
Research Article

Testing the impact of translation training on creativity: Evidence from Turkish-English student-translators

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Abstract English: Creativity is widely recognized as an essential part of translation and translator training. However, it is debatable whether such training improves creativity, and, if so, which aspects are most improved. In this regard, the current article presents two studies, a cross-sectional and a longitudinal study, designed to measure the effect of translation training on students' creative skills. Creativity was assessed using the Abbreviated Torrance Test for Adults (ATTA; Althuizen et al., 2010), which is based on the Torrance Test of Creative Thinking (Torrance, 1974). The study sample comprised undergraduate students from the Department of Translation and Interpreting and the Department of Linguistics. The results indicated that translation training was associated with significant increases in fluency, flexibility, originality, and elaboration of creativity among student translators compared to non-translation students, with the largest difference found in fluency. The longitudinal study confirmed these findings, showing a significant increase in total creativity scores, particularly in originality, after 2.5 years of translation training. These results suggest that translation training fosters not only linguistic competence but also divergent thinking and creative problem-solving abilities.

Keywords: creativity, translation training, flexibility, elaboration, longitudinal

1 Introduction

Creativity is a complex yet essential aspect of human behavior and cognition that plays an important role in various performance-based tasks, including problem-solving (Liu, Guo, Zhou, Ma, & Zeng, 2025), teaching and learning (Beghetto & Kaufman, 2016), scientific ability (Heller, 2007), and artistic performance (Thomson & Jaque, 2017). Despite its universal value, defining creativity uniformly is challenging due to its multifaceted nature and varying approaches across different disciplines. In the arts, creativity is often defined by the originality and spontaneity of artistic pieces (Glăveanu, 2018). In psychology, the focus is more on the individual, with creativity viewed as the production of novel and valuable ideas or products, emphasizing cognitive processes and intrinsic motivation (Sternberg, 2020). Social sciences

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broaden this perspective by placing creativity within its social and cultural context, introducing the concept of social creativity, which highlights the collective nature of creative endeavors (Sawyer & Henriksen, 2023). In education, creativity has been seen as a skill that can be developed, with emphasis on fostering divergent thinking, problem-solving, and original expression, largely influenced by E. Paul Torrance's work (Torrance, 1966). Despite these nuanced differences among disciplines, a common thread persists as creativity inherently involves generating something new and valuable.

In translation studies, creativity has traditionally been viewed as an intrinsic aspect rather than a peripheral attribute. Research in translator education conceptualizes translation as a decision-making process necessitating agency, interpretive judgment, and innovative problem-solving (Venuti, 2017; Malmkjaer, 2019). Translation pedagogy has increasingly moved away from product-oriented equivalence models toward process-oriented, rather than competence-based models, and treats creativity as a core competence of professional competence (Király, 2000). Recent work on translator training shows that classroom practices such as multimodal translation, translation of audiovisual materials, and song translation tasks can be conducted in ways that require students to “balance linguistic, cultural, and aesthetic constraints in highly creative ways” (Tsai, 2025; Pedersen, 2025).

On the other hand, the rapid advancement of Artificial Intelligence (AI) and machine translation technologies has brought debates about the role of human translators and the possibility of automating creative decision-making back to the fore. It may be structurally sufficient to translate the linguistic corpora adequately using an AI mechanism, but there is a need for contextual sensitivity, the aesthetic sense, and the originality of cultural connotations, which cannot be conveyed in machine output. The ongoing debate over whether AI can replace human translators has therefore led to a renewed focus on creativity as a core characteristic of human translation expertise. In this context, it is particularly important to explore the relationship between translation training and creativity, which the present study aims to address through cross-sectional and longitudinal experimental designs.

