The role of learner creativity in L2 semantic fluency. An exploratory study

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A B S T R A C T

Research about individual learner variables in L2 learning has not yet addressed in depth creativity as potentially relevant in the field. This study seeks to examine whether creativity is related to the L2 lexical production of a group of 35 12th grade Spanish EFL (English as a Foreign Language) learners. Four EFL semantic fluency tasks are used to obtain the vocabulary activated in the learner's mental lexicon as a response to four semantic categories: *beach, box, countryside* and *fun*. Creativity is measured via the PIC-J Test (Artola et al., 2008), based on Torrance (1990) and Guilford (1967), and validated for the assessment of this construct in Spanish secondary education students. While the findings reveal a significant positive relationship between all measures of creativity and EFL semantic fluency in the four categories, EFL proficiency level and semantic fluency only correlate in some categories. The most creative learners retrieved a wider variety of words and produced more uncommon responses, a result which is consistent with recent neural and cognitive research on creativity. These findings are suggestive of the need for considering creativity and its various dimensions in L2 teaching.

1. Introduction

A considerable amount of literature connects creativity to other psychological variables with relevance in second (L2) or foreign language (FL) learning,[1] such as openness to experience (Dewaele, 2012; McCrae, 1987; Verhoeven & Vermeer, 2002). Surprisingly, creativity has only received cursory attention in this field (Dörnyei, 2005), despite that creative thinking skills along with other cognitive skills are fundamental pillars of one of the most successful approaches to language learning, Content and Language Integrated Learning (CLIL) (Coyle et al., 2010; Lockley, 2013).

Creativity is part of the subject's ability to understand the world in new and original ways and to use novel approaches in solving problems. It is a complex and multidimensional phenomenon which has been approached from cognitive, psychological or social perspectives. A broad definition of creativity would understand it as the ability to both generate new ideas, possibilities and alternatives in different situations (i.e., divergent thinking) (Sternberg & Lubart, 1995), as well as to evaluate and select the most creative ones (convergent thinking) (Clapham, 1997). Within the psychometric paradigm, which posits that creativity can be measured, Guilford (1959) matches creativity to divergent thinking and establishes four essential components: (a) fluency, or the ability to generate a large number of ideas, (b) flexibility, the production of varied unusual responses that enables a transformation of the process to reach a solution, (c) originality, or characteristic of the idea that defines it as unique, unusual or different, and (d) elaboration, or

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level of detail of the creative ideas. Some of these components are measured via verbal and figural abilities, two separate abilities relying on different cognitive resources, as research suggests (e.g., Kasirer et al., 2020). Based on Guilford's constructs, Torrance (1990) elaborates his well-known TTCT (Torrance Tests of Creative Thinking), which, no stranger to criticism, is one of the most widely used tests in studies of divergent thinking to date. Creativity is not static, it can be taught and trained (Ritter & Mostert, 2017; Sun et al., 2020), which can alleviate the decline that takes place around secondary education in some of its components, for instance, fluency (Kim, 2001; Said-Metwaly et al., 2020).

Over the last years, neural and cognitive research on creativity has pointed to differences in the lexical organisation of more and less creative individuals, which may, for example, explain their variation in fluency, measured in L1 (e.g., Benedek & Neubauer, 2013). On the other hand, with respect to fluency of word production in L2, research has also identified different characteristics of L2 lexical organisation in the different learning stages, which might be also affecting L2 fluency (Crossley et al., 2010), and ultimately, lexical and communicative competence.

The main aim of this study is to ascertain whether creativity, understood as divergent thinking, and its three associated constructs (i.e., fluency, flexibility and originality), might be helping in L2 word production, specifically in learners' semantic or associative fluency in EFL, once proficiency is controlled. Elaboration is not included as it was not measured by the creativity test that we used. For that purpose, participants completed four written semantic fluency tasks to assess the semantic fluency of a group of 35 EFL learners in Spanish secondary education (grade 12). Special attention was paid to measures of verbal creativity, as further explained in section 3.

2. Background

2.1. L1 and L2 lexical organisation

Lexical competence involves, among others, breadth and depth of knowledge, being the latter developed through the associations or connections established by the words in lexical networks (Haastrup & Henriksen, 2000; Meara, 2009). The production of a word includes different stages, such as the conceptual processing of the word, the retrieval of its entry in the mental lexicon, the retrieval of the word form (e.g., its phonological constituents), and the programming of the speech motor apparatus to effectuate articulation (Runnqvist et al., 2013, p. 245). According to the Spreading Activation Theory (Collins & Loftus, 1975), both processing and lexical retrieval operate on the representation of the semantic memory, understood as a network where words are nodes connected by means of edges to other nodes. The perception or the memory of a word activates its semantic representation and this activation spreads through the neighbouring nodes, which represent related concepts. Some of the words are connected to others through a semantic relationship, for example, a *bedroom* is part of (meronym) the *house* (holonym); others connect through associations of relationship beyond form or meaning (e.g., *car* is related to *road*, *volcano* is related to *heat*). The higher the semantic distance between two words, the less connected or related they will be. In vectorial or distributional semantics, the concept of semantic distance is explained as the relatedness of any two words in terms of the visualisation of their distance in the semantic space (e.g., Taler et al., 2013).

Based on the network metaphor, in the last years, researchers have applied different analysis techniques in the identification of patterns of L1 and L2 lexical organisation. For example, a powerful line in psychology and cognitive neuroscience is applying network analysis to the study of semantic memory (e.g., Borge-Holthoefer & Arenas, 2010; De Deyne et al., 2016). Network analysis models focus on the mathematical study of graphs (i.e., systems of relations between units, represented by nodes or vertices in a network that join to others through edges). In these models, the meaning of a word is expressed by means of the quantity and type of connections with other words. Meara and his colleagues have pioneered the application of network theory to approach more objectively the study of semantic memory through the connections between words (see Meara, 2007; Meara & Schur, 2002; Wilks et al., 2005). This line of research led these authors to explore the implementation of automatic models that help understand the organisation of the lexicon in L1 and L2. Among other results, the findings indicate that the organisation of the L2 lexicon is less dense than the organisation of the L1 lexicon. In other words, the L1 speakers are able to identify more interconnections between words than the L2 learners (Wilks & Meara, 2002). Recently, different lines of research based on different network-analysis techniques have found that L2 lexical-semantic networks exhibit a poorer organisation than L1 networks (Borodkin et al., 2016; Ferreira & Echeverría, 2010). For example, Borodkin et al. (2016) found that in L2 networks the words were not usually grouped into identifiable categories and subcategories. Thus, while in L1 the item *coconut* was surrounded by representatives of the tropical fruits family, in L2 the same word was embedded in a group consisting of a mix of tropical fruits, summer fruits and root vegetables.

