ENGLISH VOCABULARY AND GRAMMAR RETENTION: BLOCKING VERSUS INTERLEAVING

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ABSTRACT

Scheduling of practice to create a spacing effect has been observed to lead to superior retention of L2 vocabulary and grammar. Two of the various methods of scheduling L2 task practice discussed widely in recent times are interleaving and blocking. In a desirable difficulty framework, both of these methods have been recommended for task repetition practices aimed at learning L2 vocabulary and grammar. Used at the appropriate level of difficulty both have been observed to facilitate the automatization and proceduralization of linguistic knowledge. Keeping two groups of 44 Indian adolescent English as L2 learners under interleaved and blocked conditions during a three-month-long task repetition practice program, the present study attempted to measure the difference in the effect of interleaving and blocking on the retention rate of English vocabulary and grammar. No statistically significant difference in the effect of these two methods on the retention of English vocabulary and grammar was recorded in a repeated measures ANOVA test (p=.17, F=2.05, d=.09) conducted on the pre-test, intermediate test, and post-test scores of the participants. Both groups continued to demonstrate limited flexibility and appropriacy in word choice and rare instances of complex forms and structures of sentences in English throughout the three tests.

Key words: task repetition, interleaving, blocking, L2 vocabulary & grammar

INTRODUCTION

L2 learners develop procedural and automatic linguistic knowledge through extensive and deliberate task repetition practice. Proceduralization is enabled by the internalization of linguistic patterns, improvement in fluency, consolidation of knowledge, and overcoming interference. Automatization of such linguistic knowledge is reflected in the L2 learners' more effective and efficient language production and comprehension (DeKeyser, 2007; Lyster & Sato, 2013). Many L2 studies (e.g., Miles, 2014; Nakata, 2015; Nakata & Suzuki, 2019; Rogers, 2017; Suzuki et al., 2022) have observed that scheduling or manipulation of task repetition practice yields the benefits of a spacing effect (Bird, 2010; Nakata & Webb, 2016) leading to superior retention of L2 vocabulary and grammar. Two of the various task repetition methods studied in recent times are blocking and interleaving (e.g., Kornell & Bjork, 2008; Nakata & Suzuki, 2019; Schmidt & Bjork, 1992; Soderstrom & Bjork, 2015; Suzuki, 2021; Suzuki & Sunada, 2020). The sets of skills or tasks identified for task repetition are arranged in the order of difficulty in blocking. The learners practise one set of skills for a while and move on to the next set of skills in a predictable order (Nakata & Suzuki, 2019; Suzuki, 2021; Suzuki & Sunada, 2020; Suzuki et al., 2022). In interleaving, on the other hand, the sets of skills or tasks identified for task repetition are arranged in an unpredictable sequence using the technique of spacing and mixing. The learners move from practising one set of skills to another set of skills in an unpredictable order (Kornell & Bjork, 2008; Schmidt & Bjork, 1992; Soderstrom & Bjork, 2015). Studies on the effect of blocking and interleaving on L2 vocabulary and grammar learning are, however, divided in their observations. In a study on L2 grammar learning conducted by Pan et al. (2019), for instance, the blocked group performed better than the interleaved group in a 2-day delayed test while the interleaved group performed better than the blocked group in a 1-week delayed test. Nakata and Suzuki (2019) also observed that the interleaved group performed better than the blocked group in L2 vocabulary and grammar learning in a 1-week delayed post-test, despite showing a higher number of errors in responses during the training session. So,

it is argued that because of a desirable difficulty framework (e.g., Kang & Pashler, 2012; Nakata & Suzuki, 2019; Pan et al., 2019; Schneider et al., 1998, 2002) blocking facilitates immediate and faster retention of L2 learning whereas, interleaving leads to long-term learning achievements (Kang, 2016). But Suzuki et al. (2022) did not observe the relevance of a desirable difficulty framework in their study on the retention of English grammar. The interleaved learners performed better than the blocked learners both in the immediate and delayed post-test (Suzuki et al., 2022).

Notwithstanding their significant contribution to the subject, certain limitations have been observed in these studies. First, the vocabulary and grammar training sessions in most of them were of a shorter duration (e.g., Miles, 2014; Nakata & Suzuki, 2019; Suzuki et al., 2022). Since extraneous factors like participants' psychological and sociological conditions also influence L2 learning, observations based on such short training programs may fail to accurately record the relevant facts. Although a clear-cut distinction between a short-term and long-term training program for language proficiency is difficult to make, they might be distinguished by their specific objectives and relative duration of skill practice. The objective of a short-term training program is to obtain quick results and to make immediate observations or measurements. It is generally conducted over a brief period, ranging from a few hours to a few months. The objective of a long-term program, on the other hand, is to examine phenomena and collect data to observe changes, trends, or effects that may emerge over time. The duration of a long-term training program may involve an extended time frame, often spanning months, years, or even decades (Shadish et al., 2001). As a result, any significant instance of the effect of desirable difficulty in the oral performance of the participants may be observed in greater clarity in a long-term teaching program. Secondly, the L2 vocabulary and grammar tasks in most of them were specified and limited (e.g., Tan Li Ning et al., 2020; Pan et al., 2019). Specifying the language tasks and limiting them to a fixed number may encourage the participants to use rote memorization. Finally, there were only two tests in most of these studies- a pre-test and a post-test (e.g., Miles, 2014; Nakata & Suzuki, 2019; Suzuki et al., 2022). We felt that the utility of the task

scheduling methods might not be accurately assessed only by one achievement test at the end of the treatment. Some important studies on this issue (e.g., Carpenter & Mueller, 2013; Pan et al., 2019; Schneider et al., 1998, 2002) have also observed variations in the effect of blocking and interleaving on L2 learning when an additional language test was administered during the treatment. We believed that a study addressing these limitations might provide more clarity on the relevance of a desirable difficulty framework in the effect of blocking and interleaving on L2 vocabulary and grammar learning. With this perspective, a longitudinal comparison of the effects of blocking and interleaving on the retention of spoken English vocabulary and grammar was attempted in the present study. Given the potential benefits of task scheduling in L2 learning, an examination of the effects of blocking and interleaving on such learning should be relevant. The observations of this study could help us gain more specific details about the more effective method of task repetition for the retention of L2 vocabulary and grammar rules.

