University of Groningen

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Tammenga-Helmantel, Marjon; Steringa, Sharon; Bazhutkina, Iryna; Suhre, Cor

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Document Version
Publisher's PDF, also known as Version of record

Publication date:
2022

Teaching complex grammar in Dutch EFL classrooms. A study on the effectiveness of deductive, inductive, implicit and incidental instruction

M. Tammenga-Helmantel, S. Steringa, I. Bazhutkina, en C. Suhre

Abstract

This study investigates the effectiveness of four types of grammar instruction and the extent to which students' learning style affects the learning outcomes of these instruction types. Our focus is on a complex grammar structure, viz. English conditionals. A total of fourteen Dutch classes with senior secondary school students aged 15-17 and their ten teachers participated in the study. Teachers and their classes were randomly distributed among implicit, incidental, inductive and deductive treatment groups and a control group. A pretest-posttest design, including a grammaticality judgement test and a semi-free writing test, was used to study the effectiveness of the treatment groups for students with a learning style focused on either learning from active experimentation or from reflective observation. Results of a multilevel covariance analysis indicate that explicit-inductive instruction effectively raises students' performance concerning complex grammatical sentences and it does so more effectively than incidental instruction but no more than other forms of grammar instruction. Post hoc comparisons reveal that these outcomes hold for all students, irrespective of their learning style.

Keywords: grammar instruction, complex grammar, EFL, learning style, explicit instruction, conditionals

1 Introduction

Recent research overviews and meta-analyses generally indicate explicit methods of teaching to be more effective than non-explicit methods regarding grammatical correctness in writing (De Graaff & Housen, 2009; Norris & Ortega, 2000; Spada, 2011; Spada & Tomita, 2010). Yet, divergent factors influence effectiveness outcomes. For example, Ellis (2002) argues that the effect of explicit instruction is more convincing for simple structures than for complex ones, and that the extent to which students are instructed as well as the availability of the target structure in non-instructional input are key variables (Ellis, 2002, p. 234). Krashen (1981) even advices against teaching complex grammatical structures while this is exactly what Hulstijn and De Graaff (1994) advocate to do. Additionally, Andringa, De Glopper and Hacquebord (2011) measure higher effect sizes for explicit instruction in general, yet with considerable differences for students with different L1s. In sum, there is no consensus regarding instruction for especially complex grammar. In addition, there is a need to clarify the effect of learner characteristics on L2 instruction such as age, L1, and language aptitude (Spada, 2011).

From a more theoretical perspective, grammar instruction is also under discussion, viz. in the interface debate. Discussed is whether explicit knowledge can convert into implicit knowledge or can foster its development (e.g., DeKeyser, 1998 and N. Ellis, 2005; R. Ellis, 1993, respectively) or that there is no connection, that is, no interface, between the two types of knowledge (e.g. Krashen, 1981). In the latter view, explicit grammar instruction is not expected to foster implicit, procedural knowledge needed in spontaneous communication. Hence, effectiveness studies that include a free production task – which taps into implicit knowledge (Ellis, 2002, 2005; Norris & Ortega, 2000; Spada & Tomita, 2010) – can contribute to the interface debate.

Grammar teaching is also discussed in teaching practice, especially in communicative language teaching. Does explicit grammar teaching contribute – directly or indirectly – to automation and L2 communication? Or does implicit teaching as exposure to the

foreign language suffice? And should teachers acknowledge differences between students regarding grammar processing?

The present study focuses on such a communicative teaching context, namely that of Dutch secondary school teachers teaching English. It investigates the effectiveness of teaching a complex grammar structure: English conditionals, which are both structurally and pedagogically complex. The study includes learning style as an additional variable. Rather than the two types of instruction studied most, viz. implicit vs. explicit (see Norris & Ortega, 2000; Spada & Tomita, 2010), we choose a more fine-grained distinction into four instruction types following Robinson's (1996) classification and operationalisation. Two of the instruction types intend conscious student learning: explicit-deductive and explicit-inductive. The other two treatments supposedly foster unconscious grammar learning: implicit and incidental (for the role of consciousness in language learning, see Ellis, 2008; Housen & Pierrard, 2005; Schmidt, 2001; Spada, 1997). Our design includes a grammaticality judgement (short: GJ) test and a writing test eliciting semi-freely constructed responses.