The differences in how creativity is defined across fields also make testing creativity equally challenging. In the arts, creativity is often assessed through holistic expert evaluations and audience responses. In psychology, it is commonly measured using divergent thinking tests and creative achievement questionnaires. Divergent thinking tests evaluate cognitive processes by measuring an individual's ability to generate unique solutions, propose diverse uses for common objects, or produce numerous ideas based on visual stimuli (Runco, 2007). Creative achievement questionnaires assess an individual's past creative accomplishments. In the social sciences, creativity assessment shifts toward evaluating creative processes within social contexts, such as through observational studies of collaborative efforts or analyses of how social networks influence the spread of novel ideas, or how cultural artefacts or artistic expressions are recognized within specific communities (Csikszentmihalyi, 1997; Sözbilir & Kaya, 2025). In educational settings, creativity assessment focuses on developing creative potential. Tools like the Torrance Tests of Creative Thinking (Torrance, 1966) are frequently used to evaluate students' abilities in areas such as fluency, flexibility, originality, and elaboration. These tests are designed to identify and nurture creative thinking skills, with a strong focus on problem-solving and innovative expressions. Since the goal of this study is to examine the effect of translator training on creativity, it adopts the educational perspective on creativity and its assessment methods.

1.1 The Impact of Experience on Creativity

Given the recognized value of creativity, a central question in research is how to enhance creative skills and which activities foster their development. Cognitive psychology research indicates that engaging in challenging tasks promotes neuroplasticity and cognitive flexibility, both fundamental to creative thinking (Paz-Baruch & Maor, 2023). Similarly, various artistic activities, such as playing musical instruments, painting, and drama, have been shown to boost creativity. For instance, Woodward and Sikes (2015) demonstrated that musicians exhibit greater bilateral frontal activity during divergent thinking compared to non-musicians. The scholars found that musicians scored significantly higher on general creativity assessments when responding to sound stimuli designed to elicit original responses. Sawyer (2003) highlights that dramatic improvisation, a core component of theatre, enhances spontaneous creativity by encouraging individuals to think rapidly, respond to unexpected situations, and generate novel ideas. Creative writing tasks, including fiction and poetry, also improve creativity and cognitive flexibility by requiring individuals to generate novel ideas, explore diverse perspectives, and manipulate language innovatively (Kaufman & Beghetto, 2009). Consistent with this, Lakoff and Johnson (1980) suggest that the use of metaphors, analogies, and figurative language stimulates creative thinking by prompting individuals to make novel connections between seemingly unrelated concepts. Erhard et al. (2014) further reported that professional training in creative writing enhances activity in the fronto-striatal area, a region associated with creativity.

Bilingualism has also been recognized as another language-related experience that can enhance creativity. Bialystok (2009), in her comprehensive review of bilingualism, demonstrates that managing multiple languages increases cognitive demands, leading to enhanced cognitive flexibility and divergent thinking. Kharkhurin (2008) also found that bilingual participants outperformed monolinguals in fluency, flexibility, and elaboration during divergent thinking tasks. These findings were corroborated by Kharkhurin (2009), who showed that bilinguals exhibit greater innovative capacity, extract novel ideas more effectively, and demonstrate a stronger ability to deviate from standard category properties. Additionally, Kharkhurin and Li Wei (2015) explored the impact of code-switching on creativity, finding that habitual code-switchers displayed greater innovative capacity than non-habitual code-switchers. The collective results of these studies suggest that engaging in cognitive tasks, artistic activities, and creative writing, as well as possessing bilingual proficiency, can positively influence creativity. Consequently, incorporating these diverse activities can cultivate and enhance creative potential.