LITERATURE REVIEW

Blocking and Interleaving: The Desirable Difficulty Framework

L2 learners practise only one set of tasks at a time in blocked practice while multiple tasks are practised simultaneously in interleaving (Nakata & Suzuki, 2019). If L2 learners, for instance, are required to practise three interrelated language tasks of A, B, and C, these tasks may be arranged by blocking them as AAA, BBB, and CCC of three repetitions, or they may be interleaved as ABC, ABC, ABC. Here, A, B, and C are practised sequentially without any spacing between the tasks in the blocked schedule, whereas the practice of task A is separated by tasks B and C with spacing between the tasks in the interleaved schedule (Nakata & Suzuki, 2019).

Interleaving has been identified as a more effective task repetition method than blocking in several studies on L2 learning (e.g., Finkbeiner & Nicol, 2003; Miles, 2014; Nakata, 2015; Rogers, 2017). In a study on the learning of L2 vocabulary through translation tasks (Finkbeiner & Nicol, 2003), for instance, interleaving was found to be

more effective than blocking. Twenty-four American university learners who practised recalling 32 pseudo-words using interleaving responded faster than the learners in the blocked condition (Finkbeiner & Nicol, 2003). It is argued that interleaving provides greater opportunities for attentive practice and a more varied distribution of task repetition sessions with intervals between the sessions of practice. Subsequently, it can bring in the element of spacing for greater retention leading to more effective learning in certain domains of L2 (Rogers, 2017).

Identifying a lack of clarity on the effect of such scheduling, some studies, on the other hand, have described the specific benefits of using both methods (e.g., Brunmair & Richter, 2019; Carpenter & Mueller, 2013; Soderstrom & Bjork, 2015). Stating the limitations of blocking, Soderstrom and Bjork (2015) observed that it was not conducive to long-term retention of L2 learning, even though it had been reported to encourage signs of effective L2 learning in the initial stages. Brunmair and Richter (2019), on the other hand, found interleaving to be less effective than blocking and suggested that it may not be effective in the retention of learning that does not require discriminative contrast. A similar observation was earlier reported in a study conducted by Carpenter and Mueller (2013). The study involved a group of English-speaking college students who were engaged in the task of learning French pronunciation rules, and the blocked participants performed better than the interleaved ones. It was observed that language tasks that involve noticing the common features, instead of noticing the discriminative contrast among the stimuli, might be more effectively practised using blocking (Carpenter & Mueller, 2013). The study implied that the retrieval benefits of interleaving in noticing discriminative contrast may not be experienced in the retention of language tasks like L2 vocabulary and grammar rules. The occasions for such retrievals by discriminative contrast are minimal in the practice of such L2 tasks.

In an attempt to explain this confusion, some studies (e.g., Bjork, 1999; Derks & Bakker, 2013; Porter & Magill, 2010) have suggested the relevance of a desirable difficulty framework. The desirable difficulty framework proposes that long-term improvement in a learning task depends on a substantial or desirable amount of work.

Enhanced learning and transfer may only be achieved through a sequence of learning tasks and feedback befitting the level of learning (Derks & Bakker, 2013). Interleaving poses, as per the framework, learning difficulty to beginners, but it presents an appropriate level of difficulty to experienced learners. Interleaving clears the way for an appropriate level of difficulty for proficient learners by increasing the contextual interference that requires greater practice (Porter et al., 2007; Porter & Magill, 2010). Despite the creation of stress in the initial phase of L2 practice, interleaving facilitates long-term retention and transfer performance (Bjork, 1994). Therefore, interleaving is proposed as an effective task repetition method for experienced and more proficient L2 learners, whereas blocking is recommended for beginners or less proficient learners. The framework suggests that both effectively facilitate retention of L2 learning if used at the appropriate level of difficulty.

Thus, it appears that interleaving has been observed to be a more effective task repetition method than blocking in some L2 learning domains such as learning vocabulary through translation tasks because of its allowance for greater opportunities for attentive practice and more varied intervals between the practice sessions. However, blocking is more effective than interleaving in language tasks that involve noticing the common features, instead of noticing the discriminative contrast among the stimuli.

L2 Vocabulary and Grammar

In studies on the effect of blocking and interleaving on L2 vocabulary and grammar learning (e.g., Miles, 2014; Pan et al., 2019; Suzuki et al., 2022; Tan Li Ning et al., 2020), the observations have been of mixed nature. The relevance of a desirable difficulty framework in the effect of scheduling on such learning has not been attested in most of these studies. Pan et al. (2019), for instance, did not find any specific benefit of using interleaving in the learning of L2 grammar rules. When two groups of undergraduate English-speaking students of a large American research university-one interleaved and the other blocked- engaged in the retention exercises of Spanish grammar rules, no statistically significant difference in

performance was observed. The post-test scores of the blocked participants were, in fact, higher than the post-test scores of the interleaved group (Pan et al., 2019). Another study on the retention of L2 vocabulary (Tan Li Ning et al., 2020) reported no statistically significant difference between blocking and interleaving. Fifty-six children in the age range of 6-10 years were given two online L2 vocabulary learning tasks- a vocabulary game of matching spoken words to pictures of novel animals and a comprehension task of arranging objects to match the spatial relations described in a spoken sentence- under blocked and interleaved conditions. Although L2 vocabulary learning occurred under both conditions, no statistically significant difference in the rate of learning was observed (Tan Li Ning et al., 2020).

