THE REVISION OF SYNTACTIC ERRORS RELATED TO COMPLEX SENTENCES IN FRENCH L1: STRATEGIES OF SECONDARY SCHOOL ADVANCED WRITERS

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Abstract

This article presents a description of the revision strategies targeting complex sentences of 16 secondary school advanced writers (15-17 years old) in the context of French L1 instruction. As the literature indicates, most errors in students' texts are syntactic errors (Boivin & Pinsonneault, 2018), and revising them entails a heavy cognitive load (Roussey & Piolat, 2008). We conducted a multiple case study among these advanced writers to identify their detection, diagnosis and correction strategies targeting syntactic problems. Thinking-aloud (Ericsson & Simon, 1993; Hayes & Flower, 1980), they revised one individual text and one experimental text containing 22 different syntactic errors related to complex sentences. We focused on the revision strategies leading to accurate changes. Our results show that advanced writers make a very limited use of detection strategies. Their diagnosis strategies are mainly reflections, grammaticality judgments and rereadings. Students with high rates of accurate changes in the experimental text use fewer diagnosis strategies than those with average rates. Self-questioning appears to be a strategy most used by students with high rates of accurate changes. The corrections are generally precise and made immediately after a problem is detected. Looking at individual cases, we also present salient profiles based on the students' posture toward revision and syntax.

Keywords: revision strategies, syntax, complex sentences, teaching and learning of writing in French L1, advanced writers in secondary school

Roussel, K., & Boivin, M.-C. (2021). The revision of syntactic errors related to complex sentences in French L1: Strategies of secondary school advanced writers. L1-Educational Studies in Language and Literature, 21, 1-40. https://doi.org/10.17239/L1ESLL-2021.21.01.07

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1. INTRODUCTION

This paper reports on a multiple case study exploring the strategies used by advanced writers in secondary school when they accurately correct syntactic errors related to complex sentences as they revise written texts.

At the end of their compulsory education in French L1 (11th grade), Quebec students exhibit knowledge gaps in writing, as do other students in the francophone regions who have reached the same level of education (Boivin & Pinsonneault, 2018; Chartrand & Lord, 2013; Diepe, 1995). Studies show that from primary school to university, Quebec students' most frequent errors in written texts are related to syntax and grammatical spelling (Ammar, Daigle & Lefrançois, 2016; Boivin & Pinsonneault, 2018, Boivin & Roussel, 2019; MELS, 2012, Roy, Lafontaine & Legros, 1995). More specifically, at the end of their compulsory education, students make, on average, 3,9 syntactic errors per 100 words (*SD* = 2,1; *min* = 0,6; *max* = 11). The most frequent are errors in punctuation (1,7 error/100 words), errors in the construction of simple sentences (1,1 error/100 words) and errors in the construction of complex sentences (0,6 error/100 words)[1]. In addition to their syntactic errors, these students make 1,6 error per 100 words (*SD* = 1,9; *min* = 0,0; *max* = 8,3) related to agreement (Boivin & Pinsonneault, 2018, p. 51-53), which also calls into question their sentence construction knowledge (Manesse & Cogis, 2007). Moreover, it is well known that, as an effect of their syntactic maturity (Hunt, 1965), writers in 11th grade produce more complex syntactic structures, notably complex sentences made by juxtaposition, coordination and subordination (Paret, 1991). Therefore, the written syntax of students, and especially complex sentences, is of particular interest.

Existing models of the revision process do not directly describe the place and role of syntax (cf. Chanquoy, 2009; Piolat, 2004). However, studies indicate that revising syntax involves a higher cognitive load than revising spelling (Piolat, Roussey, Olive & Amada, 2004; Roussey & Piolat, 2008). Unlike spelling errors, which have very limited correction options, syntactic errors may be corrected in a variety of ways—changing one word, one clause, or even a whole sentence, and this, in part, could explain the greater cognitive load: writers must evaluate these numerous syntactic possibilities, choose which one most closely reflects the idea they wish to express, and assess the grammaticality of the whole sentence.

Studies have also shown that students pay little attention to syntax while revising, when compared to lexical or spelling problems (Grégoire, 2012), even when their teacher give them written feedback on a syntactic error (Ammar et al., 2016). Ac-

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[1] These data, collected in texts, could suggest an avoidance strategy. While it is quite difficult to avoid contexts requiring punctuation or agreement, it is much easier to avoid complex sentences, which could explain why this number of errors per 100 words is relatively low (N=0,6) compared to punctuation and grammatical spelling, for instance, even if complex sentences represent a real challenge for students (see section 2.2).

cording to Graham & Perin (2007), who completed a meta-analysis of over 100 empirical studies on writing instruction, the explicit teaching of writing strategies is the most efficient way to help secondary school students improve their linguistic skills, especially with low-achieving writers. Therefore, a better syntactic knowledge and better revision strategies seem relevant to address some of the important weaknesses in students' texts.

Given the high rate of syntactic errors in texts written by Quebec 11th grade French L1 students, the interest of focusing on their complex sentences—as they naturally tend to use them more often—as well as the gap in the scientific knowledge regarding the description of the revision of syntax, we set ourselves this general research question:

> What are the secondary school advanced writers' strategies for the accurate revision of syntactic errors related to complex sentences in French L1?

Our results should be useful for teaching strategies for the revision of syntax, and especially complex sentences, as we first determine which strategies might work for secondary school students. Focusing on *advanced writers* (as defined in section 3.1), not experts nor beginners, is relevant given that experts' skills may not be directly transferable to students (cf. David, 1994; Fayol, 2007). In addition, the description of the actual capacities of good students seems pertinent to eventually determine accurately how to help beginning writers improve their skills. Considering the length of this paper, we will focus only on strategies leading to *accurate* changes, as this choice allows us to provide a first description of the advanced writers revision skills.

The main aspects of the conceptual framework and the methodology of our multiple case study on syntax revision are presented in Sections 2 and 3. Our results in Section 4 provide a description of the revision strategies used by secondary school advanced writers and some salient reviser profiles. We discuss the limits and implications of our results in Section 5.

2. CONCEPTUAL FRAMEWORK TO STUDY THE REVISION OF SYNTAX

This section presents the relevant concepts and models elaborated in cognitive psychology for the study of revision, followed by a brief description of the relevant aspects of syntax, and its place in revision.

2.1 Revision in cognitive psychology

Since Hayes & Flower (1980), the focus in writing studies has moved from the text as a product to writing as a process. Consequently, writing is seen as the combination of three interacting subprocesses: planning, translation and revision (Hayes & Flower, 1980, p. 11). This seminal model of *competent writer* is still the dominant model used in the field of teaching and learning of writing (cf. Colognesi & Lucchini, 2018; Marmy Cusin, 2021; Turgeon, Tremblay & Gagnon, 2020).

2.1.1 Revision as a process

Revision is seen as a crucial component of the writing process, especially for the learning of writing (Allal, Chanquoy & Largy, 2004; Becker, 2006; Blain, 1996; Fayol, 2007). The revision process has been the subject of numerous theoretical and empirical studies, and thematic volumes (Allal et al., 2004; Barré-De Miniac, 1995; Beard et al., 2009; Blain & Lafontaine, 2010; Horning & Becker, 2006; Lindgren & Sullivan, 2006). Among the existing revision models (Berninger & Swanson, 1994; Butterfield, Hacker & Albertson, 1996; Flower, Hayes, Carey, Schriver & Stratman, 1986; Hayes, 1996; Hayes & Flower, 1980; Kellogg, 1996; Scardamalia & Bereiter, 1983; see also the review by Chanquoy,2009), we present three widely used models from which we draw the concepts used for our analysis.

The educational standpoint of the revision model proposed by Scardamalia and Bereiter (1983) makes it a key model for studies in the teaching and learning of writing (Chanquoy, 2009; Garcia-Debanc & Fayol, 2002; Fayol, 2007). Conducting empirical studies among young writers, Scardamalia & Bereiter define their "procedural facilitation" around three linear steps, which they call *compare/diagnose/operate*, or *CDO* (1983, p. 68). The first step is a *comparison* of the actual text with the text intended by the writer. If a mismatch is detected, the writer may consider it acceptable, which starts a new *CDO* cycle, or unacceptable, which leads to the second step: *diagnose*. At this step, the writer identifies the nature of the unacceptable mismatch by calling upon his knowledge. In the third step, the writer must choose a correction based on the diagnosis and *operate* the change in the text. Once the *CDO* cycle started, all other writing processes stop, so the revision process benefits from a maximum of attentional resources. The *CDO* cycle can be used as long as the writer finds it necessary, whether s/he makes a conscious decision or not.

The second model is the one designed by Flower et al. (1986), building on previous work by Hayes & Flower (1980) and further improved by Butterfield et al. (1996). Its main contribution lies in identifying the knowledge and processes brought into play in text revision (Chanquoy, 2009; Piolat et al., 2004), notably a more detailed view of the *compare* process. Its *evaluation* component includes three reading goals: *read to comprehend*, *read to evaluate* and *read to define problems* (Flower et al., 1986, p. 24), the latter calling upon knowledge necessary to diagnose the problems encountered. Unlike Scardamalia & Bereiter, Flower et al. (1986) postulate that detection and diagnosis are not linear steps, but rather two *strategical paths*: if the problem is ill-defined, detection will lead to rewriting the text segment without any specific knowledge of the problem, a strategy called *Detect/Rewrite*; in contrast, if the problem is well defined, the diagnosis will lead to revising it specifically, a strategy called *Diagnose/Revise* (Flower et al., 1986, p. 42).

Known as the *New Model* (Chanquoy, 2009), the model developed by Hayes (1996, 2004) is the first to put reading at the same level as the other revision subprocesses, instead of including it in detection. The design of this *New Model* includes a *Control Structure*, *Fundamental Processes*, and *Resources*. The *Control Structure* is

seen as the task schema for revision, which is "a package of knowledge, acquired through practice, that is useful for performing the task" (Hayes, 1996, p. 26). In this model, detection, diagnosis and correction are fully restructured within the *Fundamental processes*, namely, the *Reflection* process*,* which includes problem-solving and decision-making*,* the *Text processing* process*,* associated with critical reading, and the *Text production* process, associated with correction (Hayes, 1996, p. 17). Along with Flower et al. (1986), Hayes does not propose a typical way to activate revision and does not linearize the process, unlike Scardamalia & Bereiter.