1.2 Creativity, Translation, and Training

Within contemporary translation studies, translation is no longer conceptualized as a mere act of linguistic equivalence but as an agentic and interpretive practice. Since the cultural turn, translators have been understood as active rewriters who negotiate meaning across linguistic, cultural, and ideological systems (Lefevere, 1992; Venuti, 2017; Malmkjær, 2019). In this view, creativity is not confined to literary translation nor treated as an ornamental skill; rather, it is inherent in translational problem-solving. Translators continuously generate alternatives, evaluate competing solutions, and make context-sensitive decisions in order to recreate meaning and effect in another language. Creativity, therefore, constitutes a structural feature of translation activity itself. This reconceptualization has gained renewed urgency in light of rapid

developments in artificial intelligence and machine translation. In more recent research, this shift has been characterized as a “technological turn” in Translation Studies, focusing on the impact of machine translation and artificial intelligence tools on professional practice and the concept of translator competence (O’Hagan, 2020). Although these tools have greatly facilitated efficiency and access, there are, however, concerns about the extent to which machine translation can cope with cultural, stylistic, and interpretative complexities. In this context, creativity and agency are being increasingly privileged as specific components of human translation expertise. As automated systems increasingly handle routine linguistic transfer, the human translator’s value lies primarily in their creative and agentive capacities, including contextual interpretation, flexibility, and originality.

Research in translator education further emphasizes that creativity can be cultivated through pedagogical design. Moving away from prescriptive and product-oriented models, contemporary translation pedagogy adopts process-oriented and constructivist approaches that encourage interpretive flexibility and student agency (Kiraly, 2000; Schäffner & Adab, 2000). Edited volumes on translator training (e.g., Venuti, 2017) document how curricula increasingly incorporate tasks that require reformulation, adaptation, and strategic decision-making rather than literal transfer. In audiovisual and multimodal translation contexts, students must balance linguistic constraints, cultural references, technical limitations, and aesthetic considerations, often under competing pressures (Pedersen, 2025; Tsai, 2025). Such tasks require generating multiple solutions, tolerating ambiguity, and reformulating innovatively.

From a cognitive perspective, translation training may therefore function as a structured environment for the development of divergent thinking. Students repeatedly engage in activities that demand fluency (i.e., producing multiple alternatives), flexibility (switching between strategies and perspectives), originality (i.e., creating novel, contextually appropriate solutions), and elaboration (i.e., refining and enriching target texts). These dimensions correspond closely to the components measured in established creativity assessments such as the ATTA. Unlike general bilingual experience, which may enhance cognitive flexibility indirectly, translation training systematically requires deliberate practice in generating alternatives, critically evaluating them, and justifying choices. It thus provides sustained exposure to complex problem-solving across linguistic and cultural systems.

In the current technological landscape, these creative dimensions have gained renewed relevance. Although AI-based machine translation systems can generate linguistically plausible outputs, they lack interpretive agency or culturally situated intentionality. Human translators, by contrast, are required to exercise originality and flexibility in resolving ambiguities, recreating stylistic effects, and negotiating contextual meaning. Investigating whether translation training enhances general creative capacity is therefore not only pedagogically relevant but also contributes to ongoing debates about the distinctive expertise of human translators in the age of AI.

In practical terms, undergraduate translation curricula expose students to a wide range of text types, including literary, vocative, and technical genres. Each of these domains requires context-sensitive reformulation, problem-solving under constraint, and reflective justification of translational choices. Through repeated engagement with such tasks, students are systematically trained to generate alternatives, tolerate ambiguity, and refine solutions. These processes closely align with established dimensions of divergent thinking as measured in creativity research.

Against this theoretical background, the present study moves beyond conceptual discussions of creativity in translation studies and empirically examines whether formal translation training systematically enhances measurable components of creative thinking. If it does, then what is

the direction of the effect, and which subcomponents of creativity are modulated through learning and practicing translation? We examined these questions in two experimental studies: one cross-sectional and one longitudinal.

