Available online at www.sciencedirect.com

ScienceDirect

System 41 (2013) 1023–1042

SYSTEM

www.elsevier.com/locate/system

Deductive versus inductive grammar instruction: Investigating possible relationships between gains, preferences and learning styles

Gladys Jean [a,*], Daphnée Simard [b]

[a] Université du Québec à Montréal, Département de didactique des langues, Université du Québec à Montréal, C.P. 8888, Succursale Centre-ville, Montréal, Québec, Canada H3C 3P8

[b] Université du Québec à Montréal, Département de linguistique, Université du Québec à Montréal, C.P. 8888, Succursale Centre-ville, Montréal, Québec, Canada H3C 3P8

Received 17 April 2012; revised 24 September 2013; accepted 2 October 2013
Available online 25 October 2013

Abstract

This study experimented the inductive and deductive approaches to grammar instruction with junior high school students in order to uncover their preferences and seek possible relationships between their learning gains, preferences and learning styles. Students were found to have expressed a preference for the deductive approach, but rated both approaches as equally effective. No relationships were discovered between their gains and their preferences or learning styles, which revealed that liking or not an approach had no influence on learning in this case. However, some connections were established between preferences and learning styles: learning styles where conscious learning play a role were generally associated with the liking of grammar instruction irrespective of the fact that it was provided inductively or deductively. Since both approaches were explicit in nature, the discussion explores the idea that explicit teaching may agree better with certain learning styles, and that it would perhaps be wise not to completely discredit implicit teaching on the basis that some studies show a learning advantage for explicit teaching.

Keywords: Grammar; Induction; Deduction; Learners' instructional preferences; Learning styles

1. Introduction

The topic of grammar teaching or focus on form in the field of second language education has been widely discussed in recent decades and the overall conclusion has been, as DeKeyser (1998) stated, that "some kind of focus on form is useful to some extent, for some forms, for some students, at some point in the learning process" (p. 42). However, there is still no firm agreement as to the best way to teach grammar (Nassaji and Fotos, 2011). In the pursuit of testing the efficacy of different types of pedagogic interventions on grammar, several researchers have focused on whether the best teaching practices should be implicit or explicit. In their meta-analysis of research on the topic, Norris and Ortega (2000) reported that explicit types of instruction tend to prove more effective than implicit types, but

* Corresponding author. Tel.: +1 514 987 3000x1654.
E-mail addresses: jean.gladys@uqam.ca (G. Jean), simard.daphnee@uqam.ca (D. Simard).

0346-251X/$ - see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.system.2013.10.008

a number of caveats were mentioned by the authors themselves and others concerning the ways both types of instruction were conceptualized, operationalized and measured (Ellis, 2008b, p. 841; Doughty, 2004; pp. 181–202).

Research into cognitive science in the latter part of the twentieth century has, according to Ellis (2008a), mainly demonstrated that implicit and explicit knowledge of language are "distinct and dissociated, they involve different types of representation, they are substantiated in different parts of the brain, and yet they come into mutual influence in processing" (p. 125). However, nothing so far seems to prove that implicit instruction leads exclusively to implicit knowledge, and explicit instruction to explicit knowledge. Indeed, explicit instruction may very well lead to implicit knowledge. Some researchers have argued on the possibility of a range of effect of explicit instruction going from a 'weak interface' (for example Ellis, 2008b) to a 'strong interface' (for example DeKeyser, 1995): the weak interface implies that explicit knowledge acquired through explicit instruction can lead to implicit knowledge under certain conditions (for example with students who are developmentally ready and eager to speak more accurately, or with grammar features that are most amenable to teaching), and the strong interface suggests that explicit instruction can lead to implicit knowledge with proper and sufficient practice (the sequence of learning going from declarative knowledge to procedural knowledge to automatization). We now seem to be confronted with the fact that explicit and implicit instruction may both have their place in language teaching, but need to know more about the processes and outcomes of both modes under different conditions and with different types of learners. For this reason, we believe, as Ellis (2008a, p. 125) does, that research in the field should continue to investigate the roles that individual differences play in the results obtained with implicit and explicit learning, and try to determine if interactions exist between specific learner aptitudes or traits and specific educational treatments.

It is from this point of view that the present research was undertaken into the much debated sub-theme of explicit instruction: deduction and induction. Before presenting our research design and results, this article will first define and address the issue of inductive and deductive grammar instruction; it will then discuss the possible contributions of learners' preferences and learning styles to the efficacy and acceptance of one type of instruction or the other.

2. Literature review

2.1. Defining deductive and inductive approaches

Both deductive and inductive grammar instruction approaches can be considered explicit teaching when they direct students to attend to a particular language feature with the intent to make students aware of the rule that governs it. Some authors (see, for example, DeKeyser, 1995) would, however, consider that inductive learning could also be associated with an implicit approach when the intent is not to develop an explicit rule, but just to infer the rule without awareness. As for the present study, we will consider inductive and deductive learning within the parameter of an explicit approach and define *explicit instruction* as an inductive treatment, where learners are required to induce rules from examples given to them, or as a deductive treatment, where learners are given a rule which they then practise using" (Ellis, 2008a,b, p. 882). Operationalization of these two types of instruction in research differs very widely (on this topic, see, for example, Decoo, 1996; Erlam, 2003; Vogel et al., 2011). The deductive approach to rule presentation is often associated with the PPP (Presentation-Practice-Production) approach. Depending on how it is operationalized, the form-meaning connection is more or less salient. From numerous examples found in language textbooks and research, one could find diverse variations on the same old theme, so to speak. To summarize, at one end of the continuum, a first option could be to present a language rule, then practice it in drill-type exercises. At the other end of the continuum, a spoken or written text could be presented in which the targeted language feature appears with a certain frequency (input flood) and is highlighted (textual enhancement). The rule is then presented and practiced in different types of exercises and meaning-focused activities, often culminating in a communicative task or open-ended production at the end of the teaching sequence. Halfway in between these two extremes, one could find a sequence in which the rule is presented, then exercised, followed by reading or listening to texts with varying degrees of authenticity in which the targeted pattern is featured.

For the inductive approach, as many different options can be found in the literature. This approach is also often referred to as the discovery or rule search approach. Again, at one end of the spectrum, one can find the illusion of a discovery: students are asked to discover a rule through a few guided questions, and then the teacher (or the book) states it. At the other end of that spectrum, one can find a type of instruction where the learners discover the rules by working with language samples, test their hypotheses with progressively more sophisticated samples, but the rules remain theirs and they are never confronted with the 'official' rules as found in grammar books. In between lie many options where

students, with the help of teachers or peers, develop rules from authentic samples. The degree to which the learners are left to redefine their rules based on new input (evidence and counter-evidence) and teacher's feedback varies. Exercises, practice activities and communicative tasks are interspersed in the sequence as for a deductive sequence. In the present study, the target forms are presented in meaningful contexts (written texts) and highlighted, and comprehension activities, meaningful grammar practice exercises and communicative tasks are distributed similarly in both instructional sequences (the inductive and the deductive ones). The feature that really distinguishes the deductive from the inductive sequence is how the rule is treated: presentation by the teacher without involving discovery in the case of the deductive sequence, and discovery of the rule in the case of the inductive sequence as per Ellis (2008b) definition above.

2.2. Research on deductive and inductive grammar instruction

The literature on the effects of deductive and inductive teaching of grammar rules has received substantial attention in past decades. In this regard, Erlam (2003) reviewed a number of studies that compared the effectiveness of both types of grammar instruction and found that the results of some studies showed an advantage for deductive instruction, others for inductive instruction and yet others found no difference. In a study with school-age learners, Erlam (2003) found that the results supported " the effectiveness of deductive language instruction in a teacher-centered classroom language learning environment […]" (p. 257). This finding in favor of the deductive approach was later not supported by Haight et al. (2007) and Vogel et al. (2011). In their study, Haight et al. (2007) compared the effectiveness of both deductive and inductive approaches to grammar teaching among French L2 college students. Eight different French grammatical structures were taught either deductively (i.e., rule explanation before use of the targeted grammar feature in exercises) or inductively (practice before rule presentation) in a counterbalance design (two classes for each condition; then the condition was reversed for the following targeted structure). Data regarding grammatical knowledge of each structure were gathered at pre- and posttests, and also through quizzes administered immediately after each grammatical sequence. Results revealed that the items taught inductively yielded significantly higher scores. Vogel et al. (2011), using the same type of design, in addition to comparing the effects of both instructional approaches on the learning of French grammar structures (ten in this case) among college students, compared their participants' preferences with the scores obtained for each approach in pre- and posttests in order to determine possible relationships. Their results revealed that the participants made significantly more gains with the inductive approach as far as short-term learning was concerned; however, no relationships could be observed between the participants' preferences (which were for the deductive approach at 80%) and the gains made over time.