2.2. Evidence of L1 and L2 lexical processes through semantic fluency

In psychology and psycholinguistics studies, one of the traditional ways of accessing the organisation of semantic memory is through semantic fluency tasks (Goñi et al., 2011). These are time-controlled continuous association tasks that use a semantic category, typically *animals* or *fruits and vegetables,* as the stimulus to activate the uninterrupted retrieval of words as they come to the individual's mind. Traditionally used in clinical research (e.g., Ardila et al., 2006), fluency tasks have been also used in non-clinical research mainly concerning first languages (e.g., Aziz et al., 2016; Kavé, 2005; Rosselli et al., 2009).

Research with semantic fluency tasks is scarce in the study of L2 vocabulary. This area has been mainly examined through tests that usually require a single answer, such as priming or association tests. Yet, a relatively recent line of studies in L2 research has made use of the semantic fluency task to obtain the lexical availability index, a measure based on the frequency and order of the words retrieved, which accounts for the most available words in a group or community of speakers. These tasks have been traditionally used over the last four decades in studies of Spanish L1 and L2 (López Morales, 1973), and most recently in research on other foreign languages (see,

for instance, Jiménez Catalán, 2014). These studies have typically focused on the number of L2 words retrieved, but they have also paid attention to other aspects such as which word classes are mostly retrieved, the most and least productive prompts, the learners' age of acquisition of the word, or the word's imageability or concreteness factor. With respect to concreteness, based on its definition as "the degree to which the concept denoted by a word refers to a perceptible entity" (Brysbaert et al., 2013, p. 904), these authors compiled a database of concreteness ratings for 40 thousand English lemma words obtained from over four thousand participants. As an example, while words like *eh*, *essentialness* or *although* were perceived as the least concrete on this database, *angelfish*, *antelope* or *apple* were perceived as the most concrete words. In Spanish as L2, less concrete categories have been usually reported to be less productive than more concrete categories (Hernández-Muñoz et al., 2006; Jiménez Catalán & Dewaele, 2017), which might be due to the fact that concrete words are easier to access, recall and make associations with (de Groot, 1989; Fliessbach et al., 2006; Hell & de Groot, 1998). On the other hand, early acquired words are found to be those that are familiar, imageable, frequent, lexically available and shorter (Hernández-Muñoz et al., 2014). Concerning word classes, differences in their retrieval may suggest variation in cognitive processing and semantic categorisation. The predominance of nouns over any other word class has been traditionally reported in lexical availability studies (e.g., Carcedo González, 2000; Samper Hernández, 2002). Several reasons can be adduced for this finding, such as the nature of the stimulus word (typically a noun, which could elicit nouns) or the fact that nouns are the most readily available vocabulary, the easiest to acquire and the first to be mastered (cf. Ellis & Beaton, 1993, as cited in Jiménez Catalán et al., 2014: 48). However, classes such as adjectives tend to appear in adult population, probably due to higher cognitive development.

2.3. Evidence of creativity via semantic fluency

Considerable research has addressed individuals' linguistic performance to explain variance in creativity constructs (e.g., Skalicky et al., 2017). Over the last decade, numerous studies have used fluency tasks to investigate patterns of creativity or divergent thinking based on semantic distance between words, as a measure of associative ability (e.g., Beaty et al., 2014; Benedek et al., 2020; Benedek & Neubauer, 2013; Prabhakaran et al., 2013; White & Shah, 2016). Among the most interesting findings, this line of inquiry has concluded that the most creative people have higher associative fluency and provide more uncommon responses. That is to say, the most creative people produce a higher number of association responses per time and their responses are based on more distant semantic connections (Benedek & Neubauer, 2013). In this line, it has been found that the semantic network of the most creative individuals is less structured, that is, it is more flexible than that of the less creative (Kenett et al., 2014), their network structures are more complex and they activate a greater range of associations (Gruszka & Necka, 2002). There seems to be a neural and cognitive basis that explains some of these processes underlying the creative thought (Benedek et al., 2020). These findings might well help explain some of the trends identified in research on creativity and L2 learning.

2.4. Creativity and L2 learning

Over the past two decades, extensive research has been conducted on creativity as a dependent variable of bilingualism and multilingualism, which has measured the effect of these linguistic processes on the speaker's creativity (Fürst & Grin, 2017; Kharkhurin, 2012; Lasagabaster, 1997). Among other results, it has been found that speaking more than one language extends the individual's cognitive abilities such as mental control and cognitive flexibility and, hence, it facilitates the creative process (e.g., Bialystok et al., 2012; Kharkhurin, 2017). Yet, research on creativity has received scant attention in the field of L2 learning. In this area, some studies have explored the relationship between the learner's creativity, and its associated constructs, along with various aspects of language learning. Most of them follow the psychometric tradition to assess creativity as divergent thinking by means of widely used standardised tests, or adaptations of them, such as Torrance's TTCT or Guilford's Alternate Uses Test. With some exceptions (e.g., Ghonsooly & Showqi, 2012; Sehic, 2017), most of this research approaches creativity as an independent variable, that is, they have primarily focused on the effect of creativity on L2 processes. Contradictory results are obtained regarding the relationship between creativity and L2 proficiency. Some studies point to a positive relation between both variables (Ottó, 1998; Pishghadam et al., 2011; Smith, 2013; Sutrisno, 2007), yet some others find no statistically significant correlation (Albert, 2006). Of these studies, only Ottó (1998) and Sutrisno (2007) address secondary school students; the rest focuses on university students.

Regarding creativity and L2 skills, findings are non-conclusive although a certain positive connection can be traced. An important part of these studies implements investigation on task performance (e.g., Albert & Kormos, 2011; McDonough et al., 2015; Pishghadam & Mehr, 2011; Zabihi et al., 2013). For example, Albert and Kormos (2011) concluded that originality, flexibility, and creative fluency had a differential effect on the performance of oral narrative tasks of a group of secondary school students. On the one hand, they found a moderate positive relationship between the dimension of creative verbal fluency and certain aspects of oral narrative tasks, such as the amount of speech. Fluency was also moderately associated to originality and complexity of narrations. On the other hand, originality and amount of speech was negatively related. McDonough et al. (2015) examined the possible link between creativity and task performance in a group of EFL Thai university students and, although they identified a positive relationship between creativity and the production of a variety of sentences, relationships were not stable. Pishghadam and Mehr (2011) and Zabihi and Rezazadeh (2013) investigated narrative task performance of two samples of EFL Iranian university students. Pishghadam and Mehr (2011) found a positive relationship between learners' performance in written narrative tasks and their global creativity (i.e., the sum of its constructs), and separately with some of these constructs (fluency, originality and flexibility). Zabihi and Rezazadeh (2013) reported a significant correlation between creative fluency and L2 fluency in individual, but not paired, task performance; and a negative relationship between originality and L2 fluency in both individual and paired task performance.

