The effects of different instructional and cognitive variables on the acquisition of grammatical gender by second language learners of French

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This doctoral dissertation is dedicated to

my parents and mentors

who made me who I am today.

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Abstract

Previous studies (Harley, 1998; Lyster, 2004; Lyster & Izquierdo, 2009; Warden, 1997) found that learners of French as a second language (L2) benefit from form-focused instruction (FFI) targeting morphological awareness of noun endings (i.e., sublexical cues) in the acquisition of French grammatical gender. A noteworthy finding from previous studies, however, is that L2 learners developed an interlanguage strategy of pronouncing French articles in an ambiguous manner as hybrid forms between *un* and *une* and between *le* and *la*. Thus, the present study hypothesizes that, in order for L2 learners to demonstrate targetlike performance regarding French grammatical gender, FFI targeting the pronunciation of gender-specific definite and indefinite articles as well as sublexical cues should be implemented in classroom instruction. Moreover, given the importance of L2 learners' executive function (EF) skills in L2 acquisition (Darcy, Mora, & Daidone, 2016; Kapa & Colombo, 2014; Linck, Osthus, Koeth, & Bunting, 2014), the current study also predicts that the extent to which L2 learners benefit from FFI will be mediated by their EF skills operationalized as inhibitory control, nonverbal visuospatial working memory, and cognitive flexibility.

To examine the hypotheses, a quasi-experimental study was conducted in six intact French L2 classrooms for university-level learners (N = 140) comprising three instructional conditions (two classrooms per condition): (a) FFI on only sublexical cues (n = 41); (b) FFI on both sublexical cues and pronunciation (n = 49); (c) control (n = 50). Those in the two FFI conditions received six 80-minute instructional sessions targeting grammatical gender and those in the control condition continued with their regular French L2 program.

To measure the effects of the instructional treatments on the acquisition of French grammatical gender, a pretest, an immediate posttest, and a delayed posttest were administrated, each of which included grammatical judgment, text-completion, forced-choice identification, read-aloud, picture-description, and article-noun congruent/incongruent tasks. To measure their EF skills, the Simon Test, the Corsi Block-Tapping Test, and the Wisconsin Card Sorting Test were administered at each of the three testing times.

Results show that participants in both FFI conditions made significant gains on the posttests in the grammatical judgment, text-completion, and article-noun congruent/incongruent tasks. In the read-aloud and picture-description tasks, participants receiving FFI on both sublexical cues and pronunciation attained significantly higher scores compared to their pretest scores and to those of the control group on the posttests, whereas participants receiving FFI only on sublexical cues did not demonstrate any significant improvement over time on either of these tasks. The multiple regression analyses confirmed that L2 phonological knowledge is a significant predictor of improving participants' accuracy regarding French grammatical gender.

In the forced-choice identification task, all participants, regardless of condition, achieved maximum scores at all three testing times, meaning that participants did not have any difficulty perceptually categorizing the sounds of *un*, *une*, *le*, and *la*. Participants in the control condition made no significant improvement on any measures.

For participants in both FFI conditions, nonverbal visuospatial working memory was a significant predictor of the learning gains in the grammatical judgment task, while inhibitory control was a significant predictor of the gains made in the read-aloud task.

The current study sheds light on the importance of L2 phonological knowledge and L2 pronunciation instruction in the acquisition of French grammatical gender in addition to the roles of EF skills in L2 acquisition.

Résumé

Des études antérieures (Harley, 1998; Lyster, 2004; Lyster et Izquierdo, 2009; Warden, 1997) ont révélé que les apprenants en classe de français langue seconde (L2) bénéficiaient d'un enseignement centré sur la forme (ECF) ciblant une conscientisation morphologique de la terminaison des noms, c'est-à-dire les indices sublexicaux, dans l'acquisition des genres grammaticaux en français. Les travaux précédents, cependant, ont fait ressortir que les apprenants en classe de français L2 développaient une stratégie de prononciation ambigüe des articles, utilisant une forme hybride entre *un* et *une* et entre *le* et *la*. Afin que les apprenants en français L2 démontrent la compétence souhaitée pour le genre grammatical, cette étude formule ainsi l'hypothèse que l'ECF, visant la prononciation spécifique de l'article défini et indéfini de même que les indices sublexicaux, devrait être intégré à l'enseignement en classe. Plus encore, étant donné l'importance des capacités de fonction exécutive chez les apprenants dans l'acquisition de la L2 (Darcy, Mora et Daidone, 2016; Kapa et Colombo, 2014; Linck, Osthus, Koeth et Bunting, 2014), cette étude prédit également que les gains issus de l'ECF seront déterminés par les capacités de fonction exécutive, opérationnalisées par le contrôle inhibitoire, la mémoire de travail non verbale et visuo-spatiale et la flexibilité cognitive.

Dans le but d'examiner ces hypothèses, une étude quasi-expérimentale a été menée auprès de six classes intactes en français L2 pour des apprenants de niveau universitaire ($N = 140$) comprenant trois conditions (deux classes par condition) : (a) ECF ciblant les indices sublexicaux seulement ($n = 41$) ; (b) ECF ciblant les indices sublexicaux et la prononciation ($n = 49$) ; (c) groupe témoin ($n = 50$). Les étudiants ayant été soumis aux deux conditions de l'ECF ont reçu des séances d'enseignement de 80

minutes ciblant le genre grammatical, tandis que le groupe témoin a suivi le programme régulier de français L2.

Pour mesurer les effets des conditions de l'ECF sur l'acquisition du genre grammatical en français, un pré-test, un post-test immédiat et un post-test différé ont été administrés, chacun d'eux incluant des tâches de jugement grammatical, de complétion de texte, de choix binaire, de lecture à voix haute, de description d'illustrations et d'accord ou de désaccord entre article et nom. Dans l'objectif d'évaluer les capacités de fonction exécutive, le test Simon, le test de Corsi et le test de classement de cartes du Wisconsin ont été conduits pour les trois tests (pré-test, post-test immédiat et post-test différé).

Les résultats montrent que les participants dans les deux groupes ayant reçu l'ECF se sont améliorés à leurs post-tests, notamment pour les tâches de jugement grammatical, de complétion de texte et d'accord ou de désaccord entre article et nom. En ce qui a trait aux tâches de lecture à voix haute et de description d'illustrations, les participants ayant bénéficié de l'ECF ciblant et les indices sublexicaux et la prononciation ont obtenu des résultats significativement plus élevés à leur post-test que le groupe témoin, alors que les participants ayant reçu l'ECF portant uniquement sur les indices sublexicaux n'ont pas démontré de progrès significatif avec le temps dans les tâches de lecture à voix haute et de description d'illustrations. Les analyses de régression multiples confirment que la connaissance phonologique en L2 est un prédicteur important de l'amélioration du participant quant à la précision du genre grammatical en français.

Concernant la tâche de choix binaire, tous les participants, peu importe leur condition, ont atteint des résultats optimaux autant au pré-test qu'aux post-tests, ce qui

signifie que ceux-ci n'avaient pas de difficulté à catégoriser de manière perceptuelle les sons *un*, *une*, *le* et *la*. Le groupe témoin n'a pas fait de progrès dans aucune des tâches.

Pour les participants soumis aux conditions de l'ECF, la mémoire de travail non verbale et visuo-spatiale s'est avérée un prédicteur important des gains relatifs aux apprentissages dans la tâche de jugement grammatical, tandis que le contrôle inhibitoire a été révélateur des progrès réalisés dans la tâche de lecture à voix haute.

L'étude présente met en lumière l'importance de la connaissance phonologique et de l'enseignement de la prononciation de la L2 dans l'acquisition du genre grammatical en français, de même que les rôles exercés par les capacités de fonction exécutive dans l'apprentissage de la L2.

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Chapter 1

Introduction

In French, all nouns have grammatical gender. In the case of inanimate nouns, they can be either masculine or feminine regardless of any semantic basis for gender attribution (Sokolik & Smith, 1992). For instance, *un chapeau* is masculine, whereas *une casquette* is feminine although both nouns indicate similar objects (i.e., a hat or a cap). Previous studies (Clark, 1985; Karmiloff-Smith, 1979; van Heugten & Shi, 2009) found that native speakers of French develop a powerful and implicit grammatical gender system by the age of 3. However, learners of French as a second language (L2) have difficulty mastering French grammatical gender in spite of intensive learning experiences such as immersion contexts and of the high frequency of gender markers in linguistic input (Harley, 1998; Lyster, 2004). In this regard, Harley (1998) argued that grammatical gender is not something that L2 learners can learn incidentally. Carroll (1989) also contended that L2 learners need mnemonic strategies and rules, which "could provide the advanced learner not only with a reasonably accurate system but also with a mechanism for guessing the gender of new items" (p. 580).

Given that noun endings are reliable predictors of gender attribution in French (Tucker, Lambert, & Rigault, 1977; Tucker, Lambert, Rigault, & Segalowitz, 1968), previous studies (Harley, 1998, Lyster, 2004; Lyster & Izquierdo, 2009; Warden, 1997) tested and revealed the effectiveness of form-focused instruction (FFI) including several noticing, awareness, and practice activities while drawing L2 learners' attention to sublexical cues. In particular, one noteworthy finding is that, as documented by Harley (1998) and Lyster (2004), L2 learners tend to pronounce French articles in an ambiguous

manner such as a hybrid form between *un* and *une* and between *le* and *la*. Lyster (2004) stated that "This strategy eases the L2 learner's burden of having to accurately mark grammatical gender so frequently" (p. 416).

Considering that L2 learners have difficulty producing the French vowels /œ̃/ (in *un*) and /y/ (in *une*) (e.g., Li & Rosen, 2016), however, it may be the case that French L2 learners misarticulate the French articles ambiguously not only to ease the cognitive burden of having to assign grammatical gender, but also because they have difficulty perceiving and producing the sounds per se (i.e., /œ̃/ and /yn/). Accordingly, it is hypothesized that, in order for L2 learners to demonstrate targetlike performance regarding French grammatical gender, FFI targeting pronunciation of the sounds as well as sublexical cues should be implemented in classroom instruction.

This dissertation entails a quasi-experimental study in French L2 classrooms with the following instructional conditions: (a) FFI on only sublexical cues, (b) FFI on both sublexical cues and pronunciation, and (c) control condition. The instructional techniques, drawing L2 learners' attention to sublexical cues, are implemented in the first FFI condition. Pronunciation instruction increasing L2 learners' production and perception accuracy of the sounds *un*, *une*, *le*, and *la* is added to the FFI on sublexical cues for the second FFI condition.

By administering various tasks, the current study is expected to provide empirical evidence as to how L2 learners can overcome their difficulty in producing grammatical gender in a targetlike manner. Based on the prediction that phonological inability might be one of the factors resulting in L2 learners' difficulty, the current study is expected to

demonstrate the benefits of FFI targeting both sublexical and phonological information in the L2 acquisition of French grammatical gender.

In addition, the present study focuses on L2 learners' individual differences. Given that L2 learners' executive function (EF) skills are important catalysts in L2 learning (Darcy, Mora, & Daidone, 2016; Kapa & Colombo, 2014; Linck, Osthus, Koeth, & Bunting, 2014), the present study attempts to examine whether the extent to which L2 learners benefit from the FFI conditions is mediated by their EF skills—inhibitory control, nonverbal visuospatial working memory, and cognitive flexibility.

The current study is expected to have many implications for L2 acquisition, education, and psycholinguistics. By showing that L2 phonological ability plays an important role in the L2 acquisition of French grammatical gender, the study aims to shed light on the importance of L2 pronunciation instruction and its interdependence with lexical and morphological domains. In addition, the present study will provide L2 practitioners with research-based instructional techniques for L2 pronunciation instruction, which they can easily adapt to L2 instruction including grammatical targets such as French grammatical gender. Moreover, based on the results regarding L2 learners' EF skills, the present study will also bring to the fore the roles of L2 learners' EF skills in the realm of L2 acquisition and psycholinguistics.

1. 1. Structure of the Dissertation

This dissertation consists of a total of six chapters. Following this introductory chapter, Chapter 2 presents the background to the present study, beginning with the motivations of the study. After a brief introduction to French grammatical gender, the

importance of noun endings as indicators of French grammatical gender attribution is introduced. Previous FFI studies targeting French grammatical gender are also summarized. With respect to EF skills, previous studies focusing on inhibitory control, working memory, and cognitive flexibility are presented. Finally, the research questions of the current study are presented along with possible implications in the field of L2 acquisition, education, and psycholinguistics.

Chapter 3 entails the methodology of the present study. Following the description of the participants, the procedure of the study and target noun endings are introduced. All instructional conditions and measures are then described along with the procedure of data preparation for data analysis.

Chapter 4 includes the results of the current study. This chapter presents descriptive and inferential statistics with respect to the following three sub-sections: (a) the effects of two FFI conditions, (b) the variables affecting the performance of the picture-description task, and (c) the roles of EF skills in learning gains.

Chapter 5 discusses the results, highlighting the differential effects of the two FFI conditions on the L2 acquisition of French grammatical gender. Based on the results, the chapter addresses the importance of L2 phonological knowledge and pronunciation instruction in the L2 acquisition of French grammatical gender. It also states the roles of EF skills in L2 instruction by revealing that the extent to which L2 learners benefit from FFI is mediated by their EF skills.

Lastly, Chapter 6 concludes this dissertation by summarizing the present study. After elaborating the pedagogical implications of the current study, this chapter proposes future directions drawing on the limitations of the present study.

Chapter 2

Background

This chapter provides the background to the current study. The chapter begins by illustrating the motivations of the present study, followed by a literature review focusing on French grammatical gender, FFI, and EF skills. After a brief introduction to French grammatical gender, the importance of noun endings as indicators of French grammatical gender attribution is presented. The pedagogical benefits of FFI in L2 learning are highlighted along with the effectiveness of FFI on the L2 acquisition of French grammatical gender. Considering that the extent to which L2 learners benefit from FFI might be mediated by their individual EF skills, the roles of EF skills—inhibitory control, working memory, and cognitive flexibility—in L2 learning are then introduced. The chapter concludes by presenting the research questions with possible implications.

2. 1. Motivation of the Present Study

Harley (1998) contended that French grammatical gender is not something that L2 learners can acquire incidentally from language exposure. In light of the importance of noun endings as predictors of gender attribution (Tucker et al., 1977; Tucker et al., 1968), previous studies (Harley, 1998, Lyster, 2004; Lyster & Izquierdo, 2009; Warden, 1997) implemented FFI drawing L2 learners' attention to noun endings as predictors of grammatical gender attribution and confirmed its pedagogical effectiveness. One noteworthy finding from previous studies is that French L2 learners tended to develop an interlanguage strategy resulting in ambiguous pronunciation of French articles and thus a

lack of intelligibility and grammatical inaccuracy after all. For instance, Lyster (2004) noted that

> In an earlier pilot study (…) we were left with a considerable amount of untranscribable data. As documented by Harley (1998), immersion students have developed a strategy of using hybrid forms that sound like a combination of both *un* and *une* or (…) Data collected during the piloting caused hours of discussion among members of the research team as we debated whether students said *un* or *une* or a hybrid form (p. 416).

Lyster (2004) stated that "This strategy eases the L2 learner's burden of having to accurately mark grammatical gender so frequently" (p. 416).

According to Li and Rosen (2016), French L2 learners (French immersion students in Southern Alberta) have difficulty pronouncing the French nasal vowel /œ̃/ (in *un*) and the oral vowel /y/ (in *une*). In particular, the nasal vowel /œ̃/ was the most challenging for the L2 learners and was not produced in a targetlike manner even after intensive L2 learning. Presumably, it may therefore be the case that French L2 learners misarticulate the French articles ambiguously not because they lack knowledge of grammatical gender. Rather, they might have difficulty perceiving and producing the sounds per se of the French articles (particularly, *un* and *une*), which might in turn predispose them to produce ambiguous pronunciation. Some studies (Goad & White, 2006; Goad, White, & Steele, 2003) also speculated that L2 morphosyntactic errors might be related to the properties of first language (L1) phonology. In this regard, the current study predicts that L2 learners' phonological knowledge is one of the variables affecting

the L2 acquisition of French grammatical gender and that pronunciation instruction on the sounds of French articles facilitates the L2 acquisition of French grammatical gender.

The effects of pronunciation instruction have been investigated in classroom settings focusing on multiple L2 segmental and suprasegmental targets (e.g., Lee & Lyster, 2016a; Saito, 2013; Saito & Lyster, 2012; Saito & Wu, 2014). In particular, Saito (2013) emphasized the role of explicit phonetic information (e.g., articulatory gestures) in pronunciation instruction, arguing that explicit phonetic information might facilitate phonetically driven L2 pronunciation learning. In this sense, by implementing pronunciation instruction including explicit phonetic information, the present study hypothesizes that pronunciation instruction targeting the sounds of French articles will facilitate the L2 acquisition of French grammatical gender by enabling L2 learners to develop more targetlike pronunciation of the sounds of French articles.

Finally, previous studies (Darcy et al., 2016; Kapa & Colombo, 2014; Linck et al., 2014) showed that L2 learners' EF skills are important predictors of L2 learning. In light of such findings, the present study hypothesizes that EF skills might be significant predictors of the extent to which L2 students benefit from FFI. Based on the motivations of the present study, I now introduce previous studies regarding French grammatical gender, FFI, and EF skills.

2. 2. French Grammatical Gender

Although natural gender exists in all animals, the way in which natural gender is expressed in language is language-specific. For instance, while gender in English is assigned to some lexical items (e.g., a husband, a wife, a son, a daughter) and some

pronouns (e.g., he, she, him, her), English is generally known as a gender-neutral language. In contrast, in some languages such as French, gender is assigned to all animate and inanimate nouns (i.e., gender attribution), and gender agreement is required within noun phrases comprising a determiner, a noun, and an adjective as in (1):

(1)

a. mon nouveau livre

b. ma nouvelle maison

According to Sera et al. (2002), French entails two gender categories (i.e., masculine and feminine). It is not a case-based system; that is, the determiner *mon* is immutable regardless of whether it is a determiner for the object noun or for the subject noun as long as the noun is masculine as in (2):

(2)

a. J'aime mon ami.

b. Mon ami m'aime.

In French, grammatical gender, as opposed to biological gender, connotes the gender of generic nouns such as inanimate nouns and some animate nouns without considering a semantic basis for gender attribution (Sokolik & Smith, 1992). For instance, *un chapeau* is masculine, whereas *une casquette* is feminine; *un calmar* is masculine, but *une crevette* is feminine. For nouns related to humans and certain animals, however, their gender attribution is usually determined by their biological gender. For instance, *un garçon* and *un lion* are masculine, and *une fille* and *une lionne* are feminine.

From generative perspectives, gender is an interpretable feature of French nouns, whereas it is an uninterpretable (formal) feature of French determiners and adjectives.

Therefore, the latter components should be checked through agreement in the syntax (Chomsky, 1995). More specifically, Bernstein (1993), Picallo (1991), and Ritter (1991) stipulated that gender and number are functional categories in the DP (determiner phrase) above the NP (noun phrase).

Carstens (2000) argued that a noun is embedded in the syntactic tree as a head of a noun phrase and entails an interpretable gender feature. The noun is raised to the AgrP (agreement phrase) and then to D (for a determiner) in which it checks uninterpretable gender features in specifier-head (for noun-adjective concord) and head-head (for determiner-noun concord) relations. Gender is lexically assigned to nouns in French, and thus gender agreement is a syntactic feature-checking operation by the syntax (Paradis & Prévost, 2004).

The most prominent psycholinguistic model presupposes that grammatical gender is encoded as a property of nouns at a representational level different from those specifying the corresponding conceptual and phonological information (Cubelli, Lotto, Paolieri, Girelli, & Job, 2005). The Word-Form Encoding by Activation and Verification Model (WEAVER++), which was proposed by Roelofs (1992) and revised by Levelt, Roelofs, and Meyer (1999), postulates three main layers in a word: The top layer conveys the meaning of the word with the aid of a network of conceptual connections. The intermediate layer includes the abstract lexical representation (lemma), which is related to nodes concerning the syntactic properties of the word such as grammatical gender. The third layer specifies the phonological form (lexeme) of the word. According to the model, the phonological form of the word is only activated after its lemma is selected, which might in turn be activated by its relevant conceptual node. In addition, gender

information is only available in the syntactic environment through competition at the level of gender feature selection, preceding the access to the phonological form.

The alternative model, the Independent Network Model (IN; Caramazza, 1997; Caramazza & Miozzo, 1997), hypothesizes three separate networks; that is, lexical-semantic, syntactic, and phonological information. In contrast to the WEAVER++ (Levelt et al., 1999; Roelofs, 1992), this model proposes that semantic representations can activate word forms directly, without assuming an intervening lemma node. The syntactic features of a word thus require the prior selection of the semantically and syntactically specified, modality-specific lexical forms. Therefore, nominal gender does not interfere with the selection of a phonological representation of a word, and lexical selection is only supplied by semantic information without assessing the syntactic features. The model thus presupposes that, instead of competition at the level of gender feature selection, gender information is an automatic sequence as a result of the selection of the modality-specific lexical forms.

Overall, both models posit that gender is only selected in gender-marked utterances. While hypothesizing that grammatical gender emerges at the phrase level, the models theoretically predict that grammatical gender might be overlooked in the production of bare nouns. Empirically, according to La Heij, Mark, Sander, and Willeboordse (1998), when target and distractor nouns had the same grammatical gender, participants showed shorter naming latencies when asked to produce noun phrases. However, such a gender congruity effect was not found in the production of bare nouns. Cubelli et al. (2005) found that bare noun production times were slower when target and distractor nouns possessed the same grammatical gender than when they had different

grammatical gender. They thus argued that, in contrast to the WEAVER++ (Levelt et al., 1999; Roelofs, 1992), the selection of grammatical gender is mandatory (i.e., even outside a sentential context). Moreover, in contrast to the IN (Caramazza, 1997; Caramazza & Miozzo, 1997), the selection of grammatical gender is not automatic, but it entails a competitive process preceding the access to morpho-phonological forms.