As Vogel et al. (2011) point out, only a few other studies investigated students' preferences or perceptions in terms of inductive or deductive learning. Mohamed (2004) is one of such studies. The author concluded that there was no difference in the appreciation of both approaches, but students were exposed to neither of them before giving their opinions. Moreover, none of these studies investigated these kinds of preferences among teenage learners.

Individual learner preferences and differences may be an important factor to consider in measuring learning from deductive and inductive instruction. Erlam (2003) believes that individual learner differences may have played a role in the results she obtained, as there was great variability within the deductive group. As Ellis (2008b) suggests, results favoring deductive or inductive FFI may "in part depend on learner's preferred learning style" (p. 882). Individual differences also seem to have played a role in Hwu and Sun (2012): inductive and deductive teaching did not affect learning performance, but 'memory for text' language aptitude, considered as an individual difference, correlated with gain scores (induction treatment leading to better scores in delayed post-tests for students with good textual memory).

2.3. Learner differences

As the operationalization of deductive and inductive instruction varies greatly across studies that compared the relative effectiveness of each, it is not at all surprising that results have so far been inconclusive. However, even if a series of studies using the same instructional sequence had been performed, it may not have produced clear-cut results since the answer to the question of the effectiveness of one approach over the others may very well be: 'it depends'. It may depend on the nature of the rule or syntactic structure (complexity, salience, markedness, frequency, scope, etc.), but it may also depend on the group of learners (adults, children, teenagers, beginner, intermediate or advanced learners, highly educated or not, etc.). It has also been argued that individual differences or learner characteristics may account for learner variation in L2 performance and play an important role in how well one reacts to instructional

treatments (Dörnyei, 2005, 2009a, 2009b). The present study focuses on this last aspect: the reaction to instructional treatments. Few studies, as mentioned earlier, have investigated how learners react to deductive and inductive approaches, and how their reaction and ultimately their learning could be affected by who they are, in this instance by what they perceive as being their learning styles. Dörnyei and Skehan (2003) define learning styles as "a typical preference for approaching learning" to differentiate from the construct of cognitive style, "a predisposition to process information in a characteristic manner" (p. 602).

Thus, the goal of the present study was to seek students' reactions to both approaches by: 1) directly asking for their appraisal and preference (after being exposed to both approaches in a sequential manner) and, 2) asking them to answer a self-report type questionnaire on learning styles, thus providing further clues about which type(s) of learners react better to one type of instruction or the other.[1] Accordingly, our research questions were the following:

1. After experiencing both a deductive and an inductive treatment of a grammatical feature, which treatment did the learners prefer in terms of effectiveness and interest?
2. Is there a difference in gains (in terms of accurate use of the targeted grammar feature) between learners who received preferred instruction type, and between learners who rated the different aspects of the treatment highly and those who did not?
3. Is there a difference in gains depending on students' learning styles as assessed through a self-report learning style survey?
4. Did learners with certain learning styles rated the unit differently or expressed different learning preferences?

3. Material and methods

3.1. Research design

In order to answer our research questions, we first designed two grammatical instructional sequences (which will be described in detail later) geared towards students studying French as a second language (FSL) in grade 7 and 8 (cycle 1 of secondary school in the province of Quebec), one using a deductive approach and the other one, an inductive approach. Since the experimentation was carried out in a quasi-experimental (ecological) fashion, we had to target a different grammar feature in each sequence (unit): determiners in the deductive unit and object pronouns in the inductive unit. A pretest assessing the accurate use of the targeted grammatical feature was given to participating students at the beginning of each unit. At the end of each unit, students received a similar posttest (cross-design method) in order to measure the gains from the beginning of the treatment to the end. As well, a unit appraisal questionnaire was filled by students at the end of each unit, with some extra questions at the end of the second one to inquire about their comparative appreciation of both units. Teachers also supplied information regarding their students' motivation to learn grammar and the exposure they already had to the targeted grammatical feature. At the very end of the treatment (teaching of both units), students filled in a learning style survey.

3.2. Participants

Seven classes of secondary school students from two different English school boards in the greater region of Montreal (province of Quebec, Canada) took part in the study. The 138 students for which we obtained usable data were divided into three Secondary 1 classes and four Secondary 2 classes. (These first two years of secondary school constitute what is called 'Cycle 1' in Quebec, learning outcomes being set in terms of cycles, rather than years). These seven classes were taught by three teachers.

Students participating in the study were between the ages of 12 and 14. They were about evenly distributed between boys and girls. They were enrolled in regular (core) French as a second language classes (French taught as a subject

[1] We acknowledge that studies on learning styles have thus far been inconclusive, often attributed in part to a problem with questionnaire validity, since surveys that have been used are mostly self-report instruments that have been developed for practical rather than research purposes (Dörnyei, 2005). Also, and maybe more importantly, as Dörnyei (2009b, p. 183) reminds us, the concept of learning styles has yet to be defined scientifically. That being said, however, we wish to stress that our use of self-assessment of learning styles is strictly limited to providing us with some indication of learning preferences, which in turn could help us explain learners' reactions to inductive and deductive approaches.

matter for 40–70 min a day) as opposed to immersion classes or welcoming classes for immigrants. Since French is compulsory in all grades in the province of Quebec and for all students, the experimental classes included a wide spectrum of ability levels. Four groups had received no previous explicit teaching of the determiners by their teachers in the current year, while three groups had received some. No groups had received explicit instruction on object pronouns.

3.3. Treatment

Two teaching units were developed by the authors in order to exemplify both approaches and ensure students grasped the difference by having them experience both types of teaching.[2] Parts of each sequence were review for some students, but rather new for others, according to the participating teachers. Students were given an exercise book for each unit that included all the materials they needed to go through the sequence. All these exercise books were collected at the end of each unit so as to ensure that the experimentation was carried out as planned. Participants whose exercise books were not completed as intended were not included in the study, as they were either absent or not involved in classroom work. The design, format and length of each unit were similar. They both started by introducing the type of texts to be read. Similar types of texts were chosen: tales (or fairy tales) for one unit, and fables for the other one. The grammar features, determiners (definite, indefinite, possessive and demonstrative) for one unit and object pronouns (*le*, *la*, *l'*, *les*, *lui*, *leur*, *en*, *y*) for the other, were selected on the basis of their similarities from a morphological and a syntactic point of view: they are both free morphemes, and they are both, at least in part, dependent on grammatical gender. Moreover, from a pedagogical point of view, they are both a major source of errors for FSL learners (they never seem to be completely acquired) and they are part of the Quebec FSL curriculum for the chosen grade levels. The targeted grammar feature was presented deductively in the case of the first unit about tales, and inductively in the case of the second unit about fables: students read texts in which the grammar feature was highlighted; each reading was followed by comprehension exercises; the exercise books then supplied students with rules in the case of the deductive unit, or had them discover the rules in the case of the inductive unit; each presentation or discovery of a rule or part of a more encompassing rule was followed by one or two practice exercises; finally, a written production task invited students to reuse the grammar feature. Appendix A summarizes the content of each unit. We will reiterate the fact that both the inductive and deductive instructional sequences were presented similarly; the only difference resided in the deductive presentation of the rules in one case, and the discovery of the rules in the other case.

Each participating teacher was provided with a teacher's guide. It included step-by-step instructions about the teaching that was to take place. Each unit was divided into 13 steps, and teachers were to report their experience (date, length, successes, and difficulties) directly in the guide in a journal-type entry at the end of each step. The deductive unit was taught first, followed immediately by the inductive unit. In some instances, participating teachers interrupted each unit with other types of activities at different times. Participating teachers' reporting time on each unit varied between 140 and 255 min. The work on each final production at the end of the sequence took an additional 150–180 min.

The units and the instruments were piloted with one class prior to the experimentation. As a result, adaptations were made to both; these consisted mainly of correcting language mistakes, simplifying some activities, making instructions clearer, simplifying language level in the questionnaires and survey, and shortening their length so as to avoid loss of interest or motivation in students.