As shown in this section, detection, diagnosis and correction of a problem may be named or organized differently across revision models, alongside other components useful to improve a given text, such as reading, reflection and comparison. These elements are highly relevant for our study on revision strategies (see Table 3).

2.1.2 Revision strategies

The revision process calls upon a great amount of knowledge and procedures, such as linguistic knowledge and the specifics of the writing task (Bisaillon, 2007; Chanquoy, 2009; Hayes & Flower, 1980; Scardamalia & Bereiter, 1983; Sommers, 1980). One way to manage its cognitive load (Fayol & Largy, 1992; Saint-Laurent, Giasson, Simard, Dionne & Royer, 1995; Tardif, 1992) is by using revision strategies. It has been shown that teaching writing strategies to students, including revision strategies, improves their writing skills (Graham & Perin, 2007).

As a subcategory of writing strategies (Torrance & Galbraith, 2006), a revision strategy is a set of cognitive and metacognitive actions aimed at improving a text (Legendre, 2005, p. 1262). There is no perfect set of revision strategies which fits all writers, given that every writer is different (Flower et al., 1986; Niedo Jones & Berninger, 2016) and has his/her "writing signature" (Levy & Ransdell, 1996).

Based on the results of six empirical studies describing expert writers, we have identified thirteen general revision strategies that could be effective to detect, diagnose and correct a problem. These strategies constitute a part of the final inventory of 35 strategies presented in Table 3.

Detection strategies include rereading (Flower et al., 1986; Hayes, 1996), reflection (Hayes, 1996), anticipation (Bisaillon, 2007), comparison (Bereiter & Scardamalia, 1987; Bisaillon, 2007; Scardamalia & Bereiter, 1983) and setting goals (Bisaillon, 2007; Flower et al., 1986; Sommers, 1980). Among the diagnosis strategies, we find rereading and reflection again, stating a rule and consulting external resources, such as a dictionary or an expert (Bisaillon, 2007; Hayes & Flower, 1980; Flower et al., 1986). Correction is associated with two main types of strategies[2]. The first concerns the *moment* when the correction is made (Bisaillon, 2007): instead of immediately

[2] *Corrections strategies such as addition, deletion and movement are described in Section 2.2.*

correcting a problem, one can choose to postpone its correction; one can also correct a problem automatically, without prior diagnosis. The second type of correction strategies is related to the *level of precision* of the correction made (Flower et al., 1986): instead of precisely targeting the problem, one can choose to make an imprecise correction, as a result of a diagnosis failure or the presence of multiple problems (Flower et al., 1986); in such cases, a large segment will be rewritten or simply erased. For example, if a relative pronoun is incorrect, it is possible to replace it with another one, correct or not (precise correction), but it is also possible to erase the whole sentence and reformulate the initial idea (imprecise correction).

Having defined the revision process, presented its main components and identified general revision strategies, we now turn to the syntactic aspects relevant to revision.

2.2 Syntax and revision

Syntax is the linguistic component that governs the hierarchical organization of words and phrases, including word order (cf. for French, among many others Boivin & Pinsonneault, 2020b; Tellier, 2016). Syntax is relevant for the present study in two ways: first, syntax provides tools for the revision process, and second, syntactic errors in a text can be the objects of revision.

2.2.1 Tools for syntactic analysis and revision

In French class, the syntactic tools for sentence analysis are the basic sentence model, the syntactic manipulations and the grammaticality judgment (Boivin & Pinsonneault, 2020b). These tools are also useful for revision.

Originating from a didactic transposition of linguistic theory, the basic sentence model is an abstract representation of the sentence, which may help writers analyze their own realized sentences (Boivin, 2012; Nadeau & Fisher, 2006; Paret, 1999; Riegel, Pellat & Rioul, 2018). This syntactic tool can be represented with grammatical categories [*S = NP + VP (+ XP)*] or grammatical functions [*S = subject + predicate (+ complement)*] (cf. Boivin, 2012; Chartrand, Lord & Lépine, 2016). The basic sentence model corresponds to a declarative, positive, neutral, personal and active sentence. If possible, full phrases or a generic pronoun (*something, someone*) are preferred to anaphoric elements (*it, s/he*). Thus, the realized sentence in (a) corresponds to the basic sentence in (b).

a) *Did he not move it, two weeks ago, to another room?*

b) *Gabriel moved the bookcase to another room two weeks ago. / Someone moved something to another room two weeks ago*.

The basic sentence model, and especially its reconstruction as in (b), is a powerful tool to reflect on language because it reveals the language's regularities and can support the analysis of almost any sentences in French (Boivin, 2012; Paret, 1999). For

instance, it can help detect structural, agreement and punctuation problems, select accurate pronouns, or identify the different clauses in a complex sentence, each clause corresponding to a basic sentence itself.

Once the basic sentence is reconstructed, syntactic manipulations can be applied to a constituent to identify its grammatical properties such as category, function and boundaries (Boivin & Pinsonneault, 2020b; Chartrand, Aubin, Blain & Simard, 1999; Gauvin, 2011; Tellier, 2016). These tests allow the writer to validate the sentence structure but also the agreements within and between phrases. In French classes, the main syntactic manipulations taught are *substitution*, *deletion*, *addition* and *movement*. For example, substituting a personal pronoun for a nominal phrase and making a cleft sentence with "C'est… qui" (*It is… who*) are characteristic of the subject. Moving and deleting a prepositional phrase and adding before it "et cela se passe" (*and this happens*) characterize an adjunct (i.e. a phrase that is directly under S, not inside the verb phrase).

Finally, each application of a syntactic manipulation requires the use of the speaker's grammaticality judgment (Boivin, 2009; Gauvin, 2011), i.e. to "determin[e], as a speaker, if a sentence is part of our own language or not" (Boivin, 2012, free translation, p. 183-184). Speakers can express this explicitly (*this sentence is grammatical/ungrammatical*) or more implicitly (*it seems ok/something sounds weird*). Grammaticality judgment only calls upon syntactic knowledge, not semantic nor stylistic (Chomsky, 1957; Tellier, 2016), hence the famous example of a grammatical sentence in c), yet problematic from a semantic point of view:

c) Colorless green ideas sleep furiously. (Chomsky, 1957, p. 15)

Sometimes, the grammaticality of a "manipulated" sentence cannot be established with only one test, so one must consider the results from a set of manipulations to draw a significant conclusion. Grammaticality judgments can, of course, be used on any given sentence without the prior use of manipulations.

Few empirical studies have focused on students using these syntactical tools, especially in French. Overall, even if metasyntactic skills—i.e. the capacity to reflect on syntax—improve with age (cf. Bialystok, 1986; Gombert, 1990), this improvement is quite slow from primary school to university. Grammaticality judgments are generally correct from around the age of seven, and it is easier to judge an ungrammatical sentence than a grammatical one (Bialystok, 1986; Gombert, 1990). However, students between the ages of 11 and 17 rarely use the syntactic manipulations properly or the correct grammatical metalanguage (for a review, see Boivin, 2018 and references therein). Moreover, students between 13 and 20 mostly affirm grammatical conclusions, such as "this is the subject," rather than ask questions about syntax and formulate grammatical hypotheses, such as "Can this be the subject? If so, I could replace it with a pronoun" (Boivin, 2009, 2014; Roy, 1995).

2.2.2 The use of complex sentences in revision

Different types of complex sentences can be used by writers as a revision strategy to improve the combination of ideas in one sentence. In that perspective, complex sentences are useful tools for describing and categorizing many syntactic changes made to one's text. Three mechanisms allow the formation of complex sentences, namely juxtaposition, coordination and subordination. *Juxtaposition* is the combination of two sentences side by side, and it is signaled in writing by a punctuation mark between them, typically a comma, as in (d). The *coordination* of sentences involves the use of a coordinating conjunction, such as *and, or, nor* or *but,* as shown in (e), and *subordination* generally involves a complementizer as a subordinate conjunction (f) or a relative pronoun (g), depending on the type of subordinate clause (cf. Boivin & Pinsonneault, 2020b; Riegel et al., 2018).

d) [The woman peers at the birds]$_1$ ***,*** *[the man reads his newspaper]$_2$.*

e) [The woman peers at the birds]$_1$ ***but*** *[the man reads his newspaper]$_2$.*

f) The man thinks [that the woman peers at the birds].

*g) [The woman [****who*** *is sitting next to the man]$_2$ peers at the birds]$_1$.*

If juxtaposition and coordination combine two syntactically independent sentences, subordination implies that a dependent clause has been inserted into a main clause. At the opposite of these three mechanisms is sentence *distribution*, as put by Faigley & Witte (1981)—or sentence *scission*, as we prefer to say to avoid any confusion with the statistical term. In that case, the writer deliberately chooses to produce two simple sentences rather than a single complex one, or to divide a complex sentence into two or more sentences.

2.2.3 Syntactic errors and syntactic maturity

A syntactic error is present when a sentence is ungrammatical based on the standard register of French. In their typology of linguistic errors, Boivin & Pinsonneault (2020a) identify the errors related to complex sentences in French. Table 1 below presents and exemplifies them[3].

[3] Following Boivin & Pinsonneault (2020a), Table 1 includes punctuation errors, because the presence of the punctuation marks depends on a syntactic analysis; other analyses consider punctuation and syntax as a single criterion (cf. MELS, 2012, p. 92).