These findings in Cubelli et al. (2005) are also compatible with those in Tucker et al. (1977). In their study, when French L1 speakers were asked to determine the grammatical gender of rare nouns and pseudonouns, the French L1 speakers reported that they tested each noun with masculine and feminine indefinite articles respectively (i.e., grammatical gender emerges at the phrase level) and then decided which one sounded better (i.e., competitive process). One of the interesting findings is that they tended to rely on noun endings unconsciously to determine which one sounded better (i.e., during the competitive process). In what follows, the importance of noun endings as indicators of French grammatical gender attribution is introduced.

2. 3. Noun Endings as Predictors of French Grammatical Gender

It is known that French L1 speakers master the grammatical gender system by the age of 3 (Clark, 1985; Karmiloff-Smith, 1979; van Heugten & Shi, 2009). Tucker et al. (1968) found that French L1 speakers assign the grammatical gender of pseudonouns based on their noun endings. For example, for the pseudonouns *florillon* and *florateur*, French L1 speakers categorized them as masculine nouns owing to the masculine markers '*-illon*' and '*-eur*'. For the pseudonoun *feuillation*, they considered it a feminine noun due to the feminine marker '*-tion*'.

According to Tucker et al. (1977), French L1 speakers develop a very powerful and implicit grammatical gender system without any explicit instruction. The study found that French L1 speakers (ages 7-17) exploit noun endings to predict the gender attribution of rare nouns and pseudonouns. French L1 speakers "focus on the ending as the most probable gender marker, and then scan backwards into the words until they can determine in which particular subcontext the terminal phone occurs" (p. 62). For instance, for the noun *nation*, French L1 speakers scan its noun endings from '*-on*' (masculine) to '*-tion*' (feminine) and then assign its grammatical gender correctly, *une nation*. Therefore, noun endings "co-occur in a systematic and predictable manner" with gender attribution (p. 57). In a similar vein, Karmiloff-Smith (1979) also found that L1 speakers develop an accurate grammatical system clearly based on suffixes.

A corpus analysis by Lyster (2006) supports the role of noun endings as predictors of gender attribution, revealing that French grammatical gender is rule-governed, having noun endings that predict gender attribution in a systematic manner. The study analyzed a corpus of 9,991 nouns appearing in *Le Robert Junior Illustré*. He found that gender attribution is vastly predicted by noun endings operationalized as orthographic representations of rhymes including either a nucleus for vocalic endings or a nucleus-and-coda blend for consonantal endings. For instance, more than 90% of nouns ending with '*-ent*', '*-ant*', '*-eau*', and '*-ai*' are masculine, whereas more than 90% of nouns ending with '*-che*', '*-esse*', and '*-asse*' are feminine.

The way in which noun endings are operationalized seems partly phonological. For instance, the final phonemes /ɑ̃/ and /o/ are mostly masculine, while the final phonemes /z/ and /ʃ / are mostly feminine (more than 90% in Lyster, 2006). However,

there are multiple instances in which final phonemes interact with orthographic representations, which override phonological representations in predicting gender attribution. For example, the final phonemes of the noun endings '*-asse*', '*-isse*', and '*-esse*' are the same as those of the noun endings '*-as*', '*-is*', and '*-ès*'. Yet, the former endings are mostly feminine (93%), whereas the latter endings are mostly masculine (99%). Accordingly, the orthographic representations of the noun endings found in Lyster (2006), some of which were employed in the current study, are more reliable than their final phonemes.

In this regard, French L1 speakers develop an accurate grammatical gender system at an early age and employ noun endings as reliable predictors of gender attribution (see also Desrochers, Paivio, & Desrochers, 1989; Holmes & de la Bâtie; 1999). On the other hand, L2 learners commonly have a great deal of difficulty acquiring grammatical gender in a targetlike manner. For instance, despite a number of years in French immersion education, 11- to 12-year-old immersion students seldom discriminated feminine nouns from masculine nouns while overgeneralizing either masculine or feminine gender markers (Harley, 1979). Bartning (2000) also found that even advanced L2 learners have difficulty with French grammatical gender, particularly with indefinite articles. A number of previous studies (e.g., Harley, 1998; Lyster, 2004) reported similar findings in which the researchers contended that French grammatical gender is still problematic in spite of the high frequency of gender markings in the input.

Surridge and Lessard (1984) conducted a study to investigate how L2 learners determine gender attribution. The study showed that L2 learners are sensitive to morphological cues to determine gender attribution in a similar manner to French L1

speakers. Hardison (1992) also reported that L2 learners tended to focus on noun endings (e.g., both phonemic and orthographic representations) to predict gender attribution.

Carroll (1989) argued that French L1 speakers acquire and process determiners and nouns as co-indexed chunks. For example, for the noun *passeport*, they encode and retrieve the noun with its determiner as a chunk such as /ləpɑspɔʀ/, *lepasseport*. When the chunk is analyzed as separate constituents, the noun still encodes its inherent gender information. However, L2 learners are more likely to encode and retrieve them as separate entities. Therefore, Carroll (1989) proposed that L2 learners need mnemonic strategies and rules, which "could provide the advanced learner not only with a reasonably accurate system but also with a mechanism for guessing the gender of new items" (p. 580). In particular, the mnemonic strategies and rules could be related to morphological aspects, sensitive to the suffixes of target nouns.

Given that L2 learners can benefit from morphological information embedded in word-internal properties (e.g., sublexical cues) to predict gender attribution, L2 researchers have implemented instructional techniques drawing L2 learners' attention to the morphological information and tested their pedagogical effectiveness by adopting several FFI techniques in classroom settings. In what follows, the definition and instructional components of FFI are presented along with its effectiveness on the L2 acquisition of French grammatical gender.

2. 4. Form-Focused Instruction on Second Language Learning

2. 4. 1. Definition and Components of Form-Focused Instruction

Spada (1997) defined FFI as "any pedagogical effort which is used to draw the learners' attention to form either implicitly or explicitly... within meaning-based approaches to L2 instruction [and] in which a focus on language is provided in either spontaneous or predetermined ways" (p. 73). According to Ranta and Lyster (2018), FFI consists of proactive and reactive FFI techniques (see Figure 1). For instance, proactive FFI begins with input enhancement which induces L2 learners to notice and process linguistic targets in the input, after which metalinguistic explanations are provided. Proactive FFI concludes with controlled and spontaneous practice to facilitate automatic and fluent use of the linguistic targets. Reactive FFI is offered as corrective feedback responding to L2 learners' erroneous utterances so they can restructure their interlanguage system.

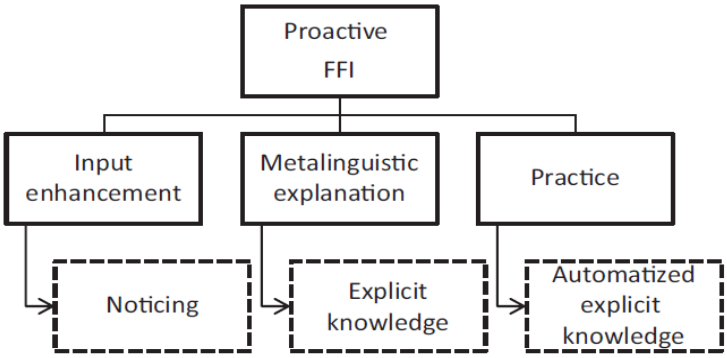

Figure 1. Components of proactive form-focused instruction (Ranta & Lyster, 2018, p. 43)

Its implementation is supported by several L2 theories. For example, the noticing hypothesis (Schmidt, 2001) proposed that noticing L2 linguistic targets is necessary and offers an initial scaffolding for successful L2 acquisition. Input enhancement in FFI

serves as an instructional tool to incite L2 learners' noticing. In addition, according to skill acquisition theory (DeKeyser, 1998, 2001; Lyster & Sato, 2013), there are two types of L2 knowledge: declarative and procedural knowledge. Declarative knowledge includes metalinguistic information such as grammatical rules, while procedural knowledge entails abilities to apply the metalinguistic information during actual use of L2. Therefore, metalinguistic explanations in FFI support the development of declarative knowledge, and practice opportunities enable learners to proceduralize the declarative knowledge (i.e., procedural knowledge). Moreover, practice opportunities are also compatible with the output hypothesis (Swain, 1985, 1995), which posits the importance of language output in L2 learning. The effectiveness of FFI has been tested and confirmed in various instructional settings while focusing on several linguistic targets (Gooch, Saito, & Lyster, 2016; Laufer & Girsai, 2008; Lee & Lyster, 2016a; Lyster, 2004; Nguyen, Pham, & Pham, 2012; Spada, Jessop, Tomita, Suzuki, & Valeo, 2014). Next, I introduce FFI studies targeting French grammatical gender.

2. 4. 2. Effectiveness of Form-Focused Instruction on French Grammatical Gender

Most French grammarians argue that French grammatical gender is arbitrary and unsystematic, particularly in the case of inanimate nouns (e.g., Laurin & Jacob, 2006). Therefore, it has been suggested that gender attribution needs to be acquired on an item-by-item basis. Yet, previous studies (Tucker et al., 1977; Tucker et al., 1968) found that gender attribution is highly related to noun endings. As such, it was suggested that L2 learners need to be aware of noun endings in order to develop skills to assign gender accurately and that instructional techniques which draw learners' attention to noun endings are worth considering in classroom settings. Four FFI studies (Harley, 1998;

Lyster, 2004; Lyster & Izquierdo, 2009; Warden 1997) targeting French grammatical gender were conducted in which several pedagogical techniques inciting L2 learners to notice and internalize noun endings as predictors of grammatical gender were developed and empirically tested. Table 1 summarizes the studies.

Table 1

Form-Focused Instruction on French Grammatical Gender

Study	Participants	FFI hours	Groups	Measures
Warden (1997)	Grade 11 French immersion students (n = 62)	12 hours over 5 weeks	1. FFI 2. Control	Pretest + Two posttests ● Listening ● Written endings ● Agreement ● Writing attribution ● Oral production
Results	Posttests: ● Listening: FFI > Control ● Written endings: FFI > Control ● Agreement: FFI > Control ● Writing attribution: No significant differences ● Oral production: No significant differences			
Harley (1998)	Grade 2 French immersion students (n = 210 ~ 300)	20 mins daily over 5 weeks	1. FFI 2. Control	Pretest + Two posttests ● Aural discrimination ● Binary-choice (*le* or *la*) ● Picture-description ● Object-identification
Results	Between-group contrasts (Posttests): ● Aural discrimination: FFI > Control ● Binary-choice (*le* or *la*): FFI > Control ● Picture-description: FFI > Control ● Object-identification : No significant differences Within-group contrasts (FFI group): ● Aural discrimination: Posttests > Pretest ● Binary-choice (*le* or *la*): Posttests > Pretest ● Picture-description: Posttests > Pretest ● Object-identification : No significant differences			

Lyster (2004)	Grade 5 Frech immersion students (n = 179)	9 hours over 5 weeks	1. FFI+Recast 2. FFI+Prompt 3. FFI-only 4. Control	Pretest + Two posttests ● Binary-choice ● Text-completion ● Object-identification ● Picture-description
Results	Posttest 1: ● Binary-choice: FFI+P > FFI+R, FFI, Control (FFI+R > Control) ● Text-completion: FFI+P > FFI+R, FFI, Control (FFI+R, FFI > Control) ● Object-identification: FFI+P > Control ● Picture-description: FFI+P > Control Posttest 2: ● Binary-choice: FFI+P > FFI+R, FFI, Control (FFI+R, FFI > Control) ● Text-completion: FFI+P > FFI+R, FFI, Control ● Object-identification: FFI+P, FFI+R, FFI > Control ● Picture-description: FFI+P, FFI+R, FFI > Control			
Lyster & Izquierdo (2009)	Adult L2 learners of French (n = 25)	3 hours over 2 weeks	1. FFI+Recast 2. FFI+Prompt	Pretest + Two posttests ● Reaction-time binary-choice ● Object-identification ● Picture-description
Results	Both groups showed significant improvement over time.			

As shown in Table 1, all studies revealed the effectiveness of FFI on increasing L2 learners' accuracy by drawing their attention to noun endings as predictors of gender attribution. One of the interesting reports from previous studies (Harley, 1998; Lyster, 2004) is that L2 learners tended to produce ambiguous pronunciation resembling a hybrid form between *un* and *une* and between *le* and *la*, resulting in a lack of both intelligibility and grammatical inaccuracy. In a similar vein, previous studies showed mixed effects in oral production. For instance, Lyster (2004) and Lyster and Izquierdo (2009) found effects for FFI in the two oral tasks (i.e., object-identification and picture-description tasks). However, Warden (1997) did not find any significant effects in the oral production task, and neither did Harley (1998) in the controlled oral production task (i.e., object-identification task).

Considering that /œ̃/ (in *un*) and /y/ (in *une*) are difficult for L2 learners to acquire (e.g., Li & Rosen, 2016), L2 learners might have had difficulty articulating the sounds of French articles in spite of their targetlike grammatical accuracy in gender attribution. To provide empirical evidence regarding this hypothesis, the present study aims to examine whether L2 learners' phonological knowledge impedes them from showing targetlike performance in oral production, and if so, whether FFI on pronunciation facilitates the L2 acquisition of French grammatical gender.

2. 5. Executive Functions Skills in Second Language Learning

According to Diamond (2012), EF skills "are a family of control functions needed when you have to concentrate and think, when acting on your initial impulse might be ill-advised. These functions depend on a neural circuit in which the prefrontal cortex plays a prominent role" (p. 336). There is a general consensus that there are three key components in EF skills: (a) inhibitory control, (b) working memory, and (c) cognitive flexibility. In what follows, I introduce each component focusing on its role in L2 acquisition.

2. 5. 1. Inhibitory Control

Inhibitory control is a cognitive process that inhibits behavior responses to stimuli (Kok, 1999; Nigg, 2000) or that suppresses predominant responses in a deliberate and controlled manner (Miyake et al., 2000). In L2 acquisition, inhibitory control enables L2 learners to process and produce an L2 while inhibiting their L1 (Green, 1998). In particular, inhibitory control is proportional to the degree of the activation of the

representations to be suppressed; higher inhibitory control is thus required when processing and producing an L2 in contrast to an L1 (Costa & Santesteban, 2004).

Empirically, Darcy et al. (2016) found that L2 learners with high inhibitory control were likely to show more targetlike speech perception and production accuracy of L2 segments. In addition, the relationship between inhibitory control and perception was stronger than the relationship between inhibitory control and production. Darcy et al. (2016) argued that high inhibitory control of L1 allows L2 learners to facilitate "the processing of phonologically relevant acoustic information in the L2 input, which in turn might lead to more accurate L2 phonological representations" (p. 742). Kapa and Colombo (2014) also tried to tease apart the role of inhibitory control in L2 learning using an artificial language paradigm. They found that adults' inhibitory control was a significant predictor of L2 learning after controlling for L1 vocabulary size and working memory.

With respect to the role of inhibitory control, most studies were conducted targeting bilingual speakers (e.g., Martin-Rhee & Bialystok, 2008; Poarch & van Hell, 2012), with a few studies targeting instructed L2 learners. The studies correlated L2 learners' current L2 knowledge and their inhibitory control, concluding that high L2 accuracy results from high inhibitory control. Given the importance of exploring the role of inhibitory control in the learning process, the current study investigates whether learning gains are mediated by L2 learners' inhibitory control. Based on Darcy et al. (2016), L2 students with high inhibitory control are expected to increase their accuracy of perceiving and producing the sounds of French articles to a greater degree than those with low inhibitory control.

2. 5. 2. Working Memory

Working memory is a cognitive system that is responsible for information holding, temporal processing, and maintenance (Miyake & Shah, 1999). Baddely and Hitch's (1974) multicomponent model of working memory consists of the central executive, the phonological loop, and the visuospatial sketchpad. The central executive is responsible for attention control while regulating the integration of information and supervising two slave systems (i.e., the phonological loop and the visuospatial sketchpad). The phonological loop is responsible for processing and storing phonological information (e.g., verbal and acoustic information), whereas the visuospatial sketchpad is responsible for processing and storing visual, spatial, and kinesthetic information (Baddeley, 2003). Baddeley (2000) added another component in the model—the episodic buffer—which controls the link between working memory and long-term memory.

Working memory is found to be an important predictor of the learning of various L2 linguistic targets. Research has found that, compared to learners with low working memory, learners with high working memory exhibit advantages in their rate of L2 vocabulary learning (Atkins & Baddeley, 1998) and also in having to look up fewer words to understand a story (Chun & Payne, 2004). Other studies have shown benefits for learners with high working memory in L2 grammar learning (French & O'Brien, 2008), online L2 parsing performance (Juffs, 2004), structural priming in L2 speech production (McDonough & Kim, 2016), and L2 morphosyntactic pattern learning (McDonough & Trofimovich, 2016). The importance of working memory has also been highlighted by several meta-analyses. For instance, Linck et al. (2014) conducted a meta-analysis to investigate the impact of working memory in L2 comprehension and production, which

found a robust and positive relationship between L2 learners' working memory and L2 learning outcomes. In particular, their analysis revealed larger effect sizes for the executive control in contrast to storage components and for verbal rather than nonverbal working memory.

Most of this research, however, has investigated verbal working memory, mainly tapping into the phonological loop. To move this line of research forward, the present study investigates the role of nonverbal visuospatial working memory for the following two reasons. First, some studies (e.g., Gangopadhyay, Davidson, Weismer, & Kaushanskaya, 2016) stated that any correlations between verbal working memory and L2 linguistic performance "may have been due to an overlap in language, rather than WM (working memory) demands, between language processing and WM tasks" (p. 188). Second, FFI in the current study was designed to draw L2 learners' attention to noun endings as predictors of grammatical gender. Therefore, L2 learners receiving FFI will be pushed to focus on noun endings to determine grammatical gender (i.e., orthographic processing focusing on sublexical cues). Orthographic processing induces learners to detect "the formation of visual representations of letters, letter patterns, and sequences of letters that serve to map spatially the temporal sequence of phonemes within words" (Pham & Hasson, 2014, p. 474). Therefore, there is a possibility that L2 learners' visuospatial working memory will be an important predictor of the degree to which L2 learners notice and internalize noun endings as predictors of grammatical gender during FFI sessions.

2. 5. 3. Cognitive Flexibility

Cognitive flexibility involves the ability to switch between two different concepts or mental sets (Miyake et al., 2000). Most previous studies investigating cognitive flexibility compared bilingual and monolingual speakers. For instance, Bialystok and Viswanathan (2009) found that bilinguals were faster than monolinguals in task switching while performing the Trail-Making Test. Similarly, Nicolay and Poncelet (2013) showed that students in immersion programs were significantly faster than monolinguals in switching attention during the Test for Attentional Performance in Children. In light of the findings, it was presupposed that small switching costs are due to a bilingual advantage (i.e., frequent switching between two languages). L2 learners with high cognitive flexibility are likely to show more rapid and accurate switching between their L1 and L2 (see also Seçer, 2016).

There are mixed results regarding the role of cognitive flexibility in L2 acquisition. For instance, Kapa and Colombo (2014) demonstrated that children's L2 performance in learning an artificial language was predicted by their cognitive flexibility. On the other hand, Stone and Pili-Moss (2015) failed to find any significant relationship between cognitive flexibility and the L2 acquisition of morphosyntax in *Brocanto2*, an artificial language.

In this regard, the current study attempts to test whether the extent to which L2 learners benefit from FFI is mediated by their cognitive flexibility. In the present study, none of the students' L1s have grammatical gender. It predicts that those having high cognitive flexibility will be at an advantage in becoming aware of grammatical gender,

which is a missing feature in their L1s, and showing targetlike L2 performance by having rapid and accurate switching between their gender-neutral L1s and L2 French.

2. 6. Research Questions

In light of previous research studies and the motivations of the current study, the research questions are as follows:

1. To improve their accuracy in French grammatical gender, do French L2 learners benefit more from FFI on only sublexical cues or from FFI on both sublexical cues and pronunciation?
2. To what extent are the benefits of these FFI conditions mediated by individual differences in L2 learners' EF skills such as inhibitory control, visuospatial working memory, and cognitive flexibility?

According to Grüter, Lew-Williams, and Fernald (2012), there are three primary sources of difficulty hindering L2 learners in their L2 acquisition of grammatical gender: (a) difficulty at the level of gender attribution (lexical knowledge); (b) difficulty at the level of gender agreement (syntactic knowledge); and (c) difficulty with assessing and deploying the lexical and syntactic knowledge in online production. In particualr, they found that L2 learners' gender attribution errors were more than 10 times as frequent as their gender agreement errors. They thus concluded that nontargetlike L2 lexical—rather than syntactic—representations might be a primary factor which prevents L2 learners from acquiring grammatical gender in a targetlike manner. Accordingly, the current study focuses on the L2 acquisition of gender attribution (not gender agreement) in French.

The present study is expected to have many implications for L2 acquisition, education, and psycholinguistics. By showing that L2 phonological ability plays an important role in the L2 acquisition of French grammatical gender, the study sheds light on the importance of L2 pronunciation instruction and its interdependence with lexical and morphological domains. In addition, the current study provides L2 practitioners with research-based instructional techniques for L2 pronunciation instruction, which they can adapt to L2 instruction targeting French grammatical gender. Finally, the study is expected to highlight the roles of L2 learners' EF skills in L2 instruction while adding emperical evidence to the exisiting body of EF literature.

In order to answer the research questions, a quasi-experimental study was conducted in French L2 classrooms. The next chapter introduces its research methodology.