3.4. Instruments

3.4.1. Pre- and post-treatment tests

Two forms of a grammatical test, used in a cross-design, counterbalancing fashion, were created for each teaching unit (see Appendix B for an example). They were administered at the beginning and end of each unit. They each consisted of three parts: in the first, students read a story and were required to fill blanks with proper determiners or

[2] The nature of the experiment forced us to create grammatical teaching units that may not be representative of what one would expect to see used with this population: although they were text- and task-based, the introduction (or review for some students) of the targeted features was quite extensive as one unit covered all types of determiners, and the other one all types of object pronouns. In this sense, the units did not quite adhere to the principles of a developmental or spiral approach, but were created as such to create several opportunities to present a rule or make students discover one and hence make sure that the students would be very aware that grammar was being taught to them in a distinctive manner in each case. Also, since students' appropriation of these grammar features were more than likely at different stages of development among our learners, it was best to cover the features in their entirety.

object pronouns out of choices of three; in part two, students had to supply the proper determiners or object pronouns in ten out-of-context sentences; finally, in part three, students had to give examples of specific types of pronouns (pronouns replacing a nominal clause or a prepositional clause) or specific types of determiners (definite, indefinite, possessive, demonstrative). This last part was intended to test metalinguistic knowledge, rather than usage (as per Widdowson's, 1978, definition: ability to produce correct sentences, or manifestation of the linguistic system) as in the first two parts.

3.4.2. Treatment appraisal and preference questionnaires

The first questionnaire, the one students had to fill in at the end of the first unit (the deductive unit), requested them to appraise diverse aspects of the unit (see questions 1 to 6 in Table 2): liking of the unit in general, and liking of the readings, the grammar exercises and the way grammar was presented (presentation of a rule vs. discovery of a rule). The questionnaire also inquired about their sense of improvement regarding the use of the targeted grammar feature. Two additional questions were asked with the first questionnaire (questions 7 and 8 in Table 2): they inquired about their degree of enjoyment in general in regards to grammar learning and in regards to reading. The second questionnaire, the one administered at the end of the second unit (the inductive unit) asked the same first six appraisal questions as in the first questionnaire, but additionally asked students to indicate their preference in terms of approach by choosing between the two units according to the following criteria: the one they prefer overall; the one that included the types of readings they liked the most; the one that included their preferred types of grammar activities; the one that dealt with grammar in the most effective or useful manner; and, the one that fits their learning style or preferences the most (see Table 3 for the questionnaire questions).

3.4.3. Learning style survey

Students were asked to complete a learning style survey (Appendix C) at the end of the last unit and after the appraisal questionnaire. The learning style survey is an adaptation of the Cohen et al. (2002) Learning Style Survey and of its adapted version for young learners (Cohen and Oxford, 2002). These surveys were chosen because they were

Table 1
Learning styles and meanings.

Questionnaire		Learning styles	General meanings[a]
Parts	Questions		
Part I	3, 4, 5, 6	Extroverted	Enjoys a wide range of social, interactive tasks.
	1, 2, 7, 8	Introverted	Likes to do more independent work or enjoys working with one other person s/he knows well.
Part II	1, 3, 6, 7	Random-intuitive	More future-oriented, prefers what can be over what is, likes to speculate about possibilities, enjoys abstract thinking, and tends to disfavour step-by-step instruction.
	2, 4, 5, 8	Concrete-sequential	More present-oriented, prefers one-step-at-a-time activities, and wants to know where s/he is going in her/his learning at every moment.
Part III	1, 2, 4, 6	Open	Enjoys discovery learning and prefers to relax and enjoys learning without concern for deadlines or rules.
	3, 5, 7, 8	Closure-oriented	Focuses carefully on most or all learning tasks, strives to meet deadlines, plans ahead for assignments, and wants explicit directions.
Part IV	1, 4, 5, 6	Global	Enjoys getting the gist or the main idea and is comfortable communicating even if s/he does not know all the words or concepts.
	2, 3, 7, 8	Particular	Focuses on details and remembers specific information about a topic well.
Part V	1, 3, 6, 8	Synthesizing	Can summarize material well, enjoys guessing meaning and predicting outcomes, and notices similarities quickly.
	2, 4, 5, 7	Analytic	Can pull ideas apart and does well on logical analysis and contrast tasks, and tends to focus on grammar rules.
Part VI	2, 4, 5, 8	Inductive	Likes to go from specific to general and prefers to begin with examples rather than rules and theories.
	1, 3, 6, 7	Deductive	Likes to go from the general to the specific, to apply generalizations to experience, and to start with rules and theories rather than with specific examples.
Part VII	1, 4, 5, 6	Field-independent	Likes to separate or abstract material from within a given context, even in the presence of distractions. May have less facility dealing with information holistically.
	2, 3, 7, 8	Field-dependent	Tends to deal with information in a more holistic or "gestalt" way. May have greater difficulty in separating or abstracting material from its context. Works best without distractions.

[a] As defined by Cohen et al. (2002).

Table 2
Results for the appraisal questions about each unit.

	Deductive		Inductive		*t* (*df*)	*p*
	M (max = 5) *n* = 138	*SD*	*M* (max = 5) *n* = 138	*SD*		
1. How much did you enjoy the readings in the unit?	3.41	0.93	3.30	1.0	1.207 (135)	n.s.
2. How much did you enjoy the grammar activities in the unit?	2.99	0.91	2.57	0.97	4.775 (137)	0.000
3. How much did you enjoy the unit in general?	3.38	0.96	3.17	0.98	2.507 (135)	0.013
4. How much did you improve the use of *les déterminants/les pronoms*?	3.74	0.96	3.7	0.93	0.164 (133)	n.s.
5. How much did you learn in general from the unit?	3.74	0.88	3.75	0.90	−0.162 (133)	n.s.
6. How much did you like the way it was structured: first you were presented with the rule, then you practiced it [or] first you were asked to discover the rule, then you practiced it?	3.83	0.99	3.46	1.18	3.893 (135)	0.000
7. In general, do you enjoy learning grammar?	2.42	1.14	–	–		–
8. In general, do you enjoy reading?	3.74	1.2	–	–		–

appropriate in terms of number of items and language sophistication. The surveys also take into account language learning related issues, which other surveys do not necessarily do. The major adaptations that were made are the following: 1) since it was originally meant to be a self-report questionnaire, all section titles (e.g., How I received information) were removed as well as the result interpretation section at the end of the questionnaire; 2) some categories that we determined to be less pertinent for our study because they were less specifically related to grammar learning per their definitions and choices of answers were not included (i.e., impulsive/reflective; metaphoric/literal; sharpener/leveler; visual/auditory; tactile/kinesthetic) – the seven categories that we retained were: extroverted/introverted; random-intuitive/concrete-sequential; open/closure-oriented; global/particular; synthesizing/analytic; inductive/deductive; field-independent/field-dependent – these deletions also helped us keep the survey to an acceptable length for these young participants; 3) in each of the chosen categories, we kept the number of statements constant at eight, four for each of the pairs of style qualifiers – these statements were presented randomly in each part rather than grouped according to each style since students did not have to tally their own points – the equal number of statements helped, we believe, put equal importance to each category; 4) Language level for the items was modeled after the young learners' learning style survey of Cohen and Oxford (2002), but was further simplified after the trial period; 5) Negatively-worded statements were replaced by more positive statements so as to keep all statements more neutral (e.g., "I don't worry about understanding everything in class" was replaced by "I feel comfortable not understanding everything in class").

Table 1 shows the learning styles that were addressed in the survey as well as the questions associated with each (please refer to Appendix C for the actual survey).

Table 3
Results for the questions about unit preference.

	Deductive unit (frequency)	Inductive unit (frequency)	X^2
1. Which of the two units did you generally prefer?	78 (57%)	59 (43%)	2635 (n.s.)
2. Which of the two units included readings you liked the most?	65 (47%)	72 (53%)	0.358 (n.s.)
3. Which of the two units included grammar activities you liked the most?	95 (71%)	39 (29%)	24.067 ($p = 0.000$)
4. Which of the two units dealt with grammar the most efficient/useful way?	67 (50%)	68 (50%)	0.000 (n.s.)
5. Which of the two units fit your learning style/preferences the most?	76 (58%)	56 (42%)	2.985 (n.s.)

Note. DF *df* = 1.

3.5. Data analysis

The data were analyzed using SPSS v.21. The normality of the distributions on the pre and post-treatment tests was determined by calculating the skew and kurtosis ratios (Larson-Hall, 2010). Possible differences in gains between pretest and posttest scores were calculated using either a Friedman test when the data were not normally distributed or an ANOVA with repeated measures when they were. As for our Likert scale type data from the appraisal and preference questionnaires, they were compared using Student *t*-test (Larson-Hall, 2010) and differences in frequencies of answers provided to the questions were identified using a Chi-Square procedure. The Mann–Whitney U procedure allowed us to look for differences in gains according to the answers provided in the appraisal and preference questionnaires as well as the learners' self reported learning styles, and finally between unit's appraisal and preference and learning styles. For all analyses conducted, the alpha level was set at 0.05.