Table 1. Types of syntactic errors related to complex sentence in French

Complex sentences' mechanisms	Errors types	Examples of errors
Coordination	Incorrect position of the correlative term	**Lily souhaite **premièrement** devenir célèbre, deuxièmement, elle voudrait voyager en Asie.* [**Lily wishes **first** to become famous, second, she wants to travel in Asia.*]
	Punctuation missing before conjunctions	**Tu dors **ø** mais ne rêves jamais.* [**You sleep **ø** but never dream.*]
	Clauses with different statuses	**Manger des légumes **et le sport** sont de bonnes habitudes pour rester en santé*. [**Eating vegetables **and sports** are good habits to preserve good health.*]
	Second complementizer missing	**J'ai un ami qui parle allemand et **ø** peut te l'enseigner.* [**I have a friend who speaks German and **ø** can teach it to you*.]
Subordination	Incorrect verbal mood or tense	**Il faut que tu **viens** m'aider*. [**You must **helping** me*.] **Si j'**aurais** été à ta place, je n'aurais pas attendu.* [**If I **was** you, I would not have waited*.]
	Incorrect verbal complementation with subordinate clause	**Éric **parle qu'**il ira voir le prochain film de superhéros*. [**Éric **talks that** he will watch the next superhero movie*.]
	Incorrect interrogative clause	**Je ne sais pas si ta veste me fera-**t-elle***. [**I don't know if your vest will **it** suit me.*]
	Double complementizer	**Wendy dort mieux quand **qu'**il fait noir*. [**Wendy sleeps better when **that** it's dark.*]
	Incorrect relative pronoun	**La décision **dont** on doit prendre est délicate.* [**The decision **of which** we must take is sensitive*.]
	Non-standard relative clause	**La rue où tu t'es garé **là** sera barrée.* [**The street where you parked **there** will be blocked.*]
	Dangling participle (coreference rule)	**En y repensant**, la solution** est évidente.* [**Thinking about it, **the solution** is obvious*.]
	Complementizer missing in the correlative clause	**J'étais **tellement** fatigué **ø** je me suis endormi dans le métro.* [**I was **so** tired **ø** I fell asleep in the subway*.]
	Punctuation missing around adjunct clause	**Je ne viendrai pas **ø** même si tu insistes*. [**I will not come **ø** even if you insist.*]
Juxtaposition	Punctuation missing between sentences	**Il neige **ø** il fait froid*. [*It's snowing **ø** it's cold.*]
Others	Incorrect chain/sequence of three sentences or more	**Il faut réfléchir à ce qu'on peut faire et choisirons la bonne solution qui règlera le problème cela aidera notre cause*. [**We must think about what one can do and will choose the best solution that will fix the problem it will help our cause*.]
	Incorrect personal pronoun with antecedent in the same graphic sentence	**Le travail des pompiers est risqué, **ils** nécessitent un grand courage*. [**The work of firemen is risky, **they** require a great courage.]*
	Orphan subordinate clause	**Parce que c'est immoral*. [**Because it is immoral*.]

As writers age, their syntactic maturity evolves. The concept of syntactic maturity is defined as "nothing more than the observed characteristics of writers in an older grade" (Hunt, 1965, p. 5). In French L1, Paret (1991) observed three characteristics of the syntactic maturation of Quebec secondary school students (12 to 17 years old): (1) the number of constituents in the sentence increases; (2) the sentence structure gets more complex; (3) the phrases are more freely moved out of their canonical position in the sentence. These findings mean more facultative complements or modifiers but also more complex sentences (Boivin, Roussel & Pinsonneault, 2017).

However, the ongoing maturation process may lead to more errors as it implies that the writer is trying to use more complex structures and is taking more risks. Complex sentences provide such structures. For instance, the construction of a relative clause is ruled by various grammatical constraints, notably the choice of a relative pronoun, and the subordination mechanisms are very challenging for students (Béguelin, 2000; Perreault, 2000; Roy, 1995). Moreover, their internal grammar may allow non-standard relative clauses (Béguelin, 2000; Boivin, 2009, Boivin & Pinsonneault, 2020b; Chartrand, 2012). As shown in Table 1, students in French L1 classes may produce many other types of syntactic errors associated with complex sentences (cf. Boivin, 2012; Boivin & Pinsonneault, 2018; Roy, 1995). It is thus important to know more about what students do when encountering syntactic difficulties with complex sentences and how they succeed in resolving them.

In sum, throughout this section, we have identified some revision strategies specifically related to syntax (Boivin, 2012; Boivin & Pinsonneault, 2020b; Chartrand et al., 2016; Nadeau & Fisher, 2006; Paret, 1991, 1999; Riegel et al., 2018): using the basic sentence model, syntactic manipulations (addition, deletion, movement and substitution) and metalanguage, making grammaticality judgments, and creating complex sentences (juxtaposition, coordination and subordination) or splitting them up (scission, or distribution, cf. Faigley & Witte, 1981).

2.3 Specific research goal

Considering the large number of syntactic errors in texts written by students at the end of compulsory education, the cognitive complexity of the revision process, and the interest of errors related to complex sentences, our specific research goal is *to identify and to describe the detection, diagnosis and correction strategies that secondary school advanced writers* (hereafter *advanced writers*) *use when they accurately revise syntactic errors related to complex sentences*[4].

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[4] *The interested reader will find in Roussel (2019) a finer description of the use of the syntactic tools in the diagnosis subprocess regarding specific syntactic problems, and the use of juxtaposition, coordination, subordination and scission in the correction of syntactic problems.*

3. METHODOLOGY AND DATA ANALYSIS

To achieve our research goal, we chose to work with a small number of participants and closely observe their revision process. Our study is a qualitative multiple case study, where each participant (or case) is studied as a "whole" (Van der Maren, 2004; Yin, 1989).

3.1 Participants

We recruited 16 advanced writers from three private secondary schools in Quebec[5]. The definition of "advanced writer" is not homogeneous in the literature, as "advanced" sometimes refers to age, sometimes to the level of performance, and sometimes to the level of instruction (cf. Bartning, 1997; Faigley & Witte, 1981; Fayol & Largy, 1992; Keck, Iberri-Shea, Tracy-Ventura & Wa-Mbaleka, 2006; Kellogg & Whiteford, 2009; Thomas, 2006). Our definition of "advanced writers" in secondary school relies both on the level of instruction and on performance. More specifically, participants met two conditions to be advanced writers for this study. First, they were at the end of the compulsory school curriculum (Grades 10-11 in Quebec French L1 classes). Second, their marks in first language class reached at least 80%, combining writing and reading skills, as reading is crucial for the revision process.

With the think-aloud protocols in mind, a third requirement was imposed on the participants (but it does not bear on the definition of "advanced writer"). We asked teachers to confirm the participants' capacity to express themselves orally without difficulty or embarrassment. We thus called upon two institutional and one impressionistic criteria for our participants' selection (Thomas, 2006).

Table 2 presents a summary of the participants' sociodemographic characteristics in our convenience sample, and each case's characteristics are detailed in Appendix A.

Table 2. The sociodemographic data of the participants

Grade	Mean age	*N*	Girls	Boys	Mean marks in French class
10th	15,8	7	6	1	89%
11th	16,4	9	5	4	89%
Total/mean	16,1	16	11	5	89%

An ethics comity approved this project, and all participants and their parents signed a consent form. To respect confidentiality, all data was anonymized: a case number was attributed to each participant, number C_1 to C_9 corresponding to 11th grade, and

[5] In Quebec, about 20% of secondary school students go to a private school (MEES, 2020). Unlike public schools, completely funded by the Government, some private schools are partially funded by the Government, and many have entrance exams.

number C_{11} to C_{17} to 10th grade[6]. One participant (C_{18}) withdrew from the project. After consideration, we excluded a participant (C_{10}) because of his linguistic skills. As a consequence, we did not reach a balance between girls and boys in the 10th-grade sample.

3.2 Procedure

Our data collection took place between January and May 2017 and lasted approximately three weeks in each of the three schools. To access the revision strategies of our participants, we used two revision tasks: (1) the revision of a text written by the participants themselves, and (2) the revision of an experimental text, both under think-aloud conditions (Ericsson & Simon, 1993; Hayes & Flower, 1980). They used Livescribe Echo Smartpens and dot paper: this material allows one to precisely record both verbalizations and revision changes. It also allowed us to pair everything done on paper to an audio file, thus facilitating data analysis. In total, we scheduled three sessions with each group of participants.

3.2.1 Week 1: Training session

Before the revision tasks, the participants had a 30-minute training session in which they learned to think aloud while revising, following the method first developed by Hayes & Flower (1980) to study the writing process.

3.2.2 Week 2: revision of the individual text

A week after the training session, the participants revised an argumentative text that they had started to draft in French class a few days before our visit. These individual texts, on various topics, were 269 word-long in average. Their teacher would then evaluate this text as a formative task, so the instruction they were given was to revise it as they usually do and "add" the thinking-aloud. They had 60 minutes to revise their text, and they could use a dictionary, just like their peers who stayed in class. At this point, we did not ask them to focus on syntax. If required, the researcher would formulate specific prompts to help them verbalize (Roussel, 2017; Vermersch, 2014). The purpose of this first revision task was to collect data in an authentic writing task in school and help participants get used to the think-aloud technique.

3.2.3 Week 3: Revision of the experimental text

Another week later, the participants were asked to revise an experimental text as if it were their own and as if they had to hand it to their teacher for evaluation. They

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[6] *This numbering corresponds to the chronological order of the revision sessions.*

had 60 minutes to complete this task. We specifically indicated that there was no spelling or vocabulary problem in the text and asked them to pay attention only to syntactic problems. For this reason, they could not use a dictionary in this task. We reminded them that syntax concerns the good construction of sentences but did not provide examples of syntactic errors to avoid influencing their revision performance. This experimental text is an opinion letter specially designed for our experiment (Appendix B), while meeting the objectives of the curriculum. It is approximately 500 word-long, a standard at this age (cf. MELS, 2012), and contains 22 syntactic errors related to complex sentences, designed in accordance with their frequency, their estimated level of difficulty and the academic curriculum (cf. Béguelin, 2000; Boivin, 2012; Boivin & Pinsonneault, 2018, 2020b; MELS, 2011; Roy, 1995)[7]. In our view, the correction of errors in complex sentences, in addition to its link to the syntactic maturity of our participants, provides a challenging context as well as some flexibility to the reviser. It should thus be a fertile ground for observing various revision strategies.

To reduce the task's cognitive load, we read the experimental text to the participants before their revision to allow them to get familiarized with its main ideas. They notably asked questions about unknown words (for instance *counter-power*, *Accueil Bonneau*).

The choice to include two different revision tasks was made to assure the completeness of our data (Ericsson & Simon, 1993). In the individual texts, the errors are authentic, but their number and categories may vary, which certainly impacts the number and variety of the revision strategies used. The revision of an experimental text provides a uniform set of syntactic errors for each participant and is specifically designed to allow for a variety of revision strategies. As for the instructions given for the two tasks, since we could not control the nature of the errors in the individual text, it did not make sense to ask the participants to focus only on syntax, as this could lead to a very unsatisfactory result for them. Although the instructions for revision in the two tasks were slightly different, the present study's objective is not to compare their performance in both tasks but to describe the use of the various revision strategies targeting complex sentences.

