifying issue that can connect neuroscience, education and translation studies is the psychological aspects of how the young, developing consciousness of future specialists perceives the other.

After conducting the quasi-experiment, the authors of the article identified typical reactions to each linguistic-cultural manifestation of the "foreign" in speech, perceived rapidly and instantly. These typical reactions included delays in perception/understanding (pauses), confusion, surprise, pun-like associations, rejection, irony, opportunism, smiles, joy, curiosity, admiration, facial expressions of satisfaction, denial, rejection and dissonance. While some of these reactions may

seem conditionally positive, they all contain a component which may negatively affect professional activities.

The immediate responses to foreign manifestations in texts perceived by students serve as significant neuro-markers of professional readiness and require further study and correction. Given that the postmodern and even post-cultural consciousness of youth tends to reject grand narratives and structures, focusing instead on language and live discourse in human understanding of the world, foreign lexical phenomena and units that convey otherness, unfamiliarity and exoticism become essential tools for immersion in culture or any other context. This immersion can provoke both interest and resistance among youth, who often adopt maximalist and subcultural perspectives.

The varying quantitative representations of reactions, along with the correlation between the number of negative reactions and specific student personalities, indicate that immediate and unconscious responses to foreign language manifestations can differ based on several factors. These include the student's ethnocultural background, their resistance to the new (the other), their experiences with different languages, their education and their lifestyle.

Following the quasi-experiment and educational modelling (method optimization), the authors of the article have provided a series of valid recommendations, presented in the previous section. To summarize, translating linguistic and cultural semes necessitates sensitivity from both the translator and the perceiver towards a multimodal understanding of reality and the surrounding world, as well as openness to engaging with various perspectives and ways of seeing. The translation of linguistic-cultural meanings is an ongoing process that requires continuous learning, reflection, dialogue, contemplation and interaction with verbal expressions of otherness (cultures and languages) to cultivate a more inclusive and nuanced personal viewpoint on diversity and manage one's responsiveness.

The practical and managerial implications of this research focus on the following neuropedagogical aspects for optimizing 1) *the educational process* (introducing technologies to mitigate neurocultural reactivity, alongside reflective practices and multimodal learning); 2) *translation practice* (promoting ongoing self-regulation and reflection in the translator's path toward self-improvement, while also cultivating continuous neurocultural and neurosocial interactions both within professional settings and beyond).

Research limitations

The authors of this article have addressed only the broad issues related to the "self-other" phenomenon, the associated reactions and recommendations for improving the reflexive responses of novice translators. For further clarification and practical implementation of these concepts, teachers need to concentrate on integrating these ideas into discourse-generating translation practices and creative activities.

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