2 Study 1

Study 1 examines the effect of translation training on the creativity of students from the department of translation and interpreting (hereafter, student-translators) utilizing a cross-sectional design. To this end, we compared the performance on a creativity test (ATTA; Althuizen et al., 2010) between last-year student-translators and first-year student-translators to determine whether the former show a creativity advantage. Second, the creativity of last-year student-translators was compared with that of last-year students from the department of English linguistics (hereafter, student-linguists). The inclusion of student-linguists allowed us to control for variables such as English proficiency, which may influence creativity, since all the participants were certified advanced users of L2 English. Furthermore, both groups had comparable educational backgrounds, having taken similar courses in academic writing, reading, speaking, linguistics, language acquisition, and cultural studies. The only distinction was that student-translators had taken translation courses (e.g., literary translation, technical translation, translation of EU documentation, and medical translation) as part of their university education. Lastly, to verify that student-translators did not have a creativity advantage at the outset of their translation training compared to student-linguists, the performance of first-year student-translators was compared with that of first-year student-linguists.

To conclude that formal translation training has a beneficial effect on the creativity of student-translators, the following conditions must be met:

1. The score of last-year student-translators on the creativity test is significantly higher than that of first-year student-translators.
2. The score of last-year student-translators is significantly higher than that of last-year student-linguists.
3. There is no significant difference in creativity between first-year student-translators and first-year student-linguists at the beginning of their translation training.

2.1 Method

2.1.1 Participants

There were four groups of participants in the cross-sectional study: Group 1 included 43 last-year student-translators from the English-Turkish division of the department of translation and interpreting (25 females), aged between 22 and 27 ($M = 22.58$, $SD = 0.98$). These participants had received formal translation training over 3.5 years at a university in Türkiye. Group 2 included 49 first-year student-translators from the same English-Turkish division (28 females), aged between 18 and 22 ($M = 19.40$, $SD = 0.93$). Group 3 included 18 last-year student-linguists from the department of English linguistics (12 females), aged between 22 and 30 ($M = 23$, $SD = 1.97$). These participants had completed a range of linguistics-related courses during their

two and a half years of university education. Group 4 included 35 first-year student-linguists from the same department (20 females), aged between 19 and 22 ($M = 20.10$, $SD = 0.92$).

Before taking the creativity test, the participants completed a background questionnaire and the Language History Questionnaire (LHQ). According to their responses, Turkish was the native language of all the participants, and English was their second language (L2), in which they were all certified as advanced users based on standardized English proficiency tests before entering their departments. Post-test debriefing revealed that all the participants were initially unaware of the study's purpose.

2.1.2 Creativity Test

The Abbreviated Torrance Test for Adults (ATTA; Goff & Torrance, 2002) was used to assess participants' creativity. The ATTA was developed based on the Torrance Tests of Creative Thinking (TTCT), which are accepted as the gold standard for assessing creativity (Torrance, 1966), and it is an abbreviated form of the TTCT that allows for easier administration. The standard ATTA evaluation includes four divergent thinking components: fluency, originality, elaboration, and flexibility.

Fluency assesses the ability to produce a quantity of ideas. A fluency raw score is calculated by summing the fluency scores from all three activities, as explained below. Originality measures the ability to produce unique or original ideas. An originality raw score is computed by adding scores from each activity. Elaboration evaluates the capacity to expand on ideas with specific details, and lastly, flexibility measures the ability to perceive things in multiple ways using the same stimuli.

The ATTA consists of three paper-and-pencil activities: Activity 1 requires test-takers to imagine they could walk on air or fly, then identify the troubles they might encounter. This activity assesses verbal fluency and originality. Activity 2 presents two incomplete figures and asks test-takers to draw pictures using these figures and to make their drawings as unusual as possible. This activity assesses figural fluency, originality, and elaboration. Activity 3 shows a group of nine triangles arranged in a 3×3 matrix and asks participants to draw as many pictures and/or objects as possible using the triangles. This activity evaluates figural fluency, originality, elaboration, and flexibility. A raw flexibility score is derived exclusively from Activity 3. Elaboration is scored in Activities 2 and 3 and summed for a raw elaboration score. Two raters evaluated the participants' tests. Interrater agreement was achieved for the four traits assessed by the ATTA.