3.3 Qualitative data analysis

We transcribed 32 hours of verbalizations and 58 pages of revisions, then used the qualitative software QDA Miners for data coding. After a trial coding, drawing upon our literature review (Section 2) in a deductive approach, we completed our code list in an inductive approach (Blais & Martineau; Loiselle & Harvey, 2007). We ended up with 35 revision strategies associated with the detection, diagnosis and correction subprocesses. It should be noted that like all strategies, the correction strategies are

[7] *For more details on the selection of these 22 syntactic errors, see Roussel (2019).*

descriptive, not evaluative: they describe what is done by the writers without providing any indication about the relevance of the strategy in context or the accuracy of the changes made. Table 3 provides an organized list of the strategies and examples drawn from our corpus.

Table 3. Revision strategies

Revision subprocess	(Subcategories)	Strategies	Examples
Detection	General	Anticipation	*That's the kind of mistake I left in my text. It is a mistake that many people do.*
		Setting a goal	*I want to be sure that the verbal tenses are correct.*
		Self-questioning*	*What is he trying to say here?*
		Rereading	*Ok… I'll read that again.*
		Reflection	*I understand the idea, but maybe there is a better way to put it.*
		Grammaticality judgment	*It doesn't work. /This sentence is syntactically correct.*
		Use of metalanguage	*I want to be sure that the **verbal tenses** are correct.*
Diagnosis	General	Recall of a similar event*	*Sometimes, in French, I know it's possible that the verb might not be linked to the subject, like in proverbs.*
		Reflection	*For the reader, maybe it's not clear enough. /I guess this is the answer to the question.*
		Self-questioning*	*Could I add a comma here?*
		Rereading	*So…* [rereads the segment]
		Consultation of an external resource	*I'm checking if I can put a comma before an "and". /If I were in class, I would have asked my teacher, it's the kind of problem that he would have helped me with.*
		Stating a rule	*You only need one inversion to create a question, not two.*
		Use of metalanguage	*It's a transitive verb. /It's a relative clause.*
		Grammaticality judgment	*However, we cannot just remove it… Oh, yes, it works!*
		Stylistic judgment*	*This sentence has way more punch!*
	Basic sentence model	Reconstruction of the canonical order	*The adverse effects that energy drinks have on health… The energy drinks have adverse effects on health…*
		Elimination of transformations	*Energy drinks should be prohibited under 18 by laws. Laws should prohibit energy drinks under 18.*
		Replacement of a pronoun by a potential antecedent	***that**… we are sensitive **to a subject**… it's **to which**.*
	Syntactic manipulations	Addition	*I can say… **And this happens** even if it's not everyone who does volunteering. It's an adverbial phrase.*

		Deletion	*I put commas because I could delete it.*
		Movement	*I'll try to move it to the beginning of the sentence.*
		Substitution	*"If any", I can replace it with "or even", so it's a conjunction.*
		Others*	*…that we can ignore… we can ignore what? The advantages.*
Correction		Use of metalanguage	*I'm adding a comma between these two sentences.*
	Moment	Automatized correction (without diagnosis)	[crosses *it* out] *Not "does it contribute".*
		Immediate correction	[diagnosis]+ [crosses *it* out].
		Postponed correction	*I'll leave it like this for the moment and come back to it at the end.*
	Level of precision	Precise correction	[crosses *it* out]
		Imprecise correction—diagnosis failure	*I'm not sure what is the role of this sentence in the paragraph, so I'll delete it.* [crosses out *Even if it is not everyone who does it.*]
		Imprecise correction—many problems in the same segment	*I'm not sure where to begin here… It'll be easier if I just erase the sentence and write a new one.* [crosses out *Second, an important contribution that improves the world.*]
	Use of complex sentences	Juxtaposition	[adds a comma between *engagement* and *it*]
		Coordination	[adds *and* between *engagement* and *it*]
		Subordination	[includes *Even if* in the previous sentence by replacing the period with a comma and the upper case with a lowercase]
		Scission	[adds a period between *engagement* and *it*]

**Strategies added after the trial coding*

For our data analysis, we identified complex sentence errors in the texts, and then coded the strategies used to resolve them. Except for the moment and the level of precision of the correction, which are obligatory decisions for the reviser when a change is made, all strategies are facultative and non-mutually exclusive, so segments could be assigned multiple coding. Two excerpts of verbalizations and their coding are given below for sentences of the experimental text.

(1) Even if it **was** not everybody who **does** volunteer work. (Incorrect verbal tense)

Verbalizations while revising sentence (1)	**Coding**
So…What did he want to say?	Detection: self-questioning
Even if it was not everybody who does… Ok, so *Even if…*	Detection: rereading
It's like… what he wants to say, if it was not everybody who does… Ok. It's *does,* the problem is *does*.	Diagnosis: reflection and grammatical judgment

[pause] *Even if it was not everybody who*…did *volunteer work* [replaces *does* by *did*].	Correction: immediate and precise

(2) *…do you think that this form of engagement does **it** contribute to improving the world, aside from their little existence?* (Incorrect interrogative clause)

Verbalizations while revising sentence (2)	**Coding**
	Detection: no strategy
[crosses out *it*] Not *does it contribute.*	Correction: automatized and precise
You only need one inversion to create a question, not two.	Diagnosis: stating a rule and metalanguage
We could have had the sentence without the first part, *ø Does it contribute to improving the world?*	Diagnosis: deletion
But because we started with *Do you think*, we cannot have also *does it*.	Diagnosis: stating a rule

In addition to coding the revision strategies, we coded the accuracy of the changes made (accurate, partially accurate, adding an error, incorrect, missing) to target the strategies related to accurate changes in our analysis[8].

Finally, to reduce subjectivity and increase data validity (Thouin, 2014; Van der Maren, 2004), we recoded 31,25% of our data four months after the first coding, using the percentage of agreement method (Miles & Huberman, 1984, 2003; Shweta, Bajpai & Chaturvedi, 2015) to measure the coding reliability. We obtained a mean intrajudge reliability of 83,2%, the median score being 95,1% (see Appendix C), which is sufficient for a counter-coding made by the same coder (Miles & Huberman, 2003, p. 126). Moreover, when setting aside the codes with three occurrences or less, only four codes out of 35 have an intrajudge score under 80%, two being strategies (*automatized correction* and *stylistic judgment*) and the others concerning the level of accuracy (*adding an error* and *incorrect*). For these codes, there are more occurrences in the recoding, suggesting that having coded the entire corpus once, we did slightly better the second time.

4. RESULTS RELATED TO REVISION STRATEGIES

This section presents the main results regarding our specific research's goal: to identify and describe the detection, the diagnosis, and the correction strategies that advanced writers use when accurately revising syntactic errors related to complex sentences. These results concern the use of various strategies by each case. Instead of

[8] *The strategies related to the other outputs (partially accurate, adding an error, incorrect, missing) are explored in Roussel (2019).*

presenting each of the 16 cases individually, we present and compare the use of detection, diagnosis and correction strategies among cases. It is important to recall that, as pointed out by Van der Maren (2004, p. 208, our translation), "comparing multiple cases is not equivalent to raising the number of subjects in the sample of a statistic study. It only serves as a base to identify common features or factors that will ground the induction of a finer comprehension". Given that our data does provide numbers, we also give basic descriptive statistics when relevant. However, one must bear in mind that the fidelity, validity, and transferability of the data rely on the choice of the conceptual framework for coding, the actual coding and recoding, and the representative character or each participant as an "advanced writer".

We first take a look at the "intensity" of the use of revision strategies for an accurate change (Section 4.1), and then describe the use of *detection* strategies (Section 4.2), *diagnosis* strategies (Section 4.3) and *correction* strategies (Section 4.4) by the 16 advanced writers when they made an accurate change targeting a syntactic error related to complex sentences. To complete our description of the advanced writers' strategical behavior, we also examine four *strategic profiles* (Section 4.5).

Recall that we chose to combine the data from the two revision tasks because it was not our goal to compare the two tasks. We used two different tasks simply to maximize the data on the various revision strategies. Moreover, the number of accurate changes in the individual texts was quite small, due to a small number of errors related to complex sentence.

We ranked the cases according to their rate of accurate changes in the experimental text (see Appendix A), which is our most comparable measure. In all the subsequent figures, the case with the highest rate of accurate changes in the experimental text is to the left (C_7), and the case with the lowest rate is to the right (C_{11}). The bars in the histograms appear in the same order from left to right as they do in the legend. We provide in Appendix D the total number of occurrences for each revision strategy.

4.1 Mean number of revision strategies for an accurate change

Before identifying the various revision strategies used by the advanced writers when they made accurate changes targeting a syntactic error related to complex sentences, we want to give a sense of the intensity of the use of strategies for such errors, using the mean number of revision strategies per accurate change.

The advanced writers used, on average, a total of 5,33 revision strategies per error accurately revised. Among these strategies, virtually no detection strategy was used (N = 0,19/error). Thus, advanced writers mostly called upon diagnosis strategies (N = 2,69/error) and correction strategies (N = 2,45/error) while revising a syntactic error.

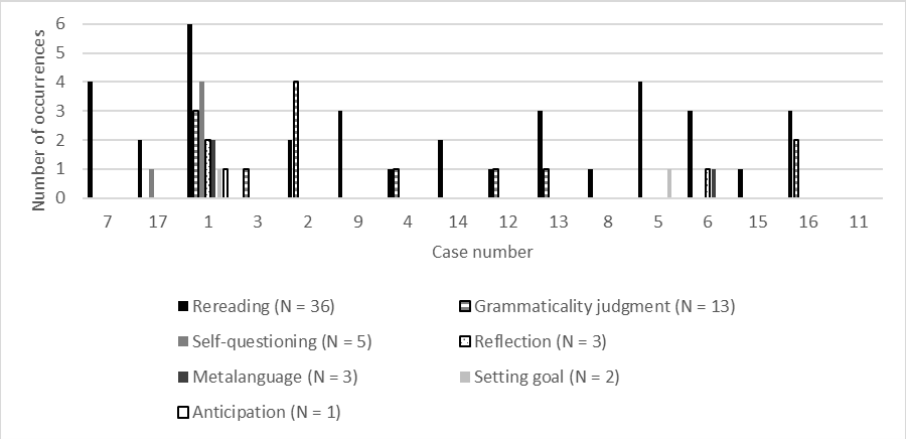
To better understand these numbers, one must recall that we always coded the *moment* and the *precision level* of the correction; consequently, we expected a mean number of correction strategies per accurate change of at least 2.