2 Literature review

Fundamental disagreement and uncertainty exist concerning instruction for complex grammar structures. According to Krashen (1981, 1985, 1994), the most effective way for the acquisition of complex language features is implicit instruction; explicit instruction is suitable only if a grammar rule is salient and simple. On the other hand, Hulstijn and De Graaff (1994) argue that it is precisely with complex structures that learners benefit most from explicit instruction, because regularities in complex structures are too difficult to notice independently. Simple language structures, on the other hand, could be effectively acquired implicitly because of their saliency. To test Krashen's hypothesis, Robinson (1996) distinguishes between four types of instruction: implicit, incidental, rule-searched and instructed. The former two are

non-explicit forms of instruction; the learners are unconscious of what grammar they are supposed to learn: no rule explication or directed attention to form occurs. Learners are exposed to enriched language input and are supposed to acquire the grammar structure available in the input unconsciously. These forms can therefore be classified as implicit following definitions by Norris and Ortega (2000, p.437). Robinson (1996) labels them – from the present perspective somewhat confusingly – implicit and incidental and provides the following operationalisations. In the case of implicit instruction, the learner must fulfil sentence memorization tasks. With incidental instruction, the learner makes text comprehension exercises, hence, focuses on meaning. In the explicit forms "instructed" and "rule-searched", grammar is offered deductively and inductively, respectively. Robinson's (1996) research partly confirms Krashen's hypothesis, revealing a greater effectiveness of explicit inductive instruction for simple language features; however, the assumption about the greater effectiveness of implicit and incidental instruction for complex structures is refuted.

Several studies emphasize the necessity of a thorough description of the model of complexity used (Bulté & Housen, 2012; Spada & Tomita, 2010). In an attempt to objectively determine a structure's complexity Tammenga-Helmantel et al. (2014a) make complexity 'countable' and integrate the aspects highlighted in previous research (e.g. Andringa, 2005; De Graaff & Housen, 2009; DeKeyser, 1995, 2005). Hence, they introduce a criteria catalogue for determining the degree of structural complexity including a cognitive, linguistic (syntactic and semantic), and pedagogic perspective (see also Newmeyer & Preston, 2014 and Hawkins, 2014 pleading for a multidisciplinary, integrated approach to complexity). It contains five aspects: (a) reliability (the number of exceptions to the rule), (b) conceptual complexity (the number of steps to apply a rule), (c) formal complexity, (d) semantic complexity, and (e) transparency (relation between form and semantics). Table 1 shows that conditionals receive a score of four out of five, resulting in a high degree of

Table 1

Degree of structural complexity for English conditionals

Criteria	Conditional sentences (English)
Reliability	High: few exceptions (use of *were*, difference *if/when*)
Conceptual complexity	**Relatively high:** applying the rule requires three steps: 1) determine whether something will happen or not 2) determine probability 3) select form to be used
Formal complexity	**Relatively high:** four different forms which look similar but express distinct meanings
Semantic complexity	**High:** different types of semantic relationships to express fact, hypothesis, or afterthought
Transparency	**Low:** relation between form and semantics not clear due to context, use of past form to express unreality, and subtle differences
Total result	**+ 4** **High degree of complexity**

Note: Criteria classified as complex are in grey.

structural complexity. What makes the structure complex is its conceptual-cognitive (i.e., several derivational steps), formal and semantic complexity, and its low transparency (i.e., different forms, different meanings, and no 1:1 mapping between form and meaning).

Several studies compare the effects of deductive and inductive types of grammar instruction in foreign language classrooms, some in secondary education, others in university settings, and show a varied picture. Some studies display better learner results regarding grammatical correctness with deductive treatment (e.g. Erlam, 2003), whereas in other studies learners with inductive instruction outperform deductive learners (e.g. Cerezo, Caras, & Leow, 2016; Haight, Herron, & Cole, 2007; Vogel, Herron, Cole, & York, 2011). Additionally, some studies do not observe any statistically significant differences in learner results for the two treatments or mention merely a trend in favour of the inductive approach (Tammenga-Helmantel et al., 2016; Jean & Simard, 2013; Shaffer, 1989). Literature reviews both in language teaching and in science conclude that inductive instruction seems to be particularly effective when the rule searching process is relatively guided (Lazonder & Harmsen, 2014 and Tammenga-Helmantel et al., 2016).