2.1.3 Procedure

The questionnaire, LHQ, and the creativity test were administered to each of the four groups separately in a classroom environment. The researcher provided instructions in participants' native language, Turkish, and confirmed their understanding by asking if the task was clear. After confirming comprehension, the participants completed the exercises. To analyze the data, the researchers evaluated all creativity tests. Scoring was conducted for each task separately, and each component of creativity and the total creativity score were assessed according to the official ATTA scoring guide.

2.1.4 Data Analysis

Descriptive statistics, including means and standard deviations, were computed to summarize the central tendencies and dispersion of the key variables in the cross-sectional and longitudinal datasets. To assess group differences while accounting for potential violations of homogeneity of variances, the Welch two-sample t-test was used instead of the standard Student's t-test. This approach is more robust to unequal variances and sample sizes, making it particularly suitable for the present data structure. All statistical analyses and visualizations were conducted using the R programming language and environment (R Core Team, 2025). Data preprocessing, statistical testing, and graphical representations were carried out using base R functions and relevant *tidyverse* (Wickham et al., 2019) packages to ensure reproducibility and transparency in the analytic pipeline.

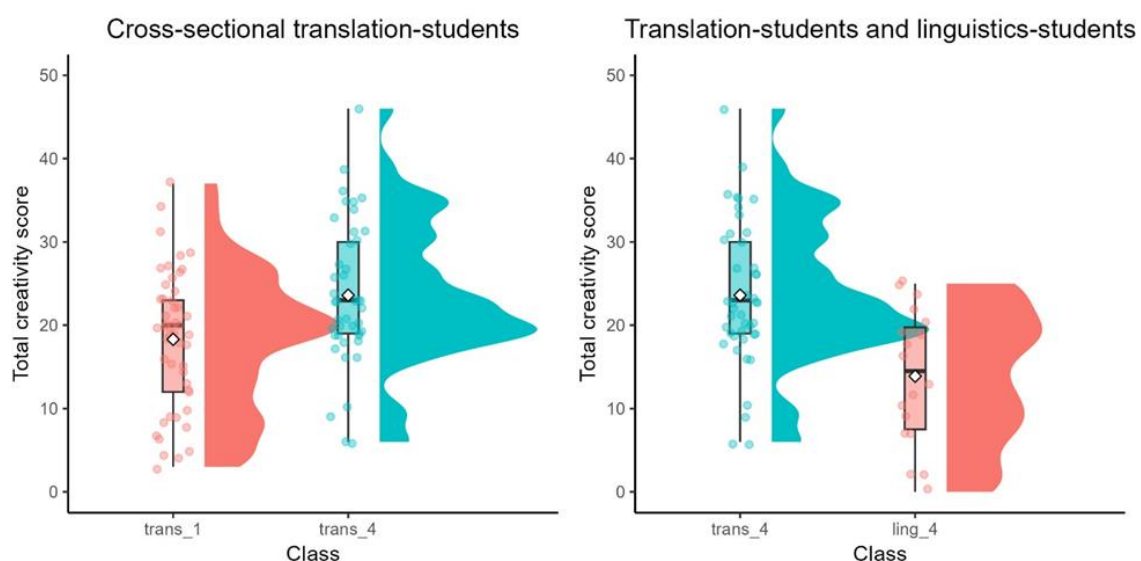
2.2 Results

2.2.1 Total Creativity Scores

Cross-sectional analyses revealed no significant difference between the first-year student-translators ($M = 18.31$, $SD = 8.19$) and the first-year student-linguists ($M = 15.83$, $SD = 7.55$) in total creativity score; $t(76.79) = 1.43$, $p = .16$. However, there was a significant difference between the last-year student-translators ($M = 23.60$, $SD = 8.62$) and the last-year student-linguists ($M = 13.89$, $SD = 8.19$), $t(33.51) = 4.16$, $p = .0002$. Furthermore, a significant difference in creativity scores was found between the first-year ($M = 18.31$, $SD = 8.19$) and the last-year student-translators ($M = 23.60$, $SD = 8.62$), favoring the latter: $t(87.10) = 3.01$, $p = .003$. No such difference was found between the first-year and the last-year student-linguists ($p = .41$).