4.2 Detection strategies related to accurate changes in both revision tasks

We now present the use of the 35 revision strategies by each advanced writer. Therefore, the number of strategies will now be presented for each case.

We examine, in turn, the detection strategies (Figure 1), the diagnosis strategies (Figures 2 and 3) and the correction strategies (Figures 4 and 5) for each case.

Figure 1. The intercase distribution of the detection strategies related to accurate changes for the two revision tasks combined.



We have identified 63 occurrences of the seven *detection strategies* in the accurate changes made by the advanced writers. Recall that in all the figures presented in section 4, the cases are presented starting with C_7 on the left (the highest rate of accurate changes in the experimental text) to C_{11} on the right (the lowest rate of accurate changes in the experimental text).

C_1 clearly stands out of the other cases. Third-ranked, C_1, used the most detection strategies, in quantity (19 out of 63) and variety (7/7). On the opposite side of the figure, C_{11}, with the lowest rate of accurate changes in both tasks (see Appendix A), did not use any of these seven detection strategies and is the only one who did not reread any text segment out loud. Most cases adopt one or two of the seven detection strategies.

The most frequent *detection strategy* associated with accurate changes is rereading (N = 36), used at least once by all cases, except C_{11}. C_1 is the one who reread text segments the most (N = 6). Grammaticality judgments, the second detection strategy most used (N = 13), were verbalized by seven of the sixteen cases, mostly by C_1 (N = 3) and C_2 (N = 4), whose rates of accurate changes are above the median, determined by the virtual line between C_{14} and C_{12}, at the centre of the histograms. Grammaticality judgments were more or less explicit (*The sentence is correct, syntactically*

speaking; here, something is… missing...). Self-questioning (*What does it mean?*) was only used by C_{17} (N = 1) and C_1 (N = 4), two cases with high rates of accurate changes. The last four detection strategies, namely reflection, use of metalanguage, setting goals (*I just want to check the verbal tenses*) and anticipation (*This is a mistake people often make*) were used by only 3 of the 16 cases and never more than twice.

In Section 4.5, we will explore how the advanced writers combine these strategies with the examination of four strategical profiles.

4.3 Diagnosis strategies related to accurate changes in both tasks

We have identified 810 occurrences of the sixteen *diagnosis strategies*. Five diagnosis strategies (reflection, grammaticality judgment, rereading, using metalanguage and stating a rule) stand out as very frequent (N = 683). Their use by each case is illustrated in Figure 2. The less frequent diagnosis strategies (N = 127) will be presented in Figure 3.

Figure 2. The intercase distribution of the most frequent diagnosis strategies related to accurate changes for the two revision tasks combined.

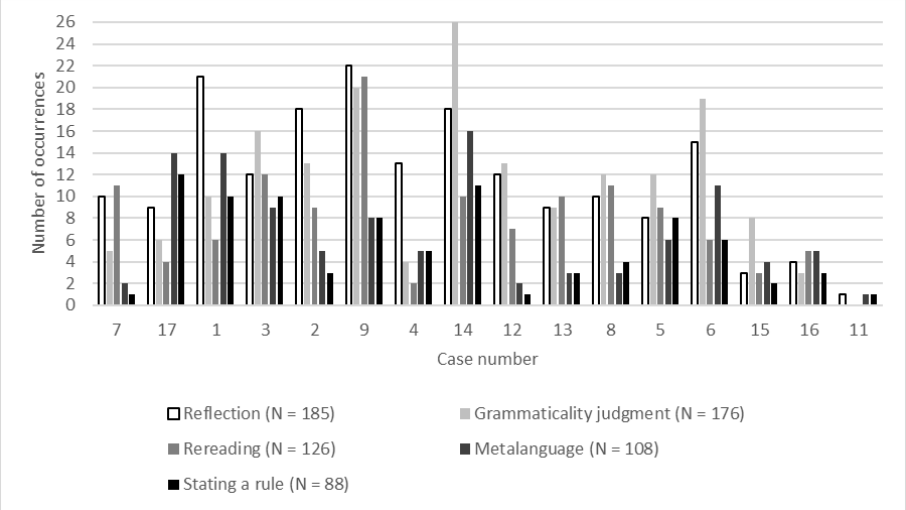


Figure 2 shows the distribution of the five most frequently used diagnosis strategies related to the advanced writers' accurate changes throughout their revisions. All cases used each strategy, except C_{11}, who did not express a grammaticality judgment nor reread the text while diagnosing a syntactic error.

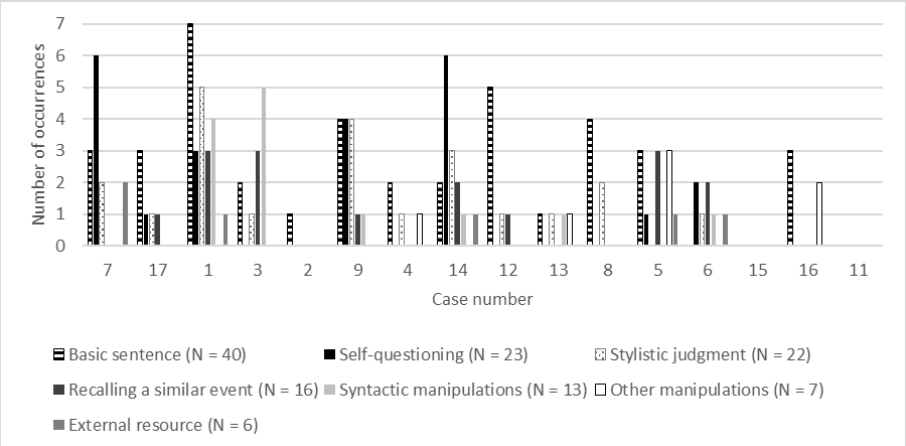
The distribution's shape of these five strategies, rather than being linear and decreasing, as one could have expected, follows a slightly asymmetrical curve. This curve shows that participants with the lowest rates of accurate changes, such as C_{15},

C_{16} and C_{11}, use less diagnosis strategies, even those most frequently used by their peers. The cases ranked in the middle, such as C_9 and C_{14}, use more of these diagnosis strategies, while the cases with the highest rates of accurate changes, such as C_7 and C_{17}, use more diagnosis strategies than the cases with low rates of accurate changes, but less than the cases ranked in the middle.

Reflections (*I could have put more articles*; *The pronoun, for the reader, maybe it's not clear*) are more frequent among the cases who obtained a rate of accurate changes above the median, especially C_1 (*N* = 21) and C_9 (*N* = 22). Grammaticality judgments were mostly verbalized by C_{14} and C_9, ranked above the median, and by C_6, ranked below the median.

The 11 other diagnosis strategies were used less frequently. Because of their small numbers of occurrences, we merged the four strategies related to syntactic manipulations (addition, deletion, movement, addition), as well as the three strategies related to the basic sentence (reconstruction of the canonical order, elimination of transformations, and replacement of a pronoun by a referential NP). As we can see in Figure 3, the maximum of occurrences for these strategies is 7, which is almost four times less than the maximum observed for the five most frequent strategies presented in Figure 2 (26). That said, most of these strategies are not relevant to every syntactic error, which could explain their lower frequencies.

Figure 3. The intercase distribution of the less frequent diagnosis strategies related to accurate changes for the two revision tasks combined.



First, it can be noted that C_{15} and C_{11} did not use any of these less frequent diagnosis strategies, which is quite remarkable.

Thirteen cases used the basic sentence model, mostly to identify the referent of a pronoun (*to which we are sensitive → we are sensitive to this subject*). When they

did so, however, none of them used the metalanguage *basic sentence*. Self-questioning (*Could I… add another adjective?*) was used by seven cases, and stylistic judgments (*I like this sentence structure a lot*) by eleven cases, and those who used them the most ranked above the median (C_7, C_1, C_9, C_{14}).

Eight cases used the recall strategy (*I'm trying to remember what my teacher told me*) between one and three times. Six cases used syntactic manipulations, most of whom ranked above the median (C_1, C_3, C_9, C_{14}). More specifically, we noted that substitution was the most frequently used manipulation (*"in addition" or "furthermore", it's the same thing, I must add a comma*), distantly followed by deletion (*We cannot just delete this word*; *We could make a sentence without this part*) and movement (*"Sadly", we can move it*). They did not use addition. Here again, none of them mentioned the general metalinguistic term *syntactic manipulation*.

Other manipulations, mainly the traditional questions targeting verbal complements (*We must open ourselves to what? To new things*), have been used by four cases, especially cases with a low rate of accurate changes (C_{13}, C_5, C_{16}). When allowed to use an external resource to help with syntactic revision of the individual text, five participants availed themselves of this opportunity. Using this resource, they checked for things like the spelling of the relative pronoun *auquel* (*to which*), the grammatical category of a word, or a punctuation rule (commas, dashes).

In sum, while the cases with a higher rate of accurate changes used more self-questioning, stylistic judgments and syntactic manipulations, cases with a lower rate tended toward traditional questions ("other" manipulations).

4.4 Correction strategies related to accurate changes in both tasks

We now examine the eleven *correction strategies*. We have identified 788 occurrences of the correction strategies in the advanced writers' accurate changes when targeting syntactic errors related to complex sentences. Before looking at the correction strategies related to metalanguage and complex sentences (Figure 5), we present in Figure 4 the three strategies related to the moment of correction, namely immediate correction, postponed correction and automatized correction (*N* = 302), as well as the two strategies linked to the level of precision (*N* =302) of the correction, namely precise correction and imprecise correction due to a diagnosis failure. No imprecise correction was due to too many problems in the same segment. Recall that these strategies were systematically coded when a change was made, because a choice must be made by the writer among the options.