4. Results

4.1. Research question 1: learners' treatment appraisal and preference

Six questions were asked at the end of each unit about how much students liked different aspects of it (see Table 2). In addition, at the end of the first unit (deductive), students were asked two questions on grammar and reading that were more general. In order to start answering our first research question, we calculated frequencies of answers provided to these appraisal questions about each unit and compared both set of answers using Student *t*-test (Larson-Hall, 2010). Table 2 displays the questions with descriptive statistics and results of the Student *t*-test conducted on the data. For ease of presentation and for later comparisons, answers given on a Likert scale (5 = a lot; 4 = quite a lot; 3 = a little; 2 = not much; 1 = not at all) were averaged to give an indication of the general rating of the participants.

Table 2 indicates that the appreciative scores regarding the types of readings included in each unit (Q1), and the amount of learning that students thought happened (Q4 and Q5) were quite similar for both units (no significant difference). In other words, the aspects not related to grammar in both units were equally liked by the students. These results also tend to indicate that the units were identical in terms of the other aspects not related to the grammar presentation. However, significant differences can be observed as far as enjoyment of the grammar presentation: overall, students enjoyed the deductive unit more (Q3), preferred the grammar activities from the deductive unit (Q2) and preferred the way the deductive unit was structured (Q6).

The two supplementary questions asked at the end of the first unit (see Table 2, questions 7 and 8) show that students do not particularly appreciate learning grammar, but enjoy reading. These results corroborate the answers given to questions 1 and 2, as the appreciation for the reading activities is higher than the appreciation for the grammar activities.

We will now turn to the five supplementary questions that were asked at the end of the second unit. These questions required students to identify the unit from the two that corresponded the most to their personal preference based on five different criteria. Table 3 presents the questions and the results in terms of frequencies of answers (and percentages of students who made each of the two choices). Results were then compared using Chi-Square. The values are found in the last column of the table.

Again, it is quite obvious that the majority of students prefer the grammar activities (Q3) from the deductive unit. However, students' answers were equally divided on question 4 which inquired about which unit dealt with grammar most efficiently. Clearly, some students prefer the deductive unit, but saw some advantages in the inductive unit. As far as which unit students thought fit their learning style the best, 58% chose the deductive unit while 42% did so for the inductive unit (a non significant difference). Further probing to come into the students' learning styles will help verify their perceptions on this issue.

4.2. Research question 2: difference in gains according to learners' unit appraisal and preference

Before looking at the possible differences in gains from pre-test to posttest according to learners' unit appraisal and unit preference, we firstly calculated the gains from pre- to posttests for each unit. Table 4 shows the raw scores for parts 1 and 2 of the pretest and posttest for each unit (deductive and inductive), and for both parts together.

Results from part 3 are presented in Table 5. These results are shown separately because they represent metalinguistic knowledge rather than usage of the grammar features as in parts 1 and 2. Furthermore, since they represent

Table 4
Scores for Parts 1 and 2 of the pre- and post-treatment grammar tests.

		Pretest		Posttest	
		M	*SD*	*M*	*SD*
Deductive ($N = 137$)	Part 1 (max = 15)	12.23	2.31	12.83	2.13
	Part 2 (max = 10)	5.91	2.35	6.51	1.91
	Total (max = 25)	18.13	3.97	19.34	3.54
Inductive ($N = 137$)	Part 1 (max = 15)[a]	8.83	2.66	10.19	2.69
	Part 2 (max = 10)	5.03	2.02	6.14	2.17
	Total (max = 25)	13.85	3.93	16.33	4.24

[a] One point was awarded for each correct answer. Since part 1 of the test for the inductive unit included 11 items instead of 15 as for the deductive unit, the scores were proportionally reported out of 15 to allow for comparisons and further analyses.

the number of students who did not provide an answer in each case, and not scores as such, they could not be used in the comparative analyses between gains and preferences and gains and learning styles.

Since the results obtained from the pre- and post-treatment tests for the deductive unit were not normally distributed (see Appendix D),[3] non-parametric procedures (Friedman test) were used to explore the gains made in that unit and showed that for Part 1 ($X^2_{F\ (1)} = 13.62$; $p = <0.000$), Part 2 ($X^2_{F\ (1)} = 7.00$; $p = 0.008$) and globally ($X^2_{F\ (1)} = 21.93$; $p = <0.000$), the participants made significant progress from pre- to posttest.[4] Since the data for the inductive unit were normally distributed, a parametric procedure (the repeated measures ANOVA) was conducted on the data and, again, it was noted that participants significantly progressed from pre- to posttest for Part 1 ($F_{1,136} = 24.45$; $p = 0.000$; partial eta squared = 0.152, power = 0.998), Part 2 ($F_{1,136} = 24.45$; $p = 0.000$; partial eta squared = 0.199, power = 1.00) and globally ($F_{1,136} = 46.85$; $p = 0.000$; partial eta squared = 0.256, power = 1.00).

Even though our intent, as expressed in our research questions, was not to compare the inductive and deductive conditions in terms of gains made under each one, we decided to do it by curiosity because several recent studies (e.g., Erlam, 2003; Haight et al., 2007; Vogel et al., 2011; Hwu and Sun, 2012) have investigated this aspect and the readers might want to make comparisons. In order to measure the differential gains between the two units, we converted the data into Z-scores, as recommended by Hatch and Faradhy (1982) in cases where performance on two tests are compared (p. 67). Then, since the data for the deductive unit was not normally distributed, we used a Wilcoxon signed ranks test to verify whether there were more gains made with one unit than the other. No significant difference was revealed by this analysis, meaning that gains from both units were similar.

As for Part 3 of the test which assessed metalinguistic knowledge of the grammar features, Table 5 shows that the number of students who could not provide answers to the request for providing examples of the grammar features went down considerably from the beginning to the end of each unit: the number of students who could provide an answer more than doubled for each treatment at posttest as compared to pretest. Once more, gains were basically the same in the case of one unit or the other.

Going back now to research questions 2, a Mann–Whitney U procedure was used to compare gains made in each unit (total gains for parts 1 and 2 of the tests or each part taken separately) and answers to each of the unit appraisal questions and the unit preference questions in order to verify whether students who preferred one unit or the other made more gains in that unit or not. Not a single difference was discovered, meaning that the fact that students indicated a preference for one treatment or the other did not generally influence positively or negatively their gains in that unit.

4.3. Research question 3: differences in gains according to learning styles

To answer our third research question on the differences in gains according to the students' self-assessed learning styles, we first compiled the results associated with the learning style survey. Table 6 shows the results in pairs of styles

[3] In order to determine whether our data were normally distributed, we proceeded in two steps. We first looked at the values of skewness and kurtosis and calculated the skew ratio by dividing the value of skew by its standard error. We considered that normality was not violated if the ratio was less than 2 (Weinberg and Abramowitz, 2002). Second, to confirm those results, we produced histograms with superimposed normal curves.

[4] Note that the non-parametric Friedman omnibus test is calculated on mean ranks and not on means as per Larson-Hall, 2010. Therefore what might appear as not substantially different statistically speaking in terms of observed means cannot always be interpreted as such.

Table 5
Results for Part 3 of the pre- and post-treatment grammar tests.

Determiners (deductive unit)	No answer (*n*)	No answer (*n*)	Object pronouns (inductive unit)	No answer (*n*)	No answer (*n*)
	Pretest	Posttest		Pretest	Posttest
Definite	112	53	Direct	112	53
Indefinite	118	56	Indirect	114	59
Possessive	94	40			
Demonstrative	121	51			

as presented in the survey. Since there were eight statements per pair of styles, some students could very well be as much of one style than the other, meaning that they did not have a preference one way or the other, which is always very possible according to Cohen et al. (2002). These cases are represented under the column "both". Obvious discrepancies between styles include: considerably more students are extroverted than introverted, closure-oriented than open, global than particular, synthetic than analytic and deductive than inductive.

By themselves, these results are informative about the composition of our sample, but what interested us mostly was to know if learning styles differently influenced gains made in one unit or the other. In order to get this information, we submitted our data to a Mann–Whitney *U* test to find out possible differences between each style within a pair of styles (extroverted and introverted; random-intuitive and concrete-sequential; open and closure-oriented; global and particular; synthesizing and analytic; inductive and deductive; field-independent and field-dependent) in terms of gains from pretest to posttest. No difference in gains (total gains for parts 1 and 2 of the tests or each part taken separately) could be observed for any of the styles.

4.4. Research question 4: relationship between learning styles and unit appraisal and preference

Finally, to answer our fourth research question, frequencies of answers (see Table 3) to the preference questions that were asked at the end of the second treatment and which requested students to choose their favorite unit based on several criteria were compared with the average of students who chose each style of each pair using a Mann–Whitney *U* test.