Chapter 3

Methodology

This chapter presents the methodology of the current study. The procedure of the study and target noun endings are provided following the description of the participants. After an overview of the instructional sessions, a detailed description of each instructional condition is presented. Each measure is also described along with an overview of the measures. Finally, this chapter concludes by explaining the procedure of data preparation for data analysis and summarizing the chapter.

3. 1. Participants

Six classrooms (Classes 1-6) in Elementary French 1 (FRSL 207/208) participated in the current study. The course was one of the French L2 courses offered by the McGill French Language Centre in the Faculty of Arts in Fall 2017. The course was open to French L2 learners who had completed 100-level French L2 courses, but not taken Grade 12- or 13-level French L2 courses in Canada or any French-speaking countries. Initially, a total of 162 students in the six classrooms participated in the present study. However, in order to control for any L1 effects on the acquisition of French grammatical gender, students whose L1 had grammatical gender (e.g., Spanish and Portuguese) were removed from the analyses. As a result, a total of 140 students participated in the present study. Table 2 summarizes their background.

Table 2

Background of Participating Students

Class	Mean age (when participating)	Sex	L1 background	Mean age (when learning French for the first time)
Class 1 (*n* = 17)	19.1 (*SD* = 1.20)	Female (*n* = 12) Male (*n* = 5)	English (*n* = 9) Turkish (*n* = 3) Japanese (*n* = 2) Mandarin (*n* = 2) Bengali (*n* = 1)	14.8 (*SD* = 5.11)
Class 2 (*n* = 24)	21.6 (*SD* = 5.05)	Female (*n* = 21) Male (*n* = 3)	Mandarin (*n* = 11) English (*n* = 10) Japanese (*n* = 1) Korean (*n* = 1) Persian (*n* = 1)	15.8 (*SD* = 5.61)
Class 3 (*n* = 25)	19.8 (*SD* = 1.66)	Female (*n* = 13) Male (*n* = 12)	English (*n* = 13) Mandarin (*n* = 9) Bengali (*n* = 1) Japanese (*n* = 1) Turkish (*n* = 1)	15.1 (*SD* = 5.43)
Class 4 (*n* = 24)	19.8 (*SD* = 2.43)	Female (*n* = 17) Male (*n* = 7)	English (*n* = 16) Mandarin (*n* = 5) Japanese (*n* = 1) Turkish (*n* = 1) Vietnamese (*n* = 1)	15.1 (*SD* = 4.37)
Class 5 (*n* = 23)	21.6 (*SD* = 3.23)	Female (*n* = 15) Male (*n* = 8)	Mandarin (*n* = 10) English (*n* = 8) Korean (*n* = 2) Indonesian (*n* = 1) Japanese (*n* = 1) Persian (*n* = 1)	16.1 (*SD* = 5.85)
Class 6 (*n* = 27)	20.5 (*SD* = 3.52)	Female (*n* = 19) Male (*n* = 8)	English (*n* = 12) Mandarin (*n* = 12) Vietnamese (*n* = 2) Turkish (*n* = 1)	17.4 (*SD* = 5.91)

None of their L1s have /œ̃/ (in *un*) as a separate phoneme. Mandarin and Turkish have /y/ (in *une*), whereas the other L1s do not. None of the participants had French-speaking parents nor lived in any French-speaking countries before coming to Montreal

for their post-secondary education. All participants reported that they seldom spoke French outside of their classrooms and began to learn French as their L2 in instructional settings (mostly, at their secondary school or McGill University). Overall, the participants stated that they were good at learning new languages (M = 5.24, SD = 1.24, Scale 1~7). In addition, most of the participants had also learned various L2s in addition to French, some of which had grammatical gender (e.g., Spanish, Italian, Hebrew, German, and Greek).

On the first day of the course, all students who were registered in the course completed a diagnostic test administered by the McGill French Language Centre. The diagnostic test was mainly composed of dictation, listening, and grammar-focused tasks. Based on the results of the test, the instructors confirmed that students' proficiency level was sufficient to take the course (i.e., neither too high nor too low) and that they had a similar proficiency level across the six classes.

Five instructors (one male and four female instructors), employed as lecturers in the McGill French Language Centre in the Faculty of Arts, also partook in the present study. All instructors were native speakers of French with 6 to 23 years of teaching experience. One instructor taught two separate classes (i.e., Classes 3 and 4), whereas the other four instructors each taught one class (i.e., Classes 1, 2, 5, or 6).

A total of 38 native speakers of French—16 male and 22 female speakers with a mean age of 23.9 (SD = 3.47)—took part in various roles in the present study: Audio-stimuli speakers (n = 2), L1 baseline participants (n = 30), and native-speaker (NS) raters (n = 6). Most of the native speakers of French were from Quebec and post-secondary students at universities located in Montreal. All native speakers of French had French-

speaking parents and completed their education in French (at least up to their secondary level) while learning various L2s including English. In particular, the NS raters were majoring in linguistics at a French-speaking university in Quebec.

All participants in the current study received monetary compensation supported by the Social Sciences and Humanities Research Council. The two audio-stimuli speakers, 30 L1 baseline participants, and six NS raters were paid $20, whereas the participating students received $80. The three instructors in the two FFI conditions also received $90 for their participation in a 1.5-hour teacher training session.

3. 2. Procedures

The two audio-stimuli speakers (one male and one female) were invited to the research office in August 2017. They provided audio stimuli for forced-choice identification and article-noun congruent/incongruent tasks. Before collecting the audio stimuli, there was a 30-minute training session with a French L1-speaking research assistant to ensure that the speakers would produce the stimuli correctly.

On the second day of the course, the researcher visited all classrooms to explain the nature of the study, such as the prospective participants' roles and monetary compensation and then obtained their consent forms (see Appendix A) along with their background information. To ensure that their participation was completely voluntary, all instructors were asked to leave their classrooms while the researcher recruited participants. The instructors did not know who did and did not participate in the study. The results obtained from the current study did not affect any grades for the course. It is also important to note that students in FRSL 207/208, regardless of their participation,

received the instructional treatments designed for the present study (for those in the two FFI conditions) and completed all tests (for all students) since those were considered part of their course curriculum in Fall 2017. Yet, only the data from the students consenting to partake in the study were extracted and analyzed in the current study.

Two weeks after the recruitment, the 140 French L2 participants completed a pretest in September 2017, which consisted of the following six tasks: (a) two tasks (grammatical judgment and text-completion tasks) to measure the accuracy of French gender attribution; (b) two tasks (forced-choice identification and read-aloud tasks) to measure the accuracy of perceiving and producing the sounds of French articles *un*, *une*, *le*, and *la*; and (c) two tasks (picture-description and article-noun congruent/incongruent tasks) to measure the accuracy of French gender attribution as well as the accuracy of perceiving and producing the sounds of French articles. Before the instructional treatment sessions, a 1.5-hour teacher training session was conducted by the researcher to help the instructors implement each condition.

After the pretest, the 140 students participated in six 80-minute instructional sessions (two sessions per week) from September to October 2017. Classes 1 and 2 received FFI on only sublexical cues (Condition 1). Classes 3 and 4 received FFI on both sublexical cues and pronunciation (Condition 2), while classes 5 and 6 received their regular instruction (Condition 3). During the instructional sessions, all classrooms (except for one control classroom) were observed by research assistants. The research assistants took field notes to document the progress of instructional sessions and liaised between the researcher and the instructors.

The field notes indicated that the instructors in the two FFI conditions implemented the instructional treatments while following the lesson schedules and administering instructional components in the way they were instructed during the teacher training session. With respect to the control classroom observed by a research assistant, the field notes revealed that the instructor did not use any instructional components adopted in the two FFI conditions, but followed the regular curriculum. Although the other control classroom was not observed, the instructor verbally reported the same as above.

There was an immediate posttest on the day following the last instructional session, and a delayed posttest was administrated approximately six weeks later. Both posttests were composed of the pretesting tasks, and were thus administered in the same manner as the pretest.

In order to investigate the extent to which learning gains were mediated by students' EF skills (i.e., inhibitory control, nonverbal visuospatial working memory, and cognitive flexibility), the Simon Test (Simon & Rudell, 1967), the Corsi Block-Tapping Test (Corsi, 1972), and the Wisconsin Card Sorting Test (Grant & Berg, 1948) were administered at each of the three testing times.

At various times from October to November 2017, the 30 L1 baseline participants completed a baseline test consisting of the pretesting tasks. The purpose of having the L1 baseline participants was twofold: (a) to ensure that the six tasks, measuring the accuracy of French gender attribution and the accuracy of perceiving and producing the sounds of French article, assessed linguistic skills other than any other problem-solving skills (thus, maximum scores were expected from the L1 baseline participants) and (b) to ensure that

the speech ratings from the six NS raters were reliable enough to answer the research questions (thus, maximum scores attained by the L1 baseline participants).

All tasks were programmed by a software tool, *LearningBranch* (https://portal.learningbranch.com/mcgill/) and a software package for psychological experiments, *PsyToolkit* (Stoet, 2010, 2017). Therefore, all tests were administered by means of individual computers at the Arts Multimedia Language Facility for the participating students and at the research office for the L1 baseline participants. Each testing session took 1 to 1.2 hours. Finally, speech samples collected from the read-aloud and picture-description tasks were rated by the six NS raters for subsequent analyses.

3. 3. Target Noun Endings

To choose target noun endings in the current study, a corpus analysis of the instructional materials was conducted, taking the following two factors into account: (a) high frequency in the instructional materials and (b) more than 90% gender-predictive values based on Lyster (2006). As a result, a total of six noun-ending types per grammatical gender were selected as listed in Table 3. All noun endings frequently appeared in the instructional materials while being reliable predictors of gender attribution with more than 90% predictive values.

Table 3

Summary of Target Noun Endings

Gender	Type	Endings	Tokens
Masculine nouns	1	*-ant* (e.g., *croissant*) *-ent* (e.g., *bâtiment*)	43
	2	*-eau* (e.g., *bureau*) *-ot* (e.g., *mot*) *-o* (e.g., *stylo*)	28
	3	*-ais* (e.g., *français*) *-ait* (e.g., *souhait*) *-et* (e.g., *billet*) *-ès* (e.g., *succès*)	27
	4	*-our* (e.g., *jour*) *-oir* (e.g., *devoir*) *-ort* (e.g., *confort*)	15
	5	*-on* (e.g., *bâton*)	12
	6	*-ain* (e.g., *refrain*) *-in* (e.g., *matin*)	8
Feminine nouns	1	*-tion* (e.g., *question*) *-sion* (e.g., *télévision*)	38
	2	*-ie* (e.g., *stratégie*)	31
	3	*-esse* (e.g., *promesse*) *-isse* (e.g., *saucisse*) *-asse* (e.g., *classe*)	15
	4	*-ance* (e.g., *chance*) *-ence* (e.g., *science*)	15
	5	*-ée* (e.g., *fumée*) *-té* (e.g., *difficulté*)	12
	6	*-che* (e.g., *marche*)	12

Note. Tokens refer to the raw number of occurrences in the instructional materials.

3. 4. Instructional Sessions

3. 4. 1. Overview

To implement the instructional conditions designed for the present study, a total of six 80-minute instructional sessions (two sessions per week) were implemented from September to October 2017. In FRSL 207/208, the instructors had used a course pack including various texts with reading, speaking, listening, and writing activities. In light of

the course schedule, the following four texts in the course pack were selected for the current study: *Réponse au sphinx* (Lissouba, 1994); *Libre opinion : L'anglo de Saint Pierre* (Higgins, 2009); *Les lettres chinoises : Lettre 2* (Chen, 1999); *Les lettres chinoises : Lettre 9* (Chen, 1999). Drawing on these texts, two instructional booklets (one for the FFI condition on only sublexical cues and the other for the FFI condition on both sublexical cues and pronunciation) were prepared by the researcher. Each booklet included various instructional techniques and activities to draw students' attention to the linguistic targets.

For the FFI condition targeting only sublexical cues, the instructional booklet included several instructional activities drawing students' attention to target noun endings that predict grammatical gender in French. With respect to the FFI condition targeting both sublexical cues and pronunciation, pronunciation activities focusing on the sounds of French articles were included in addition to the focus on sublexical cues. To equalize instructional times between FFI on only sublexical cues and FFI on both sublexical cues and pronunciation, the instruction in the former condition included more meaning-focused activities (e.g., comprehension questions) than the instruction in the latter condition.

It is also important to note that the FFI on only sublexical cues entailed no pronunciation instruction on noun endings and that pronunciation instruction in the FFI on both sublexical cues and pronunciation focused on the sounds of French articles, not on the sounds of noun endings.

3. 4. 2. Condition 1: Form-Focused Instruction on Only Sublexical Cues (Classes 1 and 2)

Each text in the instructional booklet was composed of (a) a content-focused part, (b) a language-focused part, and (c) a content-plus-language part (see Appendix B for sample materials).

The content-focused part consisted of two sub-parts: Reading and comprehension questions. The instructors were asked to read aloud each text to students, who were asked to follow along in the text as the instructors read. In each text, all target noun endings were highlighted in bold as well as the article preceding the target noun (i.e., input enhancement; Sharwood Smith, 1993). The instructors did not ask the students to pay attention to the highlighted parts, but did stress the highlighted articles while reading. By doing so, they simply drew the students' attention to the highlighted parts without any explicit explanation about grammatical gender. The instructors also added any explanations to help the students understand the text. In the comprehension questions, the students were asked to answer meaning-focused questions related to the text, after which they formed groups of two to four students to share their responses.

The language-focused part was composed of three main activities adopted in Lyster (2004): a cloze activity, a categorization activity, and a new word activity. During the cloze activity, the students were asked to complete the text (the same one that they read in the content-focused part) with blanks. They were required to write the correct article in each blank. Only target nouns were preceded by a blank, and the endings of all target nouns were highlighted. Once they completed the activity, the instructors asked them to give their answers with explanations and, when necessary, provided them with

the correct answers. In the categorization activity, the students were asked to categorize the nouns targeted during the cloze activity. In a given table, they categorized all nouns by noun endings and indicated the grammatical gender of each noun ending based on what they identified. Once it was completed, the students were asked to give their answers with explanations, after which the instructors explained the table with the correct answers. The new word activity was designed to provide the students with an opportunity to test whether the patterns they had discovered from the above two activities could also be applied to new words. The students were asked to identify the grammatical gender (i.e., masculine or feminine) of a set of new words whose noun endings appeared during the previous activities. Once it was completed, the instructors asked the students to provide their answers with explanations, and then shared the correct answers with the students. In the case of any errors, the instructors induced them to recall the patterns they had discovered (e.g., *'-tion' indique des noms féminins ou masculins?*).

The content-plus-language part was mainly composed of a writing activity and a presentation activity. In the writing activity, the students were asked to write a short composition in French, which was related to the content of the text. The instructions of the activity explicitly asked them to focus on grammatical gender and use correct articles in their composition. Once it was completed, the students presented their compositions in front of the class. While listening to them, the instructors were asked to pay attention to their use of articles and chime in when any errors occurred. In the last session, the students were given a total of 56 new words whose grammatical gender they were asked to identify based on noun endings.

Given that the current study did not aim to test the differential effects of different types of feedback, the instructors were allowed to employ various feedback types at their discretion. In the case of ambiguous pronunciation of French articles, however, the instructors were asked not to model the correct pronunciation via recasting or explicit correction in order to avoid overlap with Condition 2, which is described next.

3. 4. 3. Condition 2: Form-Focused Instruction on Both Sublexical Cues and Pronunciation (Classes 3 and 4)

In addition to the instructional materials used for the FFI condition targeting only sublexical cues, the instructor of Classes 3 and 4 offered FFI on the pronunciation of the French indefinite and definite articles, *un*, *une*, *le*, and *la* (see Appendices C and D for sample materials).

The instructor conducted a 20-minute pronunciation session in each of the six 80-minute instructional sessions. The pronunciation sessions were designed to help the students produce and perceive the sounds of French articles *un*, *une*, *le*, and *la* in a targetlike manner. In particular, they consisted of articulation-based instruction, segmental-level perception/production, sentence-level perception/production, and spontaneous-level practice.

The articulation-based instruction was composed of explicit phonetic instruction and two activities. Following Saito (2013), for the explicit phonetic instruction, the students were given the phonetic characteristics of each sound. For instance, for each sound, there was an IPA symbol as well as pictures illustrating phonetic information such as nasalization, lip rounding, and tongue position. There were two pictures per sound (a diagram showing nasalization, lip rounding, and tongue position; a photo taken of a

native speaker of French pronouncing the sound). The instructor explained these characteristics to the students and provided them with target exemplars by pronouncing *un*, *une*, *le*, and *la* clearly four times each consecutively with exaggeration. The students were simply asked to listen to the exemplars while paying attention to their articulatory gestures such as nasalization, lip rounding, tongue position, and mouth opening. The students then repeated after the instructor. For example, the instructor said *une* and then asked them to repeat after her once. There were four repetitions for each sound.

In the first activity (notice-articulatory-gestures activity), there were photos of native speakers of French pronouncing the sounds of *un*, *une*, *le*, and *la*. For each sound, there were two photos taken of one male and one female (i.e., eight photos). The students were asked to choose which sound each photo illustrated by recalling what they learned during the explicit phonetic instruction. In the second activity (mirror activity), students were given a mirror to imitate articulatory gestures such as the lip rounding and mouth opening as shown on the photos in the first activity. The instructor asked them to practice pronouncing the articles *un*, *une*, *le*, and *la* by themselves while looking into the mirror.

The segmental-level perception and production phase included three activities. The first two activities were similar to those in Lee and Lyster (2016a). In the first activity (pick-up-a-card activity), the students were given two pieces of paper. One had *un* on one side and *une* on the other side. On the other paper, *le* appeared on one side and *la* on the other side. The instructor said one of the sounds and asked the students to show her the card corresponding to what she had said. The instructor was asked to try 12 trials (4 sounds × 3 repetitions) to confirm their perception of the sounds. In the second activity (bingo activity), the students were given the following 12 words: *un*, *une*, *brun*, *brune*,

lundi, *lune*, *la*, *le*, *ma*, *me*, *ta*, and *te*. The instructor asked them to choose nine words out of the 12 words and then to write them on their 3×3 Bingo card provided in the booklet. The instructor chose nine words and said each word to the students, who in turn circled it on their card. When a student had completed two Bingo lines (vertical, horizontal, or diagonal lines), he or she could yell *Bingo*. The instructor then went to the student and asked him or her to pronounce all circled words. If the student did not make any pronunciation errors, he or she won the game. On the contrary, if there were any pronunciation errors, the instructor corrected them explicitly (*not 'X, but 'Y'*), and then she continued the game until somebody said *Bingo*. There were two rounds of this activity.

Finally, in the third activity (imitation activity), the instructor played the sound files, previously recorded from native speakers of French, four times. The students were then required to record their pronunciation of French articles using their cell phone or computer while imitating the sound files.

There were two sentence-level production activities. In the first activity (choral repetition activity), there were 12 sentences in the booklet, including French articles highlighted in red color (e.g., *Le Canada est un pays de multiculturalisme*). The instructor read aloud each sentence while exaggerating the articles to draw the students' attention to the sounds. Once the reading was done, there was choral repetition as students together read aloud each sentence. In the second activity (dictation activity), students in pairs (A and B) participated in a mini dictation exercise. Learner A read 10 sentences including the target sounds to Learner B, who in turn completed relevant blanks, and vice versa. There were one to three blanks in each sentence. The students

were required to write *un*, *une*, *le*, or *la* in each blank. After the activity, the pair of students checked their answers with each other.

In the sentence-level perception activity, the students were first given a total of 15 sentences collected from the texts that they had read. The instructor played an audio clip and then asked the students to find any pronunciation errors in each sentence. For instance, one of the 15 sentences in the booklet was written as "*Il y a toujours une réponse à une question*". However, the speaker in the audio clip intentionally mispronounced one article as follows: "*Il y a toujours une réponse à un question*". The instructor played the audio clip twice and made a brief pause between the sentences. Once it was completed, the instructor asked the students to give their own answers and confirmed them.

Finally, the students were asked to answer questions in a storytelling format (spontaneous-level practice), all of which were related to the content of the texts that they had read. The questions required them to use French articles in their storytelling.

In contrast to Condition 1, concerning unclear pronunciation of French articles, the instructor explicitly corrected the pronunciation by providing a model of correct pronunciation (e.g., *not 'X, but 'Y'*) and an opportunity to repair it.

3. 4. 4. Condition 3: Control Condition (Classes 5 and 6)

The students in the control condition engaged in the regular instruction excluding any FFI components adopted in the first and second conditions. As part of the course curriculum, the instructors in this condition provided their students with a list of noun endings along with their predictability in gender attribution. However, the instructors

offered minimal exercises (only 10 nouns) after presenting the list of the noun endings to their students only once.

3. 5. Measures

3. 5. 1. Overview

In order to investigate the effects of the two FFI conditions on the acquisition of French grammatical gender, a pretest, an immediate posttest, and a delayed posttest were administered. A total of six tasks were included in each test. First, grammatical judgment and text-completion tasks measured the participants' knowledge of French gender attribution. Given that these tasks induced students to retrieve grammatical knowledge (i.e., whether a given noun is masculine or feminine) without verbally producing French articles, the two tasks were adopted to measure grammatical accuracy. Second, forced-choice identification and read-aloud tasks assessed the extent to which the participants perceived and produced the sounds of the French articles *un*, *une*, *le*, and *la*. The forced-choice identification task measured the degree to which they perceptually categorized the four sounds. The participants were also asked to verbalize the four sounds twice in the read-aloud task. In contrast to the grammatical judgment and text-completion tasks, these two tasks mainly required them to retrieve their phonological knowledge regarding the sounds without having to account for the noun endings targeted by the FFI on sublexical cues.