Nakata and Suzuki (2019), however, recorded some advantages of using interleaving in the retention of L2 grammar rules. Dividing 115 Japanese university students into three groups under interleaved, blocked, and increased conditions, the retention of five English grammatical structures was studied. In a delayed post-test, the interleaved students produced a higher number of responses than the blocked students (Nakata & Suzuki, 2019). Earlier, Miles (2014) also found interleaving more effective than blocking in L2 vocabulary and grammar learning. Moreover, a recent study on the subject (Suzuki et al., 2022) has reported some specific advantages of interleaving. Five types of relative-clause constructions in English were learned by 60 Japanese university students under blocked and interleaved conditions. While the blocked learners practised form-focused exemplars, the interleaved learners practised mixed exemplars from different categories. The interleaved learners not only performed more accurately both in the immediate and delayed post-test than the blocked learners but it was also observed that interleaving led to skill enhancement regardless of the working memory capacity of the learners (Suzuki et al., 2022). Thus, we find that mixed results have been observed in studies on the effect of blocking and interleaving on the learning of L2 vocabulary and grammar. Although some recent studies suggest potential advantages to interleaving in L2 vocabulary and grammar learning, further research is necessary to confirm the implications of this argument. A lack of clarity on the relevance of a

desirable difficulty framework in the effect of task scheduling on L2 vocabulary and grammar learning still exists. More empirical studies focusing on the progression of the effects of task scheduling appear very relevant in this context.

As a result, an attempt was made to test the relevance of a desirable difficulty framework in the effect of task scheduling on the retention of L2 vocabulary and grammar rules in the present study. It is a longitudinal study measuring the differences in the effect of blocking and interleaving on the retention of spoken English vocabulary and grammar in a three-month-long English-speaking training program of vocabulary and grammar sessions (VGSs). To measure the difference between a blocked practice (BP) and an interleaved (IL) group in the rate of retention at various points of time during the program, the following three research questions were posed in the present study:

1. Is there any significant difference between BP and IL in the retention of English vocabulary and grammar in the first 30 days of the VGSs?
2. Is there any significant difference between BP and IL in the retention of English vocabulary and grammar in the last 60 days of the VGSs?
3. What is the difference between BP and IL in the rate of retention of English vocabulary and grammar during the 90 days of the VGSs?

METHODOLOGY

Participants

There were 44 participants (18-19 years old) in the study recruited from among the students pursuing various undergraduate programs in the sciences at Tezpur University based on their English vocabulary and grammar performance in a recruitment test (RT). The participants were distributed into BP and IL, and an attempt was made to keep an equal number of participants (n=22) in both groups at the start of the VGSs. Some participants -two from BP and two from IL- opted out of

the VGSs at different stages of the training program. The gender representation in the groups was similar as there were 10 male and 12 female participants in both groups (see Table 1).

Table 1

English Vocabulary & Grammar Performance in the RT

Speaking skill	Test mode	Selected participants M (SD)	Gender		Age (in year)	
			Male M (SD)	Female M (SD)	18 M (SD)	19 M (SD)
Vocabulary & grammar	Online interaction (OI)	44 2.7 (.88)	20 2.55 (1.00)	24 2.83 (.78)	19 2.83 (.76)	25 2.59 (.99)

Design and Materials

The English vocabulary and grammar topics (EVGTs) practised in the three rounds of the VGSs were identified after analysing the views expressed by the participants in the RT. The vocabulary and grammar rules identified for practice in the VGSs were also based on the analysis of the participants' English expressions collected in the RT. The vocabulary and grammar rules were used in the sentences designed for the oral exercises related to the EVGTs. Twelve EVGTs were selected for the VGSs and they were: How to introduce oneself (HIOS), Talking about hobbies (TAH), Describing one's native place (DONP), Expressing one's strengths and weaknesses (EOSW), Describing a favourite subject (DFS), Talking about an internship experience (TAIE), Leadership skills (LS), Managing a group (MG), Introducing a presentation (IP), Describing the content of a presentation (DCP), How to interpret results in a presentation (HIRP), and Concluding a presentation (CP).

Table 2

Sequence of the EVGTs

Weeks	EVGTs in VGSs 1		EVGTs in VGSs 2		EVGTs in VGSs 3	
	BP	IL	BP	IL	BP	IL
First	HIOS	HIOS	DFS	DFS	IP	IP
	HIOS	TAH	DFS	TAIE	IP	DCP
	HIOS	DONP	DFS	LS	IP	HIRP
	HIOS	EOSW	DFS	MG	IP	CP
Second	TAH	HIOS	TAIE	DFS	DCP	IP
	TAH	TAH	TAIE	TAIE	DCP	DCP
	TAH	TAH	TAIE	TAIE	DCP	DCP
	TAH	EOSW	TAIE	MG	DCP	CP
Third	DONP	HIOS	LS	DFS	HIRP	IP
	DONP	HIOS	LS	DFS	HIRP	IP
	DONP	DONP	LS	LS	HIRP	HIRP
	DONP	DONP	LS	LS	HIRP	HIRP
Fourth	EOSW	TAH	MG	TAIE	CP	DCP
	EOSW	EOSW	MG	MG	CP	CP
	EOSW	DONP	MG	TAIE	CP	HIRP
	EOSW	EOSW	MG	MG	CP	CP