Besides the amount of guidance, learner characteristics also may affect the effectiveness of instruction. Spada (2011, p. 232) states that this is the most under-investigated issue in SLA research. For instance, language aptitude influences effects of grammar instruction in that learners with poor textual memory scores profit more from deductive than inductive treatment (Hwu & Sun, 2012; Hwu, Pan, & Sun, 2014). Likewise, Erlam (2005, 2013) observes that language aptitude differences do not affect effective results with a more deductive approach. Conversely, learners who have high language analytic ability may be more able to benefit from an inductive approach to grammar explanation because they are more skilled at hypothesis testing.

Learning style is another aspect that might affect instruction results (e.g. Ellis, 1989; Oxford, 2003, 2011; Peacock, 2001; Reid, 1987, 1998; Wong & Nunan, 2011). Students' learning styles are based on students' preferences for processing and understanding new information. According to Felder and Silverman (1988) and Honey and Mumford (1992), the most relevant distinction in students' learning styles relates to their preferences concerning engagement in either active experimentation during lessons or in reflection on information. Also Kolb's framework of experiential learning (1984) reflects this 'active/reflective' dichotomy: His inventory classifies students into four learning style groups (convergers, accommodators, divergers and assimilators) where accommodators and con-

vergers prefer learning by active engagement and experimentation; assimilators and divergers prefer learning by reflective observation. In foreign language teaching, this refers to applying new grammatical rules in line with other, familiar rules or distilling new rules by observing and reflecting on not earlier encountered phrases (see Ueno, 2005). Since reflective observation is required when discovering grammar rules from linguistic input, we expect assimilators and divergers to benefit more from inductive instruction than convergers and accommodators (cf. Coffield, Moseley, Hall & Ecclestone, 2004). Accomodators and convergers, who prefer active engagement and experimentation without a strong focus on reflective observation might benefit more from explicit-deductive grammar teaching. However, Tammenga-Helmantel et al. (2014b), who examined the relation between the learning style and the effectiveness of deductive and inductive instruction, did not find a significant correlation between learning style and grammar instruction. Since there are hardly any significant experimental indications on the relation between learning style and achievement (Bailey, Onwuegbuzie, & Daley, 2000, p. 119) a clear need exists for more empirical data before well-grounded conclusions can be drawn.

The primary goal of this study is to gain more insights into the effectiveness of different types of grammar instruction and to clarify the relationship between the instruction type and learner characteristics (here: learning style). The study intends to extend the existing research in several ways. First, it compares not simply explicit and non-explicit instruction but differentiates between two types of explicit, viz. deductive and inductive, and two types of non-explicit instruction, viz. incidental and implicit. These four treatments represent possible options for offering a grammatical structure in foreign language teaching. Secondly, the participants of the study are senior secondary school students. The experiment has been conducted in real classroom conditions unlike most other research studies, which are generally executed with undergraduate students and often under laboratory conditions (Norris & Orte-

ga, 2000). Thirdly, the present study explores the impact of learning style. It also has a pedagogical goal of helping foreign language teachers to make conscious and statistically grounded choices in their classrooms.

Our project leans on Tammenga-Helmantel et al. (2014b) using their design, tests and setting in Dutch secondary foreign language classrooms. This enables us to compare the results of both studies. In total, 238 Dutch secondary school students participated in our study, either in one of the four treatment groups on English conditionals or in a control group. This study is framed around the following research questions:

RQ1: Do different forms of instruction (explicit-deductive, explicit-inductive, implicit, or incidental) impact senior secondary school students' capacity to judge and produce English conditional sentences and do they differ from each other in their impact?

RQ2: Do the instruction forms impact students who prefer learning from active experimentation or from reflective observation equally or does their impact differ?

3 Method

This study uses a quasi-experimental approach involving four experimental and one control condition to answer the research questions.

3.1 Materials

Grammar Structure
Four types of conditional sentences were presented to the students in all conditions:
- type I for real conditions with *present simple* tense use – "If people do not eat, they get hungry";
- type II for the conditions with great possibility to be real with *present simple* and *shall/will + verb* – "I will give you bread if you promise never to steal my corn or meal";
- type III for the rather improbable conditions, using *past simple* and *would + verb* – "If they were present, I would be surprised";

Table 2
Outline of experiment.

