



# ESPACE L2: exploring spacing effects in explicit and implicit online learning of L2 English

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**Abstract.** Language researchers and teachers have long been interested in the timing of learning, and the distributed practice effect, whereby greater inter-session intervals result in longer retention, is well-known (Kim & Webb, 2022). Many L2 studies have focused on the intentional learning of lexis (Edmonds, Gerbier, Palasis, & Whyte, 2021), neglecting implicit learning and syntactic development (Rogers, 2021). The present project includes both explicit vocabulary learning activities and incidental exposure to a complex syntactic structure via a bespoke online L2 English learning platform. The goal is to investigate the two types of learning in two spacing conditions. This paper describes (1) the learning activities created to present opportunities for explicit vocabulary learning and the concealed syntactic input, and (2) the tests used to evaluate participants' receptive and productive knowledge of target items. It aims to inform computer assisted language learning design with respect to pedagogical progression, learning activities, feedback, and learning schedules.

**Keywords:** second language acquisition, implicit/explicit learning, lexis, syntax, spacing effect, distributed practice.

## 1. Introduction

This paper presents a project on spacing effects in the online learning of lexis and syntax in second language (L2) English: ESPACE L2 (*ESpacement dans*

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*l'Apprentissage de la Complexité En L2*; spacing in the learning of complexity in L2). The project lies at the intersection of L2 teaching and learning, linguistics, and cognitive science, and involves the creation of an online platform to deliver language learning activities and collect data on learners' performances.

## 2. The L2 spacing effect

The spacing effect has been called “one of the most robust phenomena in experimental psychology” (Ellis, 1995, p. 118) and research in many domains has consistently demonstrated that the organisation of learning sessions over time (spacing) significantly influences memorisation (retention; cf Gerbier & Toppino, 2015). In studies which investigated item learning (e.g. an L2 word and its L1 translation), learners who attempted to retrieve items repeatedly in a single learning session (massed condition) made greater initial gains than those whose learning was spaced over several sessions (distributed condition), but the longer-term retention of the learners on a distributed schedule was consistently superior (distributed practice effect; cf Kim & Webb, 2022). Recent L2 studies have investigated uniform versus expanding schedules (Kang, Lindsey, Mozer, & Pashler, 2014), adaptive spacing (Lindsey, Shroyer, Pashler, & Mozer, 2014), ecological learning contexts (Rogers & Cheung, 2020), and implicit versus explicit learning (Nakata & Elgort, 2020).

The ESPACE L2 project builds on this work by comparing two types of learning – explicit learning of vocabulary and implicit learning of syntax – in two different learning schedules, using a pre-, post-, and delayed post-test design. Participants are non-English majors at the Université Côte d'Azur, randomly assigned to a 48-hour (sessions every two days) or seven-day learning schedule (sessions every week).

## 3. Pedagogical design

The platform includes nine main learning activities organised in three sessions of three activities, focusing on the meaning, form (sound and spelling), then use of 16 English verbs, with immediate feedback to learners after each attempt. In addition to the activities shown in Table 1, the first session included an initial presentation activity (pronunciation, definition, translation, and example sentence for each verb); each session ended with an opportunity to review learning, for a total of 13 exercises taking approximately 110 minutes.

Table 1. Lexical learning activities

	SESSION 1	SESSION 2	SESSION 3
1. MEANING	synonym multiple choice	translation multiple choice	synonym gapfill
prompt	<b>to loathe</b>	Most of us <b>loathe</b> asking for help, so we continue alone	The TV show received good reviews from the critics, but was _____ by the public
answer	to hate someone or something	<i>détester</i>	loathed
2. FORM	multiple choice	anagram	dictation
prompt	[audio]	A T L O E H	[audio]
answer	loathe	L O A T H E	loathe
3. USE	gapfill multiple choice	dialogue listening multiple choice	dialogue listening sentence completion
prompt	[text] The UK Independence Party (UKIP) has always campaigned for Britain to leave the European Union. Because it focused only on this question, some commentators wondered how UKIP could be so successful. Indeed, only the fact that UKIP supporters _____ continental Europe keeps them together.	[text] Angela is complaining to her friends about her job. Her friends ask:  [audio] What do you <b>loathe</b> doing the most?  [prompt] Her friends ask what	[text] Julia and Frances are discussing the difficulties of campaigning for climate change.  [audio] Julia: Of course, lots of climate change protestors absolutely loathe the media. Frances: Sorry I didn't catch that. What do the protestors loathe?  [prompt] Frances is wondering what
answer	<b>loathe</b>	Angela <b>loathes</b> doing the most	the protestors <b>loathe</b>
4. SELF-EVALUATION	Indicate for each of 16 verbs - I don't know it yet - I know it a little - I know it well	as Session 1	as Session 1

Table 1 shows how the learning programme progressed from recognition to more elaborate production tasks; learners' progress through the sessions and activities was also controlled to prevent repetition, to record only first responses, and to keep the number of exposures to target items constant.

Concerning the choice of learning targets, the verbs selected for explicit learning met three criteria: they belonged to the 5,000-6,000 frequency band, were characteristic

of learners at C2 level in the English Vocabulary Profile, and were not French cognates. The target sentences for implicit syntactic learning were embedded in the third activity of each session through the wording of the example paragraphs and answer prompts, and were controlled for lexical variation.

#### 4. ESPACE L2 research design and test battery

Participants connected to the platform six times: (1) to enrol, provide informed consent, and give a linguistic biography, (2) to take five pre-tests listed in [Table 2](#) and schedule learning sessions, (3-5) to complete the learning sessions, including an immediate post-test at the end of Session 3, and (6) to take the delayed post-test.

Table 2. Tests of proficiency, vocabulary knowledge, and syntactic development

	Test battery	Pre-test	Immediate post-test	Delayed post-test
1. PROFICIENCY	V_YesNo (Meara & Miralpeix, 2016)	√	X	X
2. VOCABULARY	Modified Vocabulary Knowledge Scale  (Paribakht & Wesche, 1993) - I've never seen this verb - I've seen this verb but I don't know what it means - I've seen this verb [provide synonym/translation/definition and use in sentence]	√	√	√
3. READING	Self-paced reading  (reaction times for target and spillover segments)	√	√	√
4. LISTENING	Aural acceptability judgement  (correct/incorrect scores on grammatical and ungrammatical exemplars)	√	√	√
5. WRITING	Sentence completion  (production of target structure)	√	X	√

The first test listed in [Table 2](#) situates the learners in terms of general proficiency, while the second provides our measure of vocabulary knowledge before and after the intervention. Since implicit syntactic learning via 48 exposures to examples

of the target structure is likely to be difficult to detect, three syntax tests were included, ranging from the most implicit measure, self-paced reading, through an acceptability judgement task, to the most explicit measure, sentence completion (cf Vafae, Suzuki, & Kachisnke, 2017). The project platform also collects responses for each participant on all learning activities.

## 5. Conclusion

The ESPACE L2 project allows for the collection of rich data for the investigation of spacing schedules for lexical learning and syntactic development. Results will contribute to our understanding of the effects of timing of practice and evaluation sessions in both explicit and implicit conditions of L2 learning.

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