Concerning L2 vocabulary learning research about creativity is still embryonic but, overall, a positive connection is suggested. For

example, Krönert et al. (2016) investigated the lexical production of a group of university French apprentices of German L2. In line with previous studies (e.g., Albert & Kormos, 2011), their findings indicate that creative learners use all possibilities to maintain fluency, control more and show more productivity. A positive relationship was also found by Seddigh and Shokrpour (2013) on the creativity and use of vocabulary learning strategies of a group of Iranian university students. Although moderate, the same positive result was observed in another study with Iranian university students between creativity and lexical reception and production (Hajilou et al., 2012).

3. Rationale and variables of this study

As seen in this literature review, there seems to be a neurocognitive basis for some connection between creativity and L1 processes, such as fluency (see section 2.3). The present study tries to ascertain whether the learner's creativity, as divergent thinking, can be also of help in fluency of L2 word production. Overall, evidence about the relationship between creativity and L2 semantic fluency is scant and partly contradictory (see section 2.4). We attempt to palliate this paucity of evidence by focusing both on the quantitative and qualitative analysis of L2 semantic fluency (i.e., the production of words belonging to a semantic category). L2 fluency is a central issue in effective communication. Its relationship with creativity can shed light on the processes that operate in the development of the depth of lexical knowledge, a strategy specific to advanced stages of learning. On the other hand, unlike most previous research, mainly aimed at tertiary level, we explore this issue in secondary education, which, as researchers have proven, is a critical stage for some of the creativity components, such as fluency and originality. In general and particularly at this educational level, evidence of a potential connection of creativity with L2 production may serve to inform adequate pedagogical planning of this variable in L2 teaching.

Based on the overall findings presented above, and, specifically, those which relate creativity to an increase of fluency in L1, the main hypothesis behind this research is that global creativity (as explained below), and some components of verbal creativity (fluency, originality, and flexibility), will have a positive effect on L2 word production both quantitatively and qualitatively regardless of L2 proficiency.

The following variables are considered here:

We address *semantic fluency* in L2 vocabulary production. This variable is measured through a verbal fluency task, as described below. We are interested in the following main aspects concerning this construct: *number of words* retrieved by each participant, *types* (total number of different words produced by a group of participants), and *word classes* (grammatical categories elicited that can offer some insight into the semantic space traversed by the participants). These aspects are traditionally addressed in the literature about fluency/lexical availability.

We also identified the *creativity profile* of both the full sample of participants and each creativity group by applying the PIC-J creativity test by Artola et al. (2008), described in the Instruments section below. This creativity profile informs about scores in the following measures:

- *Global creativity* (or simply *creativity*): the sum of *verbal creativity* and *figural creativity* scores.
- *Verbal creativity*: calculated by adding up the scores for the divergent thinking factors of (verbal) fluency, (verbal) flexibility, and (verbal) originality from various verbal tasks in the creativity test (the test we used does not measure (verbal) elaboration).
- *Figural creativity*: in the Pic-J test, this refers to the sum of (figural) originality, (figural) elaboration, specification of title and special details added to a picture.

In our analysis, we are particularly interested in investigating the connection of L2 semantic fluency with verbal creativity measures, as both imply verbal abilities. We have not considered the scores on each of the sub-components of figural creativity. However, we have decided to include the score for figural creativity as a whole to offer some evidence about its relationship with semantic fluency.

Finally, we controlled for *EFL proficiency*, measured by the *Oxford Quick Placement Test (OQPT)* (UCLES, 2001). The levels of the Common European Framework (CEFR) (Council of Europe, 2001) are also provided based on the scores in this test.

4. Research questions

The present study attempts to address the following research questions grouped in three categories according to their purpose, as follows:

Preliminary issues: description of participants and EFL stimulus categories.

RQ1 What is the creativity profile of the participants of this study according to their scores in the PIC-J test?
RQ2 Which are the most and least productive EFL semantic categories (*beach, box, countryside* and *fun*) according to the participants' responses?

Relationship between learner's creativity and EFL semantic fluency.

RQ3 Are there similarities or differences in the semantic fluency of high (HC) and low creative (LC) learners in terms of types, mean number of words, as well as word classes produced in each EFL semantic fluency task?

RQ4 Is there a relationship between the learners' global creativity (including verbal and figural creativity, along with verbal fluency, originality and flexibility) and EFL semantic fluency once proficiency is controlled?

Relationship between EFL proficiency and the rest of variables.

RQ5 Is there a relationship between EFL proficiency and global creativity?
RQ6 Is there a relationship between EFL proficiency and EFL semantic fluency?

5. Method

5.1. Participants

Our sample consisted of 35 L2 students (Spanish as L1 and English as L2; M_{age}: 17, SD_{age}: 0.36; 26 males, 9 females), in their 12th year of Spanish secondary education (science and technology branch), from two state high schools in the north of Spain. The schools were located in the same city and had similar socioeconomic status. Since data was collected on two different days, as explained below, due to possible absences, two schools were involved in order to reach a valid number of participants. For the analysis of this study, and by applying the PIC-J test (Artola et al., 2008), the sample of participants was divided via a median split ($Mdn = 94.00$) into two groups (high creativity (HC) group ($n = 18$) and low (LC) creativity group ($n = 17$)) according to their global creativity score (Table 1). Division through a median split of creativity groups is a common practice in the specialised literature.

5.2. Instruments

5.2.1. Linguistic background questionnaire

Information on participants' linguistic profiles was compiled via a paper-based linguistic background survey. In addition to providing data about their age, sex, nationality or their school centre, the participants responded in their L1 to seven questions related to their experience with English as a Foreign Language that included information on their native language(s), on extra hours of EFL outside of the school, travelling abroad, summer courses, learning of any other foreign language, type of baccalaureate or special linguistic programmes in which they could have taken part. This instrument mainly allowed us to detect any relevant differences in the linguistic profiles of the participants (e.g., bilingualism or multilingualism). The sample of participants was homogeneous in this regard.

