



Volumen 19, número 1, 2023

Research Synthesis: exploring interleaving and blocking practice in second language learning

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Abstract

Fostering long term retention of language items in ESL is always a problem that teachers need to deal with. Oftentimes, students struggle with remembering information when new information is added. In order to solve such a problem it is necessary to identify effective learning techniques that can help students develop that ability. There are many learning techniques that claim to help with that, for example, mnemonics devices or space repetition; however, current techniques have explored the effectiveness of using blocking and interleaving practice to achieve the aforementioned objective. Interleaving can be defined as learning two or more related concepts or skills by alternating between those concepts or skills. On the other hand, blocking practice can be defined as studying or learning one topic very thoroughly before moving to the next. This article is a research synthesis which explores the effectiveness of blocking and interleaving practice as learning techniques in ESL to foster long-term retention in language learning. Interleaving and blocking have been used to promote not only long-term memory retention in different domains such as mathematics, image recognition, and painting, but also in language learning with pronunciation, grammar, vocabulary, and fluency and some other aspects.

Key words: *Interleaving practice, blocking practice, learning techniques.*

Síntesis de investigación: exploración de las prácticas intercalada y en bloques en el aprendizaje de una segunda lengua

Resumen

Uno de los problemas que los maestros de inglés deben solucionar es ayudar a sus estudiantes a memorizar diferentes elementos relacionados con la gramática, el vocabulario, la pronunciación, entre otros. Existen muchas técnicas de aprendizaje para lograr tal objetivo; sin embargo, este artículo se va a centrar en la práctica intercalada (*interleaving*) y la práctica en bloques (*blocking*). Este artículo es la síntesis de una investigación que explora la efectividad de estas dos prácticas de aprendizaje en la enseñanza del inglés. De acuerdo con la literatura, estas dos técnicas pueden ser utilizadas para generar memoria a largo plazo en temas como pronunciación, gramática, vocabulario y fluidez. A pesar de que estas técnicas resultan ser efectivas, es necesario que los maestros de lenguas conozcan cómo aplicarlas en el salón de clase; este trabajo busca ayudar a maestros de inglés a utilizar estas técnicas en sus clases diarias, por medio de un análisis de diferentes artículos en donde se aplican efectivamente. Asimismo, se hace un llamado a realizar más investigación de estas técnicas de aprendizaje en otros aspectos de la lengua.

Palabras clave: *Técnicas de aprendizaje, aprendizaje de lenguas, blocking, interleaving.*

There is a lot of information regarding ESL methodologies as well as different kinds of approaches such as the Direct Method, Communicative Language Teaching, Total Physical Response, and Content and Language Integrated Learning (CLIL) to name some; however, all of these methodologies have something in common: they apply different learning techniques to ensure effective learning. There are a lot of techniques that claim to be effective for learning a new skill, this paper will focus on interleaving and blocking practice as pedagogical tools.

Interleaving can be defined as learning two or more related concepts or skills by alternating between those concepts or skills. For example, when learning two topics: topic one and topic two, instead of practicing the first topic one day and then second topic the following day, it would be better to practice both each day by adding pieces of information about the two topics. On the other hand, blocking practice can be defined as studying or learning one topic very thoroughly before moving to another. For example, when learning two topics: topic one should be mastered before attempting to start the topic number two.

Interleaving and blocking practice has been recognized for its pedagogical contributions in learning and developing new skills. Some of the ways that these techniques have contributed to this enterprise is by promoting long-term learning results (Bjork & Bjork, 2011), fostering inductive learning (Rohrer, et al., 2014), improving verb conjugation (Nakata, 2019), grammar abilities, fluency and pronunciation (Suzuki, 2021). Even though interleaving and blocking practice in learning languages has been explored in different domains of language learning, there is still room to expand the use of these techniques in other different domains such as pragmatics, collocations, fluency and accuracy. Moreover, ESL teachers must know how to use those techniques effectively in their classrooms. Therefore, this is the question that this paper will try to address: how interleaving and blocking practice can be used as effective learning techniques in the classroom?