The results revealed no significant differences between learning styles regarding the preferred type of instruction. On the other hand, the same analysis was performed on the data from the answers to the treatment (or unit) appraisal questions (see questions 1 to 6 in Table 2) asked at the end of each unit and students' self-reported learning styles, and some interesting differences were found. However, before going into these results, we would like to bring forward certain facts that can be observed just by comparing the results in Table 3 and the results in Table 6. In Table 3, we can observe that 78 students chose the deductive unit as their preferred one and 59 students the inductive unit. When we turn to Table 6, we can see that the deductive style represents the most students (86), quite close to the 78 who chose that type of unit as their preferred one. In fact, a relationship was found (see Table 7) for question 6 asking about students' liking of the way the unit was structured (rules followed by practice) and choosing the deductive learning style in the survey. However, no relationship was found for this question and the inductive learning style. In fact, it seems that students who chose the inductive unit as their preferred one were in part the ones (17) who were equally inductive and deductive learners according to the survey.

Table 6
Results for the learning style survey.

Style (*n* of students)		**Style** (*n* of students)		**Both** (*n* of students)
Extroverted	96	Introverted	31	11
Random-intuitive	54	Concrete-sequential	69	15
Open	33	Closure-oriented	98	7
Global	74	Particular	48	16
Synthetic	85	Analytic	28	25
Inductive	35	Deductive	86	17
Field-independent	57	Field-dependent	61	20

If we move now as such to Table 7 which indicate where there were significant differences between unit appraisal answers by learning styles, we can observe that it is consistently the second set of learning styles (that we grouped together because they generally involve conscious learning and attention to rules as evident in the definitions presented in Table 1) that provided the highest appraisal scores. For example, introverted learners generally enjoyed the readings (Q1) significantly more than the students who were identified as extroverted. They also significantly thought they learned more from the deductive unit (Q5) than the students who were identified as extroverted. As for the closure-oriented students, they significantly liked better the readings (Q1) and the grammar activities (Q2) from both the deductive and the inductive units than the open students, but thought they generally enjoyed more the inductive unit (Q3) and learned more from the inductive unit (Q5) than the open students, and enjoyed the structure of the deductive unit (Q6) more. Students with a particular rather than a global style significantly scored higher on the Likert scale for all aspects of the inductive unit and for four aspects of the deductive unit: enjoyment of the readings (Q1), enjoyment of the grammar activities (Q2), enjoyment of the unit in general (Q3) and appreciation of the way the unit was structured (Q6). Analytic learners preferred significantly more the readings in the inductive unit than the synthetic students. As for the deductive and inductive learners, it seems that only the deductive learners reacted positively to certain aspects of both units: the deductive learners appreciated more the grammar activities (Q2) and felt they improve more (Q4) than the inductive learners, and that in both units; the deductive learners enjoyed the way the deductive unit was structured (Q6), but felt they learned more (Q5) from the inductive unit. Answers from the inductive learners on the unit appraisal questionnaire and the learning style survey, as for the other styles in that group, failed to produce any significant difference. Finally, a few pairs of styles (random-intuitive and concrete-sequential; field-independent and field-dependent) did not react positively to any aspect of one unit or the other. Discussion will follow below.

Table 7
Relationships between unit appraisal and learning styles.

	Deductive treatment						Inductive treatment					
	Q1	Q2	Q3	Q4	Q5	Q6	Q1	Q2	Q3	Q4	Q5	Q6
Extroverted	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Random-intuitive	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Open	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Global	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Synthetic	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Inductive	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Field-independent	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Introverted	1006.00 −2.878 0.004	n.s.	n.s.	n.s.	1130.00 −2.007 0.045	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Concrete-sequential	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Closure-oriented	1139.00 −2.712 0.007	970.50 −3.660 0.000	n.s.	n.s.	n.s.	1210.00 −2.194 0.028	989.00 −3.424 0.001	1011.00 −3392 0.001	1039.00 −2.945 0.003	n.s.	1128.00 −2.698 0.007	n.s.
Particular	1259.00 −2.882 0.004	1299.00 −2.658 0.008	1278.00 −2.740 0.006	n.s.	n.s.	1331.50 −2.267 0.023	1281.00 −2.542 0.011	1355.00 −2.321 0.02	1200.00 −2.935 0.003	1382.50 −2.193 0.028	1299.00 −2.403 0.016	1146.00 −3.260 0.001
Analytic	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	859.00 −2.070 0.038	n.s.	n.s.	n.s.	n.s.	n.s.
Deductive	n.s.	1015.00 −2.986 0.003	n.s.	1077.00 −2.044 0.041	n.s.	1088.00 −2422 0.015	n.s.	1146.00 −2.185 0.029	n.s.	1186.00 −1.952 0.050	1086.50 −2.295 0.022	n.s.
Field-dependent	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

Note. n.s. = non significant differences ($p > 0.05$). Differences calculated with the Mann-Withney U. Each U value is followed by the Z value and by its p value.

Q1: Students who enjoyed the readings. Q2: Students who enjoyed the grammar activities. Q3: Students who enjoyed the unit in general. Q4: Students who felt they improved on their use of the targeted feature. Q5: Students who felt they learned from the unit. Q6: Students who liked the way the unit was structured.

5. Discussion

Our research questions did not specifically address the question of which approach, deductive or inductive, is more effective to learn grammar. We were cognizant from the start that only one treatment for each approach, and each on a different targeted language element, could not give us conclusive results. However, the results of our measures show that students learned from each unit (the gains were statistically significant), and that gains made in both units (inductive and deductive) were similar (no statistical difference between them).

Our first research question targeted the participants' preferences regarding the two grammar instructional treatments. All participants were subjected to the two treatments and rated the units through two questionnaires. The data showed that the participants generally preferred the type of grammar learning with which they were probably more familiar and that was cognitively less demanding as it did not require them to solve problems or discover patterns on their own: the deductive approach. This result is in line with prior studies such as the one by Vogel et al. (2011) that found that students preferred the deductive approach, but goes against what was found in Mohamed (2004), where no significant differences were found in terms of preferences. As noted earlier, however, the participants in Mohamed's study had not been exposed to any of the approaches prior to stating their preferences.

Students did not favor one approach over the other in so far as efficiency or effectiveness was concerned however. In Vogel et al. (2011), the participants had expressed that "explicit rule explanations provide them with a more extensive 'knowledge' and could enable them to form 'good grammatical habits' " (p. 368). In this case, the participants' age and academic levels may explain why they did not see all the advantages of one approach as compared to the other. It is interesting, however, to see that a certain number of students who did not particularly like the inductive approach found it effective.

Teachers did not try to "sell" one approach or another to the students. In fact, they were asked not to comment on it. A pedagogical implication stemming from these results might be to ensure that students who are unfamiliar with a particular approach understand its merits.

As reported in one of our previous research (Jean and Simard, 2011), L2 learners in Montreal as in other parts of the world (Loewen et al., 2009) do not generally enjoy studying grammar. This led us to conclude that learning grammar is a *mal nécessaire* (necessary evil): boring, but useful (Jean and Simard, 2011, p. 469). This fact is further confirmed with the answers given to the general question about the enjoyment of grammar learning: the average score was 2.42 out of a 5-point Likert-scale (5 being the highest score).

Our second research question addressed the issue of the possible links between the gains made on each unit between the pre- and posttest and learners' preferences in terms of the approaches. Our results did not show any type of relationships: being taught with one preferred type of approach does not seem to guarantee better learning, as far as gains measured by our tests are concerned. This result is in line with those of Vogel et al. (2011) who observed no relationship between the participants' preference and the scores obtained on the tests.

Our third research question targeted a possible differences in the gains (in terms of accurate use of the targeted grammar element) obtained through deductive and inductive grammatical instruction and students' learning styles as assessed through a self-report learning style survey. Again, our results revealed no differences in gains made on each unit according to the participants' self-reported learning styles. Inductive learners, for example, did not make more gains with the inductive unit. The same held true for the deductive learners and the deductive unit. Other learning styles did not have an influence either.