5.2.2. Oxford Quick Placement Test (OQPT)

EFL proficiency was measured through the Oxford Quick Placement paper-version test (version 2) (UCLES, 2001), which contains 60 multiple-choice and gap-filling questions. Participants obtained a mean score of 31.83 ($SD = 31.83$, $SE_M = 6.56$, $Min = 22.00$, $Max = 49.00$, Skewness $= 0.86$, Kurtosis $= 0.45$, $Mdn = 31.00$). Based on the scores in the OQPT, as can be seen from Table 2, most participants were located between A2 and B1 levels from the Common European Framework of Reference for Languages (CEFR) (Council of Europe, 2001).

5.2.3. Semantic fluency tasks

Through these paper-based tasks we obtained the EFL vocabulary that is activated in the mental lexicon of the subjects in response to four stimulus categories: *beach, box, countryside* and *fun*. These categories differ from the most typical categories (*animals* or *fruits and vegetables*) in semantic fluency. For each of these stimuli, the participants had to write all the associations in EFL that came to their mind within a time period of 2 min each. These categories were frequent words in any language which were located between A1 and A2 CEFR levels of English. We decided to use categories which differed in some features in order to explore if any of these features could have any effect on the results. Although all of them are nouns, as this word class is typical in lexical availability studies (see, for instance, Jiménez Catalán, 2014), in the case of *fun* it can also be used as adjective. Some categories varied in terms of their concreteness level. In the identification of concreteness levels, we used the abovementioned database of concreteness ratings for 40 thousand English lemma words compiled by Brysbaert et al. (2014). According to this source, on a scale from 1 (the most concrete) to 5 (the least concrete), *fun* was perceived as one of the least concrete categories with a level of 1.97, while the group of *beach, box* and *countryside* presents slight differences in the concreteness levels ranging from 4.9 (*box*) to 4.48 (countryside). Regardless of the concreteness level, the main differences in this group of words lie in the different realities they denote. Hence, according to Wordnet (Princeton University, 2010), while *beach* and *countryside* mainly denote locations, *box* denotes objects and shapes, and *fun* refers to actions. These defining features of each category might be affecting word retrieval.

Table 1
Descriptive statistics for global creativity: levels.

	M	SD	n	SE_M	Min	Max	Skewness	Kurtosis	Mdn
Global creativity									
Low	67.33	18.09	18	4.26	19.00	94.00	-.88	.85	67.00
High	121.94	29.27	17	7.10	95.00	211.00	1.90	3.19	112.00

Table 2
Descriptive statistics for CEFR levels in EFL.

	n
CEFR (range of OQPT scores)	
A2 (16–23)	16
B1 (24–30)	16
B2 (31–40)	1
C1 (over 40)	2

Table 3 summarizes the characteristics of the four categories used in this study to measure verbal fluency. It includes the concreteness levels from Brysbaert et al. (2014), and the CEFR level, word class and definitions of the words according to the English Vocabulary Profile (EVP) (Cambridge University Press, 2015). Further meanings and word classes in some of these words can be found in other dictionaries but we restricted our description of the categories to the one offered in the EVP as it contains reliable information about words that are used by learners at each CEFR level.

5.2.4. PIC-J test

Our participants were administered the paper-based PIC-J test, developed by Artola et al. (2008). It follows the psychometric tradition of Torrance (1990) and Guilford's (1967) tests and has been validated for the assessment of creativity as divergent thinking in secondary Spanish students, from 7th to 12th grade (12–18 years old). The PIC-J test evaluates creativity (divergent thinking) through four tasks in Spanish. Based on a picture of two characters by a lake, in the first task, the participants must look at the scene and write down all possible things that might be happening. Following the test's scoring guide, the responses are classified according to different categories, (e.g., responses that refer to actions, descriptions, emotions, imagination, or references to past or future events related to the scene) and are assigned the corresponding score. Based on Guilford's Alternate Uses Test, the second task asks the participants to report as many different possible uses of a rubber pipe as possible. In the third task, the participants are required to write as many consequences as possible of a hypothetical situation (if suddenly the floor became elastic). Finally, the fourth task consists of completing four pictures and adding a title to each of them. As explained above, the global creativity score is made up of both verbal creativity and figural creativity scores. The first three tasks assess verbal creativity (fluency, flexibility, originality), and the fourth task assesses figural creativity (originality, elaboration, specification of a title, and use of creative details, such as colour, shadows, rotations, or new perspectives). Fig. 1 shows the structure and variables assessed in this test.

5.3. Data collection

We collected the data of this study in two sessions during class time in each of the two high schools. Instructions for each test were provided in Spanish. Test administration order was kept as follows: during the first session, the participants completed the background questionnaire in 5 min after which they performed the verbal fluency tasks. The tasks included more prompts than the ones analysed in this study. A second session was devoted to the completion of the Quick Oxford Proficiency Test (30 min), and the PIC-J test (7 min per task).

5.4. Analyses

In the analysis of the responses to the PIC-J test, we followed the instructions provided in the test manual by Artola et al. (2008). We obtained scores for global creativity, verbal creativity (including verbal fluency, verbal flexibility, verbal originality), and pictorial or figurative creativity. On the other hand, the participants' retrieval in the EFL semantic fluency tasks was edited and encoded electronically by following the same criteria as in Jiménez Catalán and Dewaele (2017). SPSS (version 26.0; IBM Corp. Released, 2019) was used in the statistical analyses of this study. In addition, Text Lex Compare v.4.3 New index Calc (Cobb, 2020). was used to identify qualitative differences about word retrieval in the four EFL fluency tasks.