All cases generally made precise (*N* = 275; mean = 91%) and immediate (*N* = 244; mean = 81%) changes while revising syntactic errors. Thirteen cases, especially those with high rates of accurate changes (C_7, C_1, C_3), made between one and six automatized corrections. Ten cases, mostly ranked in or above the median, made between one and seven imprecise corrections due to a diagnosis failure, often associated with an avoidance strategy (*I will remove this part because I'm not sure how it fits into the sentence…*). Still, it also happened that stylistic concerns prevailed over syntactic

concerns, so a stylistic correction would be made, which indirectly but accurately corrected a syntactic error, detected or not. Finally, nine cases, mostly with average rates of accurate changes, postponed between one and eight corrections of a syntactic error. C_{12} is unique in this regard because she postponed her corrections (N = 8) at least twice as often as the others (*There are too many problems here, I will skip it and I'll come back after, I need a little time…*).

The last types of correction strategies (*N* = 184) involve how advanced writers used metalanguage and complex sentences to make their accurate changes (Figure 5).

Figure 4. The intercase distribution of the correction strategies related to accurate changes for the two revision tasks combined.

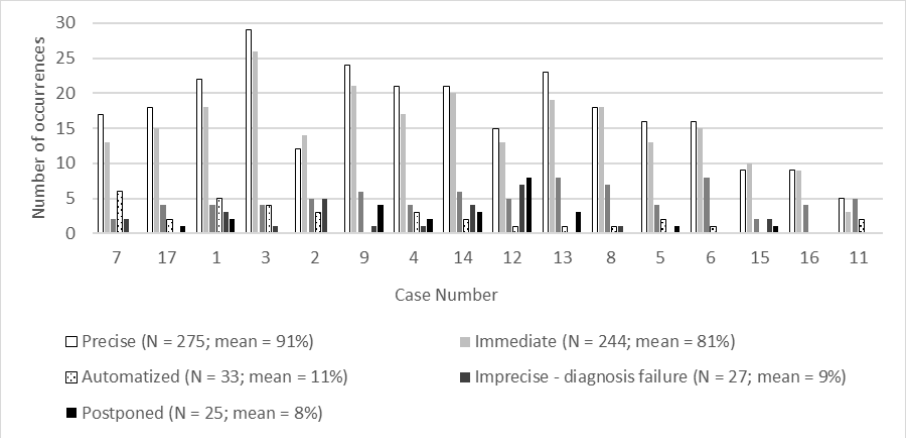
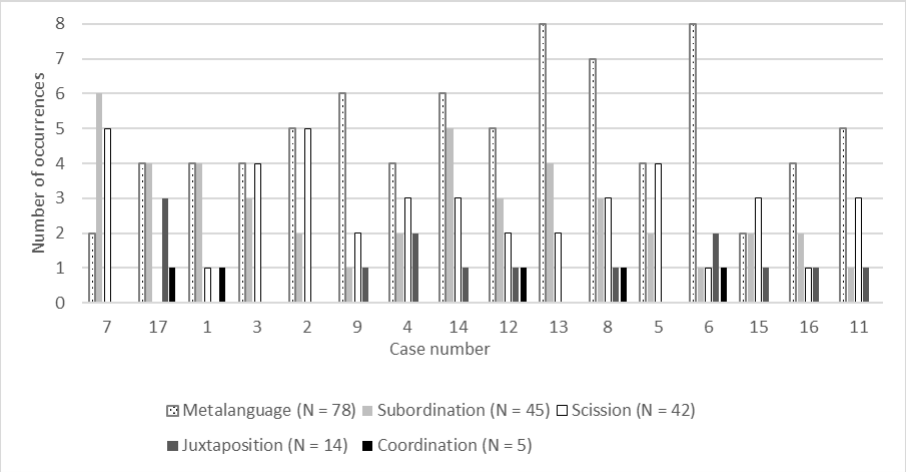


Figure 5. The intercase distribution of metalanguage and complex sentence types related to accurate changes for the two revision tasks combined.



All cases used metalanguage while correcting syntactic errors, more precisely between 2 and 8 times, mostly when they named changes in punctuation marks (*It'll take a comma*; *I'd put a period here*). All cases also used subordination (*N* = 45) as a correction strategy, generally when another subordination was near the syntactic error. The analysis of their verbalizations shows that they tend to use subordination for syntactic reasons (*It complements this sentence; it's better to stay with [an infinitive] verb*). As for the scission (*N* = 42), all cases except C_{17} used it. In most cases, it was mostly used in the experimental text to shorten graphic sentences containing two or three coordinations or juxtapositions, even if they were well formed, to increase readability (*I would start another sentence because it is too long*). Finally, they barely used juxtaposition (10 cases, *N* = 14) or coordination (5 cases, *N* = 5).

4.5 Strategic profiles of revisers

In addition to our coding of revision strategies, an extensive analysis of the advanced writers' verbalizations led us to compile some salient characteristics regarding how they navigated through revision. We report here on this exploratory analysis by briefly presenting four of the sixteen strategic profiles that came out of this work. Before doing so, we present the prime components of the advanced writers' revision profiles by distinguishing those related to the revision process in general from those related to the revision of syntax in particular (Table 4). These components emerged from our data, in an inductive approach. We highlighted in gray the ones composing the four profiles that follow, chosen for their relevance, their richness, and their contrasts.

Table 4. Prime components of the advanced writers' strategic profiles

Posture towards revision	Process	Posture towards syntax	
Commitment to the task	Perfectionist	Detection focus	Punctuation changes
	Precise		Surface changes
	Naive		Syntactic changes
	Expeditious		Text-based changes
Resourcefulness	Polyvalent	Diagnosis	Metasyntactic
	Not very explicit		Syntax first
Control over the task	In control		Ambivalent
	Careful		Style first
	Relying on a routine	Correction	Syntactic maturity
	Going by rote		Textual maturity
	Erratic		

4.5.1 Case 1: a polyvalent reviser in control

C_1, the third highest-performing advanced writer in the revision of the experimental text, is the only one who used all the detection strategies, and he also used them the most (Figure 1). For instance, he anticipated some errors (*It's a mistake that many people make*), formulated explicit grammaticality judgment (*the sentence is good, syntactically speaking*) and set specific goals (*I want to [check] the verbal tenses*). Furthermore, he questioned the spelling of few words in his individual text (*I know it's not the verb at all, but is it spelled like that?*) as well as sentence meaning and the intention of the author in the experimental text (*What did he want to say?*).

Regarding his diagnoses, C_1 once again used a large variety of strategies (Figures 2 and 3), notably the stylistic judgment (*the sentence has way more punch!*), the basic sentence model (*he wants to say that "we are sensitive to the topic", we must link the pronoun to the topic, so the "that"[que] will become "to which" [auquel]*) and the deletion manipulation (*we could have written the sentence without this segment*).

C_1 is aware of his weaknesses in punctuation (*Punctuation, that's not one of my strengths!*), but that didn't stop him from trying new structures (*Once again, I went for a sentence structure that I'm not quite comfortable with, but I will still try to keep it like that. [This] is [a structure] that the teacher said was good. [In] the worst-case scenario, I'll make a little punctuation mistake!*). He is the only one who used an external resource to find answers to his punctuation problems.

In his revision of the experimental text, C_1 easily found different solutions for a problem, then selected the simplest one (*It'll be simpler*) or the best one regarding the meaning to convey (*The author really wants to keep this in the present*).

In sum, C_1 skillfully played with the numerous revision strategies he has mastered and showed a clear knowledge of his weaknesses. Still, he was not afraid of making an error when he was confident that his sentence's structures met his teacher's ex-

pectations. He can also cleverly juggle many solutions. For these reasons, we consider this case to be polyvalent in using the revision strategies and also in control of his revision process.

4.5.2 Case 17: a metasyntactic reviser

C_{17}, the second highest-performing advanced writer for the revision of the experimental text overall, was also, by far, the best among 10th-grade students. All of his corrections were precise (Figure 4), and he is the only one who never used scission (Figure 5): he always seemed to know the kind of linguistic problem he faced, calling upon many syntactic rules, combined with metalanguage (*There is no verb. So, this is not a sentence; it's a transitive verb*). Consequently, he revised quickly compared to his peers, focusing strictly on syntactic problems in the revision of the experimental text. Besides, his revision of the individual text suggests that he had already treated meaning and stylistic considerations at his first draft, which distinguishes him from C_1, who continued to polish his individual text at a deeper level.

In the experimental text, he showed an excellent comprehension of the relationship between the adverb and the correlative subordinate clause—which we consider to be difficult—, relying on his previous knowledge of subordination, although his metalanguage remained inaccurate (*"so many advantages", it's a… how do we say, it's a… I don't know the word. It takes a "that" because… it's a relative clause linked to "so many advantages", yes! Yes, that's it, "the advantages that we can't"… euh… It can't be. The "that" comes from the "so many", here, so it's a… completive clause, I suppose*).

Overall, C_{17}'s quality of syntactic knowledge and the advanced metalanguage he used led us to profile him as a metasyntactic reviser.

4.5.3 Case 4: a syntactically and textually *mature reviser*

C_4 is among the "average" cases, ranking seventh with his rate of accurate changes in the experimental text. Like C_{17}, he spent less time revising both texts, but he wasn't as effective, which indicates that speed does not necessarily lead to a good performance. A possible explanation of his median performance may be his underuse of two general strategies: rereading and grammaticality judgment. However, when he did use these strategies, he also used specific metalanguage (*"whose" [dont], it's not the correct relative pronoun*; *there is no predicate*) or succeeded in reducing a tensed clause to an infinitive clause (**without it is damaging→ without damaging*), two pieces of evidence of his syntactic maturity.

C_4 kept the reader in mind while revising (*The reader will know that we're talking about volunteering because we've mentioned it three times already*) and avoided repetition with pronominalization (*who does volunteering→ who does it*). He also considered the introduction paragraph of the experimental text when revising the

first sentence of the second paragraph, so his changes would be coherent with the text's previous content.

Altogether, the changes made by C_4 showed a reviser able to condense the information using advanced syntactic structures and avoid repetition and incoherence. Therefore, we consider this case to be mature on a syntactic level and a textual level. His median performance in our sample of advanced writers is seemingly related to his underuse of general strategies.