Research Synthesis

This section will outline some of the most important research done using interleaving and blocking as learning techniques. Interleaving and blocking practice can be used in two ways in the classroom; for example, both can be used as tools to introduce information. This is particularly important to teachers, since this can be utilized as ways to offer new information in the presentation stage (according to the PPP methodology). These techniques can also be used as

means to foster long-term memory. Teachers can benefit from them by helping students to refresh old information in the practice stage.

Interleaving and blocking as a means to generate induction

Some of the pioneers in using interleaving as a learning technique are Bjork and Bjork (2011). They state that what makes interleaving effective is the fact that it enhances inductive learning. There are two elements that make this learning possible: spacing and interleaving. These two techniques can foster long-term retention and transfer. They also mention that the value of interleaving lies in the combination of different categories. This means that the simultaneous presentation of one category does not promote learning, whereas simultaneous presentation of different categories might be beneficial, in other words, interleaving promotes the learning of differences rather than the similarities in a concept. This is important because the use of interleaving in the learning of languages can help spot differences in tenses. Despite the fact that their experiments were used to differentiate painting styles from different authors, interleaving is still quite promising since it promotes long-term retention.

Interleaving practice has also been explored in other domains such as mathematics (Rohrer, et al. 2014). A comparison was done between interleaving and blocked practice. This paper suggests that interleaving and blocking can be used together in order to improve the learning of a specific skill. This is possible due to the students' ability to make use of a strategy to solve a problem. However, even though interleaving had better results as a learning technique, exploring both techniques in getting better learning results is critical. Rohrer et al. say that "the findings reported here [their article] do not suggest that blocked practice be avoided entirely. In fact, a small block of problems might be optimal because it gives students an opportunity to focus on the execution of a strategy" (Rohrer, et al. 2014, p. 906)

This is particularly important because this triggers the possibility of students to choose a strategy or self-regulate based on a problem. This opens the opportunity to explore the optimal conditions to include both types of techniques to achieve better learning results. For example, teachers can utilize two similar topics to activate in students the ability to find the best way to solve a language problem, so students will have to apply either an interleaving or blocking practice or even both techniques to reach the correct answer.

Another way to use interleaving as a learning technique was conducted by Taylor and Rohrer (in Roher et al., 2014), they explored interleaving long-term learning. They found that interleaving is effective because it improves discriminability. In the process of changing tasks students had to pair a problem with its skill. This means the interleaving works in a specific way, that is to say, blocking learning focuses on similarities between concepts whereas interleaving deals with differences between concepts. For instance, students were asked to distinguish between similar paintings. They had to classify them according to different authors, but the paintings were very similar. Students who used interleaving got better results because they focused on the small differences of the paintings. Therefore, interleaving works better when concepts are similar because it looks for those small differences.

One last domain where interleaving has been explored is its relation with spacing. Zulkipli and Burt (2013), in his experiments, concludes “that spacing works through interleaving and that interleaving is more beneficial when category discrimination is difficult” (p. 26). This means that “inductive learning of categories that are difficult to distinguish would be more effective if the exemplars” (p. 25) from a category are presented consecutively. Moreover, Rohrer (2012) adds that interleaving improves discrimination learning because of two reasons: spacing effect (when exposure to a single concept is spaced apart and not massed in immediate succession) and comparison and contrast of members of one category with members of a different one.

To summarize this section, interleaving and blocking practice have had positive benefits in learning. Some advantages are that teachers can make use of the techniques to promote long-term memory of information; this is possible because these techniques promote retrieval, spaced repetition, adaptability, matching the skill with the problem, and the learning of differences. Another benefit is fostering induction since the evaluation of two similar concepts can promote differentiation between them, in other words, two resembling concepts can be defined by discrimination.

Interleaving as a tool for learning a new language

Grammar and verb conjugation

As it can be seen in the previous section, interleaving has been explored in different fields of study; however, the domain of second language learning is the main concern for this paper. The main question is to know if interleaving practice can be beneficial for learning a new language.