Note. HIOS How to introduce oneself, *TAH* Talking about hobbies, *DONP* Describing one's native place, *EOSW* Expressing one's strengths and weaknesses, *DFS* Describing a favourite subject, *TAIE* Talking about an internship experience, *LS* Leadership skills, *MG* Managing a group, *IP* Introducing a presentation, *DCP* Describing the content of a presentation, *HIRP* How to interpret results in a presentation, *CP* Concluding a presentation

These EVGTs were practised in 48 sessions of the three-month-long VGSs. They were arranged differently for BP and IL following the relevant method of sequencing (see Table 2). The sequence of the EVGTs in BP followed a predictable order. In the first 16 days of the first round of the VGSs, the sequence, for instance, followed the traditional predictable order of *aaaa, bbbb, cccc, dddd*. The EVGTs of HIOS, TAH, DONP, and EOSW were practised continuously for four days each of the four weeks, respectively, following this order. Four practice sessions of HIOS, for instance, were followed by four practice sessions of TAH, and so on.

Table 3

Samples of Some Sentences Used in the VGSs

EVGTs	Vocabulary samples	Grammar points	Example sentences
HIOS	compromise, residing, pursuing, dishonesty, straightforward	Simple present tense (Subject- verb co-ordination)	"I do not compromise with any dishonesty in life or in work."
TAH	spare, aspirations, obsessed, mindset, championship	Simple present tense (Subject- verb co-ordination)	"Whilst I am not fitness obsessed, keeping fit helps me to maintain a positive mindset."
DONP	commute, overcast, seldom, rarely, fondness	Simple present tense (Subject- verb co-ordination)	"Like most of Scotland, there are not many sunny days and often it is grey, overcast, and there is a light rain."
EOSW	exceptional, deadline, rectify, resolving, outstanding	Simple present tense (Subject- verb co-ordination)	"I feel that my strongest quality is my ability to provide exceptional customer care services at all times."
DFS	inclined, distress, mime, dedicated, potential	Simple past tense (conditional)	"Given the gravity of the impact that science has on our lives, I could not turn my eyes away from studying it."
TAIE	standup, collaborate, synthesis, fliers, delegate	Simple present tense (sub-ordinate clause)	"I have experience of working on projects that needed to be completed on different deadlines on short notice."
LS	align, stint, outlined, catered, overwhelmed	Simple past tense (compound sentence)	"In my previous position, I met with my team once every quarter to review company objectives and tracked the progress of overall team goals."

EVGTs	Vocabulary samples	Grammar points	Example sentences
MG	comply, reiterated, turmoil, scouted, appraisals	Present continuous tense (conditional)	"I only make quick decisions if the risk involves something detrimental to the organization I am working for."
IP	handouts, generous, indebted, endeavor, facilitated	Simple present tense (complex sentence)	"I thank the organizers for allowing me to present my research before you all."
DCP	overview, limitation, phenomenon, repository, quantitative	Simple future tense (sub-ordinate clause)	"The third part of my presentation will present the findings and analysis of the data which will be followed by further discussion, scope and limitation."
HIRP	holistic, inclusive, decipher, vivid, stance	Simple present tense (complex sentence)	"My goal is to decipher the main causes of this phenomenon cited above from an inclusive and holistic approach with quantitative data from different disciplines."
CP	highlight, delve, provoking, implications, enriched	Simple present tense (conditional)	"In conclusion, I would like to highlight the need for an inclusive theory in the study of this phenomenon."

Note. HIOS How to introduce oneself, *TAH* Talking about hobbies, *DONP* Describing one's native place, *EOSW* Expressing one's strengths and weaknesses, *DFS* Describing a favourite subject, *TAIE* Talking about an internship experience, *LS* Leadership skills, *MG* Managing a group, *IP* Introducing a presentation, *DCP* Describing the content of a presentation, *HIRP* How to interpret results in a presentation, *CP* Concluding a presentation

An interleaved order of the EVGTs, on the other hand, was used in IL. In the first 16 days of the first round of the VGSs, for instance, the interleaved order of *abcd, abbd, aacc, bdcd* was followed. The

EVGTs of HIOS, TAH, DONP, and EOSW were practised in an interleaved order. The sequence of the EVGTs in the first four days of the VGSs was HIOS, TAH, DONP, and EOSW was followed by an order of HIOS, TAH, TAH, and EOSW in the next four days of the VGSs. The rest of the practice sequences of the EVGTs in BP and IL were arranged accordingly.

The speaking practice sessions of the EVGTs began with a presentation of the relevant e-content. For instance, the e-contents of greeting someone (Cake English, 2021), speaking about hobbies (Easy English, 2019), describing a native place (Pocket Passport, 2020) and character strengths (Confident Kids Program, 2018) were played in the sessions on the EGVTs of HIOS, TAH, DONP, and EOSW, respectively. These e-contents were videos of 3-4 minutes in duration and the English conversation examples presented through them were mostly for beginners. The objective of playing them at the start of the sessions was to prepare the learners for the specific English-speaking exercises.

The video clips of the sentences to be practised in the sessions followed the presentation of the e-contents. These video clips were also 3-4 minutes in duration. They were played several times, and the participants were instructed to watch, listen, and make notes for practice. Separate PPT slides of the same sentences were presented in sequence for repeated practice (see Table 3). Two writing exercises-scrambled sentences and fill-in-the-gaps- were performed by the participants after revising the sentences orally several times. These exercises were performed to learn the appropriate use of certain words and grammatically correct constructions. The writing exercises were followed by a role-playing interview game in which the instructors asked the participants questions related to the EVGTs. The participants responded to the instructors' questions orally using the sentences practised that day. The participants were asked to revise the sentences several times before the conclusion of a session.