4.5.4 Case 16: a reviser focused on the surface and going by rote

Among the cases with the lowest rates of accurate changes in the experimental text, C_{16} made no automatic nor postponed correction (Figure 4), and barely used the less frequent diagnosis strategies, except the basic sentence model and the traditional questions (Figure 3). On several occasions, her grammaticality judgments on pronouns were wrong. For instance, by asking the traditional question, typically used to find a verbal complement (*it's… ignore what? So, it's ignore "the advantages", that's why I put a "that"*), C_{16} incorrectly favored an analysis where the word *that* [*que*] is seen as a relative pronoun rather than as a subordinating conjunction linked to the correlative adverb *so many* [*tellement*]. As mentioned earlier, we expected that this specific problem would be difficult; however, the fact that C_{16} "forced" an antecedent on a non-anaphoric element is quite surprising. In comparison, when C_{17} tried to do the same, he quickly realized it was impossible (*it's a relative clause […] "the advantages that we can't…" euh… It can't be*).

Moreover, C_{16} is the only one who used an autocorrection technique learned in primary school. It consisted of revising, one by one, six types of surface problems: spelling of the sound [e] (*-é, -er, -ez*), punctuation marks, agreement marks, conjugation, homophones and lexical spelling. If it was a useful way to revise when she was younger, it didn't seem to be the case anymore because she made very few errors of these types in her individual text. Plus, as she was told at the beginning of the study, there were no errors of these types in the experimental text. Even so, C_{16} spent precious minutes focusing on surface problems, led by a method ill adapted to her needs, which could explain her low rate of accurate changes.

Overall, C_{16} used few appropriate revision strategies. Her diagnoses were often inadequate, as was her autocorrection technique: we thus qualified this case to be a reviser focused on surface and going by rote.

5. DISCUSSION AND PEDAGOGICAL PERSPECTIVES

Overall, these results suggest that there are three types of advanced writers in our sample: (1) the high-achieving ones, who have higher rates of accurate changes and possess a greater variety of strategies; (2) the average achievers, who have average rates of accurate changes and exploit all the strategies they possess; and (3) the low achievers who, despite their advanced status, have lower rates of accurate changes

and do not possess a variety of revision strategies, or are unable to use or verbalize them. This split in our advanced writers' sample is very salient in their diagnosis strategies (Figures 2 and 3), and also present in their correction strategies (Figure 4), and in the strategic behavior described in the four profiles (Section 4.5).

5.1 A selective use of the strategies

The contrast between the types of advanced writers leads us toward a strong explicative hypothesis, exposed here in two points, for the use of diagnosis and correction strategies. (1) The high-achieving advanced writers not only know and verbalize a large number and variety of revision strategies, but they seem to be able to wisely select appropriate strategies for the specific problem they are facing, thus combining metacognitive and metasyntactic skills. (2) The average achievers use more strategies than the high achievers because although they know the strategies, they do not select them as well in a given context. The fact that cases with a high rate of accurate changes used more the diagnosis strategies of self-questioning and syntactic manipulations (Figures 2 and 3), which indicate a metalinguistic posture (Barré-de-Miniac, 1995; Boivin, 2014; Nadeau & Fisher, 2006; Roy, 1995), would support this hypothesis. Self-questioning, in particular, reflects a certain control over sentence analysis tasks (Boivin, 2014). The ability to choose the relevant strategy seems to us to reveal a certain level of "expertise" in writing.

5.2 Some crucial strategies for a good diagnosis

Regarding the diagnosis subprocess, we found out that three general strategies were used far more often than the others, namely reflection, grammaticality judgments and rereading (Figure 2). Students who barely use them, especially the rereading strategy (Flower et al., 1986), are among low-achieving writers. Our results are thus consistent with the models that give an important role to reading in revision, notably Hayes (1996, 2004), who considers rereading to be a part of the fundamental process named *Text processing*, as well as Flower et al. (1986, p. 24), who distinguish between *read to comprehend*, *read to evaluate* and *read to define problems*. This latter distinction certainly could be explored further.

As for using the basic sentence model, we are not surprised by the fact that this specific strategy was used less often, as we already pointed out (Figure 3), because its use is not relevant for every syntactic problem (Boivin & Pinsonneault, 2020b). Advanced writers mostly used the basic sentence to correct pronouns; the complete reconstruction of the canonical order was quite marginal. However, it is worth noting that, when it is used, the basic sentence model proves to be efficient (see also Roussel, 2019).

As was explained earlier in the theoretical framework (Section 2.2), the syntactic manipulations are very powerful tools that should be at the heart of grammatical

instruction in French L1. Despite their usefulness and versatility, they were practically never used—or at least verbalized—by advanced writers (Figure 3). However, when they were used, they proved to be useful. A few hypotheses may explain this lack of use. It could be (1) that advanced writers have not yet managed to transfer their grammatical knowledge in the revision tasks, (2) that the syntactic errors they revised were not difficult enough to lead them to activate these powerful syntactic tools, or (3) that the manipulations are not systematically taught in class (Lord, 2012).

Moreover, the few advanced writers who favored traditional questions over syntactic manipulations were among cases with low rates of accurate changes, suggesting that the questions are insufficient to produce accurate syntactic reasonings (Nadeau & Fisher, 2006). In light of this result, we must insist on the limits of these traditional procedures (Lord, 2012).

It thus seems that the basic sentence model and syntactic manipulations, as well as the use of grammaticality judgments, which have not been included in the studies on revision strategies (Section 2.1), could be fruitfully added to the set of revision strategies that yield a good diagnosis.

5.3 The correction strategies: precise and immediate

The correction strategies used by the advanced writers correspond to what we expect from students in French classes: to a very large extent, the corrections precisely targeted the syntactic errors and were made immediately after they were detected or diagnosed. Few automatized corrections were observed (Figure 4), mainly among cases with the highest rates of accurate changes (C_7, C_1 and C_3): this could indicate that most of the advanced writers' syntactic knowledge is not yet automatized (as suggested by their *advanced* status, rather than *expert*; cf. Bisaillon, 2007). The rare imprecise corrections were often made to avoid a possible mistake, but we also noted that imprecise corrections could result from stylistic overriding syntax (Section 4.4). Finally, few corrections were postponed (Figure 4), mostly by average-achieving students. Maybe the time constraint did not encourage the participants to use this strategy. Although postponing can indicate control, the results suggest the presence of a more challenging problem for the average-achieving writers.

5.4 The use of metalanguage

The use of metalanguage deserves a particular note. Our advanced writers' use of metalanguage is mainly associated with the diagnosis subprocess, generally when a grammatical rule is stated. It is also often used during the correction subprocess when punctuation marks were changed. In the detection subprocess, the few occurrences found mostly concerned verbs. These findings suggest that the advanced writers may be quite familiar with the basic grammatical terminology (*period, comma, verb, verbal tense*), as expected from their academic level (cf. MELS, 2011). However,

they rarely used the complex sentences terms (*subordination, relative pronoun, relative clause, present participle, coordination* or *juxtaposition*) nor the name of the syntactic tools (*basis sentence, syntactic manipulation*), a result in agreements with previous studies' findings (cf. Boivin, 2009, 2014; Élalouf, 2005).

5.5 Some pedagogical perspectives

Because syntactic errors are the most frequent type of problems observed in texts written by students in primary and secondary school (Ammar et al., 2016; Boivin & Pinsonneault, 2018), and because our results have shown that advanced writers used very few detection strategies (Figure 1), the question of the detection strategies they possess must be addressed. Based on this, we would suggest that French classes include frequent detection activities specifically oriented toward syntactic errors; such activities would increase students' awareness of different types of syntactic errors, improve their grammaticality judgments, and therefore improve their detection skills. Detection activities could be done with both one's own text and peers' work, in order to increase the distanciation effect. It is worth noting that these activities may also help students balance their attentional resources between surface and text-based revisions (Faigley & Witte, 1981; Fitzgerald, 1987; Kirkpatrick & Klein, 2016; Roussey & Piolat, 2005).

Our results on the use of self-questioning as a useful diagnosis strategy are in line with the conclusion of previous work (Blain & Lafontaine, 2010; Boivin, 2014; Fisher & Nadeau, 2014) in favor of fostering self-questioning for revision among students. Given the rare use of the syntactic manipulations, we believe that self-questioning could also target syntactic manipulations (*Can I use a syntactic manipulation here? Which one would be more decisive? Could I use two?*).

6. CONCLUSION

We conclude with a summary of our main results, followed by a reflection of theoretical implications, the limits of this multiple case study, and possible new lines of inquiry.

6.1 Main results

This paper has proposed a precise description of the detection, diagnosis, and correction strategies used by advanced writers when accurately revising syntactic errors related to complex sentences. Detection strategies were not often observed; cases with the highest rates of accurate changes in the experimental text used them the most. The two most frequent were *rereading* and *grammaticality judgment*. When making a diagnosis, advanced writers mainly relied on general strategies (*reflection*, *grammaticality judgment*, *rereading*) instead of specific ones (*basic sentence recon-*

struction, *syntactic manipulations*). Interestingly, cases with the highest rates of accurate changes called upon fewer diagnosis strategies than cases with median rates of accurate changes, suggesting better control of the revision process and a better selection of strategies for a given problem. Regarding the correction, as we expected, advanced writers mainly corrected a syntactic error *immediately* after they detected it, targeting it *precisely* in the sentence. Little *automatized* corrections were made, which could be seen as evidence of our participants' *advanced* status rather than *expert*; as for the few *postponed* corrections, they may be explained by the time constraint imposed in the educational context. Therefore, it is likely that postponing a correction would be reserved for more difficult problems.

Looking at individual cases, we have presented four salient profiles of revisers based on their posture concerning the revision process and syntax. These four strategic profiles are just the tip of the iceberg since we have identified other components in the revision behavior of our advanced writers (Table 4). We are looking forward to pursuing this work, convinced that more pieces of this puzzle are yet to be found, notably regarding the *resourcefulness* and the *correction* components.

6.2 Theoretical implications

The coding process shed some light on certain aspects of the revision models (Section 2.1). The theoretical choice to distinguish detection strategies from diagnosis strategies and to consider them as two linear steps, even if supported by the literature (cf. Scardamalia & Bereiter, 1983), created numerous coding challenges. First, these two subprocesses share a few strategies, such as rereading, self-questioning, reflection and grammaticality judgment. The small number of detection strategies used could indicate that advanced writers were having trouble verbalizing their detection. Nevertheless, given the shared strategies, it could be that we coded a part of their detection strategies as diagnosis strategies.

The distinction between detection and diagnosis in the revision process is thus not always clear. This could indicate that, as Scardamalia & Bereiter (1983) suggested, detection is, most of the time, a very limited step in the process, occurring in a split second when a problem is read. In that case, trying to *identify and describe* what constitutes this short point in time is quite an arduous task, since it is happening nearly instantaneously.