Table 3
Characteristics of stimulus categories.

|	CEFR level, word class, and definition (English Vocabulary profile, 2020 – British English)	Concreteness value (Brysbaert et al., 2014)
Beach	(A1) Noun. An area of sand or small stones next to the sea.	4.79
Box	(A1) Noun. (Container): a square or rectangular. container. (A2) Noun. (Square space): a small square on a page that gives you information or where you write information.	4.9
Countryside	(A2) Noun. Land which is not in towns, cities or industrial areas and is either used for farming or left in its natural condition.	4.48
Fun	(A1) Noun. Enjoyment of pleasure, or something that gives you enjoyment or pleasure. (A2) Adjective. Enjoyable or entertaining.	1.97
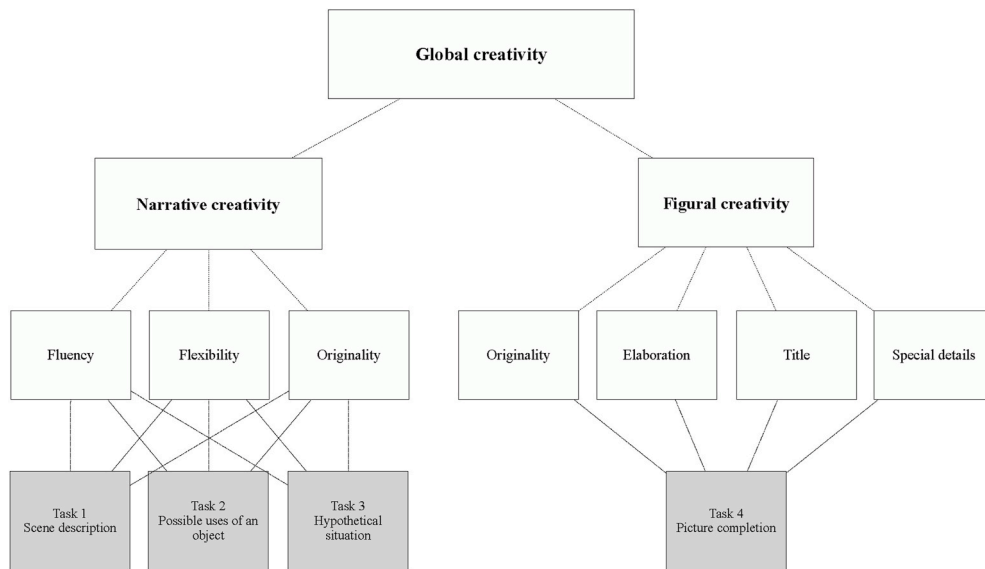
Fig. 1. Structure of PIC-J test (adapted from Artola et al., 2008, p. 38).

6. Results

RQ1 What is the creativity profile of the participants of this study according to their scores in the PIC-J test?

Table 4 shows the descriptive statistics for the scores of the full set of creativity measures in each of the two creativity groups (low and high). Based on an alpha value of 0.05, the results of a series of ANOVAs prove that differences between our groups were statistically significant in global creativity ($F(1, 33) = 44.65, p < .001$), and all measures of verbal creativity (verbal creativity ($F(1, 33) = 27.62, p < .001$), narrative fluency ($F(1, 33) = 17.89, p < .001$), narrative flexibility ($F(1, 33) = 38.27, p < .001$), and narrative originality ($F(1, 33) = 22.42, p < .001$)). No significant differences are identified in figural creativity.

The profile plot in Fig. 2 allows a deeper insight into these differences by displaying the verbal creativity profile of each group, (i.e., their scores in the divergent thinking factors of verbal creativity: fluency, flexibility, and originality). This visual technique requires that all variables have the same unit of measurement. Therefore, we converted raw scores to percentile scores by following the PIC-J test's scoring system (Artola et al., 2008). Percentile scores represent how our participants' scores compare to the test's normative sample. For example, a percentile rank of 50 means the test taker scored as well or better than 50 percent of other test takers from the comparison group. In both groups (high and low), fluency has the highest score, followed by flexibility and originality. The HC group scores quite similarly in flexibility and originality, whereas the difference between these two factors is bigger in the LC group.

Table 4
Descriptive statistics for creativity measures per global creativity level.

|	M	SD	n	SE_M	Min	Max	Skewness	Kurtosis	Mdn
Global creativity									
Low	67.33	18.09	18	4.26	19.00	94.00	-.88	.85	67.00
High	121.94	29.27	17	7.10	95.00	211.00	1.90	3.19	112.00
Verbal creativity									
Low	63.11	23.50	18	5.54	18.00	126.00	.67	1.37	61.50
High	110.41	29.56	17	7.17	76.00	200.00	1.81	3.13	102.00
Verbal fluency									
Low	34.44	16.10	18	3.80	11.00	87.00	1.82	4.53	33.50
High	56.82	15.15	17	3.67	39.00	104.00	1.88	3.69	55.00
Verbal flexibility									
Low	19.00	4.86	18	1.15	7.00	27.00	-.47	.37	19.00
High	28.24	3.88	17	.94	20.00	35.00	-.30	-.40	28.00
Verbal originality									
Low	9.67	5.43	18	1.28	.00	19.00	.20	-.57	10.00
High	25.35	12.90	17	3.13	13.00	63.00	1.58	2.22	21.00
Figural creativity									
Low	7.94	4.89	18	1.15	.00	20.00	.65	.37	8.00
High	10.76	3.54	17	.86	6.00	19.00	.81	.14	10.00
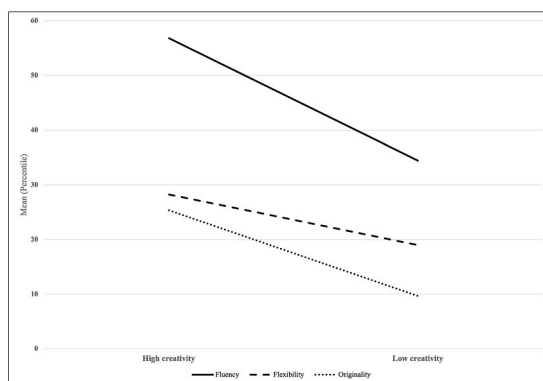
Fig. 2. Verbal creativity profile per global creativity level.

RQ2 Which are the most and least productive EFL semantic categories (*beach, box, countryside,* and *fun*) according to the participants' responses?

In order to better interpret the relationship between the variables of the present study, we explored the characteristics of the four semantic categories included in it with respect to the participants' retrieval . As Table 5 shows, the mean number of words produced by the participants varies regarding the category, being *beach* and *countryside* the categories with higher means per participant, followed by *fun* and box. Aspects concerning the nature of the stimulus category, which may help understand these differences, are considered in the discussion. In addition, we complemented this result by tallying the types, that is, the total number of different words, produced by the full sample in each fluency task. Our sample of participants elicited a significantly higher number of types for *countryside* (209 types), closely followed by *box* (199 types) and *beach* (193 types). *Fun* (167 types) was the least productive category.

RQ3 Are there similarities or differences in the semantic fluency of high (HC) and low creative (LC) learners in terms of types, mean number of words, as well as word classes produced in each fluency task?