In the picture-description task, the participants were asked to describe pictures in French, using target nouns and distractors in the singular form. Therefore, they were required to determine the grammatical gender of the nouns and then verbally produce the

articles followed by the nouns to complete the task successfully. With respect to the article-noun congruent/incongruent task, they listened to correct and incorrect noun phrases (e.g., *un chapeau* and **une chapeau*) via a headset and then judged whether they were grammatically correct or not. To complete this task in a targetlike manner, the students needed to know the grammatical gender of given nouns in addition to being able to accurately perceive the sounds of the articles.

There were two versions of each task, A and B, allowing for a counterbalanced design to reduce practice effects. The participants were randomly selected so that half followed an ABA sequence across the three testing sessions, while the other half followed a BAB sequence. For the baseline participants, half of them were given A and the other half of them received B.

The following was the order of the six tasks in each testing session: (1) grammatical judgment task, (2) text-completion task, (3) picture-description task, (4) read-aloud task, (5) forced-choice identification task, and (6) article-noun congruent/incongruent task.

The students also completed three tests measuring their EF skills to examine the extent to which learning gains were mediated by their cognitive controls. A different measure was administered at each testing time: the Simon Test with the pretest; the Corsi Block-Tapping Test with the immediate posttest; the Wisconsin Card Sorting Test with the delayed posttest. The rationale for administering them at different times was to ensure that the students completed each test within given class hours. The Simon Test was designed to measure their inhibitory control. The Corsi Block-Tapping Test was

administered to measure their nonverbal visuospatial working memory. The Wisconsin Card Sorting Test was conducted to measure their cognitive flexibility.

3. 5. 2. Target Nouns

Based on the target noun endings presented in Table 3, various inanimate nouns were used in the grammatical judgment, text-completion, picture-description, and article-noun congruent/incongruent tasks (refer to each task for details). Given that the pronunciation of *un* changes before a vowel, all nouns began with consonants, which also controlled for the use of the gender-neutral elided article *l'*.

The target nouns were categorized as familiar nouns, high-frequency unfamiliar nouns, and low-frequency unfamiliar nouns. The familiar nouns appeared in the instructional materials, whereas the unfamiliar nouns did not. In particular, the high-frequency unfamiliar nouns were the ones used frequently in many French L2 textbooks and on a daily basis. Given the L2 participants' proficiency level, therefore, the participants were likely to have encountered them before, but the nouns did not occur during the instructional sessions and were not explicitly taught. They were unlikely to know and learn the low-frequency unfamiliar nouns due to their low frequency.

According to Lexique 3.82 (New, Pallier, Ferrand, & Matos, 2001), the high-frequency unfamiliar nouns in the tests were, overall, frequent to very frequent (frequency $M = 39.4$; $SD = 5.64$) in its corpus (5 = very rare, 10 = rare, 20 = frequent, 50 = very frequent). On the other hand, the low-frequency unfamiliar nouns were rare to very rare (frequency $M = 8.23$; $SD = 9.12$). Considering the nature of the tasks, the low-frequency unfamiliar nouns were only used for the grammatical judgment task.

3. 5. 3. Grammatical Judgment Task

In each of the 48 trials comprising the grammatical judgment task, a French noun appeared on the participant's computer screen along with two articles (i.e., *un* vs. *une* or *le* vs. *la*; half with *un* vs. *une* and half with *le* vs. *la*), after which the participant was asked to select the correct article. There was no predetermined time interval between trials, so participants clicked the *next* button to move onto next trials. Of the 48 trials with 48 different nouns, 24 were masculine nouns and 24 were feminine nouns. Each set of 24 trials consisted of 12 familiar nouns, six high-frequency unfamiliar nouns, and six low-frequency unfamiliar nouns. The familiar nouns were prepared by choosing two nouns from each of the six noun-ending types in Table 3. In a similar manner, one noun from each of the six noun-ending types was selected for the six high-frequency unfamiliar nouns and the six low-frequency unfamiliar nouns.

3. 5. 4. Text-Completion Task

For the text-completion task, participants were required to write two separate texts (i.e., writing an email and a short advertisement), in which they were required to use a total of 12 nouns (i.e., six masculine and six feminine nouns). The six masculine nouns included four familiar nouns and two high-frequency unfamiliar nouns.

To control for the number of trials per task, not all noun endings could be included, so they were selected on the basis of their frequency in the instructional materials (see Table 3). The four familiar nouns included nouns associated with noun-ending Types 1 to 4 in Table 3: one from '*-ant*' or '*-ent*'; one from '*-eau*', '*-ot*', or '*-o*'; one from '*-ais*', '*-ait*', '*-et*', or '*-ès*'; one from '*-our*', '*-oir*', or '*-ort*'. The two high-frequency unfamiliar nouns included nouns associated with noun-ending Types 1 to 2:

one from '*-ant*' or '*-ent*'; one from '*-eau*', '*-ot*', or '*-o*'. The same method was applied for the six feminine nouns.

Given that this task was not intended to measure whether the participants knew the meanings of the nouns, the English equivalent of each French noun was provided (e.g., *billet* – ticket). The participants were given 10 minutes (i.e., a timed setting) and two verbs per task were also provided. Finally, it is also important to state that the participants were explicitly instructed to use all nouns in the singular form.

3. 5. 5. Forced-Choice Identification Task

Audio stimuli were first prepared with the aid of the two audio-stimuli speakers. The speakers were asked to utter the four French articles (i.e., *un*, *une*, *le*, and *la*), which were audio-recorded in the research office. During the test, the participants listened to a stimulus and then were asked to select what they heard among four options (i.e., *un*, *une*, *le*, and *la*). Each stimulus was played only once; there was no predetermined time interval between trials and the participants moved on to the next trials by clicking the *next* button on the computer screen. They completed a total of 32 trials (4 words × 2 speakers × 4 repetitions).

3. 5. 6. Read-Aloud Task

Participants were asked to pronounce the four sounds (i.e., *un*, *une*, *le*, and *la*) twice (Attempt 1 and Attempt 2). Their productions were audio-recorded via a headset.

3. 5. 7. Picture-Description Task

Participants were instructed to describe six pictures, each of which included four target nouns (i.e., 24 nouns including 12 masculine and 12 feminine nouns). The 12 masculine nouns comprised eight familiar nouns and four high-frequency unfamiliar

nouns. Of the eight familiar nouns, six were selected from each of the six noun-ending types in Table 3. Two nouns associated with noun-ending Types 1 to 2 (one '*-ant*' or '*-ent*'; one from '*-eau*', '*-ot*', or '*-o*') were then added based on their high frequency in the instructional materials. To control for the number of trials per task, not all noun endings could be included for trials with high-frequency unfamiliar nouns. Based on the frequency in the instructional materials, therefore, the four high-frequency unfamiliar nouns included nouns associated with noun-ending Types 1 to 4: one from '*-ant*' or '*-ent*'; one from '*-eau*', '*-ot*', or '*-o*'; one from '*-ais*', '*-ait*', '*-et*', or '*-ès*'; one from '*-our*', '*-oir*', or '*-ort*'. The same method was applied for the 12 feminine nouns.

In each picture, there were four target nouns (e.g., *un rasoir*, *un mirroir*, *une lotion*, and *une photographie* in Figure 2) in addition to one distractor (e.g., *une brosse à dents*). In order to draw the participants' attention to the target nouns, all singular objects illustrating the target nouns were identified with a check mark. The participants were required to read a sheet showing all target nouns including distractors before the task and then asked to use them to describe the pictures with correct articles (*un*, *une*, *le*, or *la*). Their productions were audio-recorded via a headset.

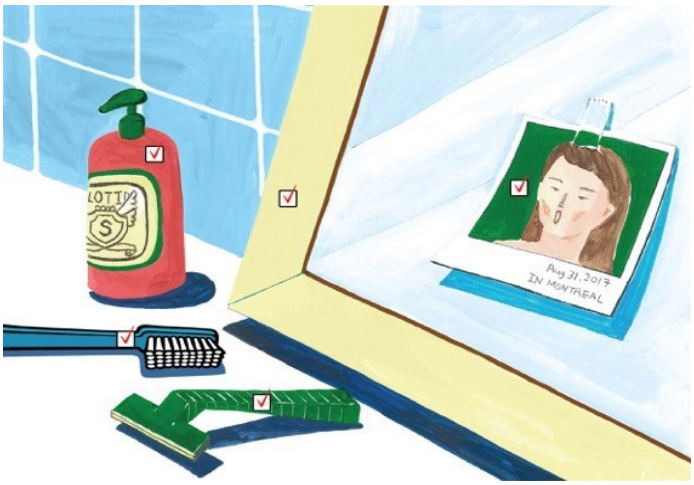

Figure 2. Example of a picture-description task

3. 5. 8. Article-Noun Congruent/Incongruent Task

Participants listened to a noun phrase with its correct or incorrect article (e.g., *un chapeau* and **une chapeau*) via a headset and were asked to determine whether or not the audio stimulus was grammatical in French by clicking either the *right* or *wrong* button on the computer screen. Each stimulus was played only once. There was no predetermined time interval between trials. Therefore, the participants moved on to the next trials by clicking the *next* button on the computer screen.

Audio stimuli were first prepared with the two audio-stimuli speakers. The speakers were asked to produce 48 nouns phrases (i.e., 48 trials), half of which were recorded by the male speaker and half of which were recorded by the female speaker. The 48 trials were composed of 24 trials with masculine nouns and 24 trials with feminine nouns. The 24 trials with masculine nouns were prepared with eight familiar nouns and four high-frequency unfamiliar nouns. The eight familiar nouns were arranged by selecting one noun from each of the six noun-ending types in addition to two nouns associated with noun-ending Types 1 to 2 (one '*-ant*' or '*-ent*'; one from '*-eau*', '*-ot*', or '*-o*') entailing high frequency in the instructional materials. To control for the number of trials per task, not all noun endings could be included for trials with high-frequency unfamiliar nouns. The four high-frequency unfamiliar nouns included nouns associated with noun-ending Types 1 to 4: one from '*-ant*' or '*-ent*'; one from '*-eau*', '*-ot*', or '*-o*'; one from '*-ais*', '*-ait*', '*-et*', or '*-ès*'; one from '*-our*', '*-oir*', or '*-ort*'. Four of the eight familiar nouns were prepared with *un-une*; for instance, *un stylo* (congruent trial) and **une stylo* (incongruent trial), whereas the remaining four familiar nouns were prepared with *le-la* such as **le vie* (incongruent) and *la vie* (congruent). In the same vein, two

unfamiliar nouns from the four high-frequency unfamiliar nouns were prepared for *un-une* trials, whereas the remaining two unfamiliar nouns were prepared for *le-la* trials. Accordingly, there were a total of 24 trials for the masculine nouns (12 congruent and 12 incongruent trials). The same method was applied for the feminine nouns (i.e., 24 trials including 12 congruent and 12 incongruent trials).

3. 5. 9. Measures of Executive Function Skills

The Simon Test, the Corsi Block-Tapping Test, and the Wisconsin Card Sorting Test were adopted to measure students' EF skills. In the Simon Test, the students were asked to press the *a* key on the left side of the keyboard in response to the word *left* on the computer screen and the *l* key on the right side of the keyboard in response to the word *right* on the computer screen. The words appeared either on the left side of the screen or on the right side of the screen, which resulted in congruent trials (i.e., the word *left* appearing on the left side of the screen; the word *right* appearing on the right side of the screen) and incongruent trials (i.e., the word *left* appearing on the right side of the screen; the word *right* appearing on the left side of the screen). Each stimulus was present on the screen until the participant responded up to a maximum of 5,000 ms. Participants were required to complete practice trials until they answered eight consecutive trials correctly, after which a total of 28 trials (14 congruent and 14 incongruent trials) were provided in a randomized order. The Simon Test measured response times on congruent and incongruent trials.

In the Corsi Block-Tapping Test, stimuli were a random array of blocks spread out on the computer screen. In each trial, each block flashed one at a time in a sequence. The students were required to repeat the sequence in the same order by clicking each

block using a computer mouse. The sequences began with two blocks. There were two trials for each sequence length, and the sequences increased by one block after every second trial. Testing was terminated when the students failed to complete both trials in a given sequence. The students had a practice session beforehand. The test recorded the longest sequence length that a student could replicate.

In the Wisconsin Card Sorting Test, the students were asked to match a given card to one of the four cards presented on the computer screen. They were required to find a matching rule (i.e., by color, shape, or number of shapes) by themselves while completing a few trials with right-or-wrong feedback. Once they correctly matched a set number of consecutive cards using one matching rule, a new matching rule was introduced to the students who were in turn requested to find the new rule and complete another set of trials. Testing was terminated once they correctly matched cards in six categories or 128 cards. The test recorded preservation errors which resulted from upholding the previous matching rule in spite of its change.

3. 6. Data Preparation

Concerning the grammatical judgment, forced-choice identification, and article-noun congruent/incongruent tasks, each score was prepared by calculating percentages of correct responses. Owing to the small number of items (eight familiar and four high-frequency unfamiliar nouns), the number of correct responses was counted for the text-completion task. For the grammatical judgment task, each score per participant was calculated by lexical familiarity and frequency (i.e., familiar, high-frequency unfamiliar, and low-frequency unfamiliar nouns) on each test. With respect to the text-completion

and article-noun congruent/incongruent tasks, each score per participant was prepared by lexical familiarity (i.e., familiar and high-frequency unfamiliar nouns) on each test. As for the forced-choice identification task, each score per participant was calculated on each test.

Regarding the read-aloud and picture-description tasks, the target sounds audio-recorded by the participants were first extracted from raw speech files, each of which was rated by the six NS raters. For instance, the raters were asked to judge whether each sound file referred to *un*, *une*, *le*, *la*, or *aucun/pas sûr* after listening to the file collected from the read-aloud task, and then to assess how good the pronunciation was between 1 (Strongly/extremely difficult to understand) and 9 (Strongly/extremely easy to understand). For the sounds from the picture-description task, the raters were instructed to choose the article they believed the participant used before the target noun (e.g., *un*, *une*, *le*, *la*, or *aucun/pas sûr*) and then to score it between 1 (Strongly/extremely difficult to understand) and 9 (Strongly/extremely easy to understand). The raters were allowed to listen to a stimulus as often as needed before moving on to the next stimulus by clicking the *next* button on the computer screen. If the raters chose the correct response (e.g., choosing *une* when a student was instructed to pronounce *une* in the read-aloud task), its rating (1 to 9) was taken into account for further analyses. Otherwise (e.g., incorrect responses or *aucun/pas sûr*), '0' was recorded regardless of its rating (see also Lee & Lyster, 2017).

Given that one sound file was rated by the six NS raters, interrater agreement (Cronbach's alpha) was calculated. All speech samples indicated reliability indexes of 0.70-0.80, which are considered acceptable in L2 research (Larson-Hall, 2010).

Therefore, by averaging the six NS raters, each score per participant was calculated by article (i.e., *un*, *une*, *le*, and *la*) for the read-aloud task at each testing session. Similarly, for the picture-description task, each score per participant was prepared by lexical familiarity (familiar and high-frequency unfamiliar nouns) at each testing session.

There were missing data exclusively from the text-completion and picture-description tasks in cases where the participants did not use a sufficient number of target nouns in their writing and oral production. The missing data accounted for less than 5% in the entire data set and were excluded for subsequent analyses.

Regarding the Simon Test, a Simon effect score was calculated for each participant by subtracting mean response times on congruent trials from mean response times on incongruent trials. As shown in previous studies (e.g., Bialystok, Craik, Klein, & Viswanathan, 2004), a smaller Simon effect score refers to higher inhibitory control. With respect to the Corsi Block-Tapping Test, the score was the longest sequence length that a participant could replicate (Milner, 1971). Finally, of particular interest in the Wisconsin Card Sorting Task is the percentage of preservation errors resulting from upholding the previous matching rule in spite of its change. The percentage of preservation errors is known to be an indicator of cognitive shifting ability (Miyake et al., 2000).

3. 7. Summary

This chapter introduced the participants, the design and procedures of the study, and data preparation. Instructional treatments were described, after which six linguistic measures and three EF measures were presented. In addition, the chapter also explained

the procedure of data preparation for data analysis. Next, Chapter 4 reports the data analysis and results.

Chapter 4

Results

This chapter presents the results of the current study. After presenting the data collected from the baseline participants and the students in the control condition, the chapter entails three main sections: (a) the effects of two FFI conditions, (b) the variables affecting the performance of the picture-description task, and (c) the roles of EF skills in learning gains. Each section begins with its statistical model followed by results. The chapter concludes by summarizing the results of the present study.

4. 1. Pre-Analysis

As expected, the L1 baseline participants showed maximum scores on all measures. In the grammatical judgment task, they attained mean accuracy scores of 98.33 (*SD* = .82), 99.86 (*SD* = .76), and 99.61 (*SD* = .91) for the familiar, high-frequency unfamiliar, and low-frequency unfamiliar nouns (out of 100), respectively. They also attained mean accuracy scores of 7.97 (*SD* = .18) and of 3.97 (*SD* = .18) for the familiar (out of 8) and high-frequency unfamiliar nouns (out of 4) in the text-completion task.

In the forced-choice identification task, their mean accuracy score was 98.33 (*SD* = 1.78) out of 100. Their mean ratings in the read-aloud task were 8.90 (*SD* = .40) for *un*, 8.97 (*SD* = .18) for *une*, 8.93 (*SD* = .25) for *le*, and 8.97 (*SD* = .18) for *la* (out of 9). Moreover, the baseline participants attained high pronunciation ratings in the picture-description task (*M* = 8.90 out of 9, *SD* = .31 for the familiar nouns; *M* = 8.90 out of 9, *SD* = .32 for the high-frequency unfamiliar nouns). Their mean accuracy score in the

article-noun congruent/incongruent task was 98.12 (*SD* = 2.79) for familiar nouns and 98.24 (*SD* = 1.29) for high-frequency unfamiliar nouns (out of 100).

Given the homogeneity of these high results, therefore, it was confirmed that the tasks required the baseline participants to use their L1 knowledge of gender attribution and the sounds of French articles rather than nonlinguistic problem-solving skills, which would have yielded more variable results. In addition, considering that their speech samples received high ratings from the NS raters, it was also confirmed that the rating scores from the NS raters were reliable enough to answer the research questions in the current study.

Before investigating the effects of the two FFI conditions, separate mixed effects models with repeated measures were conducted to examine whether those in the control condition showed any significant improvement across the three testing sessions. The students in the control condition made no significant improvement on any measures (p_S > .05). Their descriptive statistics are reported in the section below along with the two FFI conditions.

4. 2. Effects of Two Form-Focused Instructional Conditions

4. 2. 1. Statistical Model

The L2 participants' scores were statistically analyzed using linear mixed effects models in *R* (R Core Team, 2016) using the *lme4* package (version 1.1-15) and restricted maximum likelihood.

For the grammatical judgment task, fixed effects included 'condition' (FFI on only sublexical cues, FFI on both sublexical cues and pronunciation, and no FFI), 'time'

(pretest, immediate posttest, and delayed posttest), 'trial' (familiar, high-frequency unfamiliar, and low-frequency unfamiliar nouns), and their two-way and three-way interactions. The fixed effect factors 'condition' and 'time' were coded using treatment coding while having the control condition (condition) and the pretest (time) as a reference level. The fixed effect factor 'trial' was coded using Helmert coding. Therefore, there were two contrasts: (a) familiar nouns vs. unfamiliar (high-frequency and low-frequency) nouns; and (b) high-frequency unfamiliar nouns vs. low-frequency unfamiliar nouns. In a similar vein, for the picture-description and article-noun congruent/incongruent tasks, the models included the fixed effect factors 'condition', 'time', 'trial' (familiar and high-frequency unfamiliar nouns), and their two-way and three-way interactions. Considering that the fixed effect factor 'trial' had two categories, the factor was thus centered (-0.5 and 0.5) using the *rescale()* function in the *arm* package in *R* (R Core Team, 2016).

To analyze data for the read-aloud task, two models were designed, each of which had the fixed effect factors 'condition', 'time', 'trial', and their two-way and three-way interactions. The first model had two categories (*un* and *une*) as its 'trial' factor, whereas the second model had two categories (*le* and *la*) as its 'trial' factor. For both models, the fixed effect factor 'trial' was centered (-0.5 and 0.5) using the *rescale()* function in the *arm* package in *R* (R Core Team, 2016). Due to the small number of items in the text-completion task (eight familiar nouns and four high-frequency unfamiliar nouns), the number of correct responses—instead of calculating percentages—was counted. Therefore, there were two models (one for familiar nouns and the other for high-frequency unfamiliar nouns), each of which had 'condition', 'time', and their two-way

interactions as fixed effect factors. For the forced-choice identification task, the model included ‘condition’, ‘time’, and their two-way interactions as fixed effect factors.

For all models, students and classes were treated as random effects with students nested under classes. Random intercepts for students and classes were included, as were random slopes for ‘time’ for both students and classes, using a maximal random effects structure. In addition, with respect to the models including the ‘trial’ factor, random slopes for ‘trial’ and ‘time’ by ‘trial’ interaction were also included for both students and classes.

Considering that two-way or three-way interactions including both ‘condition’ and ‘time’ factors were the main interests in the current study, only the interactions including both factors are interpreted in this chapter. Prior to each analysis, statistical assumptions were verified (e.g., the explanatory variables were linearly related to the response; the errors had constant variance, which were independent and normally distributed). All statistical outcomes were interpreted with alpha set at .05. The intercept in each model refers to the expected mean value of a dependent variable (y) when all independent variables (x) are equal to 0.

4. 2. 2. Grammatical Judgment Task

Table 4 summarizes the descriptive statistics for the grammatical judgment task (see Figure 3 for its boxplot). The maximum score is 100 in the grammatical judgment task as a result of calculating the percentages of correct responses.