While Scardamalia & Bereiter (1983) consider that detection comes before diagnosis, Flower et al. (1986) propose a theory in which detection and diagnosis are doors to two alternative paths (*Detect/rewrite* vs *Diagnose/revise*). This position suggests a complete elimination of the sequencing of these two subprocesses, as is also proposed by Hayes (1996, 2004).

6.3 Limits of the study

Our qualitative methodology comes with some inherent limitations. The most salient is that the think-aloud protocols, even when well conducted, cannot perfectly reflect the cognitive processes of writers: they only allow indirect access to the revision strategies they used. In fact, the first condition to answering our research's goal was to lead participants to explicit their thought process out loud; otherwise, the marks in their revised texts would not suffice to provide a detailed description of their syntactic reasoning. Most of our participants did well on that part, but we still faced some challenges in this regard. For instance, one participant spoke very slowly and did not complete the revision of the experimental text in time (C_7). Some used many vague terms, preventing us from interpreting their thoughts accurately (C_3, C_6).

The strategy named *reflection*, shared by the detection and diagnosis subprocesses, ended up being something of a catch-all for all the verbalizations not fitting elsewhere, like consideration for the reader or the difference between speech and written texts. This certainly explains why this strategy is used so often. A closer examination of what was coded as *reflection* would be needed to better understand the results related to this strategy. In Hayes' model (1996, 2004), *Reflection* is a Fundamental process, and our coding suggests that it is indeed a concept that can cover a large set of facts.

6.4 New lines of inquiries

These results lay the groundwork for other studies in the field of teaching and learning of writing in French, especially on students' syntactic skills. First, it would be interesting to test our explicative hypothesis on the selective use of strategies, and given the importance of the rereading strategy, to explore the various types of rereading (i.e. *read to evaluate,* Hayes, 1996, 2004).

Second, the strategies that we have identified could be taught, and their effectiveness tested in various quasi-experimental contexts. In addition, it would be interesting to design collaborative studies with teachers, in which students would learn to exploit the basic sentence model and syntactic manipulations more productively, for instance, for the verbal phrase analysis, since using the ineffective traditional questions tends to remain students' first strategy.

We also intend to pursue the work on our strategic profiles to better describe and understand the revision process of students learning French.

ACKNOWLEDGEMENTS

The authors would like to thank the Social Sciences and Humanities Research Council of Canada (SSHRC) and the Fonds de recherche québécois - Société et culture (FRQ-SC) for their financial support.

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APPENDIX A

Characteristics of the 16 cases

Case	Grade	Sex	Age	Mean mark in French class (%)	Duration of the revision (min)		Rate of accurate changes (%)		Total number (N) of strategies used in their accurate changes		
					IT	ET	IT	ET	detection (N = 63)	diagnosis (N = 810)	correction (N = 788)
C_1	11th	M	16	87,6	48:53	47:35	33	66	19	84	60
C_2	11th	F	17	92,0	47:03	54:20	-*	59	6	49	46
C_3	11th	F	16	83,6	57:39	51:24	62	61	1	70	71
C_4	11th	M	16	86,5	21:40	34:13	29	53	2	33	55
C_5	11th	F	17	89,1	53:28	32:37	50	44	5	54	42
C_6	11th	M	16	82,7	12:45	38:50	25	37	5	64	45
C_7	11th	M	17	94,8	48:07	52:58	14	83	4	42	51
C_8	11th	F	17	88,5	30:15	38:32	17	48	1	46	53
C_9	11th	F	16	93,6	28:13	55:20	23	59	3	93	60
C_{11}	10th	F	15	86,0	05:41	13:20	0	18	0	3	20
C_{12}	10th	F	15	94,0	56:16	51:26	25	50	2	42	56
C_{13}	10th	F	15	89,3	57:28	59:30	24	50	4	38	60
C_{14}	10th	F	16	93,0	64:48	55:13	33	52	2	96	65
C_{15}	10th	F	16	89,0	06:23	45:30	0	31	1	20	30
C_{16}	10th	F	16	87,6	43:00	50:43	12	20	5	25	26
C_{17}	10th	M	16	87,1	09:00	36:14	25	74	3	51	48

*IT: Individual text, ET: Experimental text *This text contained no complex sentence error to correct.*

APPENDIX B

Translation of the experimental text and its 22 syntactic errors related to complex sentences. The errors are indicated with underlining and categorized with letters referring to Table 1. The original version in French can be found in Roussel (2019).

The engagement of young people

Dear readers of the section "Power of words",

Nowadays, many people want to do good deeds, but does the engagement of young people in particular contribute to improving the world in which we live? o) I sincerely believe that yes their engagement helps our society, with volunteering, boycott, protests and other advantages can be linked to it.

Volunteering

First, volunteering is a form of engagement that possesses l) so many advantages we cannot ignore it. Effectively, h) when that we volunteer, it allows us to develop our self-confidence, to know our strengths and weaknesses better c) and a surpassing of oneself. Statistics show that 28% of the volunteers find a job because of their volunteering d) and also 62% of them believe f) to find one soon. To have a volunteering experience thus looks well on the CV of young people, k) while improving on a personal level. Adolescents have a lot to gain to be volunteers n) do you think that this form of engagement g) does it contribute to improving the world, aside from their little existence?

Of course, yes! One could not remove the 197 million hours of volunteer work accomplished each year in Quebec e) without it is harmful to our society, since volunteer work and the community milieu are two of the most important counter-powers of our society. Young volunteers form a considerable part of the 1.3 million Québécois volunteers, their contribution is thus crucial. q) Even if it e) was not everybody who does volunteer work. A lot of charities like *Unicef* and *Accueil Bonneau* need volunteers. Without them, these charities cannot ensure their services' good functioning. Fortunately, many partnerships exist between charities and schools, school is thus a good place where one can recruit young people j) there who will clearly have a positive impact on society.

Boycott and protests

q) Second, an important contribution that improves the world. The boycott of specific products or enterprises and the protests are also distinct forms of direct engagement n) p) it constitutes a real political power for us, young people. With our immense buying power, boycotting a non-ecological product c) and the refusal of taking part into an event are two pressure tactics within our reach. Moreover, our participation in protests indicates that we do not approve of a decision made with respect to a topic that concerns us or i) that we are sensitive. We can thus defend our opinions and our values while being active in the society, and thereby contribute to making it better.

To conclude, volunteering is one of the main means i) of which the youth uses in order to improve the world, but p) they can also boycott products or protest against political decisions. However, there remains for one to find a way to mobilize more adolescents in their community… If more young people e) would volunteer, great planetary changes would occur! For the moment, k) by giving one little our or his time, the society already improves.

APPENDIX C

Coding reliability: Percentage of agreement

Revision subprocesses	Strategies	*N* Agreement	Total of occurrences	%
Detection	Anticipation	0	1	0,0
	Setting goal	9	10	90,0
	Self-questioning	7	7	100,0
	Rereading	29	34	85,3
	Reflection	0	1	0,0
	Grammaticality judgment	9	10	90,0
	Use of metalanguage	2	2	100,0
Diagnosis	Recall of a similar event	10	11	90,9
	Reflection	128	159	80,5
	Self-questioning	20	24	83,3
	Rereading	65	77	84,4
	Consultation of external resource	11	11	100,0
	Stating a rule	71	77	92,2
	Use of metalanguage	105	110	95,5
	Grammaticality judgment	89	105	84,8
	Stylistic judgment	24	34	70,6
	Reconstruction of the canonical order	7	7	100,0
	Elimination of transformations	0	0	100,0
	Replacement of pronoun with its referent	23	24	95,8
	Addition	0	0	100,0
	Deletion	1	3	33,3
	Displacement	1	1	100,0
	Substitution	20	21	95,2
	Others	2	2	100,0
Correction	Use of metalanguage	42	43	97,7
	Automatized correction (without diagnosis)	11	18	61,1
	Immediate correction	133	138	96,4
	Postponed correction	28	30	93,3
	Precise correction	155	159	97,5
	Imprecise correction- diagnosis failure	20	21	95,2
	Imprecise correction - many problems in the same segment	0	1	0,0
	Juxtaposition	7	8	87,5
	Coordination	4	4	100,0
	Subordination	19	20	95,0
	Scission	17	17	100,0
Level of accuracy of the change made	Accurate	142	145	97,9
	Partial	9	9	100,0
	Adding an error of any type	7	11	63,6
	Incorrect	7	10	70,0
	Missing (no change made)	97	97	100,0
			Mean	83,2
			Median	95,1
			Min	0,0
			Max	100,0

APPENDIX D

Number of occurrences of each strategy in the context of accurate changes

Revision subprocesses	Strategies	IT	ET	Total
Detection	Anticipation	1	0	1
(N = 63)	Setting goal	0	2	2
	Self-questioning	1	4	5
	Rereading	5	31	36
	Reflection	1	2	3
	Grammaticality judgment	0	13	13
	Use of metalanguage	1	2	3
Diagnosis	Recall of a similar event	3	13	16
(N = 810)	Reflection	24	161	185
	Self-questioning	4	19	23
	Rereading	10	116	126
	Consultation of external resource	5	1	6
	Stating a rule	16	72	88
	Use of metalanguage	14	94	108
	Grammaticality judgment	21	155	176
	Stylistic judgment	6	16	22
	Basic sentence - Reconstruction of the canonical order	0	11	11
	Basic sentence - Elimination of transformations	0	0	0
	Basic sentence - Replacement of pronoun with its referent	2	27	29
	Manipulation - Addition	0	0	0
	Manipulation - Deletion	0	2	2
	Manipulation - Displacement	1	0	1
	Manipulation - Substitution	8	2	10
	Manipulation - Others	1	6	7
Correction	Use of metalanguage	9	69	78
(N = 788)	Automatized correction (without diagnosis)	5	28	33
	Immediate correction	41	203	244
	Postponed correction	6	29	25
	Precise correction	49	226	275
	Imprecise correction - diagnosis failure	3	24	27
	Imprecise correction - many problems in the same segment	0	0	0
	Juxtaposition	0	14	14
	Coordination	2	3	5
	Subordination	0	45	45
	Scission	0	42	42

IT: Individual text, ET: Experimental text