Our third research question aims at exploring the participants' EFL semantic fluency according to the two global creativity levels in terms of the types, average number of responses and word classes retrieved for each of the categories of the fluency task (*beach, box, countryside,* and *fun*). See section 3 for the definition of these variables. Table 6 shows total, unique and shared types per category and creativity group. Absolute and relative (%) frequencies are offered for unique and shared types. Absolute frequency refers to the count of the number of word classes (nouns, adjectives, verbs, others) that occur in each case, while relative frequency refers to the percentage of unique or shared types of the total types produced by a group in a category. We observe that the HC group surpasses the LC group in total types across all categories. The most creative group produces more unique types ($M = 65.06\%$ of the total types) than the least creative group ($M = 47.56\%$ of the total types) in all categories, and mainly in *box* and *fun*. Table 7 displays the results about the average responses produced by the participants in each creativity group. HC learners retrieve more words than the LC ones in all categories. A series of analyses of variance (ANOVA) determined that this result is statistically significant (*beach*: $F(1, 33) = 20.19$, $p < .001$; *box*: $F(1, 33) = 19.66$, $p < .001$; *countryside*: $F(1, 33) = 32.52$, $p < .001$; *fun*: $F(1, 33) = 16.79$, $p < .001$).

Table 8 displays the absolute and relative (%) frequencies of the word classes found in each group's retrieval of unique types per category. In the case of homonyms, we looked for possible clues (e.g., collocations) in the subject's word retrieval. In all cases, both in absolute and relative values, nouns are the most frequently retrieved categories. Adjectives and verbs follow in this order in all categories except for *fun*, where verbs that mainly express enjoyable activities are more frequent than adjectives in both groups of learners. Regarding absolute frequency, the HC group outperforms the LC group in all word classes retrieved across all stimuli. Concerning relative frequency, in *beach* and *countryside*, the percentage of nouns within the LC group is higher than in the HC group. In these categories, the HC group outperforms the LC group in the percentage of adjectives and verbs. The opposite results are found for *box* and *fun*.

Overall, the HC group extends the typical semantic fields triggered by each category to others, which explains the quantitative findings above (e.g., retrieval of more unique types). For example, in *beach*, in addition to items for physical description of the

Table 5

Descriptive statistics for the participants' responses in each category.

	M	*SD*	*SE$_M$*	Min	Max	Skewness	Kurtosis	*Mdn*
Beach	16.57	6.52	1.10	2.00	32.00	.34	.01	16.00
Box	10.94	5.69	.96	2.00	24.00	.40	-.42	11.00
Countryside	16.09	5.97	1.01	5.00	31.00	.52	.18	16.00
Fun	12.94	5.29	.89	4.00	27.00	.40	-.26	12.00

$N = 35$.

Table 6

Descriptive statistics for total, unique and shared types in each category by creativity group: absolute and relative (%) frequency.

	Total types	Unique types		Shared types	
Beach					
Low	105	50 (47.62%)		55	(52.38%)
High	143	88 (61.54%)			(38.46%)
Box					
Low	95	48 (50.53%)		47	(49.47%)
High	151	104 (68.87%)			(31.13%)
Countryside					
Low	110	47 (42.73%)		63	(52.27%)
High	162	99 (61.11%)			(38.89%)
Fun					
Low	79	39 (49.37%)		40	(50.63%)
High	128	88 (68.75%)			(31.25%)

Table 7

Descriptive statistics for mean number of words in each category per creativity group.

	M	*SD*	*n*	SE_M	Min	Max	Skewness	Kurtosis	*Mdn*
Beach									
Low	12.72	4.62	18	1.09	2.00	20.00	-.41	-.09	13.00
High	20.65	5.78	17	1.40	13.00	32.00	.45	−1.07	20.00
Box									
Low	7.61	4.23	18	1.00	2.00	15.00	.43	−1.14	6.50
High	14.47	4.91	17	1.19	6.00	24.00	.44	-.53	14.00
Countryside									
Low	12.06	3.84	18	.91	5.00	20.00	.24	-.054	11.00
High	20.35	4.74	17	1.15	15.00	31.00	1.06	.22	19.00
Fun									
Low	10.00	4.21	18	.99	4.00	20.00	.74	.04	10.00
High	16.06	4.53	17	1.10	9.00	27.00	.42	.26	16.00

Table 8

Word classes in unique types: absolute and relative (%) frequency.

	Nouns	Adjectives	Verbs	Others
Beach				
Low	43 (86%)	5 (10%)	2 (4%)	
High	54 (61.36%)	16 (18.18%)	18 (20.45%)	
Box				
Low	33 (68.75%)	10 (20.83%)	5 (10.42%)	
High	78 (75%)	15 (14.42%)	11 (10.58%)	1 (.96%)
Countryside				
Low	40 (85.10%)	5 (10.63%)	2 (4.25%)	
High	80 (80.81%)	12 (12.12%)	7 (7.07%)	
Fun				
Low	29 (74.35%)	1 (2.56%)	9 (23.07%)	
High	69 (78.40%)	2 (2.27%)	19.31%)	

landscape, animals, personal relations, or sport activities, this group incorporates new fields, such as emotion words (e.g., *happy, new, amazing, relaxing, freedom, danger*). In *box*, for instance, they augment the shared vocabulary about presents, stationery, post, and physical description with specific words for shape and size (e.g., *little, cubic, empty, green, rectangle, rectangular*), emotions (e.g., *boring, happy*), purpose (e.g., *useful, useless, worthless*). They even extend it to other semantic fields, such as other domestic uses (e.g., *weapon, juice, cereal, milk, gun, doll, jewelry, earring*), or other areas or activities, such as industry (e.g., *manufacturing, customer, department*).

RQ4 Is there a relationship between the learners' global creativity (including verbal and figural creativity, along with verbal fluency, originality and flexibility) and EFL semantic fluency once proficiency is controlled?

In this question, we address global and verbal creativity, along with the divergent thinking dimensions of verbal creativity: fluency, originality and flexibility. Partial correlation was used to explore the relationship between the four stimulus categories and each of the creativity variables, while controlling for EFL proficiency. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. As shown in Table 9, based on an alpha value of .05, a statistically significant correlation is found between each creativity variable and each of the four categories. Except for the medium effect size found in the

Table 9
Partial correlation results among creativity variables and EFL semantic fluency.