Instruments

During the three-month-long VGSs, four spoken English vocabulary and grammar tests- RT, a pre-test (PT 1), an intermediate

vocabulary and grammar test (IVGT), and a post-test (PT 2) - were administered to the participants (see Table 4). The oral tests were designed to assess the participant's responses to the instructor's questions about their personal and academic life. The participants were required to answer in a 5-6-minute-long speech. Instead of using a specific and limited collection of English words and sentences as test items, as done in previous studies on the subject (e.g., Miles, 2014; Nakata & Suzuki, 2019; Suzuki et al., 2022), a discourse-level test was deemed appropriate. Considering the length of the English language learning experience (12-15 years) of the participants, we assumed that testing their speech discourse might show a more accurate state of their oral proficiency.

The assessment tool (CBSE, 2012) used for the evaluation of the participants' oral responses distributed English vocabulary and grammar performance into five categories. The scale of performance ranged from lack of flexibility and struggle for appropriate words using basic vocabulary (1 point), to limited flexibility and appropriacy in the choice of vocabulary communicated through rare and less complex forms of sentence structures (2 points), and limited vocabulary for description and expression of views in the occasional use of complex forms of sentence structures (3 points), to some flexibility and appropriacy in the choice of vocabulary on most topics demonstrated through the frequent use of complex forms of sentence structures (4 points), and some flexibility and appropriacy in the use of vocabulary on a wide variety of topics expressed in the frequent use of complex forms of sentence structures (5 points).

Table 4

Details of the Three Tests

Test	EGVTs	Vocabulary & grammar	Question examples
Pre-test	No specific EGVT	-Basic vocabulary related to personal life -8 grammar points to be practiced VGSs	(name of the student), Do you like to play games? Tell us about your favourite game.

Test	EGVTs	Vocabulary & grammar	Question examples
Intermediate test	HIOS TAH DONP EOSW	-Vocabulary practiced in the first 4 EGVTs -Simple present tense (Subject- verb co-ordination)	(name of the student), Who are there in your family? What do you want to share about your family with us?
Post-test	DFS TAIE LS MG IP DCP HIRP CP	-Vocabulary practiced in the 8 EGVTs -Simple past tense (conditional) Simple present tense (sub-ordinate clause) Simple past tense (compound sentence) Present continuous tense (conditional) Simple present tense (complex sentence) Simple future tense (sub-ordinate clause) Simple present tense (conditional)	(name of the student), Please introduce yourself and the topic of your presentation.

Note. HIOS How to introduce oneself, *TAH* Talking about hobbies, *DONP* Describing one's native place, *EOSW* Expressing one's strengths and weaknesses, *DFS* Describing a favourite subject, *TAIE* Talking about an internship experience, *LS* Leadership skills, *MG* Managing a group, *IP* Introducing a presentation, *DCP* Describing the content of a presentation, *HIRP* How to interpret results in a presentation, *CP* Concluding a presentation

Four assessors were engaged in the assessment of the oral responses. All four assessors had a postgraduate degree in English and a minimum of five years of English language education experience. The descriptors of the assessment tool were explained to the assessors before the start of the assessment process. They assessed the oral responses individually in the first round of the evaluation and the inter-rater reliability ratio at this stage was 72%. The assessors discussed the points of disagreement in a meeting in the second round of the assessment. They finalized the score sheet after a thorough rechecking of their assessment biases. A similar percentage after the

readjustments in the assessment meeting was 94%.

Procedures

Adopting a true experimental research design, the control (BP) and the experimental (IL) groups were given spoken English vocabulary and grammar instructions in different sequences of EVGTs for three months. The participants in BP were given the treatment of task repetition practices following a predictable order while a task repetition drill of the interleaved sequence was followed in the VGSs of IL. There were 52 participants in the RT and the analysis of the oral responses showed that 44 of them had limited flexibility and appropriacy in the choice of vocabulary communicated through simple forms of sentence structures. The responses of eight participants were given scores between four and five points by the assessors as their oral responses showed some flexibility and appropriacy in the use of vocabulary on a wide variety of topics expressed in regular use of complex forms of sentence structures. These participants were identified as outliers and they were not selected for the study. The scores given to the oral responses of the remaining 44 participants were between two and three points and the mean value of their scores was 2.7 (see Table 1).

The objective of the RT was to collect data regarding the participants' speaking proficiency and need preferences. So, three open-ended questions were asked - "Introduce yourself", "Tell us about your locality", and "What do you want to learn in an English-speaking training program?". Similarly, open-ended questions such as "Tell us about your favourite game", "Who is in your family? What do you want to share about your family with us?", and "Please introduce yourself and the topic of your presentation" were asked by the instructor in the PT 1, IVGT, and PT 2, respectively (see Table 4). Since the principal objective of the open-ended questions was to collect speech data at different stages of the VGSs by encouraging the participants to speak about a specific topic related to their life or expertise, we assumed that test validity and reliability issues would be relatively redundant in these tests.

The oral responses collected in the four tests were recorded,

transcribed, and assessed. The assessment of the change in L2 vocabulary and grammar use recorded in the participants' spoken discourse was not, as stated earlier, limited to the retention of a specific number of English vocabulary and grammar rules. The objective of the assessment was to check whether the set of English vocabulary and grammar rules practised during the VGSs triggered any change in their speech discourse or not. Moreover, the assessment tool (CBSE, 2012) used for the evaluation of the spoken discourse also described vocabulary and grammar as a single component of the speech assessment criteria. Therefore, a single assessment strategy noting the change in the participants' vocabulary and grammar use was considered appropriate for the study.