The answer to this question varies depending on the parts of the language interleaving is used for, as an example of it, some positive results are reported by Pan, et al. (2019). They conclude that interleaving can improve long-term learning and learning practice when learning verb conjugation. This is important since one of the aspects of learning a new language is not only the mastery of verb form but also its meaning. This paper shows that the benefits of interleaving are advantageous in developing long-term learning of verb conjugation skills (the differences between preterit and imperfect past tenses in Spanish). Another remarkable element to take into account is the suggestion that in order to get better results in the teaching of foreign language grammar the combination of both types of practice: blocking and intervening might be necessary. The research conducted by these authors revealed “that the traditional blocked training approach may not be the most efficacious method of foreign language grammar instruction, and that a hybrid blocked-to-interleaved schedule can generate considerable improvements in learning” (Pan, et al. 2019, p. 24). Since teachers do not know how much blocking or interleave practice should students be exposed to; this opens the opportunity to find an ideal ratio that might be beneficial for language teachers.

Another issue that was brought up regarding the specificities of interleaving as a tool for learning a second language is whether the order of concepts to be learned matter in the process of getting long-term learning results. According to Pan et al. (2019) neither interleaving nor schedule alone appears to be sufficient to achieve long-lasting results. He states that for verb conjugation skills to be fully developed and any other materials involving study and problem-solving practice, both interleaving and blocking schedules are needed. They state that the benefits of this technique might depend on the schedule of the training and the type of task, in other words, in order for interleaving to enhance learning, it is essential to be systematic and when studying and practicing.

This paper sheds light on some practical guidance for teachers in the process of learning a second language for verb conjugation training. According to Pan et al. (2019), interleaving “should be presented in a logically organized sequence that predictably alternates between to be learned tenses” (p. 461). They also say that by implementing alternation systematically, it will be possible to have more opportunities to make comparisons. They recommend that when practicing prediction of tenses should be avoided. They assure that randomization “will keep learners guessing on each attempt and require them to engage in greater amounts of retrieval” (p. 441).

In other words, when presenting a new grammar point where two tenses are similar, a logical and systematic approach should be used in order to maximize opportunities for comparison. When practicing those grammar points, interleaving should be used because this would foster retrieval opportunities for students.

When dealing with grammar learning, the work of Nakata (2019) sheds light on the advantages of using interleave practice rather than blocking. In his study, he evaluated the effects blocking and interleaving has on the learning of L2 grammar. These experiments were conducted with 115 Japanese students who were learning 5 different English grammatical structures under 1 of 3 conditions (blocking, interleaving, and increasing. The results showed that interleaving is an advantage when learning L2 grammar. Even though during the practice most students got a lot of answers incorrect in the interleaving experiment, in the long term learning students were able to do better in a delayed exam. One of the pedagogical benefits that can be extrapolated from this work is that grammar learning may be enhanced by incorporating interleaved practice.

Pronunciation and speaking fluency

On the other hand, there is one paper where the benefits of interleaving for learning a foreign language are not explicit. This study was conducted by Carpenter and Mueller (2013). In their study, they explored the effects of interleaving versus blocking on learning French pronunciation. In this work, native English speakers had to learn some French words which followed some pronunciation rules. These rules were introduced either in a blocked or in an interleaved fashion. In their experiments, blocking practice helped students select a complete correct pronunciation. Does this mean that interleaving practice is not beneficial when learning pronunciation? There is a point to discuss: the way the activities were conducted. According to Carpenter and Mueller (2013, p. 679) “past studies reporting benefits of interleaving used tasks that required discriminative contrast, whereas the present task may have been more likely to require the analysis of shared features”. In other words, interleave should be used for specific types of activities in order to be effective. This paper suggests that tasks or activities where contrast is necessary should be addressed by interleaving whereas activities that require analysis of similar features should be done using blocking. This is critical because the types of activities matter in the learning of a foreign language.

Another way to use interleave as a tool for learning languages was carried out by Suzuki (2021). In his paper, he utilized practice repetition in blocking and interleaving in order to develop fluency in speaking. The results of his experiments showed that blocked practice improved fluency in the form of faster articulation rate and shorter mid-clause pause duration, than when using interleaved practice. This paper explores another aspect of learning a language: fluency and interleaving. Even though it did not show great advantages when using interleave practice, it represents another way to explore the effectiveness of the learning technique for learning a second language.