With our last research question, we looked at possible differences between the students' answers to the questions related to their unit preference and appraisal of each unit according to their learning styles as identified through a self-report learning style survey. We remark, first, that the majority of students (86 out of 138) assessed themselves as deductive in that survey. However, such a study can only speculate about the reasons why there are more deductive learners than inductive ones. More extensive past experiences with such an approach could be seen as a possible explanation. Other analyses (Table 3) show that the grammar activities of the deductive unit were preferred over the ones in the inductive unit. A certain relationship between the deductive learning style and preferred treatment of grammar could be indirectly drawn here: more deductive learners may make for more widespread appreciation of the deductive treatment. However the comparisons of the results of the learning style survey (Table 6) with the results of the unit preference questionnaire (Table 3) and the unit appraisal questionnaire (Table 2, questions 1–6) show a different pattern. Indeed, the results do not give clear indications as to which style could be more suited for one kind of instruction or the other: no relationships whatsoever were found between preferred unit and inductive and deductive

styles, nor with all the other styles used in the survey. However, the fact that a particular group of styles did not produce any relationships with the unit appraisal questions (Table 7) while the other group produced many instances of relationships (i.e., there were numerous instances of statistically higher appraisal scores with one group of styles and none with the other) is rather surprising. A possible answer could perhaps be attempted with regards to the Ehrman and Leaver (2003) construct which divides learning styles in two wide categories: synoptic and ectenic. "In foreign language learning, synoptic learning is reliant on intuition and subconscious control whereas ectenic learning generally occurs under the conscious control of the learner" (Leaver et al., 2005, p. 70). The only type of students who seemed to appreciate grammar instruction as presented in both units were those who reported learning styles (particular, analytic and deductive) found under the ectenic learning of the construct. (The Leaver, Ehrman and Shekhtman's construct does not include introverted and closure-oriented learning styles, however.) The field-dependent and the field-independent styles did not lead to any difference, possibly because it is less clearly defined in terms of conscious and rule learning than the other pairs, even though Leaver, Ehrman and Shekhtman's construct include field-dependent under the ectenic pole and field-independent under the synoptic pole.

Further probing into the learning styles and their definitions (Table 1) also provide some interesting food for thoughts as to why some learners did not interact positively with either explicit units: extroverted learners because the tasks were not social or interactive; open learners because they enjoy learning without concerns for rules; global learners because they are comfortable communicating even if they don't know all the words or the concepts; synthetic learners because they are the opposite of the analytic learners who tend to focus on grammar rules; inductive learners because rules are not their first priority. As for the two pairs of learning styles that fail to produce any kind of interaction effects (random-intuitive/concrete-sequential and field-independent/field-dependent), it may be that these two pairs of learning styles have less to do than the others with language learning, at least grammar instruction. The obvious question we are left with is why a specific group of learning styles did not react positively to any aspect of the inductive and the deductive unit, while positive reactions to many aspects of both the inductive and deductive units were observed from the other group of learning styles. The answer could possibly be found in the definition of each style in each group. It is apparent that the group of styles that did not produce significant results is not generally associated with learning through rules, and the other group does. It seems then that learning the rules through an inductive or a deductive approach does not make much difference for those students who appreciate being exposed to rules in an instructional sequence, but does not appeal much to students who rather like unconscious learning. We concluded earlier that inductive or deductive learning does not affect gains, and we can now conclude that specific learning styles are not associated with preferences for one type of learning or the other, but that when students exhibit learning styles that are in line with the enjoyment of learning through rules (i.e.: in an explicit manner), they react generally positively and indiscriminately to both inductive and deductive learning.

6. Conclusions

A number of conclusions can be drawn from this research, while keeping in mind that it was carried out with a limited number of students, representative of a small subsample of all the L2 learners in the world, and that there are of course a number of uncontrollable factors with any kind of classroom research as this one. First, grammatical learning gains can be made with one approach or the other. Secondly, learners prefer to learn grammar deductively; however they find both approaches equally effective. It is impossible to say if their preferences come from their degree of familiarity with the deductive approach or with the less cognitively demanding nature of the approach. We suspect it is both. Thirdly, preferences in terms of approaches and learning styles have no significant effect on learning gains. Lastly, positive reactions to different aspects of one unit or the other and learning styles lead to results that are quite interesting: positive effects did not seem to be related to the differences between inductive and deductive instruction. In fact, since both units were explicit, the results might rather indicate that certain learning styles - extroverted, open, global, synthetic, inductive - are less suited for explicit learning, while others - introverted, closure-oriented, particular, analytic and deductive – are more in line with the nature of explicit learning. Could it be then that some learners with specific learning styles (for example synoptic learners according to the Leaver, Ehrman and Shekhtman's construct discussed above) do not react emotionally well to explicit teaching or that their motivation is not optimal under that type of learning? We feel that it surely could be an avenue to explore in further research. Even though preferences and learning styles do not seem to affect learning (i.e., students seem to be able to adapt), teaching not in line with one's learning styles may in the long run discourage students to continue their language training.

Acknowledgments

This study was funded by the Social Sciences and Humanities Research Council of Canada. Partial preliminary results were presented at the conference of the American Association for Applied Linguistics in Denver in 2009. The authors wish to thank the anonymous reviewers for their insightful comments, the teachers and students who participated in the study and research assistants Nicolas Dalmasso and Michael Zuniga for their help.

Appendix A

Teaching sequences

Deductive unit	Inductive unit
Title: *Fabuleux déterminants*	**Title**: *Des pronoms pour raconter – Des contes à raconter*
Approach to grammar instruction: Deductive	**Approach to grammar instruction**: Inductive
Targeted grammar feature: Determiners (definite, indefinite, possessive, demonstrative)	**Targeted grammar feature**: Object pronouns (*le*, *la*, *les*, *l'*, *lui*, *leur*, *y*, *en*)
Topic: African fables	**Topic**: Tales from the Francophone world
Step 1: Knowing the unit Introduction to the topic of fables. Their origins, their narrative structure.	**Step 1: Knowing the unit** Introduction to the topic of tales. Their origins, their narrative structure.
Step 2: Knowing the use of determiners Introduction to the importance of determiners by reading an excerpt from *Le coupeur de mots* (Hans Joachim Scädlich) in which a schoolboy is reduced to talk without determiners or prepositions. Teacher explains why determiners are important.	**Step 2: Knowing the use of object pronouns** Introduction of the importance of using pronouns by reading a version of *Little Red Riding Hood* which contains numerous unnecessary repetitions due to the absence of pronouns. Students discuss meaning, then reflect on language: Why is this tale not so well written? What would you do to improve it?
Step 3: Reading a fable and starting the appropriation of determiners • Reading of an African fable. Determiners are highlighted. • Comprehension activity. • Opinion-sharing activity.	**Step 3: Reading a tale and starting the appropriation of object pronouns** • Reading of another version (by another author) of *Little Red Riding Hood* but with all the replacement pronouns highlighted. • Reflection activity on meaning. • Reflection activity on language: Why is this tale better written? What role do the highlighted words play?
Step 4: Understanding the use of determiners Presentation of a grammar explanation: "What is a determiner?" Questions are asked and answers are given. Teachers present it explicitly and deductively as a rule.	**Step 4: Discovering the use of the pronouns *le, la, l', les*** Observation and discovery activity: students underline the nominal clause used as subject in a sentence, then link it to the object pronoun that it replaces in a second sentence (ex.: ***Le Petit Chaperon rouge*** *aime beaucoup sa grand-mère. Sa grand-mère* ***l'****aime aussi beaucoup.)*
Step 5: Understanding the use of definite and indefinite determiners Presentation of a grammar explanation: "What is an indefinite determiner?" and "What is a definite determiner?" Same type of explanations as above.	**Step 5: Show understanding of the use of the pronouns *le, la, l', les*** • Observation and discovery activity: Students identify the verbal clauses in sentences and the nominal clauses inside these verbal clauses. Students then associate a short sentence using an object pronoun to each of the long sentences (ex.: *Le loup* ***mange la petite fille et sa grand-mère.*** *Le loup* ***les*** *mange*.) Students are led to discover what direct object pronouns replace. • Exercise: Students associate two sentences by their meanings. They then identify the clause that the pronoun replaces (ex.: *Le bûcheron a un fusil. Il ne l'utilise pas pour tuer le loup.* « *l'* » *est un pronom qui remplace* « *un fusil*».)
Step 6: Using definite and indefinite determiners and understanding a fable • Reading of a fable in which the students supply the missing definite and indefinite determiners. • Comprehension and opinion-sharing activity on the fable.	**Step 6: Using the object pronouns *le, la, l', les* and understanding a tale** • Exercise: Students fill in the missing direct object pronoun in the continuation of the story *Little Red Riding Hood.* • Reflection activity on meaning.