The VGSs and the tests were conducted online at Tezpur University, India in the second half (July-September) of 2021. The mean values and the standard deviations of the English vocabulary and grammar scores of BP and IL were calculated and analysed using descriptive and inferential statistics in SPSS 26.0. A repeated measures ANOVA test was used to measure the difference between the two groups in the retention of English vocabulary and grammar rules at different stages of the VGSs. Parametric tests were used in the study for three reasons: the data collected through the assessment were mean values, blocked and interleaved treatments were given to the samples, and the purpose of the analysis was a comparison of these two treatments. Following previous studies on the subject (e.g., Nakata & Suzuki, 2019; Pan et al., 2019; Suzuki et al., 2022), analysis of the data was done without specific reference to the gender identity of the participants. Since the ratio of representation of male and female participants was equal in the groups, we assumed that the effect of gender on the findings of the study might at best be nominal.

FINDINGS AND RESULTS

Initial Phase of the VGSs

One of the main objectives of the study was to measure the difference between BP and IL in the retention of English vocabulary and grammar rules in the first few weeks of the three-month-long

training program. The first research question was posed to achieve this objective. The question was: is there any significant difference between BP and IL in the retention of English vocabulary and grammar in the first 30 days of the VGSs?

Table 5

English Vocabulary & Grammar Performance in PT 1 and IVGT

Speaking skill	Test mode	Group	PT 1 M (SD)	IVGT M (SD)	df	F	p	Effect size[a]
Vocabulary & grammar	OI	IL	2.11 (1.01)	1.70 (.10)	1	1.90	.18	.07
		BP	2.34 (1.45)	2.34 (1.45)				

[a]Partial Eta^2

The mean values and the *SD*s were calculated from the English vocabulary and grammar scores secured by BP and IL in the first two tests- PT 1 and IVGT- administered at the start and end of the first round of the VGSs. They were analysed to measure the difference in the retention of English vocabulary and grammar rules in the initial phase of the VGSs. The mean values of IL and BP in PT 1 were 2.11 and 2.34, respectively (see Table 5). The performance of the participants in BP and IL in PT 1 conducted a day before the commencement of the first round of the VGSs was approximately the same. The slightly higher mean value recorded in favour of BP was because of the presence of an outlier in the group as their *SD* of 1.45 was higher than the *SD* of 1.01 in IL.

It is, however, noteworthy that the mean value calculated from the scores of IL in IVGT, conducted after the end of the second round, was only 1.70, indicating a decline in performance. The mean value of the scores secured by BP in the same test remained constant at 2.34. The presence of an outlier even in the IVGT influencing the average performance of BP could not be ignored as the *SD* of the mean value calculated for BP remained higher at 1.45 than the *SD* of .10 recorded in IL.

The decline in the scores of IL might also have been influenced by

the minor differences in the subjective assessment standards of the assessors. Despite this decline, no statistically significant difference between BP and IL in the retention of English vocabulary and grammar rules was observed in the initial phase of the study. The p-value of the comparison was .18, reflecting a similar low F-value of 1.90 and a statistically insignificant effect size of .07.

Final Phase of the VGSs

The second research question of the study was: is there any significant difference between BP and IL in the retention of English vocabulary and grammar in the last 60 days of the VGSs? The objective of this research question was to measure the difference between BP and IL in the retention of English vocabulary and grammar rules in the final few weeks of the training program.

Table 6

English Vocabulary & Grammar Performance in IVGT and PT 2

Speaking skill	Test mode	Group	IVGT M (SD)	PT 2 M (SD)	df	F	p	Effect size[a]
Vocabulary & grammar	OI	IL	1.31 (1.13)	1.68 (1.35)	1	1.52	.227	.048
		BP	1.98 (1.62)	2.30 (1.84)				

[a]Partial Eta^2

The mean values and the *SD*s of the English vocabulary and grammar scores secured by BP and IL in IVGT and PT 2, after excluding the scores of the four dropouts- two from BP and two from IL, were analysed to measure the difference in performance (see Table 6). Since the four dropouts occurred at different stages of the VGSs- the second round in BP and the third round in IL- the scores of BP and IL used for measuring the difference in performance in the final stage of the VGSs were excluded from the analysis. The mean values and *SD*s shown for IVGT in the analysis of the initial phase of the VGSs (see Table 5) were not used for the analysis of the IVGT scores for

measuring the difference in the final stage (see Table 6).

The mean values of the scores of IL and BP in IVGT, after excluding the scores of the dropouts, were 1.31 and 1.98, respectively. The *SD* of 1.62 recorded for BP was still higher than the *SD* of 1.13 in IL, indicating the presence of the outlier in the group. The mean values of the scores of IL and BP rose to 1.68 and 2.30, respectively, in PT 2. It is interesting to note that the mean values of both groups grew in PT 2, and the relatively higher growth in favour of BP could be ignored as its *SD* of 1.84 was higher than the *SD* of 1.35 in IL.

The minor rise in the mean values recorded in both groups might also have been influenced by the minor differences in the subjective assessment preferences of the assessors. No statistically significant difference between BP and IL in the retention of English vocabulary and grammar rules was observed in the final stages of the VGSs. The p-value of the comparison in a repeated measures ANOVA test was .227, representing a low F-value of 1.52 and a statistically insignificant effect size of .048.

Difference in Progression during the VGSs

Exploration of the differences between BP and IL in the progression of learning English vocabulary and grammar rules throughout the three rounds of the VGSs was another important objective of the present study. The third research question was posed to examine these differences and the question was: what is the difference between BP and IL in the rate of retention of English vocabulary and grammar during the 90 days of the VGSs?