Figure 1

Half-violin plots showing the differences in total creativity scores between first-year and final-year translation students, and final-year translation and linguistics students



2.2.2 Components of Creativity

We also investigated differences among the student groups and classes based on the four components of creativity: fluency, originality, elaboration, and flexibility. The results indicated that the last-year student-translators scored significantly higher in all four components compared to the last-year student-linguists (all $ps < .05$) (see Table 1). Notably, the largest difference was observed in fluency, where the last-year student-translators ($M = 11.21$, $SD = 3.51$) outperformed the last-year student-linguists ($M = 6.50$, $SD = 3.67$); $t(30.71) = 4.63$, $p = .00006$.

Table 1

The component creativity scores for first- and final-year translation and linguistics students, with the means and standard deviations shown in parentheses

Component	translation-students 1	translation-students 4	linguistics-students 1	linguistics-students 4
Fluency	8.94 (3.57)	11.21 (3.51)	7.69 (3.06)	6.50 (3.67)
Originality	3.88 (2.55)	5.49 (2.57)	3.80 (2.34)	3.00 (2.54)
Elaboration	4.37 (3.28)	5.84 (3.98)	3.57 (3.13)	3.89 (2.81)
Flexibility	1.12 (0.78)	1.07 (0.63)	0.77 (0.69)	1.50 (0.79)

3 Study 2

Study 2 was conducted for triangulation purposes to validate the findings of study 1 and to further examine the effect of translation training on the creativity of the student-translators using a longitudinal design. For this purpose, the creativity test scores of the student-translators who received translation training over two and a half years were compared to those of student-linguists, who served as a control group, both at the beginning and end of the translation training period.

To conclude that formal translation training has a positive effect on the creativity of the student-translators, the following conditions must be met:

1. The creativity scores of the student-translators and the student-linguists do not significantly differ before their training.
2. The creativity scores of the student-translators show a significant improvement after the training, relative to the student-linguists.

3.1 Method

3.1.1 Participants

Two groups of participants took part in study 2: Group 1 (experimental) included 20 student-translators from the English–Turkish division of the department of translation and interpreting (12 males), aged between 20 and 22 ($M = 20.6$, $SD = 0.68$) at the time of the pretest. These participants received formal translation training for 2.5 years, beginning in the second year of their education. Group 2 (control) included 13 student-linguists from the department of English linguistics (11 females), aged between 20 and 24 ($M = 21.6$, $SD = 1.03$) at the pre-test. These participants completed a series of linguistics-related courses during their university education.

Before the creativity test, all the participants completed a background questionnaire and the LHQ. According to their responses, Turkish was the native language of all the participants, and English was their second language (L2), in which they were all certified as advanced users based on standardized English proficiency tests before entering their departments. Post-test debriefing revealed that all the participants were initially unaware of the study's purpose.

3.1.2 Creativity Test

Study 2 employed the same creativity test (ATTA) and questionnaires as used in study 1.

3.1.3 Procedure

Both the questionnaire, LHQ, and the creativity test were administered separately to the experimental and control groups in a classroom setting. The first round of the data collection took place at the beginning of the participants' second year, coinciding with the start of their translation training. The instructions were provided in Turkish, and the participants confirmed task clarity before beginning. The second round of the data collection occurred at the end of the participants' final academic year, in two and a half years. Both groups completed the same creativity test under researchers' supervision and with identical instructions.