(*continued*)

Deductive unit	Inductive unit
Step 7: Understanding the use of possessive determiners Grammar presentation of possessive determiners: teachers present the rule with questions and answers supplied in the exercise book.	**Step 7: Discovering the placement of pronouns** Observation and discovery activity: Students discover with examples where to place direct object pronouns. They then write a rule about it.
Step 8: Using possessive determiners and understanding a fable • Reading of a fable. • Opinion-sharing activity on the fable. • Grammar exercise on the possessive using the fable: identification of the possessive, the noun giving its gender and number, and the possessor. • Reading of a fable in which the students supply the missing possessive determiners. • Comprehension and opinion-sharing activity on the fable. • Writing of two short descriptions of animals (pictures supplied in the workbook) using possessives (an example is supplied).	**Step 8: Discovering the use of *lui, leur, y en*and understanding a tale** • Reading of a tale from Palestine. • Reflection activity on meaning. • Reflection activity on language: students read the story again noticing the highlighted object clauses that are repetitious and trying to avoid unnecessary repetitions by using the pronouns *y, en, lui, leur.*
Step 9: Understanding the use of demonstrative determiners Grammar presentation of demonstrative determiners: teachers present the rule with questions and answers supplied in the exercise book.	**Step 9: Discovering the use of *lui, leur, y en*; identifying prepositional and nominal clauses** • Observation and discovery activity: students find the verbal clauses in given sentences then underline the prepositional clauses. Students then indicate the pronouns that took the place of the clauses in the corresponding sentences that use direct object pronouns (e.g.: L'enfant pauvre **obéit à l'enfant riche.** L'enfant pauvre lui obéit. "lui" remplace "à l'enfant riche". • Observation and discovery activity: from the examples provided in the previous activity, students write a rule for using the pronouns *lui, leur, y* and *en.* From supplementary examples, students add an element to their rule regarding the use of *en* to replace a nominal clause starting with an indefinite determiner (e.g.: *Les enfants mangent du pain. Les enfants en mangent.*) as opposed to a prepositional clause like in *L'enfant riche abuse de son pouvoir. L'enfant riche en abuse.*
Step 10: Using demonstrative determiners; understanding descriptions of animals • Grammar exercise: Supply the proper missing demonstrative in riddles using animals from the unit fables, then answer the riddles (ex.: ***Cet*** *agile mammifère rongeur se déplace très vite =* ***Le lièvre***.) • Writing of two short descriptions of animals using the riddles as models. Students make their peers guess the answers to their riddles.	**Step 10: Using the pronouns *lui, leur, y, en*** • Exercise: Students identify the prepositional clauses or the nominal clauses in sentences and replace it with a pronoun. • Reflection activity on meaning.
Step 11: Identifying and using determiners; understanding a fable • Grammar exercise: Supply the missing nominal clauses in a fable. These clauses include definite, indefinite, possessive and demonstrative determiners. Choices are provided. • Comprehension and opinion-sharing activity on the fable.	**Step 11: Using object pronouns; understanding a tale** • Exercise: Students read another tale and underline all the object pronouns that they see. They then make an arrow to the prepositional or nominal clause that they replace. • Reflection activity on the meaning of the fable. • Reflection activity on language: Students write a summary of what they have learned on object pronouns.
Step 12: Understanding a fable; choosing the appropriate determiners • Grammar exercise: Supply the missing definite, indefinite, possessive and demonstrative determiners in a fable. • Opinion-sharing activity on the fable.	**Step 12: Understanding a tale; using object pronouns** • Reading of a tale from Niger. • Reflection activity on meaning. • Exercise: Students rewrite the story using more pronouns to avoid repetitions.
Step 13: Creating a fable and using determiners accurately • Final task: Completing a fable already started, or translating into French a fable from one's country, or inventing a new fable. Using determiners appropriately. • Sharing the fables or publishing a book of fables.	**Step 13: Creating a tale and using object pronouns** • Final task: Completing a tale already started, or translating into French a tale from one's country, or inventing a new tale. Using object pronouns appropriately. • Sharing the tales or publishing a book of tales.

Appendix B

Form A deductive unit test

1. Choisis le déterminant approprié dans chaque cas.

Gratitude

(fable d'Afrique du Nord)

Un jour, ***un*** – ~~***son – ce***~~ brave homme découvre ***un - le - ce*** bébé serpent et décide de le garder. Il le rapporte chez lui et lui donne à manger, car ***ce - mon - un*** serpent était *visiblement* ***un - son - cet*** orphelin. L'homme s'occupe de lui avec beaucoup de soin jusqu'à ce que ***le - ton - un*** serpent devienne adulte.

Un matin que l'homme s'approche pour dire bonjour à ***son - un - leur*** serpent, qu'il considère comme ***un - son - ce*** propre fils, celui-ci s'enroule autour de son cou et dit :

- À présent, je vais te tuer. ***La - une - cette*** gratitude n'existe pas dans ce monde.
- Eh, attends un peu, s'écrie l'homme. Allons demander à ***sa - cette - leur*** vache là-bas ce qu'elle en pense.

Mais ***la - une - votre*** vache répond :

- Non, la gratitude n'existe pas. Pas de la part de l'homme à qui je donne mon lait toute ma vie et qui me tuera afin de manger ***ma - la - une*** chair.

Ensuite, ils interrogent un arbre.

- Non, il n'y pas de gratitude sur cette terre, répond l'arbre. ***Les - Mes - Ces*** hommes mangent ***les - mes - ses*** fruits, chaque année, mais à la fin ils vont me couper et me brûler.

Puis, ils interrogent un bœuf.

- Non, répond le bœuf, il n'y a pas de gratitude. Je travaille très fort, année après année, transportant de lourdes charges, et à la fin, ils vont me tuer pour que ma peau serve à la fabrication de ***ses - ces - leurs*** chaussures.

Le serpent, convaincu, décide de tuer l'homme. Toutefois, l'épouse de son maître, ayant tout entendu, sort de la maison et, pour sauver ***son - sa - un*** mari, offre au serpent son mets favori : ***une - son - sa*** assiette de crème. -

- Vite, tue-le, dit à l'homme un hérisson qui avait tout entendu.

L'homme prend alors un bâton et tue le serpent. Le hérisson, lui, part de là très vite. Il s'est dit qu'il n'attendrait pas de savoir si l'homme savait ce qu'est la gratitude.

(Adapted from Knappert, J. (1982). *Fables d'Afrique*. Paris: Castor Poche Flammarion.)

2. Insère les mots (déterminants) qui manquent. Le genre des noms est indiqué entre parenthèses.

Exemple : Où avez-vous acheté ___*vos*___ beaux souliers *(masc.)*?

a) Vous avez beaucoup acheté et maintenant il faut payer _____ achats *(masc.)*, monsieur!
b) Marie est _____ soeur *(fém.)*, dit Paul. Je suis bien son frère.
c) Je n'ai jamais vu _____ fille-là *(fém.)*.
d) _____ politesse *(fém.)* est une grande qualité.
e) J'ai _____ problème *(masc.)*, vous pouvez m'aider?
f) Marie ne parle pas souvent à _____ père *(masc.)* parce qu'elle n'habite plus à la maison paternelle.
g) Tu as un calendrier. Quand seront _____ vacances *(fém.)* de Pâques cette année?
h) Pierre, quelle est ____ date *(fém.)* de naissance? Tu es Capricorne?
i) Achète-moi _____ pommes *(fém.)* quand tu iras au marché!
j) Chloé et Saadia n'ont pas vu _____ parents *(masc.)* depuis deux semaines et elles n'aiment pas être seules à la maison.

3. Donne, si tu peux, des exemples de :

Déterminants (articles) définis : _____

Déterminants (articles) indéfinis : _____

Déterminants (adjectifs) possessifs : _____

Déterminants (adjectifs) démonstratifs : _____

Appendix C

Learning style survey

SECTION 2: Your learning style[a]

With the following questions, we want to know your preferences in terms of learning. For each item, indicate the response that represents best what you do in general. Please make sure you complete all items. When you read the statements, try to think about what you generally do when learning. Do not spend too much time on any item – indicate your immediate feeling and move on to the next item.

Part I	Always	Often	Sometimes	Rarely	Never
1. When I am in a large group, I tend to keep silent and listen.					
2. I only have a few interests, and I really concentrate on them.					
3. It is easy for me to talk to strangers.					
4. I learn better when I work or study with others than by myself.					
5. I learn better in the classroom than with a private tutor.					
6. Interacting with lots of people in class gives me energy.					
7. I prefer individual or one-on-one games and activities.					
8. After working in a large group, I am very tired.					

Part II	Always	Often	Sometimes	Rarely	Never
1. I plan carefully for future events.					
2. I prefer things presented in a step-by-step way.					
3. I like to discover things myself rather than have everything explained to me.					
4. I read instruction manuals (for example, for computers or VCRs) before using the device.					
5. I trust concrete facts instead of new, untested ideas.					
6. I add many original ideas during class discussions or activities.					
7. I accept easily new suggestions from my peers.					
8. I follow directions carefully.					

Part III	Always	Often	Sometimes	Rarely	Never
1. I feel comfortable not understanding everything in class.					
2. I have many piles of paper on my desk at home.					
3. I like to plan language study sessions carefully and do lessons on time or early.					
4. I delay finishing assignments when I have other things to do.					
5. My class notes, handouts, and other school materials are carefully organized.					
6. I feel comfortable not finding immediate answers to my questions in class.					
7. I like to be certain about what things mean in a language.					
8. I like to know how to use grammar rules and why I need to use them.					