Since four participants opted out of the VGSs at different stages, only the scores of those participants in BP and IL who participated in the study continuously from the first round through the second to the third round of the VGSs were calculated to compare the rates of progression between the two groups. Even though two participants in BP who had opted out earlier after the first round re-joined the VGSs in the third round, their scores were excluded from the final calculation and analysis. Thus, the mean values of the groups presented in the sections on the differences in the initial and final phases of the VGSs (see Table 5 & Table 6) were not used for the

comparison of the rates of progression involving all three rounds of the VGSs (see Table 7). As the dropout rate was quite small, the differences between the mean values calculated including the test scores of the dropouts, and the mean values calculated without their scores were not significantly different from the average rate of progression observed in the initial and final stages of the VGSs separately.

Table 7

Progression through the VGSs

| Speaking skill	Test mode	Group	PT 1 M (SD)	IVGT M (SD)	PT 2 M (SD)	F	p	Effect size[a]
Vocabulary & grammar	OI	IL	2.10 (1.01)	1.70 (1.10)	2.17 (1.12)	2.05	.17	.09
		BP	2.88 (1.62)	2.43 (1.42)	2.90 (1.62)			

[a]Partial Eta^2

Recalculated after excluding the test scores of the two dropouts from all three test results, the mean values of the scores secured by IL in PT 1, IVGT, and PT 2 were 2.10, 1.70, and 2.17, respectively. Likewise, the mean values of the test scores of BP, recalculated after excluding the scores of the two dropouts in the group, were 2.88, 2.43, and 2.90 in PT 1, IVGT, and PT 2, respectively. The higher mean values recorded for BP might be because of the presence of the outlier as the SDs of 1.62, 1.42, and 1.62 in PT 1, IVGT, and PT 2 respectively recorded for the mean values of BP were higher than the SDs of 1.01, 1.10, and 1.12 recorded for the mean values of IL in the same three tests. Minor declines in performance in the first two tests- from 2.10 to 1.70 in IL and from 2.88 to 2.43 in BP- and minor spikes in performance in the final test- from 1.70 to 2.17 in IL and from 2.43 to 2.90 in BP- were observed in the study (see Figure 1).

Figure 1 indicates the progression of IL and BP throughout the VGSs.

Figure 1

Comparison of the Scores in PT 1, IVGT, and PT 2
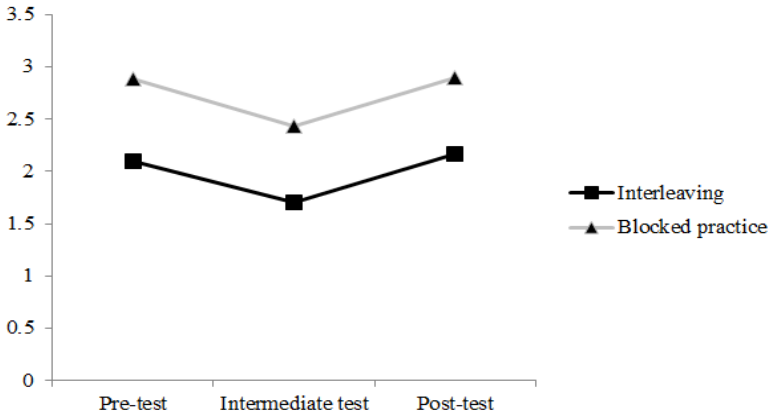
These changes in scores might also be interpreted as the influence of the differences in the subjective assessment preferences of the four assessors. Otherwise, no statistically significant difference was observed between the two groups in the rate of learning English vocabulary and grammar rules throughout the three rounds of the VGSs. In a repeated measures ANOVA test, the p-value of the comparison was a meagre .17, representing a similar low F-value of 2.05 and an effect size of .09.

DISCUSSION

Difference in the initial phase of the VGSs

The blocked and the interleaved groups did not demonstrate any statistically significant difference in the rate of retention of L2 vocabulary and grammar in the first 30 days of the VGSs. As per their performance in the pre-test, the participants in both groups communicated with limited flexibility and appropriacy on some topics

related to their personal life. They also exhibited a very limited amount of vocabulary for the expression of new ideas and the forms and structures of their sentences were rarely complex. In the intermediate test administered after the first round of the training, with a gap of around a month between the pre-test and the intermediate test, no exceptional progress in their English communication was recorded. Neither group showed flexibility and appropriacy of word choice nor used complex forms and structures of sentences in their oral performance. The interleaved participants became slightly less flexible in their use of English words and most of them struggled to form even grammatically correct English sentences in the intermediate test. In agreement with previous findings (e.g., Pan et al., 2019; Schneider et al., 1998, 2002), the blocked participants, however, continued to demonstrate the features of word choice and sentence formation observed in the pre-test even in the intermediate test. Even though the minor differences in the subjective assessment preferences of the assessors might also have contributed to the results of the tests, the difference in the scores was not exponential. On both counts, the effects of blocking and interleaving on the retention of English vocabulary and grammar showed no statistically significant difference at the beginning of the practice sessions, in contrast with findings recorded in previous studies (e.g., Miles, 2014; Nakata & Suzuki, 2019; Pan et al., 2019; Schneider et al., 1998, 2002).

Difference in the final phase of the VGSs

The two groups did not demonstrate any statistically significant difference in the rate of retention of L2 vocabulary and grammar even in the last 60 days of the VGSs. No exceptional progress in the use of appropriate English words and grammatically correct sentences was observed in the post-test among the participants. As per the post-test scores, the participants under both conditions continued to show limited flexibility and appropriacy in their choice of words. The forms and structures of the English sentences produced by them were still rarely complex. In partial agreement with previous studies (e.g., Tan Li Ning et al., 2020; Pan et al., 2019), the blocked participants, however, continued to demonstrate a slightly more flexible and

appropriate word choice and occasional use of complex forms and structures of sentences than the interleaved participants. Nevertheless, the margin of performance between the two groups was extremely thin and no significant conclusion in favour of blocking may be drawn from this negligible margin. The influence of the minor differences in the subjective assessment preferences of the assessors could not be ignored in this context.