	Treatment groups	Control group
Session 1	Learning style test; GJ pretest; semi-free writing pretest	Learning style test; GJ pretest; semi-free writing pretest
Session 2	deductive/inductive/ implicit/incidental	No input
Session 3	deductive/inductive/ implicit/incidental	No input
Session 4	Game exercise	No input
	GJ posttest; semi-free writing posttest	GJ posttest; semi-free writing posttest

Note: Experimental treatment in grey.

- type IV for the conditions that could be real in the past but were not fulfilled with *had + past perfect* and *past participle* – "I would have kept waiting, if they had not been that late".

Treatments
Each experimental treatment consisted of four 45-50-minute sessions. During session 1 all students took three tests: a learning style test, a grammaticality judgment (short: GJ) pretest, and a semi-free writing pretest (see Appendix B). Sessions 2 and 3 were dedicated to assigned instructional treatment. During session 4 all students were offered one additional, identical exercise followed by two posttests: a GJ posttest and a semi-free writing posttest. Table 2 displays the structure of the experiment.

The control group only completed the testing parts. They had regular English classes between the pre- and posttest but without input regarding conditionals.

We exposed all students in the four treatment groups to the same amount of the targeted structure by using one text as the basis for the materials of all four instructional types: the authentic text "The Cat and the Mouse"[1] that contains multiple instances of conditional sentences, see Appendix A. The main difference between the instruction types was the manner in which the grammar was presented. We applied Robinson's (1996) fine-grained classification and the operationalisations of his four approaches. Importantly, all treatments include both receptive and productive exercises to prepare the students for the receptive GJ-test and the productive semi-free writing

task.

The deductive approach intends to trigger conscious grammar learning using rule explanation and practicing in blank exercises. Session 2 of this treatment starts with a text explaining conditionals in general and conditional type I specifically:

The following sentences indicate a condition. These sentences are also called *if* clauses or conditionals. An *if*-clause consists of two parts: a main clause and a subordinate clause starting with *if*, which may appear before or after the main clause. The *if* always denotes the condition.
1. The cat **will** only **give** me back my tail *if* I **fetch** her some milk.
2. I **would give** you some milk, *if* you **got** me some hay.
3. *If* you **promise** never to steal my corn or meal, I **will give** you bread.

There are four types of *if* phrases. Each type of *if* clause has a slightly different meaning. You can recognize the type of *if* clause by the tense used. Type I conditions display present tense in both the main clause and the subordinate clause (present simple).
1. *If* you **melt** ice, it **becomes** water.
2. *If* people **do not eat**, they **get** hungry.

This type of *if* clause presents a logical rule. What is expressed in the main clause is a direct consequence of what is in the *if* clause. If one thing happens, the other follows with absolute certainty.

Type I conditionals are formed as follows: The present tense (present simple) is used both in the main and in the subordinate clause. This type of conditional indicates that

something is 100% certain.

Then students do an exercise in which they identify sentences with a type I conditional in the text "The Cat and the Mouse". This is followed by a rule explanation of conditional type II and an exercise identical to the first one. In addition, students complete sentences with type I or II conditionals:

Type I - use present simple in main and subordinate *if* clause
1. If you (speak) _____ loudly, they (can) _____ hear you.
2. Ice (melt) _____, if the temperature (get) _____ higher than zero degrees.

Type II - use present simple in the subordinate *if* clause and *shall/will* + infinitive in the main clause
1. If you (send) _____ this letter now, she (receive) _____ it tomorrow.
2. If I (do) _____ this test, I (improve) _____ my English.

Session 3 has the same outline as session 2, yet now introducing type III and IV conditionals. It concludes with a written overview of the four conditionals. The final session of the series, which is the same for all treatment groups, includes a game which elicits conditional usage without explicating the notion conditional or using other metalinguistic terminology:

This assignment is a variation of noughts and crosses, which is played in pairs. One player draws crosses, the other draws noughts, but only after finishing a sentence correctly. Take turns in finishing one of the sentence fragments written in the boxes below; the first who has three in a row has won.