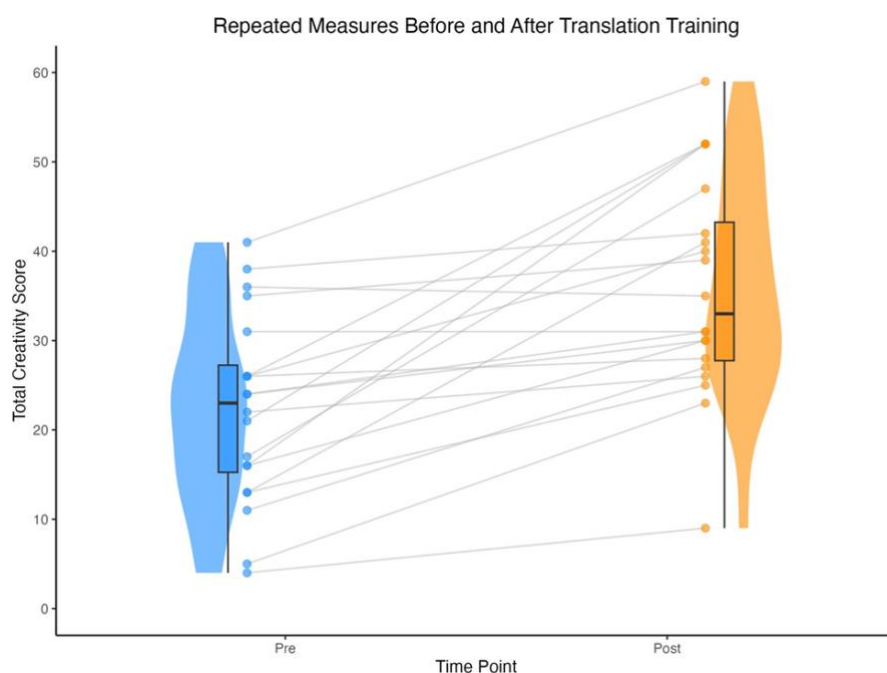
3.2 Results

3.2.1 Total Creativity Scores

The longitudinal analysis showed that translation training significantly improved the total creativity scores from pre-test ($M = 22.25$, $SD = 10.54$) to post-test ($M = 35.95$, $SD = 12.34$), $t(30.71) = 4.63$, $p = .00003$. In contrast, linguistics training did not lead to a significant improvement, $t(12) = 1.90$, $p = .08$.

Figure 2

Half-violin plots showing the difference in total creativity scores among the translation students between the pretest and the posttest



3.2.2 Components of Creativity

As in the cross-sectional analysis, we conducted an additional longitudinal analysis based on the creativity components for the student-translators. Results showed that translation training significantly improved all four components of creativity (all p s < .05) (see Table 2). Notably, the greatest improvement was observed in the originality component, $t(19) = 8.67$, $p < .0001$, between pre-test ($M = 3.30$, $SD = 2.11$) and post-test ($M = 7.35$, $SD = 2.39$).

Table 2

Component scores from the pretest and the posttest between translation and linguistics students, with the means and standard deviations shown in parentheses

Component	pretest translation- students	posttest translation- students	pretest linguistics- students	posttest linguistics- students
Fluency	9.20 (4.15)	12.90 (4.18)	7.69 (2.98)	9.62 (4.29)
Originality	3.30 (2.11)	7.35 (2.39)	4.08 (2.25)	3.23 (2.62)
Elaboration	6.90 (4.70)	10.80 (4.96)	4.15 (3.41)	7.38 (3.31)
Flexibility	2.85 (2.39)	4.90 (2.59)	0.69 (0.63)	1.31 (2.06)

4 Discussion

The current study explored the effect of translation training on creativity skills through two studies. The first study examined whether translation training improves creativity using a cross-sectional design, comparing first-year and final-year student-translators with first-year and final-year student-linguists, who served as a control group. The results showed that, before the start of their formal training in translation and linguistics, the participants did not differ in creativity. This finding ruled out the possibility that more creative students chose the translation department, thereby starting with an initial advantage over student-linguists. However, the results concerning the performance of student-translators and student-linguists at the end of their training revealed that final-year student-translators scored higher on the ATTA than both first-year student-translators and final-year student-linguists. The second experiment, using a longitudinal design, verified the improvement in creativity through translation training. The same groups of student-translators and student-linguists were tested during their second and final years of study. The results indicated that while student-translators showed significantly higher scores in their final year, student-linguists did not exhibit such improvement.