Difference in progression during the VGSs

No statistically significant difference between blocking and interleaving in the progression of English vocabulary and grammar learning was observed at any stage during the 90-day-long vocabulary and grammar training programme. The test performance of the participants did not demonstrate any major difference in the effect of blocking and interleaving. The continuity in slightly more flexible and appropriate word choice and slightly more frequent use of complex forms and structures of sentences in English demonstrated by the blocked participants in both the intermediate and the post-test could not be considered noteworthy. The data collected in the present study do not categorically point towards any specific advantage in the use of blocking and interleaving, and the minor difference in test performance in favour of the blocked group was possibly because of the influence of the differences in the assessors' subjective standards of assessment.

The advantage recorded in favour of blocking because of the effect of a desirable difficulty framework (Porter et al., 2007; Porter & Magill, 2010) was not recorded in the present study with any clarity. Even though the participants in the study had an English language learning experience of more than a decade, the participants' pre-test performance demonstrated that they had very limited flexibility and appropriacy in English word choice, and their forms and structures of English sentences were also rarely complex. Considering the low spoken English proficiency of the participants in both groups, interleaving should have created stress because of contextual interference as per some observations in the past (e.g., Nakata & Suzuki, 2019; Pan et al., 2019). Blocking, on the other hand, should

have presented an appropriate level of difficulty to the participants. So, the blocked participants should have shown a more flexible and appropriate word choice and more frequent use of complex forms and structures of sentences in English in their speech performance.

Moreover, task repetition practices with high similarity or stimuli retrieval are also more effectively performed in blocking than in interleaving (e.g., Brunmair & Richter, 2019; Carpenter & Mueller, 2013; Carvalho & Goldstone, 2014; Zulkiply & Burt, 2013). Since the retention of L2 vocabulary and grammar rules involves noticing the common features among stimuli more than noticing discriminative contrast, interleaving might not benefit L2 learners in such language tasks. The retrieval benefits of blocking, on the other hand, should have provided multiple opportunities for L2 learners to practise the same group of L2 vocabulary and grammar rules assisting in faster retention (Brunmair & Richter, 2019; Carpenter & Mueller, 2013). All the same, no specific benefits of using interleaving or blocking were observed in the present study, in contrast to the observations made about the specific usefulness of these methods in L2 vocabulary and grammar learning in several L2 studies in the past (e.g., Miles, 2014; Nakata & Suzuki, 2019; Pan et al., 2019; Schneider et al., 1998, 2002; Suzuki et al., 2022; Tan Li Ning et al., 2020). Neither the participants using blocking nor the ones using interleaving learned more L2 vocabulary and structures of grammar in the present study.

PEDAGOGICAL IMPLICATIONS

A couple of pedagogical implications could be drawn from the present study. One, the nature of the task repetition practices in the L2 classroom should be decided after testing the language proficiency of the learners. L2 teachers may use an interleaved order of task practice for high-proficiency learners. L2 learners may be challenged and engaged by mixing the vocabulary and grammar exercises more dynamically. On the other hand, L2 teachers should avoid the interleaved order of practice in language learning exercises involving low-proficiency L2 learners. Since it creates stress among L2 learners with low proficiency, task repetition practices arranged in a blocked

sequence might be more appropriate in such pedagogical situations. Similar exercises should be grouped to allow the low-proficiency learners to focus on specific vocabulary and grammar information before moving to the next set of items. It could help reduce stress and promote a sense of accomplishment. Special pedagogical attention, however, should be paid to such learners as problems of L2 learning cannot be solved only by task scheduling strategies. L2 teachers may provide additional support, personalized feedback, and a motivating environment to help such learners progress faster.

Two, special attention should be given to the arrangement of the units while preparing teaching modules of L2 vocabulary and grammar lessons for beginners or learners with low L2 proficiency. These arrangements might be based on the difficulty level of the language tasks and the relatedness of the topics in which such tasks are presented. L2 course designers may organize the vocabulary and grammar lessons by gradually introducing more complex tasks as the course progresses. The course may introduce basic vocabulary related to greetings, introductions, and common objects and the corresponding basic sentence structures and verb conjugations in the present tense in the beginning. Sequencing the units by blocking this way might be a more effective strategy, but it isn't the only way to present the content. The L2 module may supplement the blocked sequencing with occasional interleaved practices to provide varied and challenging learning experiences.

CONCLUSION AND LIMITATIONS

The effect of blocking and interleaving on the retention of English vocabulary and grammar was examined in the present study. No statistically significant difference between blocking and interleaving, neither in the initial nor in the final stage of the vocabulary and grammar practice sessions, was observed. Although the blocked participants showed a slightly more flexible and appropriate word choice as well as more complex forms and structures of sentences in English than the interleaved participants, this margin of difference could not be considered significant. The relevance of a desirable

difficulty framework in the effect of task scheduling on L2 learners could not be clearly attested in the present study.

There were, however, several limitations in the present study. Two of the most significant were related to the online mode of task practice. First, because of the limitations of online communication, task repetition practices could not be performed with complete involvement. The sessions were frequently disturbed in the middle by power supply issues and frequent disconnections of internet networks. At times, the sessions could not start at their scheduled hours, creating frustration among the participants. Second, the instructors could not monitor the continuous presence and task performance of the participants during the practice sessions. Continuous oral interaction between the instructors and the participants could not be established on many occasions. Because of this, the practice sessions might have turned out ineffective and monotonous at times. As a result, we firmly believe that a more specific and comprehensive understanding of the effect of blocking and interleaving on the retention of L2 vocabulary and grammar might be achieved in a longitudinal study involving a face-to-face mode of task practice.

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