Part IV	Always	Often	Sometimes	Rarely	Never
1. When I get the main idea of what I hear or read, it's enough for me.					
2. I'm good at catching new words when I hear them.					
3. I need very specific examples in order to understand fully.					
4. I leave aside details if they don't seem important to the task.					
5. I prefer short and simple answers rather than long explanations.					
6. It is easy for me to see the overall plan or big picture.					
7. I enjoy activities where I have to fill the blanks with missing words.					
8. I pay attention to specific facts or information.					

Part V	Always	Often	Sometimes	Rarely	Never
I can quickly summarize what I hear or read.					
I am good at noticing even the smallest details.					
When I read or write, I go first to the main points.					
I like to focus on grammar rules.					
I'm good at solving complicated mysteries and puzzles.					
I use what's going on around me to try to understand what people say.					
I have a hard time understanding when I don't know every word.					
I enjoy activities where I have to put many ideas together.					

(*continued*)

Part VI	Always	Often	Sometimes	Rarely	Never
1. I want to be given rules rather than being asked to discover them.					
2. I prefer to learn the rules of a new game as I play it.					
3. When learning a new game, I like to know all the rules before playing.					
4. I find memorizing grammar rules a waste of time.					
5. I figure out rules by myself based on what I hear or read.					
6. When learning new grammar, I like to be presented with the rule before doing exercises on it.					
7. I find memorizing grammar rules very useful.					
8. I like to discover grammar rules as I do exercises.					

Part VII	Always	Often	Sometimes	Rarely	Never
1. When I speak or write in a second language (French), I am able to pay attention to the correct grammatical structures to use.					
2. Details are unimportant for me.					
3. When I speak or write, I concentrate on saying something meaningful rather than saying or writing it well.					
4. When I compare two illustrations with slight differences, I can easily find these differences.					
5. I can concentrate even though there are lots of distractions around.					
6. When I read, I pay more attention to the details than to the main points.					
7. I need to be in a quiet environment to concentrate.					
8. When I read, I can summarize the main ideas and forget about the details.					

[a] Adapted from Cohen, A. D., Oxford, R. L., and Chi, J. C. (2002). *Learning style survey: Assessing your own learning styles*. Minneapolis, MN: Center for Advanced Research on Language Acquisition, University of Minnesota. [In Cohen and Weaver (2006), pp. 15-21].

Appendix D

Table D1 Pre- and post-treatment tests: Mean, standard deviation, distribution.

		Pretest			Postest		
		Mean (SD)	Skewness (SE)	Kurtosis (SE)	Mean (SD)	Skewness (SE)	Kurtosis (SE)
Deductive	Part 1	12.23 (2.31)	−1.021 (0.207)	0.626 (0.411)	12.83 (2.13)	−1.153 (0.207)	1.037 (0.411)
	Part 2	5.91 (2.35)	−0.483 (0.207)	−0.380 (0.411)	6.51 (1.91)	−0.521 (0.207)	−0.021 (0.411)
	Total	18.13 (3.97)	−0.616 (0.207)	−0.251 (0.411)	19.34 (3.54)	−0.797 (0.207)	0.166 (0.411)
Inductive	Part 1	8.83 (2.66)	−0.031 (0.207)	−0.054 (0.411)	10.19 (2.69)	−0.222 (0.207)	−0.808 (0.411)
	Part 2	5.03 (2.02)	0.214 (0.207)	−0.458 (0.411)	6.14 (2.17)	−0.525 (0.207)	0.050 (0.411)
	Total	13.85 (3.93)	0.239 (0.207)	−0.020 (0.411)	16.33 (4.24)	−0.237 (0.207)	−0.585 (0.411)

Note. Part 1, max = 15; part 2, max = 10; Total = 25. $n = 137$.

References

Cohen, A.D., Oxford, R.L., Chi, J.C., 2002. Learning Style Survey: Assessing Your Own Learning Styles. Center for Advanced Research on Language Acquisition, University of Minnesota, Minneapolis, MN [In Cohen & Weaver, 2006, pp. 15–21].

Cohen, A.D., Oxford, R.L., 2002. Young Learners' Language Strategy Use Survey. Center for Advanced Research on Language Acquisition, University of Minnesota, Minneapolis, MN [In Cohen & Weaver, 2006, pp. 75–78].

Cohen, A.D., Weaver, S.J., 2006. Styles and Strategies-based Instruction: a Teachers' Guide. Center for Advanced Research on Language Acquisition, University of Minnesota, Minneapolis, MN.

Decoo, W., 1996. The induction-deduction opposition: ambiguities and complexities of the didactic reality. IRAL – Int. Rev. Appl. Linguist. Lang. Teach. 34, 95–118.

DeKeyser, R., 1995. Learning second language grammar rules. An experiment with a miniature linguistic system. Stud. Sec. Lang. Acquis. 17, 379–410.

DeKeyser, R., 1998. Beyond focus on form. In: Doughty, C., Williams, J. (Eds.), Focus on Form in Second Language Acquisition. Cambridge University Press, Cambridge, pp. 42–63.

Dörnyei, Z., 2005. The Psychology of the Language Learner: Individual Differences in Second Language Acquisition. Lawrence Erlbaum, Mahwah, NJ.

Dörnyei, Z., 2009a. Individual differences: interplay of learner characteristics and learning environment. Lang. Learn. 59, 230–248.

Dörnyei, Z., 2009b. The Psychology of Second Language Acquisition. Oxford University Press, Oxford.
Dörnyei, Z., Skehan, P., 2003. Individual differences in second language learning. In: Doughty, C.J., Long, M.H. (Eds.), The Handbook of Second Language Acquisition. Blackwell, Malden, MA and Oxford, UK, pp. 589–630.
Doughty, C., 2004. Effects of instruction on learning a second language: a critique of instructed SLA research. In: VanPatten, B., Williams, J., Rott, S., Overstreet, M. (Eds.), Form-meaning Connections in Second Language Acquisition. Lawrence Erlbaum, Mahwah, NJ, pp. 181–202.
Ellis, N.C., 2008a. Implicit and explicit knowledge about language. In: Cenoz, J., Hornberger, N.H. (Eds.), Encyclopedia of Language and Education, Knowledge about Language, second ed., vol. 6. Springer, New York, pp. 119–132.
Ellis, R., 2008b. The Study of Second Language Acquisition, second ed. Oxford University Press, Oxford.
Ehrman, M., Leaver, B.L., 2003. Cognitive styles in the service of language learning. System 31, 393–415.
Erlam, R., 2003. The effects of deductive and inductive instruction on the acquisition of direct object pronouns in French as a second language. Mod. Lang. J. 87, 242–260.
Haight, C.E., Herron, C., Cole, S.P., 2007. The effects of deductive and guided inductive instructional approaches on the learning of grammar in the elementary foreign language college classroom. Foreign Lang. Ann. 40, 288–310.
Hwu, F., Sun, S., 2012. The aptitude-treatment interaction effects on the learning of grammar rules. System 40, 505–521.
Hatch, E., Faradhy, H., 1982. Research Design and Statistics for Applied Linguistics. Newbury House Publishers, Rowley, MA.
Jean, G., Simard, D., 2011. Grammar teaching and learning in L2: necessary, but boring? Foreign Lang. Ann. 44, 467–494.
Larson-Hall, J., 2010. A Guide to Doing Statistics in Second Language Research Using SPSS. Routledge, New York.
Leaver, B.L., Ehrman, M., Shekhtman, B., 2005. Achieving Success in Second Language Acquisition. Cambridge University Press, Cambridge.
Loewen, S., Li, S., Fei, F., Thompson, A., Ahn, S., Chen, X., 2009. L2 learners' beliefs about grammar instruction and error correction. Modern Lang. J. 93, 91–104.
Mohamed, N., 2004. Consciousness-raising task: a learner perspective. ETL J. 58, 228–237.
Nassaji, H., Fotos, S., 2011. Teaching Grammar in Second Language Classrooms. Integrating Form-focused Instruction in Communicative Context. Routledge, New York.
Norris, J.M., Ortega, L., 2000. Effectiveness of L2 instruction: a research synthesis and quantitative meta-analysis. Lang. Learn. 50, 417–528.
Vogel, S., Herron, C., Cole, S.P., York, H., 2011. Effectiveness of a guided inductive versus a deductive approach on the learning of grammar in the intermediate-level college French classroom. Foreign Lang. Ann. 44, 353–380.
Weinberg, S.L., Abramowitz, S.K., 2002. Data Analysis for the Behavioural Sciences Using SPSS. Cambridge University Press, New York.
Widdowson, H.G., 1978. Teaching Language as Communication. Oxford University press, Oxford.