Table 4

Mean Percentage Scores and Standard Deviations (in parentheses) for the Grammatical Judgment Task

Condition	Test	Familiar nouns	High-frequency unfamiliar nouns	Low-frequency unfamiliar nouns
FFI on only sublexical cues (*n* = 41; Condition 1)	Pretest	66.60 (20.12)	68.75 (19.39)	66.50 (22.62)
	Immediate posttest	92.46 (4.45)	92.82 (5.10)	93.24 (5.25)
	Delayed posttest	92.19 (4.43)	92.72 (5.49)	92.25 (6.44)
FFI on both sublexical cues and pronunciation (*n* = 49; Condition 2)	Pretest	68.04 (17.86)	68.04 (18.40)	69.17 (19.13)
	Immediate posttest	92.21 (4.49)	93.44 (5.25)	92.76 (6.25)
	Delayed posttest	93.02 (5.00)	93.60 (5.51)	92.33 (6.33)
Control (*n* = 50; Condition 3)	Pretest	64.51 (20.13)	66.95 (18.32)	65.60 (16.21)
	Immediate posttest	64.77 (16.25)	65.53 (14.88)	65.45 (14.68)
	Delayed posttest	67.30 (15.11)	64.69 (16.92)	65.65 (17.05)

The statistical model summarized in Table 5 shows that the scores of students in both FFI conditions became significantly higher on the immediate and delayed posttests compared to the reference levels (i.e., control condition and pretest). Given that there were no significant three-way interactions that included ‘trial’, it was confirmed that the students in both FFI conditions significantly improved their scores in the grammatical judgment task regardless of lexical familiarity and frequency (see also the descriptive statistics in Table 4).

Table 5

Summary of Fixed Effects for the Statistical Model for the Grammatical Judgment Task

Predictor	Estimate (β)	Standard error	*t*-value	*p*-value
Intercept	65.64	4.19	15.65	**.001**
Condition 1	2.30	6.04	0.38	.730
Condition 2	2.89	5.96	0.49	.663
Time 2	-0.38	4.39	-0.09	.937
Time 3	0.25	4.33	0.06	.959
Trial 1	-1.18	1.10	-1.07	.286
Trial 2	-0.95	1.32	-0.72	.471
Condition 1×Time 2	25.10	6.31	3.98	**.032**
Condition 2×Time 2	24.65	6.24	3.95	**.035**
Condition 1×Time 3	24.08	6.25	3.85	**.033**
Condition 2×Time 3	24.10	6.16	3.91	**.035**
Condition 1×Trial 1	0.50	1.65	0.31	.761
Condition 2×Trial 1	0.79	1.59	0.50	.620
Condition 1×Trial 2	-0.63	1.98	-0.32	.752
Condition 2×Trial 2	1.74	1.91	0.91	.361
Time 2×Trial 1	0.69	1.51	0.46	.647
Time 3×Trial 1	2.60	1.51	1.72	.086
Time 2×Trial 2	0.90	1.85	0.48	.629
Time 3×Trial 2	1.63	1.85	0.88	.380
Condition 1×Time 2×Trial 1	-0.38	2.28	-0.17	.869
Condition 2×Time 2×Trial 1	-0.89	2.18	-0.41	.684
Condition 1×Time 3×Trial 1	-2.09	2.29	-0.91	.362
Condition 2×Time 3×Trial 1	-2.17	2.18	-1.00	.319
Condition 1×Time 2×Trial 2	0.98	2.79	0.35	.725
Condition 2×Time 2×Trial 2	-2.17	2.66	-0.82	.415
Condition 1×Time 3×Trial 2	-0.37	2.80	-0.13	.895
Condition 2×Time 3×Trial 2	-3.29	2.66	-1.24	.217

Note. p-values smaller than .05 are highlighted in bold. Trial 1 is a comparison between familiar nouns and unfamiliar (high-frequency and low-frequency) nouns, whereas Trial 2 is a comparison between high-frequency unfamiliar nouns and low-frequency unfamiliar nouns.

4. 2. 3. Text-Completion Task

Table 6 includes descriptive statistics for the text-completion task (see Figure 3 for its boxplot). The maximum score is 8 for the familiar nouns and 4 for the high-frequency unfamiliar nouns as a result of counting the raw number of correct responses.

Table 6

Mean Scores and Standard Deviations (in parentheses) for the Text-Completion Task

Condition	Test	Familiar nouns	High-frequency unfamiliar nouns
FFI on only sublexical cues (n = 41; Condition 1)	Pretest	2.43 (1.90)	1.10 (1.18)
	Immediate posttest	4.39 (1.80)	1.67 (1.40)
	Delayed posttest	4.95 (1.84)	1.70 (1.32)
FFI on both sublexical cues and pronunciation (n = 49; Condition 2)	Pretest	2.41 (1.42)	1.15 (1.03)
	Immediate posttest	4.31 (1.74)	1.58 (1.29)
	Delayed posttest	4.71 (2.03)	1.81 (1.44)
Control (n = 50; Condition 3)	Pretest	2.16 (1.77)	1.12 (1.12)
	Immediate posttest	2.84 (2.10)	1.22 (1.22)
	Delayed posttest	2.30 (2.10)	1.22 (1.09)

According to Table 7 summarizing the statistical outcomes, with respect to the familiar nouns, the scores of students in both FFI conditions were significantly higher on the immediate and delayed posttests compared to the reference levels. However, there were no significant interactions for the high-frequency unfamiliar nouns in the text-completion task.

Table 7

Summary of Fixed Effects for the Statistical Model for the Text-Completion Task

Trial	Predictor	Estimate (β)	Standard error	*t*-value	*p*-value
Familiar nouns	Intercept	2.23	0.26	8.30	**< .001**
	Condition 1	0.26	0.39	0.67	.503
	Condition 2	0.22	0.37	0.59	.558
	Time 2	0.68	0.30	2.28	**.023**
	Time 3	0.80	0.30	2.68	**.008**
	Condition 1×Time 2	1.32	0.45	2.93	**.004**
	Condition 2×Time 2	1.23	0.43	2.85	**.005**
	Condition 1×Time 3	1.72	0.45	3.81	**< .001**
	Condition 2×Time 3	1.53	0.43	3.56	**< .001**
High-frequency unfamiliar nouns	Intercept	1.20	0.18	6.13	**< .001**
	Condition 1	-0.08	0.27	-0.29	.776
	Condition 2	0.03	0.26	0.11	.912
	Time 2	0.10	0.21	0.46	.640
	Time 3	0.10	0.21	0.46	.640
	Condition 1×Time 2	0.54	0.32	1.67	.095
	Condition 2×Time 2	0.33	0.31	1.07	.281
	Condition 1×Time 3	0.51	0.32	1.57	.116
	Condition 2×Time 3	0.56	0.31	1.81	.071

Note. *p*-values smaller than .05 are highlighted in bold.

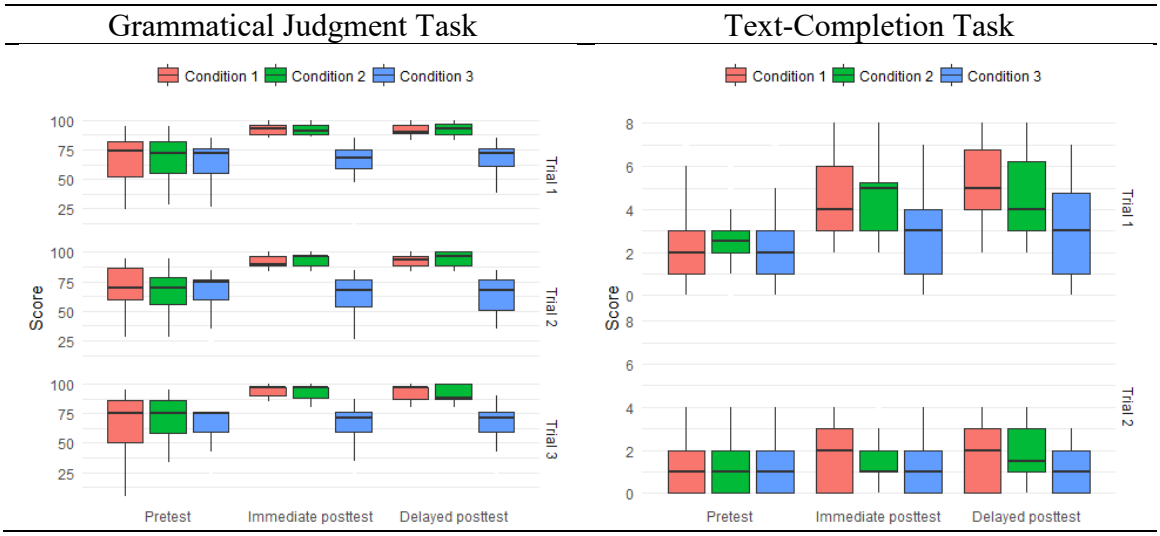

Figure 3. Boxplots of the scores of grammatical measures (Condition 1 = FFI on only sublexical cues; Condition 2 = FFI on both sublexical cues and pronunciation; Condition 3 = Control; Trial 1 = Familiar nouns; Trial 2 = High-frequency unfamiliar nouns; Trial 3 = Low-frequency unfamiliar nouns).

4. 2. 4. Forced-Choice Identification Task

The descriptive statistics for the forced-choice identification task are reported in Table 8 (see Figure 4 for its boxplot). The maximum score is 100 in the forced-choice identification task as a result of calculating the percentages of correct responses.

Table 8

Mean Scores and Standard Deviations (in parentheses) for the Forced-Choice Identification Task

Condition	Test	Score
FFI on only sublexical cues (*n* = 41; Condition 1)	Pretest	98.11 (8.23)
	Immediate posttest	99.30 (1.62)
	Delayed posttest	99.44 (1.84)
FFI on both sublexical cues and pronunciation (*n* = 49; Condition 2)	Pretest	98.35 (5.41)
	Immediate posttest	99.43 (1.35)
	Delayed posttest	99.12 (2.57)
Control (*n* = 50; Condition 3)	Pretest	96.00 (15.4)
	Immediate posttest	98.91 (3.56)
	Delayed posttest	96.85 (14.28)

The students in all conditions showed maximum scores on all tests. As shown in Table 9, the statistical model did not detect any significant interactions in the forced-choice identification task.

Table 9

Summary of Fixed Effects for the Statistical Model for the Forced-Choice Identification Task

Predictor	Estimate (β)	Standard error	*t*-value	*p*-value
Intercept	97.15	1.44	66.41	**< .001**
Condition 1	2.12	2.12	1.00	.342
Condition 2	2.45	2.07	1.18	.268
Time 2	2.91	1.63	1.79	.075
Time 3	0.85	1.63	0.52	.602
Condition 1×Time 2	-1.73	2.45	-0.71	.481
Condition 2×Time 2	-1.83	2.34	-0.78	.434
Condition 1×Time 3	0.48	2.46	0.20	.844
Condition 2×Time 3	-0.09	2.34	-0.04	.971

Note. A *p*-value smaller than .05 is highlighted in bold.

4. 2. 5. Read-Aloud Task

The descriptive statistics for the read-aloud task appear in Table 10 (see Figure 4 for its boxplot). The maximum score is 9 for each sound in the read-aloud task, indicating 1 (Strongly/extremely difficult to understand) to 9 (Strongly/extremely easy to understand).

Table 10

Mean Scores and Standard Deviations (in parentheses) for the Read-Aloud Task

Condition	Test	*un*	*une*	*le*	la
FFI on only sublexical cues (*n* = 41; Condition 1)	Pretest	4.56 (2.34)	5.95 (1.98)	5.98 (2.04)	7.46 (1.35)
	Immediate posttest	4.20 (1.39)	5.87 (1.46)	7.42 (1.33)	7.74 (1.18)
	Delayed posttest	4.10 (1.38)	5.92 (1.09)	7.15 (1.40)	7.59 (1.15)
FFI on both sublexical cues and pronunciation (*n* = 49; Condition 2)	Pretest	4.36 (1.87)	5.22 (2.34)	6.22 (1.91)	6.45 (2.10)
	Immediate posttest	7.84 (1.21)	7.73 (1.24)	7.38 (.70)	7.55 (.91)
	Delayed posttest	7.52 (1.57)	7.61 (1.37)	6.60 (2.05)	6.83 (2.10)
Control (*n* = 50; Condition 3)	Pretest	4.49 (1.86)	6.34 (1.59)	6.37 (1.48)	7.43 (1.28)
	Immediate posttest	4.92 (1.57)	6.57 (1.75)	7.44 (1.00)	7.79 (.43)
	Delayed posttest	4.66 (1.62)	6.35 (1.64)	7.14 (1.16)	7.51 (.86)

The statistical model in Table 11 reveals that the students receiving FFI on both sublexical cues and pronunciation showed significant improvement on the immediate and delayed posttests compared to the reference levels. Moreover, considering that the three-way interactions with ‘trial’ failed to reach significance, there were no significant differences between *un* and *une* in terms of the improvement. In contrast, those receiving FFI on only sublexical cues did not show any significant two-way and three-way interactions.

Table 11

Summary of Fixed Effects for the Statistical Model for un and une

Predictor	Estimate (β)	Standard error	*t*-value	*p*-value
Intercept	5.40	0.70	7.73	**.005**
Condition 1	-0.11	0.99	-0.11	.920
Condition 2	-0.72	0.99	-0.73	.519
Time 2	0.36	0.52	0.69	.541
Time 3	0.12	0.55	0.22	.839
Trial	1.91	0.51	3.72	**.023**
Condition 1×Time 2	-0.62	0.74	-0.83	.468
Condition 2×Time 2	2.70	0.75	3.61	**.035**
Condition 1×Time 3	-0.39	0.77	-0.50	.650
Condition 2×Time 3	2.71	0.78	3.46	**.039**
Condition 1×Trial	-0.55	0.73	-0.76	.492
Condition 2×Trial	-1.05	0.74	-1.42	.229
Time 2×Trial	-0.21	0.29	-0.74	.461
Time 3×Trial	-0.16	0.29	-0.55	.584
Condition 1×Time 2×Trial	0.51	0.41	1.24	.218
Condition 2×Time 2×Trial	-0.76	0.43	-1.76	.079
Condition 1×Time 3×Trial	0.62	0.41	1.50	.135
Condition 2×Time 3×Trial	-0.60	0.43	-1.38	.170

Note. *p*-values smaller than .05 are highlighted in bold.

Table 12 summarizes fixed factors for the statistical model for the sounds *le* and *la*. The analysis indicated significant three-way interactions on both posttests in the group receiving FFI on both sublexical cues and pronunciation. In other words, their scores were significantly higher on the immediate and delayed posttests compared to the reference levels, particularly favoring the sound *la*. However, the analysis revealed no significant interactions in the group receiving FFI on only sublexical cues.

Table 12

Summary of Fixed Effects for the Statistical Model for le and la

Predictor	Estimate (β)	Standard error	*t*-value	*p*-value
Intercept	6.88	0.35	19.64	**< .001**
Condition 1	-0.14	0.50	-0.28	.795
Condition 2	-0.58	0.51	-1.14	.329
Time 2	0.74	0.42	1.78	.178
Time 3	0.45	0.50	0.90	.438
Trial	1.06	0.18	6.03	**.001**
Condition 1×Time 2	0.10	0.59	0.18	.873
Condition 2×Time 2	0.43	0.60	0.72	.522
Condition 1×Time 3	0.18	0.71	0.25	.818
Condition 2×Time 3	-0.02	0.72	-0.03	.981
Condition 1×Trial	0.40	0.25	1.59	.156
Condition 2×Trial	-0.85	0.26	-3.28	**.012**
Time 2×Trial	-0.71	0.18	-3.86	**.000**
Time 3×Trial	-0.69	0.18	-3.80	**.000**
Condition 1×Time 2×Trial	-0.45	0.26	-1.71	.089
Condition 2×Time 2×Trial	0.65	0.28	2.37	**.019**
Condition 1×Time 3×Trial	-0.34	0.26	-1.28	.203
Condition 2×Time 3×Trial	0.71	0.28	2.57	**.011**

Note. *p*-values smaller than .05 are highlighted in bold.

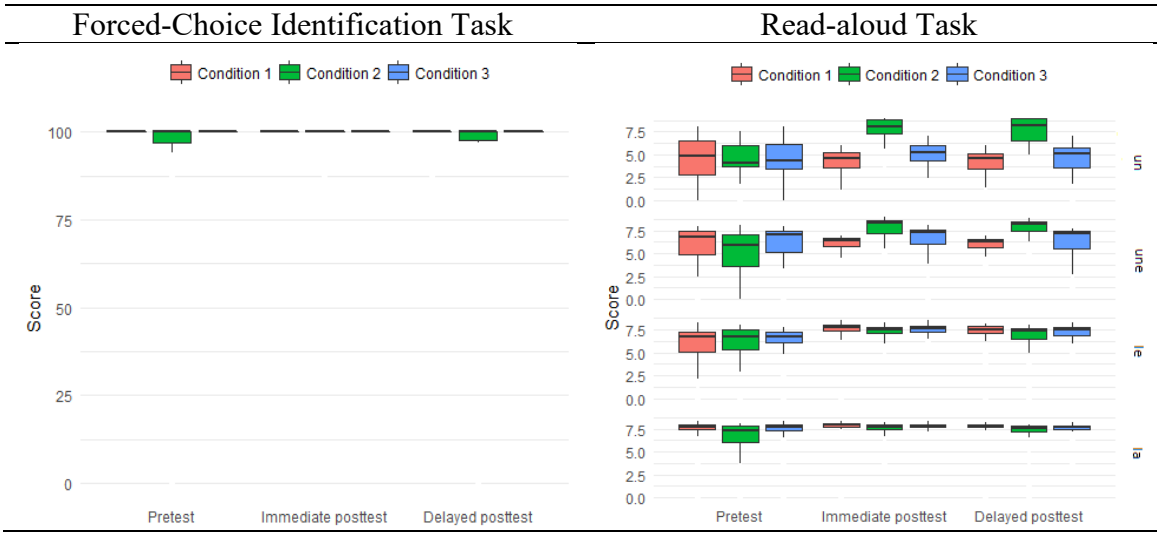

Figure 4. Boxplots of the scores of phonological measures (Condition 1 = FFI on only sublexical cues; Condition 2 = FFI on both sublexical cues and pronunciation; Condition 3 = Control).

4. 2. 6. Picture-Description Task

Table 13 includes descriptive statistics for the picture-description task (see Figure 5 for its boxplot). The maximum score is 9 in the picture-description task, indicating 1 (Strongly/extremely difficult to understand) to 9 (Strongly/extremely easy to understand).

Table 13

Mean Scores and Standard Deviations (in parentheses) for the Picture-Description Task

Condition	Test	Familiar nouns	High-frequency unfamiliar nouns
FFI on only sublexical cues (n = 41; Condition 1)	Pretest	1.63 (1.00)	1.42 (.97)
	Immediate posttest	2.61 (1.22)	2.43 (1.33)
	Delayed posttest	2.84 (1.27)	2.94 (1.58)
FFI on both sublexical cues and pronunciation (n = 49; Condition 2)	Pretest	1.62 (1.03)	1.34 (1.13)
	Immediate posttest	6.86 (1.31)	2.58 (1.75)
	Delayed posttest	7.07 (1.39)	2.81 (1.65)
Control (n = 50; Condition 3)	Pretest	1.97 (.83)	1.59 (1.10)
	Immediate posttest	2.33 (1.14)	2.25 (1.32)
	Delayed posttest	2.35 (.91)	2.46 (1.25)

As shown in Table 14, the students receiving FFI on both sublexical cues and pronunciation obtained significantly higher scores on the immediate and delayed posttests (i.e., significant two-way interactions) compared to the reference levels. In particular, considering that there were also significant three-way interactions including ‘trial’, they gained significantly higher scores for the familiar nouns in contrast to the high-frequency

unfamiliar nouns. On the other hand, those receiving FFI on only sublexical cues did not show any significant interactions.

Table 14

Summary of Fixed Effects for the Statistical Model for the Picture-Description Task

Predictor	Estimate (β)	Standard error	*t*-value	*p*-value
Intercept	1.77	0.18	9.91	**.001**
Condition 1	-0.26	0.26	-1.00	.372
Condition 2	-0.27	0.25	-1.07	.350
Time 2	0.52	0.19	2.79	**.037**
Time 3	0.65	0.25	2.63	.073
Trial	-0.38	0.16	-2.36	**.019**
Condition 1×Time 2	0.49	0.28	1.79	.122
Condition 2×Time 2	2.69	0.27	10.08	**< .001**
Condition 1×Time 3	0.68	0.36	1.89	.139
Condition 2×Time 3	2.81	0.35	8.04	**.003**
Condition 1×Trial	0.18	0.24	0.72	.470
Condition 2×Trial	0.11	0.23	0.49	.625
Time 2×Trial	0.30	0.21	1.40	.162
Time 3×Trial	0.49	0.21	2.27	**.024**
Condition 1×Time 2×Trial	-0.29	0.32	-0.89	.376
Condition 2×Time 2×Trial	-4.32	0.31	-14.03	**< .001**
Condition 1×Time 3×Trial	-0.19	0.32	-0.60	.552
Condition 2×Time 3×Trial	-4.49	0.31	-14.57	**< .001**

Note. *p*-values smaller than .05 are highlighted in bold.

4. 2. 7. Article-Noun Congruent/Incongruent Task

Table 15 summarizes descriptive statistics for the article-noun congruent/incongruent task (see Figure 5 for its boxplot). The maximum score is 100 in the article-noun congruent/incongruent task, as a result of calculating the percentages of correct responses.