Control Variable: EFL proficiency		Total creativity	Verbal creativity	Fluency	Flexibility	Originality
Beach	Correlation	.67[a]	.68[a]	.64[a]	.52[a]	.68[a]
	Sig. (2-tailed)	.000	.000	.000	.001	.000
	df	32	32	32	32	32
Box	Correlation	.59[a]	.61[a]	.58[a]	.38[a]	.64[a]
	Sig. (2-tailed)	.000	.000	.000	.028	.000
	df	32	32	32	32	32
Countryside	Correlation	.74[a]	.79[a]	.78[a]	.55[a]	.76[a]
	Sig. (2-tailed)	.000	.000	.000	.001	.000
	df	32	32	32	32	32
Fun	Correlation	.52[a]	.54[a]	.56[a]	.51[a]	.40[a]
	Sig. (2-tailed)	.001	.001	.001	.002	.018
	df	32	32	32	32	32

[a] Correlation is significant at the 0.05 level (2 tailed), $n = 35$.

relationship between flexibility and *box* ($r = 0.38$, $p = .028$), and originality and *fun* ($r = 40$, $p = .018$), in the rest of cases the correlation is strong. In these cases, the creativity measures explained an average of 40% of the variance in the number of words retrieved in each category. *Countryside* is the prompt with the highest correlations with the creativity measures, followed by *beach*, *box* and *fun*, in this order.

RQ5 Is there a relationship between EFL proficiency and global creativity?

This question addresses the connections between EFL proficiency, measured via the OQPT, and global creativity. Although in previous analyses we have controlled the effect of EFL proficiency in the relationship between creativity measures and vocabulary production, we wanted to know if there is some link between language proficiency and creativity since, as we have seen in the literature review, creativity has been found to be related to foreign language proficiency in some studies. Table 10 displays the descriptive statistics in EFL proficiency obtained by LC and HC groups. The HC group's EFL proficiency level is higher than in the LC group, however, a Pearson product moment correlation coefficient (Table 11) reveals no statistically significant relationship between both variables.

RQ6 Is there a relationship between EFL proficiency and EFL semantic fluency?

With respect to the possible relationship between the learners' EFL proficiency level, measured via the OQPT, and their EFL word retrieval in the semantic fluency tasks. As shown in Table 12, a Pearson correlation analysis reveals statistically significant positive correlations of EFL proficiency with the number of words retrieved only in the categories *beach* ($r = .51$, $p = .002$) and *countryside* ($r = 0.46$, $p = .005$). The correlation coefficient between proficiency and *beach* indicates a large effect size. The correlation coefficient between EFL proficiency and *countryside* suggests a moderate effect size.

7. Discussion

The role of creativity in foreign language learning remains largely unexamined. The scarcity of research is more obvious at levels below tertiary education, for which research has identified certain decrease in creativity levels. Concerning L2 vocabulary learning, previous research suggests a tendency towards a positive relationship between both variables in different regards. Given the paramount role that semantic fluency or vocabulary production have in the acquisition of L2 communicative competence, the primary aim of this research was to contribute to the understanding of the possible effect of creativity, as divergent thinking, on the L2 semantic fluency of a group of EFL secondary education learners. Four written semantic fluency tasks were used to measure semantic fluency of a group of EFL secondary education learners. Global creativity, including verbal and figural creativity, was assessed along with various dimensions of verbal divergent thinking, such as fluency, flexibility and originality.

As regards the creativity profile of our group of EFL learners (RQ1), we found that the HC group significantly outperformed the LC group in global creativity and all measures of verbal creativity. Verbal creativity profiles showed similar patterns in both groups. Creative fluency had the highest score in both groups, followed by flexibility and originality. No significant differences were found in figural creativity. Artola et al. (2011) also observed this pattern in children, adolescents, and adults. The HC group scored quite

Table 10
Descriptive statistics for EFL proficiency by global creativity level.

	M	*SD*	*n*	SE_M	Min	Max	Skewness	Kurtosis	*Mdn*
EFL proficiency									
Low	29.17	5.86	18	1.38	22.00	43.00	.94	.00	27.00
High	34.65	6.19	17	1.50	28.00	49.00	1.21	.63	33.00

Table 11

Pearson correlation results for EFL proficiency and global creativity.

		Global creativity
EFL proficiency	Pearson Correlation	.30
	Sig. (2-tailed)	.076

Table 12

Pearson correlation results for EFL proficiency and categories.

		Beach	Box	Countryside	Fun
EFL proficiency	Pearson Correlation	.51[a]	.24	.46[a]	.25
	Sig. (2-tailed)	.002	.152	.005	.153

[a] Correlation is significant at the 0.05 level (2 tailed), n = 35.

similarly in flexibility and originality, whereas the difference between these two factors was bigger in the LC group. The relationship of these measures with L2 semantic fluency will be discussed later.

Concerning our RQ2 (i.e., the identification of the most and least productive EFL semantic categories (*beach, box, countryside,* and *fun*)), the participants produced a higher mean number of responses for *beach*, followed by *countryside*, *fun* and box. The total sample of participants produced more types (i.e., different words) for *countryside*, closely followed by *box* and *beach*. *Fun* was the least productive category. The reasons why the participants retrieved more average responses for *beach* and *countryside* may be due to the fact that they are familiar locations for them. The countryside is the place where they live, and the beach is a nearby location which many of them may visit in their holidays. In these two categories, they produced words related to their first-hand experience. *Countryside* was also the prompt which retrieved more types probably due to this familiarity feature along with the fact that, as a location, it might be richer than *beach* in the activation of frequent words within the proficiency range or vocabulary breadth of these learners. On the other hand, *fun* was one of the less productive categories, perhaps due to the difficulty imposed by its low concreteness level, as research has found that less concrete categories are less productive (Hernández-Muñoz et al., 2006; Jiménez Catalán & Dewaele, 2017). The degree of coincidence in the responses given for this category might be due to the limited set of enjoyable activities shared by adolescents, as exemplified in some of the most frequently retrieved words, such as *friend, party, sport, family, holiday, music, football, game, television,* or *cinema*, among others. On the other hand, the concreteness factor can also explain learners' behavior in all categories but *box*, a highly concrete category which retrieves low average number of words. One intuitive explanation for this result might be that, being equally concrete, and, in general, sharing other variables such as frequency or CEFR level, the semantic space of nouns that denote objects might be more difficult to traverse than nouns that denote locations, such as *countryside* or *beach*. Further research would help explain this result. While a panoramic mental visualisation may easily offer most of the input for a semantic fluency task in the case of locations, this resource may not facilitate semantic retrieval for objects like *box*, for which the participants had to look for other types of relations, like purpose or shape and size.