To summarize this section, interleaving and blocking practice as learning techniques have been effective in some domains, specifically in the improvement of grammar skills (verb conjugation) Pan et al. (2018) and Pan et al. (2019). However, in other domains such as fluency or pronunciation the results do not look quite beneficial (interleaving used as one tool). But learning benefits become clearer when both strategies are used in tandem (blocking and interleaving) as stated by Suzuki (2021) and Carpenter and Mueller (2013).

The pedagogical side of interleaving and blocking practice in the classroom

Interleaving and blocking practice can be used in two ways in the classroom, for example, both can be used as tools to introduce information in the presentation stage. This can be done in two ways; when using interleaving, two concepts or ideas should be similar to generate inductive learning, whereas with blocking, topics should not have anything in common. The second form of using both techniques is to foster long-term memory of any type of information. By shuffling information randomly, concepts can be retrieved due to space repetition. This is particularly helpful for teachers since this can help students remember more efficiently information in tests and real life situations regarding language.

Interleaving and blocking as a means to generate induction

The specificity of interleaving according to Bjork and Bjork (2011) is that what makes interleaving effective is the fact that it enhances inductive learning. The way that interleaving works is as follows: the simultaneous presentation of one category does not promote learning, whereas simultaneous presentation of different categories might be beneficial. In other words, interleaving promotes the learning of differences rather than the similarities in a concept that is to say, for interleaving be effective in producing inductive learning, but it is necessary that two

concepts that are similar can be presented in an interleaving way since it is easier for students to notice the differences between two concepts that are similar.

On the other hand, blocking can be used to introduce one idea at a time, which is also valuable since this can help students focus on only one concept. According to Rohrer et al. (2014, p. 907) “a small block of problems might be optimal, especially at the outset of an assignment given immediately after students are introduced to that kind of problem, perhaps because it gives students an opportunity to focus on the execution of a strategy (e.g., procedural steps and computation)”. This represents that blocking learning focuses on similarities between concepts whereas interleaving deals with differences between ideas.

Finally, there is the opportunity to use both types of learning simultaneously. This opens the opportunity to explore the optimal condition to include both types of techniques to achieve better learning results (blocking and interleaving ways to teach). Blocking and interleaving as tools to foster long term memory in language learning.

Blocking as a tool for learning languages can be used effectively when practicing pronunciation. Carpenter and Mueller (2013), in their study, explored the effects of interleaving versus blocking on learning French pronunciation. Native English speakers learned several French words that conformed to specific pronunciation rules, and these rules were presented either in blocked fashion or in an interleaved fashion. In their experiments blocking practice was particularly advantageous for helping participants choose a fully correct pronunciation. Therefore, blocking practice works better if activities require the analysis of similar features.

Interleaving as a tool for learning languages can be utilized in the classroom effectively when learning or practicing verb conjugation. According to Steven, his research reveals that the traditional blocked training approach may not be the most efficacious method of foreign language grammar instruction, and that a hybrid blocked-to-interleaved schedule can generate considerable improvements in learning.

Finally, using both techniques to explore the optimal way of long term memory retention is one last way that can be used in the classroom. It is necessary to be careful in choosing the type of task since tasks or activities where contrast is necessary need to be addressed by interleaving, whereas activities that require analysis of similar features need to be done using blocking (Carpenter & Mueller, 2013).

Conclusion

As it was previously shown, interleaving and blocking practice are some techniques that can help teachers to improve long-term learning not only on different subjects but also in the learning of a second language. There is information that highlights the benefits of interleaving and blocking practice in the learning of a second language in different domains such as verb conjugation, grammar, fluency, and pronunciation. However, it is necessary to explore how the different ways that interleaving and blocking practice can help students to better learn pronunciation skills such as past simple regular verbs. Rather than just focus on one element I think the best one to find better results is by the combination of the two. This will benefit both teachers and students since both look for better practices that can enhance the learning of a second language in the long term.

Finally, the possibilities of interleaving and blocking practice should be explored in other domains of language such as sociolinguistic, pragmatics, content, accuracy, fluency of the language, and lexical items. It would be interesting to explore some other aspects of the language and see the benefits of these techniques. However, this exploration could be addressed in other research papers.

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