Table 15

Mean Scores and Standard Deviations (in parentheses) for the Article-Noun Congruent/Incongruent Task

Condition	Test	Familiar nouns	High-frequency unfamiliar nouns
FFI on only sublexical cues (n = 41; Condition 1)	Pretest	64.45 (14.65)	63.13 (18.68)
	Immediate posttest	84.52 (12.77)	84.26 (13.33)
	Delayed posttest	88.03 (11.29)	81.74 (15.97)
FFI on both sublexical cues and pronunciation (n = 49; Condition 2)	Pretest	63.72 (12.32)	64.65 (16.39)
	Immediate posttest	88.28 (9.84)	83.07 (12.16)
	Delayed posttest	86.12 (12.25)	84.71 (13.27)
Control (n = 50; Condition 3)	Pretest	63.94 (16.38)	62.63 (18.06)
	Immediate posttest	66.13 (12.23)	67.50 (16.85)
	Delayed posttest	66.13 (16.10)	61.63 (18.90)

Table 16 shows that the students in both FFI conditions attained significantly higher scores on the immediate and delayed posttests compared to the reference levels. Moreover, the scores from those receiving FFI on both sublexical cues and pronunciation had a significant Condition 2×Time 2×Trial interaction. That is, they attained

significantly higher scores for the familiar nouns in comparison to the high-frequency unfamiliar nouns on the immediate posttest.

Table 16

Summary of Fixed Effects for the Statistical Model for the Article-Noun Congruent/Incongruent Task

Predictor	Estimate (β)	Standard error	*t*-value	*p*-value
Intercept	63.28	1.90	33.28	**< .001**
Condition 1	0.28	2.85	0.10	.921
Condition 2	0.92	2.74	0.33	.739
Time 2	3.53	2.03	1.74	.084
Time 3	0.59	2.17	0.27	.785
Trial	-1.29	2.02	-0.64	.528
Condition 1×Time 2	17.34	3.05	5.68	**< .001**
Condition 2×Time 2	17.72	2.92	6.07	**< .001**
Condition 1×Time 3	20.48	3.28	6.25	**< .001**
Condition 2×Time 3	20.55	3.12	6.58	**< .001**
Condition 1×Trial	-0.11	3.03	-0.04	.970
Condition 2×Trial	2.26	2.92	0.78	.443
Time 2×Trial	2.69	2.71	0.99	.322
Time 3×Trial	-3.19	2.71	-1.18	.240
Condition 1×Time 2×Trial	-1.48	4.08	-0.36	.717
Condition 2×Time 2×Trial	-8.95	3.89	-2.30	**.022**
Condition 1×Time 3×Trial	-1.71	4.09	-0.42	.677
Condition 2×Time 3×Trial	0.80	3.89	0.20	.838

Note. *p*-values smaller than .05 are highlighted in bold.

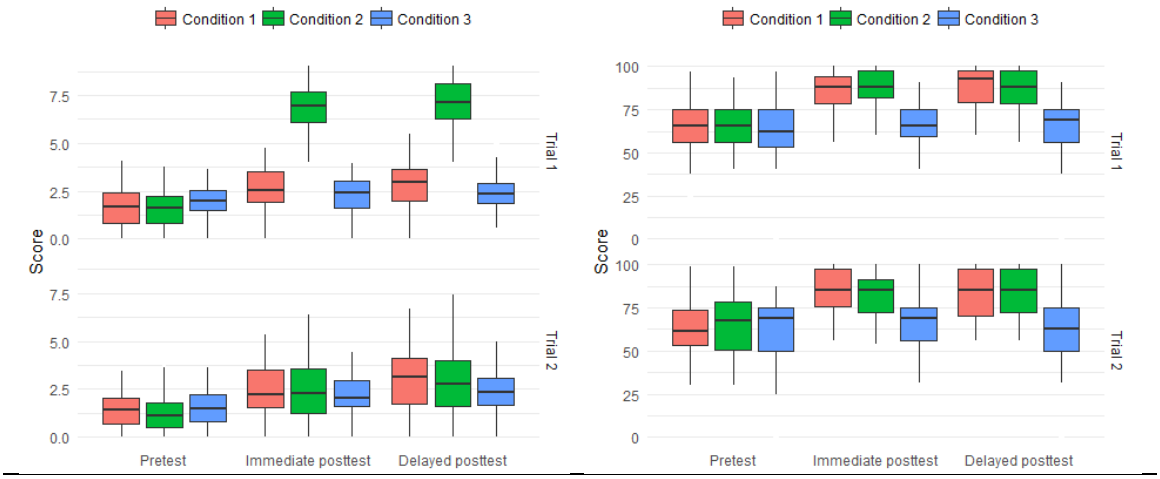

Figure 5. Boxplots of the scores of grammatical + phonological measures (Condition 1 = FFI on only sublexical cues; Condition 2 = FFI on both sublexical cues and pronunciation; Condition 3 = Control; Trial 1 = Familiar nouns; Trial 2 = High-frequency unfamiliar nouns).

4. 3. Variables Affecting the Performance of the Picture-Description Task

4. 3. 1. Statistical Model

Previous studies (e.g., Harley, 1998; Lyster, 2004) reported L2 learners' ambiguous pronunciation of French articles in oral production (e.g., picture-description task). In order to investigate the variables affecting the performance of the picture-description task, multiple linear regression was modelled using the *lm()* function in *R* (R Core Team, 2016). The dependent variable for each participant was an overall score (i.e., regardless of lexical familiarity) collected from the picture-description task on each test. Predictors were five sets of overall scores from the grammatical judgment, text-completion, read-aloud, forced-choice identification, and article-noun congruent/incongruent tasks on each test.

There were several sets of multiple linear regression: (a) all students on the pretest, (b) those in the two FFI conditions on the immediate posttest, and (c) those in the

two FFI conditions on the delayed posttest. The motivation for including the last two analyses was to examine any changes after the relevant FFI sessions. Before conducting the analyses, the assumptions of linearity, homoscedasticity, normality, and independence were verified. All statistical outcomes were interpreted with alpha set at .05.

4. 3. 2. Results

Table 17 summarizes the statistical outcomes of the multiple regression model on the pretest. The scores of the grammatical judgment task and those of the read-aloud task were significant predictors of the scores of the picture-description task. The other predictors failed to reach statistical significance. In particular, the read-aloud task yielded the standardized β of .34, whereas the grammatical judgment task showed the standardized β of .22. That is, the read-aloud task had a higher degree of importance in the model.

Table 17

Linear Model of Predictors of the Performance of the Picture-Description Task on the Pretest with 95% Confidence Intervals (in parentheses)

Predictor	*B*	Standard error (*B*)	β	*t*-value	*p*-value
Intercept	-.86 (-2.24, .52)	.70		-1.23	.220
Grammatical judgment task	.01 (.01, .02)	.01	.22	2.68	**.008**
Text-completion task	.06 (-.06, .18)	.06	.07	.98	.328
Forced-choice identification task	.01 (-.02, .02)	.01	.01	.023	.982
Read-aloud task	.23 (.13, .33)	.05	.34	4.44	**< .001**
Article-noun congruent/incongruent task	.01 (-.01, .01)	.01	.03	.31	.756

Note. $R^2 = .21$. *p*-values smaller than .05 are highlighted in bold.

Tables 18 and 19 show statistical outcomes for the two FFI conditions on the immediate and delayed posttests. After the FFI sessions, students in the two FFI conditions demonstrated different patterns. The scores of the read-aloud task were the only significant predictor of those of the picture-description task on both posttests.

Table 18

Linear Model of Predictors of the Performance of the Picture-Description Task on the Immediate Posttest with 95% Confidence Intervals (in parentheses)

Condition	Predictor	*B*	Standard error (*B*)	*β*	*t*-value	*p*-value
FFI on only sublexical cues (*n* = 41; Condition 1)	Intercept	8.25 (-9.79, 26.29)	8.87		.93	.359
	Grammatical judgment task	.05 (-.02, .12)	.04	.17	1.35	.187
	Text-completion task	.07 (-.03, .17)	.05	.17	1.46	.154
	Forced-choice identification task	-.14 (-.32, .04)	.09	-.20	-1.61	.117
	Read-aloud task	.57 (.39, .75)	.09	.80	6.39	**< .001**
	Article-noun congruent/incongruent task	-.01 (-.02, .02)	.01	-.01	-.11	.914
FFI on both sublexical cues and pronunciation (*n* = 49; Condition 2)	Intercept	-1.50 (-12.13, 9.15)	5.27		-.28	.778
	Grammatical judgment task	-.02 (-.13, .09)	.05	-.07	-.36	.719
	Text-completion task	.05 (-.10, .20)	.08	.11	.67	.504
	Forced-choice identification task	.02 (-.04, .09)	.03	.10	.69	.497
	Read-aloud task	.47 (.08, .85)	.19	.37	2.42	**.020**
	Article-noun congruent/incongruent task	.03 (-.02, .08)	.02	.21	1.13	.264

Note. R^2 = .61 for Condition 1. R^2 = .18 for Condition 2. *p*-values smaller than .05 are highlighted in bold.

Table 19

Linear Model of Predictors of the Performance of the Picture-Description Task on the Delayed Posttest with 95% Confidence Intervals (in parentheses)

Condition	Predictor	*B*	Standard error (*B*)	*β*	*t*-value	*p*-value
FFI on only sublexical cues (*n* = 41; Condition 1)	Intercept	-4.81 (-29.51, 19.90)	12.13		-.40	.695
	Grammatical judgment task	-.01 (-.14, .13)	.07	-.01	-.04	.967
	Text-completion task	.07 (-.10, .24)	.08	.15	.87	.388
	Forced-choice identification task	.03 (-.22, .28)	.12	.04	.24	.809
	Read-aloud task	.29 (.08, .50)	.10	.44	2.80	**.009**
	Article-noun congruent/incongruent task	.03 (-.02, .08)	.02	.29	1.23	.228
FFI on both sublexical cues and pronunciation (*n* = 49; Condition 2)	Intercept	-.63 (-17.32, 16.10)	8.27		-.08	.940
	Grammatical judgment task	-.02 (-.13, .09)	.05	-.07	-.37	.713
	Text-completion task	.10 (-.04, .23)	.07	.21	1.40	.169
	Forced-choice identification task	.01 (-.14, .17)	.08	.02	.17	.865
	Read-aloud task	.53 (.12, .93)	.20	.37	2.63	**.012**
	Article-noun congruent/incongruent task	.02 (-.02, .07)	.02	.19	.99	.328

Note. R^2 = .31 for Condition 1. R^2 = .24 for Condition 2. *p*-values smaller than .05 are highlighted in bold.

4. 4. Roles of Executive Function Skills in Learning Gains

4. 4. 1. Statistical Model

To examine the extent to which the gains made by the L2 participants in each task were mediated by their EF skills (i.e., inhibitory control, nonverbal visuospatial working

memory, and cognitive flexibility), multiple linear regression was modelled using the *lm()* function in *R* (R Core Team, 2016). There were two models for each task. In the first model, the dependent variable was immediate gains (i.e., immediate posttest minus pretest), whereas in the second model the dependent variable was delayed gains (i.e., delayed posttest minus pretest). A score for each task at each testing session was prepared by calculating an overall score from all trials (i.e., regardless of lexical familiarity and frequency). Given the specific research question, only the students in the two FFI conditions were included in the analyses. Moreover, the forced-choice identification task was excluded since all participants showed maximum scores on all tests.

The students' Simon effect scores (inhibitory control), Corsi spans (nonverbal visuospatial working memory), and percentages of preservation errors in the Wisconsin Card Sorting Test (cognitive flexibility) were entered as predictors in the models. Prior to the analyses, the statistical assumptions such as linearity, homoscedasticity, normality, and independence were verified. All statistical outcomes were interpreted with alpha set at .05.

4. 4. 2. Results

The mean of the Simon effect scores was 58.68 (*SD* = 66.10). The mean of the Corsi spans was 6.03 (*SD* = 1.73) and that of the percentages of preservation errors in the Wisconsin Card Sorting Test was 12.15 (*SD* = 6.77).

Tables 20 and 21 summarize the linear models of predictors in the grammatical judgment and text-completion tasks. For the grammatical judgment task, the nonverbal visuospatial working memory was the only significant predictor of the immediate and delayed gains. According to the model, the higher Corsi spans (i.e., higher working

memory) the students had, the greater learning gains they showed in the grammatical judgment task. Yet, none of the EF skills predicted the learning gains for the text-completion task.

Table 20

Linear Model of Predictors of the Learning Gains of the Grammatical Judgment Task with 95% Confidence Intervals (in parentheses)

Gains	Predictor	*B*	Standard error (*B*)	*β*	*t*-value	*p*-value
Immediate gains	Intercept	-21.00 (-34.99, -7.01)	7.05		-2.98	**.004**
	Inhibitory control	.03 (-.01, .06)	.02	.15	1.54	.126
	Nonverbal visuospatial working memory	2.57 (.71, 4.42)	.94	.28	2.74	**.007**
	Cognitive flexibility	.18 (-.29, .66)	.24	.08	.76	.447
Delayed gains	Intercept	-33.49 (-49.95, -17.04)	8.29		-4.04	**< .001**
	Inhibitory control	.02 (-.02, .06)	.02	.16	1.60	.113
	Nonverbal visuospatial working memory	4.01 (1.82, 6.20)	1.10	.36	3.64	**< .001**
	Cognitive flexibility	.46 (-.11, 1.01)	.28	.16	1.60	.113

Note. R^2 = .10 for the immediate gains. R^2 = .13 for the delayed gains. *p*-values smaller than .05 are highlighted in bold.

Table 21

Linear Model of Predictors of the Learning Gains of the Text-Completion Task with 95% Confidence Intervals (in parentheses)

Gains	Predictor	*B*	Standard error (*B*)	*β*	*t*-value	*p*-value
Immediate gains	Intercept	2.75 (-.11, 5.61)	1.44		1.91	.059
	Inhibitory control	.01 (-.01, .01)	.01	.18	1.78	.078
	Nonverbal visuospatial working memory	-.19 (-.57, .19)	.19	-.10	-.97	.334
	Cognitive flexibility	-.04 (-.13, .06)	.05	-.08	-.74	.460
Delayed gains	Intercept	1.78 (-1.21, 4.77)	1.51		1.18	.240
	Inhibitory control	.01 (-.01, .01)	.01	.09	.86	.393
	Nonverbal visuospatial working memory	-.07 (-.47, .33)	.20	-.04	-.34	.733
	Cognitive flexibility	.04 (-.06, .14)	.05	.08	.76	.449

Note. R^2 = .05 for the immediate gains. R^2 = .02 for the delayed gains.

Table 22 shows the linear model of predictors in the read-aloud task. As shown in Table 22, the inhibitory control was the only significant predictor of the immediate and delayed gains. In light of the model, the smaller Simon effect scores (i.e., higher inhibitory control) the students showed, the greater gains they made in the read-aloud task.

Table 22

Linear Model of Predictors of the Learning Gains of the Read-Aloud Task with 95% Confidence Intervals (in parentheses)

Gains	Predictor	*B*	Standard error (*B*)	*β*	*t*-value	*p*-value
Immediate gains	Intercept	.66 (-.73, 2.06)	.70		.94	.347
	Inhibitory control	-.01 (-.01, -.01)	.01	-.42	-4.48	**< .001**
	Nonverbal visuospatial working memory	-.02 (-.20, .17)	.09	-.02	-.19	.850
	Cognitive flexibility	.03 (-.02, .07)	.02	.11	1.12	.265
Delayed gains	Intercept	-.26 (-2.03, 1.50)	.89		-.29	.770
	Inhibitory control	-.01 (-.01, -.01)	.01	-.32	-3.34	**.001**
	Nonverbal visuospatial working memory	.08 (-.15, .32)	.12	.07	.70	.485
	Cognitive flexibility	.03 (-.03, .09)	.03	.09	.88	.379

Note. R^2 = .18 for the immediate gains. R^2 = .12 for the delayed gains. *p*-values smaller than .05 are highlighted in bold.

Finally, Tables 23 and 24 include the linear models of predictors in the picture-description and article-noun congruent/incongruent tasks. All predictors failed to reach statistical significance in both tasks.

Table 23

Linear Model of Predictors of the Learning Gains of the Picture-Description Task with 95% Confidence Intervals (in parentheses)

Gains	Predictor	*B*	Standard error (*B*)	*β*	*t*-value	*p*-value
Immediate gains	Intercept	.62 (-.36, 1.59)	.49		1.26	.212
	Inhibitory control	-.01 (-.01, .01)	.01	-.11	-1.06	.291
	Nonverbal visuospatial working memory	.00 (-.13, .13)	.07	.01	.01	.996
	Cognitive flexibility	.01 (-.03, .04)	.02	.03	.31	.757
Delayed gains	Intercept	.93 (-.04, 1.89)	.49		1.90	.060
	Inhibitory control	-.01 (-.01, .00)	.01	-.20	-1.95	.054
	Nonverbal visuospatial working memory	-.02 (-.15, .11)	.07	-.03	-.27	.785
	Cognitive flexibility	.01 (-.02, .04)	.02	.06	.57	.573

Note. $R^2 = .01$ for the immediate gains. $R^2 = .04$ for the delayed gains.

Table 24

Linear Model of Predictors of the Learning Gains of the Article-Noun Congruent/Incongruent Task with 95% Confidence Intervals (in parentheses)

Gains	Predictor	*B*	Standard error (*B*)	*β*	*t*-value	*p*-value
Immediate gains	Intercept	17.29 (2.01, 32.50)	7.66		2.26	**.026**
	Inhibitory control	-.02 (-.06, .02)	.02	-.09	-.89	.375
	Nonverbal visuospatial working memory	-1.10 (-3.12, .92)	1.02	-.11	-1.08	.283
	Cognitive flexibility	-.24 (-.75, .28)	.26	-.10	-.91	.363
Delayed gains	Intercept	17.29 (1.42, 33.16)	7.99		2.16	**.033**
	Inhibitory control	-.01 (-.05, .03)	.02	-.03	-.29	.770
	Nonverbal visuospatial working memory	-1.43 (-3.54, .68)	1.06	-.14	-1.35	.181
	Cognitive flexibility	-.17 (-.71, .37)	.27	-.07	-.64	.526

Note. R^2 = .02 for the immediate gains. R^2 = .02 for the delayed gains. *p*-values smaller than .05 are highlighted in bold.

4. 5. Summary

For the grammatical judgment task, students in both FFI conditions showed significant improvement on the two posttests regardless of lexical familiarity and frequency. They also demonstrated significantly higher scores for familiar but not unfamiliar nouns in the text-completion task at the time of posttesting. Similarly, for the article-noun congruent/incongruent task, students in both conditions attained significantly higher scores on the posttests; in particular, those with FFI on both sublexical cues and

pronunciation showed significantly higher scores for familiar nouns on the immediate posttest.

In the forced-choice identification task, all participants, regardless of condition, achieved maximum scores at all three testing times. For the picture-description task, students receiving FFI on both sublexical cues and pronunciation attained significantly higher scores on the posttests, favoring the familiar nouns. In addition, they also showed significantly higher scores on the posttests in the read-aloud task. Whereas they showed similar improvement in pronouncing *un* and *une*, they showed significantly higher scores in pronouncing *la* compared to *le*. In contrast, students receiving FFI on only sublexical cues did not demonstrate any significant improvement in the picture-description and read-aloud tasks. As expected, the L1 baseline participants showed maximum scores on all measures, and those in the control condition did not reveal any significant improvement across the three testing sessions.

The scores of the grammatical judgment task and those of the read-aloud task were significant predictors of students' performance in the picture-description task on the pretest. On the posttests, however, a different pattern emerged, with the scores of the read-aloud task being the only predictor on the immediate and delayed posttests.

Finally, the learning gains made by students were mediated by their individual EF skills. For instance, nonverbal visuospatial working memory was a significant predictor of the gains in the grammatical judgment task. Inhibitory control was a significant predictor of the gains in the read-aloud task.

In the next chapter, I discuss the results of the current study focusing on the differential effects of FFI on only sublexical cues and on both sublexical cues and pronunciation as well as the roles of EF skills in L2 instruction.

Chapter 5

Discussion

This chapter discusses the results of the present study. There are two sections in the chapter. The first section addresses the differential effects of FFI on only sublexical cues and on both sublexical cues and pronunciation on the acquisition of French grammatical gender. The importance of L2 phonological knowledge in addition to L2 grammatical knowledge is highlighted in the first section. The second section addresses the roles of EF skills in the acquisition of French grammatical gender. In particular, it sheds light on the finding that the extent to which L2 learners benefit from instruction depends on their EF skills. Finally, the chapter concludes with a summary that leads into the concluding chapter.

5. 1. Differential Effects of Form-Focused Instruction on Only Sublexical Cues and on Both Sublexical Cues and Pronunciation

The results of the present study revealed that students receiving FFI on only sublexical cues showed significant improvement in the grammatical judgment, text-completion, and article-noun congruent/incongruent tasks, but not in the read-aloud and picture-description tasks. In contrast, those receiving FFI on both sublexical cues and pronunciation showed significantly higher scores in all five tasks after the FFI sessions. With respect to the forced-choice identification task, all participants obtained maximum scores across the three testing sessions, indicating that they did not have any difficulty perceptually categorizing the sounds *un, une*, *le*, and *la* either before or after the study.

There were also effects of lexical familiarity. Students in both FFI conditions showed significantly higher accuracy for familiar nouns, but not for unfamiliar nouns, in the text-completion task at the time of posttesting. In a similar vein, those receiving FFI on both sublexical cues and pronunciation attained significantly higher scores only for familiar nouns in the picture-description task. In what follows, I discuss the differential effects of FFI on only sublexical cues and on both sublexical cues and pronunciation by task.