Based on the results above, according to RQ3 we wanted to explore the semantic fluency of HC and LC learners quantitatively and qualitatively in each of the four EFL semantic tasks. In line with a positive tendency in previous research (Albert & Kormos, 2011; Krönert et al., 2016), the present study confirms statistically significant differences concerning the mean number of responses per learner in favour of the HC group. In both groups, *beach* was the category eliciting more average responses, followed by *countryside*, *fun* and *box*, in this order. In the case of total, unique and shared types retrieved by each creativity group as a whole, the HC group also retrieved more unique types across categories, particularly in *box* and *fun*. As regards word classes, in all categories with the exception of *fun*, both groups produced mainly nouns, followed by adjectives and verbs, in this order. With some differences in relative frequency, the HC group outscored the LC group in all grammatical categories in absolute frequencies. In sum, the group of high creative learners recalled a wider variety of words, they explored the semantic spaces more deeply, and this exploration was more detailed. The most creative learners were found to produce more uncommon responses (unique types), a result which is consistent with the literature that identified most creative individuals' higher associative fluency, based on more distant semantic connections (Benedek & Neubauer, 2013), a more flexible semantic network (Kenett et al., 2014), or more complex network structures (Gruszka & Necka, 2002). The dimension of flexibility (i.e., the production of varied unusual responses that enables a transformation of the process to reach a solution) might be having an impact on this result.

With regard to RQ4, we intended to address the relationship between the learners' global creativity, including associated dimensions, and their vocabulary production in each semantic fluency task while controlling for EFL proficiency. A significant positive correlation was found in all cases. In global creativity, this was a strong correlation, although it was not observed that creativity had a higher specific incidence in less productive cases. Looking at each category and variable separately, except for the moderate relationship between flexibility and *box,* and originality and *fun*, in the rest of the cases the correlation coefficient was strong. It is almost 80% in *countryside*, nearly 70% in *beach*, around 60% in *box* and 50% in *fun*. In addition, there were no variations in the order of the effect of each divergent thinking dimension on the productive behavior by category: the most fluent, flexible and original learners behaved better in *countryside*, *beach*, *box* and *fun,* in this order. We can point to a possible ceiling effect of the learners' vocabulary size, that is, the number of words that learners are familiar with, as a plausible reason for this lack of variation.

Regarding RQ5, we wanted to explore the relationship between the learners' EFL proficiency and global creativity. No relationship

was observed between EFL proficiency and creativity. This finding is in accord with Albert (2006) but contradicts the positive connection identified in other studies such as Ottó (1998) or Pishghadam et al. (2011). Further research is needed on this aspect as this contradictory evidence might suggest the interaction of other variables. Finally, as regards RQ6 we wanted to examine the relationship between the learners' EFL proficiency and their vocabulary production in each EFL fluency task. Interestingly, while a correlation was observed between all creativity measures and the vocabulary production, a correlation concerning proficiency is only observed for *beach* and *countryside*. No relationship is found for *box* and *fun*. These results are again suggestive of the contribution of creativity in L2 learning. Regardless of the learners' EFL proficiency level, the results in this research suggest that creativity rather than proficiency might be having an impact on their capacity of exploring the semantic space.

8. Conclusion

Research about individual learner variables in L2 language learning has not yet addressed in depth the learner's creativity as a potentially relevant variable in the field. Evidence has suggested that fluency and originality decrease in secondary education, which might be affecting performance in L2. This study contributes to the scarcity of creativity research on L2 learning in secondary education by ascertaining whether creativity might be facilitating the EFL semantic fluency of a group of 35 Spanish EFL learners (26 males, 9 females) in their 12th year of schooling. Four semantic tasks for four categories (*beach, box, countryside, fun*) were used to measure EFL semantic fluency. Learners' global creativity, verbal creativity (including the components of fluency, flexibility, originality), and figural creativity were identified through the PIC-J Test (Artola et al., 2008), based on Torrance (1990) and Guilford's (1967) tests, and validated for the assessment of creativity as divergent thinking in Spanish secondary education. We explored the relationship between L2 fluency in the four stimulus categories and each of the creativity variables, while controlling for EFL proficiency. Statistically significant correlations were found between L2 semantic fluency in the four categories and global creativity (including verbal creativity and its three dimensions). In most cases L2 fluency and each creativity measure were strongly correlated, while only L2 fluency in two categories correlated with EFL proficiency. At least one limitation should be pointed out in this research: learners' vocabulary size has not been assessed, which could be likely offering some evidence on a possible ceiling effect that might affect L2 learners' retrieval, and therefore its relationship with creativity. Further research should explore if vocabulary size or any other linguistic or individual learner variables with proven relevance in the field, such as openness to experience or motivation, are mediating these results. Notwithstanding these limitations, this work offers valuable insights into the positive effect of the learner's divergent thinking skills (verbal fluency, flexibility and originality) in traversing the semantic space in a foreign language regardless of their L2 proficiency. Consistent with previous literature, the most creative learners' retrievals contained a wider variety of words and less typical responses. Along this line, this study proves that creativity seems to have a particular incidence on the retrieval in less closed or less predictable semantic categories, which do not tend to typically elicit a fixed type of semantic relationships (e.g., *animals* is a closed category typically eliciting types of animals). This might imply that, when necessary, the most creative learners would resort to their creative capacity to manage oral or written production, for example in conversation tasks or essay writing, even if the topic imposes certain challenges. Considerably more work will need to be done to examine this issue.

Students' creative capacity is largely implicit in most academic curricula; however, research has demonstrated that explicit teaching of creativity is possible since this is not an immutable construct and can be learned (Ritter & Mostert, 2017; Sun et al., 2020). This line of evidence has significant implications for the development of creativity training programmes across the curriculum, and especially in L2 learning. This discipline is particularly flexible to provide valid scenarios for promoting creative skills through communicative methodologies and approaches, such as CLIL or Task-based language teaching (TBLT). Regarding TBLT, for instance, traditional creativity tasks, such as the ones based on Torrance (1990) or Guilford (1967), could be naturally integrated with the parameters of task design (e.g., Ellis, 2009; Willis & Willis, 2011) to work with a selection of L2 skills and components. In fact, various task types in TBLT are inherently based on creativity, such as tasks involving listing, fact-finding, or problem resolution. Both language and creativity could be addressed at once within this framework. For example, an enquiry-rich problem-solving task could be devised to provide the learners opportunities to use the conditional forms while they produce oral or written solutions to a given hypothetical situation. All responses could be assessed from more to less creative by means of some creativity scoring guide, and the learners could receive explicit teaching of strategies to improve the different dimensions of their creative thinking. This type of scenario would contribute to stimulate the learners' divergent and convergent thinking skills through meaningful and contextualized language practice.

Declarations of competing interest

None.

Credit author statement

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