If I were you,	She would have finished the exam	Unless he finished soon,
If they had known,	He takes his umbrella, if	You wouldn't have been late if
He wishes	If you hadn't been so rude,	He would give you some help if

In the inductive treatment, students must attend to form but unlike in the deductive group a grammar rule is not presented yet has to be distilled from the linguistic input and subsequently practiced. We opted for guided inductive instruction because of its effectiveness (see Literature review) and its ecological validity. In fact, this is what inductive grammar teaching is like in Dutch foreign language teaching materials: students fill out paradigms or complete a grammar rule based on a selected set of prototypical sentences containing the target structure, which can be classified as rather unchallenging (Tammenga-Helmantel, 2013). Concretely, students fill out a pre-formulated rule and receive feedback from their teachers and then practice with the same exercises as in the deductive treatment. The lesson series for the explicit-inductive group starts with reading "The Cat and the Mouse", followed by an exercise that guides the students to discover the rule for using conditional type I:

The following sentences are from the reading text. These are claims that are always true. Look at the sentences below. What tense is used for the underlined verbs in the main clause and in the *if* clause?
If people do not eat, they get hungry.
And if a cat gets hungry, she hunts mice.

1. Do not eat =
2. Get =
3. Gets =
4. Hunts =

Complete the line by entering the correct tense type:
If a sentence is logically true, use the ...., both in the main clause and in the if **clause.**
This is the type I conditional.

This is followed by the same kind of exercise for conditional type II. Analogous to the deductive intervention, the session ends with students completing sentences with a conditional. Session 3 follows the same pattern as session 2, only this time students are instruc-

ted to find rules for conditional types III and IV. Likewise, this is followed by a completion exercise identical to the one in the deductive treatment.

Unlike in the explicit treatments, learners in the implicit and incidental conditions do not consciously work on grammar rule formation. In the implicit treatment, they supposedly construct their grammar rules through intentionally stored linguistic input. Concretely, the students must memorize parts of a reading text full of conditionals (input enhancement). The implicit lesson series begins with an exercise that students make in pairs. Students read different parts of the text "The Cat and the Mouse" and reproduce these parts orally for their partner, so that at the end both know the whole story. Subsequently, they do an exercise describing the pictures related to the text and using sentences from the text containing conditionals:

Write full sentences below the pictures about what each character wants before they want to do something else. Use the text to
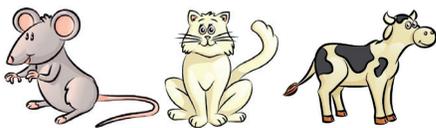
find the actions.
The mouse gets its tail back if he finds milk.
…………………………….............………
…………………………….............………

The last exercise in session 2 triggers the usage of conditionals:

You do this assignment in pairs. You will answer the questions below. In turn, one person asks a question and the other answers this question, after which the roles are reversed. You are not supposed to write down the answers. After practicing you will have to answer these questions in complete sentences in front of the class.
1. If you had a million dollars what would you spend it on?
2. If you could meet any person in the world who would it be and why?
3. If you had to live in another country which

one would you choose?

In session 3 students read the text again and memorize conditional sentences. Then they complete the sentences without having direct access to the text:

Now write down the sentences from the text that you just had to remember in the previous exercise. The first words of each sentence are given. You are not allowed to browse back!
1. If people _____
_____
2. Well, I would _____
_____
3. The cat _____
_____

In the last exercise of session 3 students learn by heart a dialogue containing conditionals and subsequently present it in front of the group.

Under the incidental condition, students are also supposed to construct grammar knowledge based on linguistic input but – unlike the implicit group – not through intentionally storing the input but through actively 'working' with the linguistic input and focussing on meaning, viz. in text comprehension and translation exercises. At the beginning of the incidental lesson series the students read the text "The Cat and the Mouse" and decide whether certain statements about the content of the text are true or false:

Read the text. Below are sentences that deal with this text. Evaluate each statement and choose either TRUE or FALSE. Cross out what is not applicable.
1. The first paragraph isn't part of the story itself: it's an introduction to the fairy tale. TRUE/FALSE
2. The cat only wants to return the mouse's tail if the mouse gets some meat for the cat. TRUE/FALSE
3. The cow is convinced that the mouse is able to get her some hay. TRUE/FALSE

Subsequently, students construct senten-

ces summarizing the content of the text from blocks containing parts of the text. In the next exercise students translate the text into Dutch with a dictionary. Session 3 starts with reading the text again. Then they search given words in the text and describe them to their partner. The selected words do not have any relation to the conditional forms. Session 3 finishes with a word search puzzle containing words from the text.