5. 1. 1. Grammatical Judgment and Text-Completion Tasks

In the grammatical judgment task, students in both FFI conditions showed significant improvement after the FFI sessions. In particular, they obtained more than 90% accuracy for familiar, high-frequency unfamiliar, and low-frequency unfamiliar nouns on the posttests. Both FFI conditions included several instructional techniques drawing students' attention to noun endings as predictors of gender attribution. For instance, all target noun endings were highlighted in the texts along with their articles. Students also completed a number of awareness activities (e.g., cloze, categorization, and new word activities) in which they found various patterns in noun endings that predict gender attribution and tested their knowledge with several nouns. Such activities induced them to notice and internalize noun endings as reliable predictors of gender attribution and thus develop more targetlike declarative knowledge regarding French grammatical gender.

Students in both conditions also showed significant improvement in the text-completion task. In addition to the aforementioned activities, those in both conditions participated in writing activities in which they were incited to pay attention to the

grammatical gender of given nouns in their compositions. It seems to be the case that the writing activities predisposed them to retrieve their declarative knowledge and proceduralize the declarative knowledge in the text-completion task (see skill acquisition theory, DeKeyser, 1998, 2001; Lyster & Sato, 2013). The instructors in the present study were also asked to employ various types of corrective feedback when they noticed any errors in terms of gender attribution. Accordingly, corrective feedback might have helped students to restructure their declarative knowledge towards greater accuracy and thus facilitated more targetlike output.

However, the effects of FFI were limited to the familiar nouns in the text-completion task. In contrast to the grammatical judgment task, students were required to focus on not only sublexical cues but also other linguistic domains (e.g., L2 lexical, syntactic, and pragmatic domains) to produce meaningful texts in French. The nature of the task might have imposed more cognitive demands and detracted from the students' attention to grammatical gender, particularly to noun endings to determine the gender attribution of unfamiliar nouns. With respect to the familiar nouns, the students were consistently prompted to retrieve the gender attribution of these nouns while engaging in several activities during the FFI sessions. These practice opportunities might have led to the proceduralization of the familiar nouns to some extent, which resulted in higher accuracy for the familiar nouns in contrast to the unfamiliar nouns.

5. 1. 2. Forced-Choice Identification and Read-Aloud Tasks

In the forced-choice identification task, all participating students attained maximum scores even on the pretest (i.e., more than 98.11%), meaning that they were able to categorize the sounds *un*, *une*, *le*, and *la* in a targetlike manner before the study

began. This finding was somewhat surprising since the current study predicted that L2 learners would have difficulty in both perceiving and producing the sounds, leading to ambiguous pronunciation of French articles. In this regard, the finding confirmed that the students in the present study were able to perceive the correct pronunciation of each article and, thus, that their perception accuracy was not preventing them from showing targetlike performance in oral production.

Notwithstanding their targetlike accuracy in the forced-choice identification task, interesting enough, they had difficulty pronouncing the sounds of French articles *un*, *une*, *le*, and *la* (in that order of difficulty) in the read-aloud task. As previous studies (e.g., Li & Rosen, 2016) showed, they had most difficulty pronouncing *un* in a targetlike manner. Such mismatches between their perception accuracy and production accuracy are compatible with previous studies (Bradlow, Pisoni, Akahane-Yamada, & Tohkura, 1997; Lee & Lyster, 2017). For instance, Lee and Lyster (2017) argued that L2 learners' targetlike perception accuracy might be a requisite for targetlike L2 speech production, but does not necessary result in targetlike L2 speech production. They also suggested that explicit pronunciation instruction including ample production opportunities be considered to facilitate targetlike L2 speech production. In this regard, the students receiving FFI on both sublexical cues and pronunciation showed significant improvement in the read-aloud task.

The articulation-based instruction offered at the beginning of the pronunciation instruction provided them with metalinguistic information as to how each sound should be articulated. They also participated in a number of production opportunities in which they produced the target sounds, monitored their productions, and received corrective

feedback including positive exemplars of the sounds. Accordingly, FFI on pronunciation helped them articulate the sounds closer to targetlike norms. Owing to the lack of pronunciation instruction, students receiving FFI on only sublexical cues were not able to show any significant improvement in the read-aloud task.

5. 1. 3. Picture-Description and Article-Noun Congruent/Incongruent Tasks

In the picture-description task, students receiving FFI on both sublexical cues and pronunciation showed significant improvement on the posttests. Due to the effects of FFI drawing their attention to noun endings as predictors of gender attribution, as discussed in the grammatical judgment and text-completion tasks, they drew on their knowledge of noun endings to determine gender attribution. As reported in the read-aloud task, the students had difficulty pronouncing the sounds of French articles at the time of pretesting, and FFI on pronunciation helped them develop more targetlike pronunciation. Consequently, those receiving FFI on both sublexical cues and pronunciation were able to show higher performance on the posttests, thus having benefited from the combined FFI not only to determine the gender of given nouns but also to pronounce the articles more accurately.

However, its effects were limited to the familiar nouns. As in the text-completion task, the students had to focus on other linguistic domains in the picture-description task. For instance, they needed to consider other lexical items in addition to the target nouns and L2 syntactic and phonological properties to describe pictures in spontaneous speech. Consequently, the nature of the task imposed additional cognitive demands that prevented participants from focusing on noun endings reliably to indicate the gender of the unfamiliar nouns and thus from producing targetlike phrases in oral production. In

addition, they had a number of opportunities to produce the familiar nouns with their correct articles during the FFI sessions, which helped to proceduralize their use of familiar nouns with correct articles. In the absence of similar practice opportunities with the unfamiliar nouns, participants fared less well in qualifying them with correct gender markers.

As discussed in regard to the grammatical judgment and text-completion tasks, the students receiving FFI on only sublexical cues were able to draw on their knowledge of noun endings to determine gender attribution as much as those receiving FFI on both sublexical cues and pronunciation. Nevertheless, the former students failed to show any improvement in the picture-description task. Considering that the students in the current study had difficulty articulating the sounds of French articles, presumably their lack of L2 phonological knowledge prevented them from showing targetlike performance in spite of their accurate grammatical knowledge.

The importance of L2 phonological knowledge is also supported by the multiple regression analyses. On the pretest, the scores of the grammatical judgment task and those of the read-aloud task were significant predictors of students' performance in the picture-description task. In other words, their nontargetlike performance in the picture-description task resulted from not only their lack of grammatical knowledge in gender attribution but also their lack of phonological knowledge in producing the sounds of French articles. Its importance was even more evident after the FFI sessions. On the posttests, the scores on the read-aloud task were the only significant predictor of the scores on the picture-description task. As such, the results of the current study indicate

that targetlike L2 phonological knowledge is needed for L2 learners to show targetlike performance in oral production.

In the article-noun congruent/incongruent task, students in both FFI conditions showed significant improvement. They showed higher scores for the familiar and unfamiliar nouns on the posttests. Given that they did not have any difficulty perceiving *un*, *une*, *le*, and *la* in the forced-choice identification task, their performance in the article-noun congruent/incongruent task was more likely to depend on their accuracy in gender attribution. Due to the effects of FFI on sublexical cues, the students in both FFI conditions were able to increase their accuracy in assigning grammatical gender, which in turn helped them to improve significantly in the article-noun congruent/incongruent task after the FFI sessions. One of the noteworthy points is that the stimuli (i.e., the target nouns) were provided aurally in this task. The instructional components in the FFI explicitly induced the students to pay attention to noun endings focusing on their orthographic representations (e.g., '-*eau*' → masculine). Since all target nouns appeared visually in written form in the grammatical judgment and text-completion tasks, it may have relatively been easy for students to draw on their knowledge of noun endings to assign grammatical gender. In the article-noun congruent/incongruent task, on the contrary, they were required to rely on the phonemic information of given nouns to determine their gender attribution. The finding that participants' accuracy increased for both unfamiliar nouns and familiar nouns on the posttests suggests two possible ways of processing gender cues. The first way is for participants, when hearing the noun *chapeau* /ʃapo/, to focus on the final phoneme /o/ and then search for possible noun endings representing the phoneme /o/ (e.g., -*eau*, -*ot*, or -*o*), after which they could assign its

grammatical gender based on the orthographic representations. The second way is for participants to encode the orthographic and phonemic representations at the same time. For instance, during the instructional activities, the instructors consistently verbalized the target nouns while drawing the students' attention to noun endings to indicate gender attribution. Therefore, the students could encode both representations (e.g., '*-eau*' - /o/) with gender information (e.g., masculine) and retrieve both simultaneously to determine gender attribution when hearing /ʃapo/. In either case, the current study lends support to Hardison's (1992) argument that L2 learners exploit both the phonemic and orthographic representations of noun endings to predict gender attribution.

5. 1. 4. Summary

In sum, FFI on sublexical cues was beneficial for L2 learners to improve their accuracy of French grammatical gender by drawing their attention to noun endings as predictors of gender attribution. These findings are also compatible with those of previous studies (Harley, 1998, Lyster, 2004; Lyster & Izquierdo, 2009; Warden, 1997). Although the students in the control condition were given a list of noun endings (only 10 nouns) with their predictability in gender attribution, they failed to show any significant improvement on any measures. Accordingly, L2 learners need FFI and ample practice opportunities rather than being given a list of noun endings and minimal exercises.

More importantly, pronunciation instruction played a complementary role in the acquisition of French grammatical gender. It enabled L2 learners to develop more targetlike pronunciation of the sounds *un*, *une*, *le* and *la*, which helped them approximate targetlike norms in oral production (e.g., picture-description task). In this regard, the

current study suggests that pronunciation instruction be included in L2 instruction targeting French grammatical gender.

5. 2. Roles of Executive Function Skills in Second Language Development

The present study found that nonverbal and nonlinguistic EF skills mediated the extent to which the students benefit from FFI. There were task-specific effects. Nonverbal visuospatial working memory was a significant predictor of the learning gains in the grammatical judgment task. Inhibitory control was the only significant predictor of the learning gains in the read-aloud task. Cognitive flexibility failed to predict any gains.

FFI pushed the students to focus on noun endings to determine gender attribution. To do so, the students had to pay attention to the orthographic representations of target noun endings (e.g., '*-ent*', '*-tion*', or '*-eau*'), which results in orthographic processing. According to Pham and Hasson (2014), orthographic processing entails attention to "the formation of visual representations of letters, letter patterns, and sequences of letters that serve to map spatially the temporal sequence of phonemes within words" (p. 474). In this regard, those having high nonverbal visuospatial working memory might be at an advantage in detecting, encoding, and retrieving the orthographic representations of noun endings to assign grammatical gender. Considering that the grammatical judgment task exclusively required them to detect noun endings and then determine gender attribution in a controlled setting, the role of nonverbal visuospatial working memory seems to be evident in this specific task.

Previous studies (Darcy, Mora, & Daidone, 2014; Darcy et al., 2016) found that inhibitory control is important for targetlike L2 speech perception and production of L2

segments. In a similar vein, the current study revealed that inhibitory control was a significant predictor of the degree to which the students improved their production accuracy of the sounds *un*, *une*, *le*, and *la*. As argued by Darcy et al. (2016), those showing high inhibitory control might have been able to articulate the L2 sounds in a targetlike manner while inhibiting their L1 phonology and tuning into phonologically relevant acoustic properties in French.

None of the students' L1s had grammatical gender. The current study predicted that those with high cognitive flexibility would be more aware of grammatical gender, which is a missing feature in their L1s, and benefit more from FFI by having rapid and accurate switching between their gender-neutral L1s and L2 French. However, this variable failed to predict any gains. Given previous studies (e.g., Kapa & Colombo, 2014; Stone & Pili-Moss, 2015) showing mixed results, the role of cognitive flexibility in L2 learning is somewhat uncertain and needs more empirical testing.

The results of the present study lead to the conclusion that some EF skills (i.e., nonverbal visuospatial working memory and inhibitory control) are important in L2 learning and instruction. The gains made in the grammatical judgment task were affected by nonverbal visuospatial working memory, while the gains made in the read-aloud task were influenced by inhibitory control. As such, the effects of EF skills were found only in the relatively controlled tasks—the grammatical judgment and read-aloud tasks. Considering that the picture-description and text-completion tasks required L2 learners to draw on multiple aspects of their L2 knowledge (e.g., L2 lexical, syntactic, and phonological knowledge), the impact of the EF skills proved less evident in these tasks than in the tasks requiring knowledge of a single domain.

5. 3. Summary

This chapter discussed the results of the current study. FFI on sublexical cues was effective for the students to increase their accuracy in assigning grammatical gender. Moreover, pronunciation instruction contributed even more to the acquisition of French grammatical gender by enabling the students to develop targetlike pronunciation of the sounds.

Participants' learning gains were mediated by their EF skills. For instance, those with high nonverbal visuospatial working memory had an advantage in terms of detecting, encoding, and retrieving noun endings as predictors of gender attribution. In addition, participants with high inhibitory control were better able to articulate the sounds *un*, *une*, *le*, and *la* in a targetlike manner as they focused on phonologically relevant acoustic properties in the target language without interference from their L1 phonology. In the next chapter, I conclude the present study by summarizing it and proposing pedagogical implications in addition to future directions.

Chapter 6

Conclusion

This chapter concludes the dissertation. After a summary of the current study, its pedagogical implications are addressed in relation to the field of L2 education. Finally, future directions are then proposed in light of the limitations of the current study.

6. 1. Summary of the Current Study

In contrast to L1 speakers, French L2 learners are known to have difficulty acquiring grammatical gender in spite of the frequency of gender markers in linguistic input (Harley, 1998; Lyster, 2004). Considering that L2 learners' errors in grammatical gender are likely to occur as a result of their lack of knowledge of gender attribution (Grüter et al., 2012) and that noun endings are important predictors of gender attribution in French (Lyster, 2006), the current study attempted to investigate the extent to which L2 learners benefit from FFI drawing their attention to noun endings as a means of determining gender attribution.

One of the interesting reports from previous studies (Harley, 1998; Lyster, 2004) is that L2 learners tend to produce ambiguous pronunciation of French articles that leads to a lack of intelligibility and grammatical inaccuracy after all. Considering that L2 learners have difficulty acquiring /œ̃/ (in *un*) and /y/ (in *une*) (Li & Rosen, 2016), the present study hypothesized that L2 learners' phonological difficulty impeded them from acquiring French grammatical gender in a targetlike manner. As such, the current study also tested FFI on pronunciation to examine whether it could facilitate their acquisition of French grammatical gender in oral production. In addition, given that L2 learners' EF

skills are important in L2 learning (Darcy et al., 2016; Kapa & Colombo, 2014; Linck et al., 2014), the current study investigated whether the degree to which L2 learners benefit from FFI would be mediated by their EF skills, which, in the present study, included inhibitory control, nonverbal visuospatial working memory, and cognitive flexibility.

A quasi-experimental study was conducted with a total of 140 L2 students in Elementary French 1 (FRSL 207/208) at McGill University. Two instructional conditions (i.e., FFI on only sublexical cues and FFI on both sublexical cues and pronunciation) in addition to one control condition were implemented in six different classrooms (two classrooms per condition). Those in the two FFI conditions received six 80-minute instructional sessions. The students in the first FFI condition partook in a number of instructional activities drawing their attention to noun endings as predictors of gender attribution, whereas those in the second FFI condition received not only FFI on sublexical cues but also pronunciation instruction targeting the sounds of French articles, *un*, *une*, *le*, and *la*. In order to equalize instructional hours between the two FFI conditions, the former condition had more meaning-focused activities. The students in the control condition received regular L2 French lessons excluding any FFI components adopted in the two FFI conditions. A total of six linguistic tasks, measuring their grammatical knowledge in gender attribution and their phonological knowledge in producing and perceiving the sounds of French articles, were conducted at three different times. The Simon Test (inhibitory control), the Corsi Block-Tapping Test (nonverbal visuospatial working memory), and the Wisconsin Card Sorting Test (cognitive flexibility) were also administered to measure L2 students' EF skills.

Results showed that FFI on sublexical cues is beneficial for the students to increase their accuracy in determining gender attribution. More importantly, FFI on pronunciation contributed to the acquisition of French grammatical gender by enabling the students to develop more targetlike pronunciation of the sounds and to show better performance in oral production (e.g., the picture-description task). In addition, students' learning gains were mediated by their EF skills, specifically nonverbal visuospatial working memory in the grammatical judgment task and inhibitory control in the read-aloud task.

The present study confirmed the effects of L2 phonological knowledge and pronunciation instruction on the acquisition of French grammatical gender. It also demonstrated the roles of EF skills in L2 acquisition. Based on these findings, I elaborate pedagogical implications as follows.

6. 2. Pedagogical Implications

The findings in the present study lead to several pedagogical implications. First, the current study showed that FFI on sublexical cues is beneficial for L2 learners to notice and internalize noun endings as predictors of gender attribution. In line with previous studies (Harley, 1998, Lyster, 2004; Lyster & Izquierdo, 2009; Warden, 1997), it is recommended for L2 practitioners to consider adapting FFI on sublexical cues including noticing, awareness, and practice activities instead of either teaching grammatical gender on an item-by-item basis or expecting their students to learn it incidentally. The instructors in the control condition provided their students with some sets of noun endings and briefly explained their predictability in gender attribution.

Nevertheless, those in the control condition did not show any significant improvement on any measures. In this regard, L2 practitioners need to help their students to find the patterns by themselves and to practice them through controlled and spontaneous practice activities. Based on skill acquisition theory (DeKeyser, 1998, 2001; Lyster & Sato, 2013), such practice opportunities help students to proceduralize declarative knowledge in a targetlike manner.

The present study also found that L2 phonological knowledge plays an important role in the acquisition of French grammatical gender. Targetlike L2 phonological knowledge helps L2 learners to show better performance in oral production. In this sense, L2 practitioners should consider implementing pronunciation instruction focusing on the sounds of French articles along with FFI on sublexical cues. In line with previous studies (Lee & Lyster, 2017; Saito, 2013), explicit phonetic instruction including articulatory information as to how each sound is articulated is highly recommended. As contended by Lee and Lyster (2017), ample practice opportunities should be made available for L2 learners to develop targetlike production accuracy.

6. 3. Future Directions

In this section, I propose future directions drawing on the limitations of the current study. The students in the present study spoke several L1s and learned other L2s in addition to French. Although all students whose L1 had grammatical gender were removed, there were a number of students who learned other L2s with grammatical gender (e.g., Spanish), which could have affected their acquisition of French grammatical gender. In addition, Mandarin and Turkish have /y/ as a separate phoneme, which might

help Mandarin L1 and Turkish L1 speakers produce the sound *une* with less difficulty in contrast to other students. Accordingly, for future studies, it would be interesting to see if L1s and other L2s affect the acquisition of French grammatical gender and the effectiveness of FFI (and, if so, to what extent?) by controlling for students' L1s and other L2s.

The effects of FFI were limited to the familiar nouns in the text-completion and picture-description tasks. It was speculated in the discussion that this finding was due to the nature of tasks requiring participants to use multiple linguistic domains such as L2 lexical, syntactic, and pragmatic domains. Given that these two tasks are similar to those in real-life language use, it would be pedagogically important to delve into how L2 practitioners can help L2 learners increase their accuracy with unfamiliar nouns.

FFI in the current study drew L2 students' attention to noun endings, and those in both FFI conditions showed significant improvement for familiar, high-frequency unfamiliar, and low-frequency unfamiliar nouns in the grammatical judgment task. As such, it was inferred that the students showed higher accuracy after the FFI sessions since they focused on noun endings to predict gender attribution. To examine the extent to which L2 learners in fact use noun endings to determine gender attribution in the task, it would be intriguing to employ other procedures such as eye-tracking techniques.

In the present study, the Simon Test, the Corsi Block-Tapping Test, and the Wisconsin Card Sorting Test were adopted to measure the students' EF skills. The present study found partial effects of EF skills on the learning gains. It would be worth considering other EF tests to have a broader understanding of EF skills in L2 learning and teaching.

Given the roles of EF skills in L2 learning, Kapa and Colombo (2014) stated that "it may be possible to integrate EF training, which is becoming increasingly popular (...), along with language instruction in order to improve individuals' language learning outcomes" (p. 250). Numerous studies (e.g., Diamond, Barnett, Thomas, & Munro, 2007; Diamond & Lee, 2011; Thorell, Lindqvist, Bergman Nutley, Bohlin, & Klingberg, 2009) showed the effectiveness of training on EF skills and possible transfer effects between EF skills. Blair and Razza (2007) and Diamond and Lee (2011) found that training on EF skills facilitates school readiness and academic success such as math skills and literacy levels. In this sense, it would also be interesting to investigate whether L2 learners with training on EF skills would be at an advantage in L2 acquisition and processing in contrast to L2 learners without training. I believe that this research question will yield important implications in the field of L2 education and acquisition.

Finally, a number of previous studies targeting L2 pronunciation domains have found that L2 pronunciation instruction is effective for L2 learners to improve their accuracy in L2 speech production and perception (Lee & Lyster, 2016a, 2016b, 2017; Saito, 2013; Saito & Lyster, 2012; Saito & Wu, 2014). The current study showed new insights into L2 pronunciation instruction; that is, the importance of L2 phonological knowledge and pronunciation instruction in L2 grammar teaching and learning focusing on French grammatical gender. It is hoped that future studies investigate the role of L2 phonological knowledge in L2 grammar and vocabulary learning in a broader sense, as well as the effects of L2 pronunciation instruction on the acquisition of L2 lexical and morphological targets.

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Appendix A

Informed Consent Form for Participating Students

McGill

INFORMED CONSENT FORM FOR PARTICIPATING FRENCH LEARNERS (FRENCH L2 PARTICIPANTS)

Dear Student,

Thank you for your interest in participating in our SSHRC-funded research study (# 430-2017-00372). The purpose of this study is to investigate the extent to which learners of French as a second language benefit from different types of instruction on grammatical gender (REB file # 93-0817). In order to achieve the goal of the current study, your participation will be highly valued.