Findings from both studies demonstrate that translation training positively affected the students' creativity. These results support the view that translation is far more than a linguistic exercise, but it is a cognitively demanding and creative process. Translation involves more than the replacement of lexical items and grammatical structures; it also requires interpreting meaning, resolving ambiguities, and navigating between two linguistic and cultural systems. These mental operations demand and enhance creative skills, especially those related to divergent, non-standard thinking and considering multiple perspectives.

Creativity is widely regarded as a composite skill consisting of several dimensions. The ATTA, the primary data collection tool in this study, identifies and assesses four such components: fluency, originality, flexibility, and elaboration. The impact of translation training on creativity was examined based on these dimensions.

Findings from both studies indicate that translation training was associated with significant increases in all four components of creativity, with the most pronounced benefits observed in originality and flexibility. The substantial enhancement in originality, which is defined as the ability to produce original and/or unique ideas, is likely linked to the nature of translation tasks. Student-translators frequently deal with idiomatic and metaphorical language and culture-specific references that have no direct equivalents in the target language. The translation of such passages demands creative, contextually appropriate solutions that preserve both meaning and effect. These conditions may have fostered the students' ability to generate novel and surprising alternatives, thereby enhancing originality. In this regard, our findings align with the arguments of Schäffner and Adab (2000), who emphasized the role of translation in expanding learners' expressive repertoires, and with those of Wilss (1989), who identified originality as one of the cognitive foundations of the translation process.

Another creativity component that benefited notably from translation training was flexibility, which is the ability to perceive stimuli in diverse ways. Translation naturally involves choosing among various strategies (e.g., literal translation, adaptation, omission) and considering alternative lexical and grammatical solutions suited to the target audience, purpose, and culture. Additionally, the continual exposure to multiple linguistic and cultural systems, which is characteristic of translation practice, is known to foster mental flexibility (Kharkhurin, 2012).

Fluency and elaboration were also positively affected, albeit to a slightly lesser extent. Fluency, or the ability to generate numerous ideas quickly, may have improved through

consistent practice in paraphrasing and producing multiple translations of the same source text. These experiences likely enhanced students' speed and ideational output compared with those of the non-translators. Elaboration, the ability to enrich ideas with detail, may have improved as students engaged with tasks requiring them to adapt context-specific content and enrich textual meaning for the target culture. Translators are also required to attend to subtle details such as tone, connotation, and authorial intent to convey nuanced meaning.

From a pedagogical standpoint, these findings suggest that translation activities should be included in curricula not only for their linguistic benefits but also to foster students' creative skills. In particular, the strong effects observed in originality and flexibility suggest that translation training may promote ingenuity, tolerance for ambiguity, and open-mindedness. Thus, this study adds to the growing body of evidence that translation training is not solely a practical linguistic activity but also an effective method to nurture creativity.

Additionally, in light of the current debates surrounding AI and its use in translation, this research has broader implications for Translation Studies. Although AI systems generally demonstrate a high degree of grammatical and semantic accuracy in translation, they lack interpretive agency and culturally or context-specific intentionality (O'Hagan, 2020). In contrast, our findings indicate that human translators develop and refine their creative skills, especially originality and flexibility, through translation training and practices. Flexibility and originality in problem-solving are recognized as key aspects of interpretive agency and the active decision-making process in translation, distinguishing professional translators' expertise (Venuti, 2017; Malmkjær, 2019).

As a result, our findings contribute to ongoing debates about the extent to which AI systems can simulate core aspects of translational cognition and challenge the view that AI will soon replace human translators.

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Data Availability Statement

The data of the study is available but according to the consent form signed by the participants, it cannot be shared and/or used in another study.

Declaration of Interest

No potential conflict of interest was reported by the authors.

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*Artificial intelligence tools were used exclusively for English proofreading.