3.2 Instruments

To investigate the effectiveness of the different treatments, two types of tests were used in this study: a grammaticality judgment test (GJ-test) and a semi-free writing test for receptive and productive language proficiency skills, respectively. The GJ-test consists of 30 sentences: 16 of them contain one of the four types of conditionals and 14 are fillers. Students are to judge sentences as either grammatically correct or grammatically incorrect. Every type of conditional is used 4 times of which two are correct and two incorrect. The semi-free writing test consists of 11 situations to which the students should respond in writing. The beginning of the sentence is given and triggers the use of conditionals. Examples of both tests are included in appendix B. For scoring the GJ test, the number of sentences that students correctly identified as right or wrong was counted, with a maximum score of 15 points. The semi-free writing test was evaluated by recording the right use of conditional sentences, with a maximum score of 11 points. Minor grammatical and spelling errors unrelated to the conditional forms were ignored.

We slightly altered the pre- and posttest sentences so that our participants would not recognize the test, thus avoiding student demotivation. Since our focus was on conditionals, i.e. the verbal domain, changes affected the nominal domain (e.g. names or adjectives) only.

To assess students' learning style we used a learning style inventory specifically designed for Dutch speaking secondary school students (Dienst Beroepsopleidingen, 2007). This inventory consists of a list of 28 statements – seven for each of Kolb's four learning styles. Students indicated for each statement to what extent it matches their learning preference by selecting one of the following answer options: "yes", "often", "sometimes", and "no". Based on the highest score on one of Kolb's four learning styles, students were classified as accommodator, diverger, assimilator or converger. In case students have equal scores on two or more learning styles, the outcome was defined as "unclear" and therefore their data were not included in our analysis.

3.3 Participants

A total of ten teachers and their classes, at seven schools across the Netherlands, took part in the experiment. The participating teachers were acquired mainly through the teacher training program network of the University of Groningen. The instruction types were randomly assigned to the participating teachers. 238 students, aged 15-17 years, participated in this study. The students are senior secondary school students attending higher general (Dutch: havo) and pre-university

Table 3
Overview Participants and distribution of learning styles over instruction groups

| Instruction group | Learning style | | | | |
	assimilator	accomodator	converger	diverger	Total
explicit-deductive	2	13	22	25	62
explicit-inductive	3	8	15	17	43
implicit	3	12	12	18	45
incidental	1	6	17	11	35
control	2	12	25	14	53
Total sample	11	51	91	85	238

secondary education (Dutch: vwo).

The experiment was conducted during regular school lessons and was integrated into the planned curriculum. Yet some of the teachers withdrew their participation during the experiment due to time constraints that appeared between their commitment to the experiment and its execution. Therefore, the number of participants per group is not evenly distributed across the instruction types.

Table 3 displays student numbers for each learning style in the five instruction groups. Most students in our research are convergers or divergers; assimilators are in the minority. The distribution over the instruction groups does not differ significantly ($\chi^2(12) = 8.729$, p = .73).

3.4 Procedure

Every participating teacher received an extensive description of the lesson series with details regarding the lesson procedures and recommendations for giving feedback. No explicit instruction on English conditionals was provided to the students prior to the intervention according to the participating teachers and the grammar curriculum of the regular EFL lessons. Analyses of Dutch foreign language teaching materials display a Focus on Forms approach (Piggott, Tribushinina & De Graaff, 2019) implying that both teachers and students are notably familiar with explicit types of instruction. This will be explored in the Discussion.

Concretely, students in all treatment groups received feedback in the form of plenary correction of the written exercises. No form-focused feedback was given for the oral reproduction task (implicit treatment) or the noughts and crosses game (all treatments). Two of the researchers were in close contact with the teachers and discussed progression with them during the experiment. They also observed part of the teachers' classes and asked teachers to report on any deviations from the lesson plans, none of which were mentioned. To minimize the influence of the teacher, students received written grammar instruction, and teachers were asked to strictly follow the assigned instruction without adding their own activities or explanations.

Although all tests could be taken either on paper or electronically, most teachers decided to use printed versions of the tests.