Your classroom has been chosen to collaborate in joint project with the Faculty of Education. This project involves piloting some new instructional techniques that aim to increase your ability to accurately use grammatical gender in French. Your instructor will integrate a focus on grammatical gender for a total of about 8 hours (six 80-minute instructional sessions) during the first half of the semester into the activities that normally comprise FRSL 207/208. In addition, on three different occasions, you will partake in computer-assisted tasks targeting grammatical gender as extra practice during lab sessions. The purpose of this letter is to ask for your permission to use the results of these assessment tasks for research purposes.

Here is a description of the tasks you will complete. At Time 1, Time 2, and Time 3, you will (a) identify correct French articles (e.g., *un* or *une* for the word *stylo*); (b) write compositions with given words; (c) identify whether a given word, played via a headset, is *un*, *une*, *le*, or *la*; (d) read French words; (e) describe pictures; and (f) identify whether a given phrase, played via a headset, is grammatical. Also at each of the three testing times, your executive function skills will be measured.

Your utterances will be audio recorded and then rated by native speakers of French. Due to the recognizability of the human voice, the confidentiality of your identity will not be completely guaranteed. Nevertheless, your personal information will not be publicized under any circumstances and your speech will be solely used for this study.

The results obtained from the above tests will not affect your grade in the course; your instructor will not know whether or not you agreed to let us use the test results, so you are under no pressure or obligation to give us consent. Your participation is completely voluntary. Even if you agree now to participate, you can change your mind later and withdraw from the study at any time without any negative consequence.

There is monetary compensation of $80 for releasing your results regardless of whether you complete all duties and/or withdraw from the study.

The results of this study will be submitted for peer review and publication in professional journals, newsletters, and conferences. Signing below will give us the permission to use the results for that purpose.

Every effort will be made to ensure that the confidentiality and privacy of participants is protected. Your personal information will not be revealed in any reports of the results. Only the researchers (Roy Lyster and Andrew Lee) will have access to identifiable data (e.g., your name, date of birth, and contact information), none of which will be provided to other study participants and be publicly disseminated. The results will be reported in an aggregated fashion. Data will be stored in a secure hard drive. The hard drive will be kept in a safe place locked for security purposes in the research laboratory. Please note that the data are being kept after the study is over. This is for purely archival purposes in keeping with university policy to keep research data for seven years following publication.

A copy of this consent form will be provided to you. If you have any questions about this research, are concerned about your privacy, or would like to withdraw your consent at any time, please feel free to contact us by email at roy.lyster@mcgill.ca or andrew.lee@mcgill.ca.

Finally, if you have any ethical concerns or complaints about your participation in this study, and want to speak with someone not on the research team, please contact the McGill Ethics Manager at 514-398-6831 or lynda.mcneil@mcgill.ca.

Thank you very much.

Dr. Roy Lyster
Professor
Department of Integrated Studies in Education
McGill University
3700 McTavish Street
Montreal, QC Canada H3A 1Y2
Email: roy.lyster@mcgill.ca

Mr. Andrew Lee
Ph.D. candidate
Department of Integrated Studies in Education
McGill University
3700 McTavish Street
Montreal, QC Canada H3A 1Y2
Email: andrew.lee@mcgill.ca

Please sign below if you have read the above information and consent to participating in this study. Agreeing to participate in this study does not waive any of your rights or release the researchers from their responsibilities. A copy of this consent form will be given to you and the researcher will keep a copy.

Participant's Name: (please print) _____

Participant's Signature: _____

Appendix B

Instructional Materials for Form-Focused Instruction on Only Sublexical Cues

(e.g., Les Lettres Chinoises : 9)

Les lettres chinoises : 9

Je suis deux cours d'informatique **le jour** et un cours de français **le soir**. En cl**asse**, je n'arrive pas encore à répondre au professeur, parce que très souvent je ne comprends pas **les** ques**tions**. Mes réflexes semblent ralentir depuis que je suis ici. Le professeur n'ose plus me poser de ques**tion** de peur de mes « Pardon ? » À vrai dire, père, j'ai un peu honte de moi-même. Alors Nicolas m'a dit :

« Ça vient avec le temps. Pense qu'on n'a même pas, nous autres, le courage d'aller suivre un cours en chinois ! »

Il me prête ses notes et je mets trois fois plus de temps que les autres pour étudier les matières.

Je ne pratique pas beaucoup **le** franç**ais** en dehors du campus. Crois-moi, cher père, ce n'est pas par par**esse**. Partout où je vais, on a tend**ance** à me parler en angl**ais**. Alors, oralement, je fais plus de progrès en angl**ais** qu'en franç**ais**. Il est plus naturel, paraît-il, qu'un Asiatique parle angl**ais**. Quelquefois, j'insiste pour parler franç**ais**, mais dès que je fais une faute, on passe à l'angl**ais**. Cette attitude m'a beaucoup découragé au début, car je croyais qu'on me parlait angl**ais** parce que **mon** franç**ais** n'était pas bon. Puis Nicolas m'a dit qu'on fait cela plutôt par courtois**ie**. Je découvre que **la** v**ie** n'est pas vraiment

insupportable pour ceux qui vivent dans un pays étranger dont ils ne maîtrisent pas parfaitement la langue. « Ah, se dit-on, ces gens-là ont **la** difficul**té** de la langue. » Et d'un geste las, on pardonne tout.

Je ne me pardonne pas d'avoir eu une mauvaise note pour **le** dev**oir** de la semaine dernière. Il faut que je fasse plus d'efforts. Je vous écrirai plus longuement la prochaine fois. Je pense beaucoup à vous et à maman.

Votre fils, de Montréal

Activité 1 : répondez aux questions suivantes !

1. À qui Yuan a-t-il écrit cette lettre ?

   _____

   _____

2. En quelle langue Yuan suit-il ses cours ?

   _____

   _____

3. Pourquoi Yuan a-t-il honte de lui-même ? Trouvez trois raisons.

   _____

   _____

4. Qui est Nicolas ? Comment a-t-il aidé Yuan ?

   _____

   _____

5. (À ton avis/Selon le texte) Pourquoi est-ce que Yuan a de la difficulté à pratiquer son français en dehors du campus ?

   _____

   _____

6. Que suis Yuan le soir ?

_____

_____

7. Nomme trois langues que parle Yuan.

_____

_____

8. Que fait-il pour que les gens lui parlent en anglais, même s'il insiste pour parler français ?

_____

_____

9. Qu'a-t-il eu pour le devoir de la semaine passée ?

_____

_____

Activité 2 : Masculin ou féminin ?

- **En lisant le texte *Les lettres chinoises : 9*, remplissez les espaces vides par LE, LA, UN, UNE, MON, MA, SON, SA, CET, CETTE, ou DU pour indiquer si les noms sont masculins ou féminins.**
- **Ensuite, classifiez les noms soulignés selon leur terminaison dans le tableau suivant le texte.**

Je suis deux cours d'informatique le jour et un cours de français _____ s**oir**. En c**lasse**, je n'arrive pas encore à répondre au professeur, parce que très souvent je ne comprends pas les questions. Mes réflexes semblent ralentir depuis que je suis ici. Le professeur n'ose plus me poser

de ques**tion** de peur de mes « Pardon ? » A vrai dire, père, j'ai un peu honte de moi-même. Alors Nicolas m'a dit :

« Ça vient avec le temps. Pense qu'on n'a même pas, nous autres, le courage d'aller suivre un cours en chinois ! »

Il me prête ses notes et je mets trois fois plus de temps que les autres pour étudier les matières.

Je ne pratique pas beaucoup _____ franç**ais** en dehors du campus. Crois-moi, cher père, ce n'est pas par par**esse**. Partout où je vais, on a tend**ance** à me parler en angl**ais**. Alors, oralement, je fais plus de progrès en angl**ais** qu'en franç**ais**. Il est plus naturel, paraît-il, qu'un Asiatique parle angl**ais**. Quelquefois, j'insiste pour parler franç**ais**, mais dès que je fais une faute, on passe à l'angl**ais**. Cette attitude m'a beaucoup découragé au début, car je croyais qu'on me parlait angl**ais** parce que mon franç**ais** n'était pas bon. Puis Nicolas m'a dit qu'on fait cela plutôt par courtois**ie**. Je découvre que _____ v**ie** n'est pas vraiment insupportable pour ceux qui vivent dans un pays étranger dont ils ne maîtrisent pas parfaitement la langue. « Ah, se dit-on, ces gens-là ont _____ difficul**té** de la langue. » Et d'un geste las, on pardonne tout.

Je ne me pardonne pas d'avoir eu une mauvaise note pour _____ dev**oir** de la semaine dernière. Il faut que je fasse plus d'efforts. Je vous écrirai plus longuement la prochaine fois. Je pense beaucoup à vous et à maman.

Votre fils, de Montréal

Terminaisons :	Noms retrouvés dans le texte *Les lettres chinoises : 9*. Inscrivez une seule fois chaque nom précédé du bon déterminant.	M ou F ?
-ais, -ait, -et, -ès		
-our, -oir, -ort, -ir		
-ée, -té		
-tion, -sion		
-ie		
-esse, -isse, -asse		
-ance, -ence		

Activité 3 : Masculin ou féminin ?

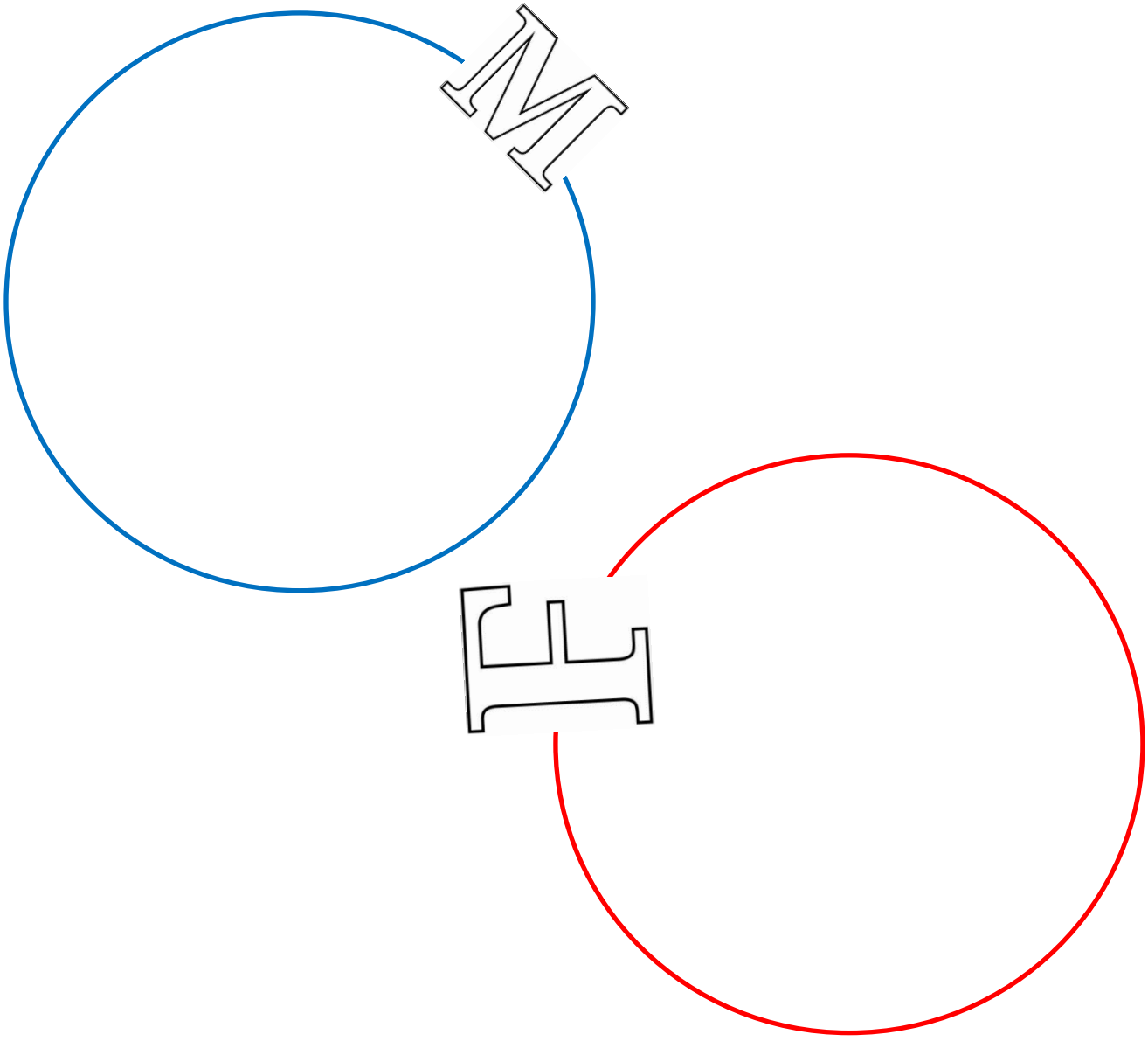
Les mots suivants se trouvent également dans *La lettre chinoise : 9*, mais vous ne pouvez pas déterminer dans le texte s'ils sont masculins ou féminins. Encerclez la bonne réponse.

1. les questions : la question / le question
2. français : la français / le français
3. courtoisie : la courtoisie / le courtoisie

Activité 4 : découvrez de nouveaux mots

- **Selon les régularités présentées dans le tableau de l'Activité 2, classifiez les mots suivants selon leur genre grammatical (M ou F ?) :**

  liberté, lotion, photographie, cuisse, réservoir, finance, substance, détour



Activité 5 : Une courte rédaction

Racontez une bonne expérience et une mauvaise expérience quand vous avez essayé de parler en français ici à Montréal (5-8 phrases). Soulignez les terminaisons qui se trouvent dans votre texte et qui se trouvent également dans le tableau de l'Activité 2. De plus, soulignez les mots LE, LA, UN, et UNE pour indiquer si le mot est masculin ou féminin.

_____

_____

_____

_____

_____

_____

_____

Appendix C

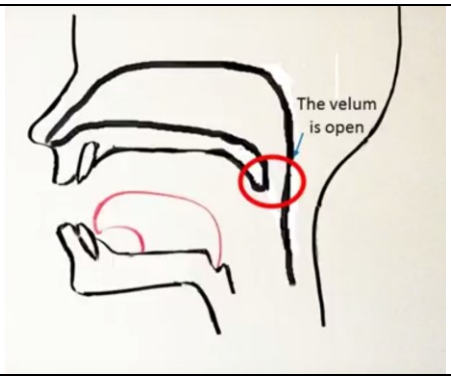
Instructional Materials for Articulation-Based Instruction (Explicit Phonetic Information)

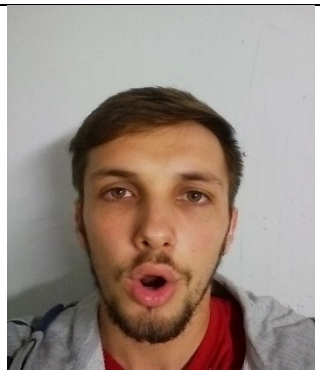
ACTIVITÉ 1 : COMMENT PRONONCER « UN », « UNE », « LE » ET « LA » ?

Un /œ̃/

Caractéristiques :

- **un son nasal (l'air sort par le nez et par la bouche)**
- **Pincez votre nez en prononçant « un » et sentez les vibrations !**
- **les lèvres arrondies**
- **la langue au milieu, avancée**

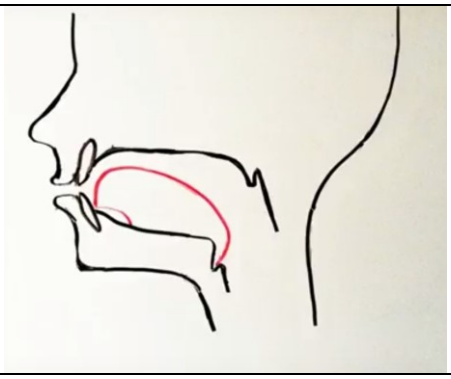




Une /yn/

Caractéristiques :

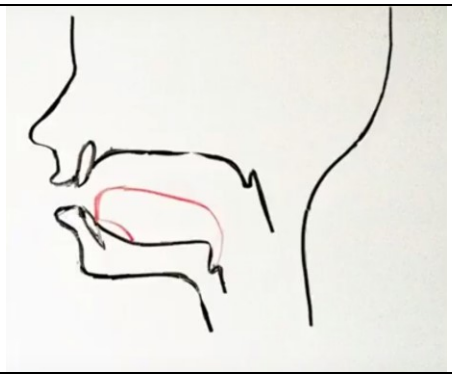
- **les lèvres extrêmement arrondies, lèvre supérieure pointée vers le nez**
- **la langue vers le haut, avancée**
- **Les lèvres sont arrondies et projetées fortement vers l'avant ; la pointe de la langue touche les incisives inférieures comme pour le son /i/ !**

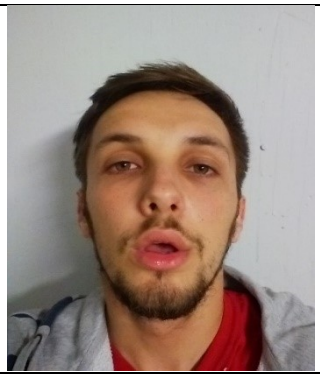


Le **/lə/**

Caractéristiques :

- **un son paresseux (un effort minimal)**
- **la mâchoire lâche, les lèvres arrondies très peu**
- **la langue au milieu, un peu avancée**

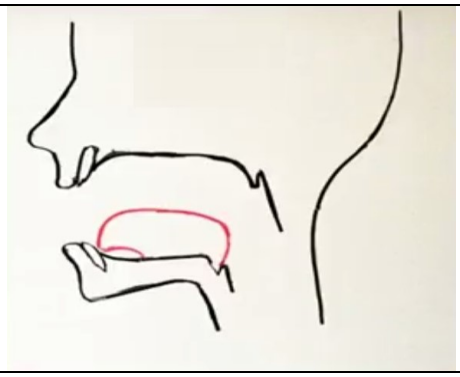


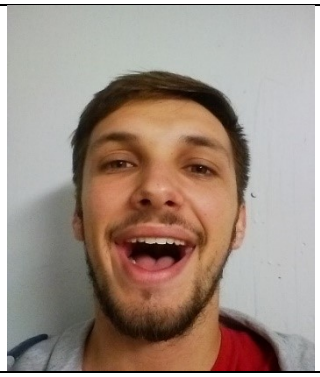


La **/la/**

Caractéristiques :

- **la bouche grande ouverte, lèvres légèrement tirées**
- **la langue vers le bas, avancée**





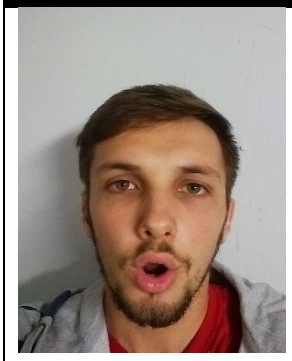
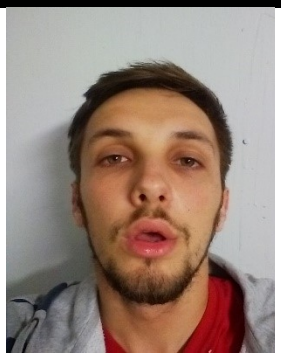
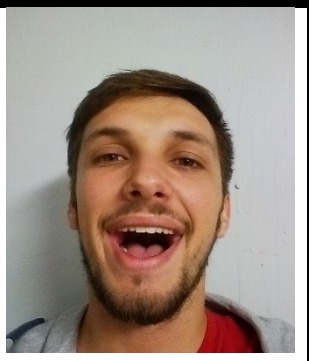
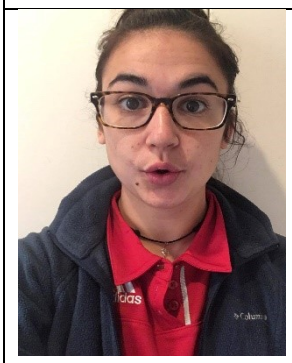
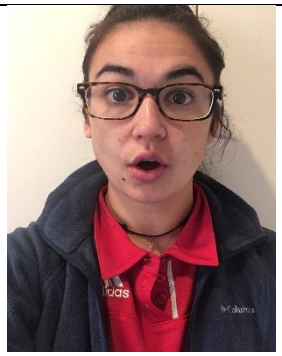
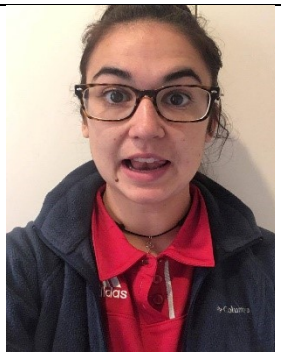
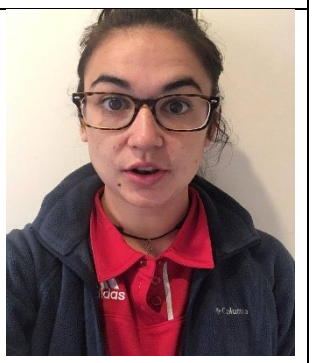
Appendix D

Instructional Materials for Articulation-Based Instruction

(Notice-Articulatory-Gestures and Mirror Activities)

ACTIVITÉ 1 : MON VISAGE AVEC « UN », « UNE », « LE » ET « LA »

1. Choisissez le déterminant qui correspond à l'articulation parmi les deux options données. Écrivez la réponse sous la photo.

un ou une	un ou une	le ou la	le ou la
			
un ou une	**un ou une**	**le ou la**	**le ou la**
			

2. Observez les illustrations modèles de l'activité précédente et prononcez « un », « une », « le » et « la ».

3. Utilisez le miroir remis afin de recréer les articulations des modèles. Au besoin, utilisez votre téléphone cellulaire.