3.5 Data analysis

Our analysis strategy focuses on evaluating the differences between the four instruction types and the control group in mean test scores on the grammaticality judgment and the semi-free writing post-tests (RQ1) and on identifying potential differences between the instruction types in their effects on students of the two distinguished learning style groups (RQ2). To study the (differential) impact of the grammar instruction types, we opted for the use of a multilevel random intercepts models with students nested in classes, specifying instruction and learning style groups as fixed factors as well as their interaction and the pre-test scores as covariates. Scores on the pretest were specified as a covariate, adjusted by means of grand mean centering.

Before conducting the analyses, we first checked the homogeneity of the regression slopes of the two covariates on the respected post-tests scores. This check revealed that the regression lines between classes do not differ significantly, neither for the GJ-test (F(13, 210) = 0.348, p = .81), nor for the semi-free writing test (F(13, 210) = 1.50, p = .12). A second check on our intended analysis approach concerned the homogeneity of error variances in the covariance analysis design using Levene's test for equality of error variances. This check indicated significant deviation from homogeneity for both the GJ-test (F(27, 210) = 1.62, p = .03) and the semi-free writing test (F(27, 210) = 1.58, p = .04). To address the apparently evidential heteroscedasticity, we performed the multilevel covariance analysis using the lme package in R allowing variances to differ between the respective treatments and the control group.

For each posttest, we estimated four models. A null or empty model was estimated to assess the available variance at the class and the student level. This information was used to calculate the intraclass coefficient. We evaluated the significance of treatment and learning style effects by evaluating differences in Log-likelihood between three

Table 4

Descriptive data on pretest and posttest scores in the treatment and control groups: averages (SDs between parentheses) on the student level

Instruction group	GJ test		Semi-free writing test	
	Pretest (scale 0-15)	Posttest (scale 0-15)	Pretest (scale 0-11)	Posttest (scale 0-11)
explicit-deductive	9,35 (1,76)	10,15(1.27)	2,40(1.62)	3,15(1.70)
explicit-inductive	11,05 (2,00)	11,58(1.83)	3,95(2,15)	4,35(2,59)
implicit	9,91 (1,46)	9,96(1.52)	3,42(1.83)	3,36(1.54)
incidental	9,37 (1,77)	8,91(1.84)	2,06(1.03)	1,97(1.07)
control	8,89 (1,64)	9,42(1.46)	2,42(1.41)	2,28(1.62)
Total sample	9,66 (1,86)	10,03(1.76)	2,83(1.78)	3,04(1.93)

Table 5

Descriptive data on pretest and posttest scores for the two learning style groups: averages (SDs between parenthese) on the student level

Leaning style	GJ test		Semi-free writing test	
	Pretest (scale 0-15)	Posttest (scale 0-15)	Pretest (scale 0-11)	Posttest (scale 0-11)
Assimilator/diverger	10,03(2,08)	10,22(1,86)	2,96(1,76)	3,25(2,02)
Converger/accomodator	9,42(1,66)	9,89(1,68)	2,74(1,80)	2,89(1,87)
Total	9,66(1,86)	10,03(1,76)	2,83(1,78)	3,04(1,93)

increasingly complex models, starting with a model containing only the covariate, subsequently adding the treatment factor and finally the interaction between the treatment factor and learning style factor. Model improvement was evaluated by assessing the drop in the Log-likelihood values between the models at a 5% significance level. Main effects and interactions were subsequently evaluated by post hoc comparisons, applying Bonferroni procedure.

4 Results

Our prime interest in this study is to investigate the effect of four instructional treatments and to determine which instructional treatments improve students' mastery of complex grammatical sentences, most effectively (RQ1) and whether the effectiveness of specific treatments might be restricted to students with a preference for a specific learning style (RQ2). The effectiveness of the different instructional treatments was evaluated by comparing students' adjusted mean scores on the grammaticality judgement (GJ) and the semi-free writing test posttest scores in a

multilevel covariance analysis.

Before discussing the outcomes of this analysis we first present the raw descriptive data. Table 4 summarizes the descriptive data of students' scores on both the GJ and semi-free writing pre- and posttest for the four treatment groups and the control group. Students in all five groups score relatively high on the GJ pretest and display slight differences in mean scores on the GJ pretest ($F(4, 7.828) = 4.78$, $p = .03$) and GJ posttest ($F(4, 6.861) = 16.968$, $p = .00$) as well as on the semi-free writing pretest ($F(4, 6.836) = 10.15$, $p = .005$) and posttest ($F(4, 6.649) = 12.36$, $p = .003$). The mean scores on the semi-free writing pre- and posttests are low compared to the maximum score of 11.

Table 4 also shows that both explicit treatment groups score higher on the posttests than on the pretests. Students in the explicit-inductive group have the highest mean scores on the GJ-tests and the writing tests. Table 5 shows that students who are classified as convergers or accomodators achieved somewhat lower scores on pre- and posttests; differences between learning styles appeared to be only significant for the GJ pretest ($F(1, 223) = 6.14$, $p = .014$).

Table 6 presents the outcome of the analysis procedure for the GJ test. The first model is the null model, estimating students' post-test score and a random intercept. The intraclass coefficient under this model is 0.23, which indicates similarity among students in the same class. Model 2 includes the pretest as covariate. The plausibility of treatment effects was investigated by comparing the main effects model with the covariate only model, more specifically by testing the significance of the drop in the Log-likelihood value of the main effect model. The test of the drop in the Log-likelihood value indicates evidence of a treatment effect ($\chi^2(4) = 21.10$, p = .0003). Post-hoc comparisons based on model 3, using Bonferroni correction, reveal

that the explicit-inductive instruction group differs significantly in adjusted post-test scores from the control group (t(9) = 4.88, Bonferroni corrected p-value .009). The explicit-inductive instruction group further significantly differs from the incidental instruction group (t(9) = 5.437, Bonferroni corrected p-value .004).

The comparison between models 3 and 4, evaluated by means of a chi-square difference test of a further drop in the Log-likelihood value, further indicates evidence of possible interaction effects between treatments and learning style (χ^2 (5) = 12.88, p = .0245). Based on the findings about treatment effects in model 3 we therefore conducted further pairwise comparisons to evaluate differences

Table 6

Fixed effects estimates of instruction groups and learning style on performance on the GJ post-test with standard errors in parentheses (Top) and random effect parameters (Bottom)

Parameter	Empty model	Covariate model	Main effect model	Interaction model
	Fixed effects			
Intercept	10.120 (0.254)	10.093(0.213)	9.510(0.236)	9.748(0.362)
explicit-deductive[a]			0.658(0.292)	0.113(0.434)
explicit-inductive[a]			1.922(0.394)	1.818(0.560)
implicit[a]			0.415(0.348)	0.792(0.476)
incidental[a]			-0.563(0.410)	-1.181(0.649)
Learning style category				
Convergers and accomodators[b]				-0.370(0.439)
Interaction between instruction form and learning style category				
explicit-deductive* learning style category				0.927(0.542)
explicit-inductive* learning style category				0.154(0.712)
Implicit* learning style category				-0.769(0.608)
Incidental* learning style category				0.941(0.794)
Pretest GJ test[c]		0.144 (0.058)	0.109(0.057)	0.095(0.057)
	Random parameters			
Variance at class level	0.744	0.482	0.028	2.128e-08
Variance at student level	2.429	1.499	1.528	1,509
Log-likelihood	-455.675	-449.367	-438.813	-432.373

[a] *0=control group 1 =this instruction type.* [b] *reference group: divergers and assimilators*

[c] *pretest was grand mean centered*

Table 7

Post-hoc comparisons between the two learning style groups in the explicit inductive group and in the incidental instruction and control group

Pairwise comparisons	Estimated Difference[1]	t-value	p-value	Bonferroni corrected p-value
Explicit-inductive Assimilator/diverger vs Control group Assimilator/diverger	1.828(0.560)	3.25	.010	.081
Explicit-inductive Converger/accomodator vs Control group Assimilator/diverger	1.601(0.531)	3.02	.015	.117
Explicit-inductive Assimilator/diverger vs Control group Converger/accomodator	2.188(0.508)	4.31	.002	.016
Explicit-inductive Converger/accomodator vs Control group Converger/accomodator	1.971(0.467)	4.22	.002	.018
Explicit-inductive Assimilator/diverger vs Incidental Assimilator/diverger	2.998(0.686)	4.37	.002	.014
Explicit-inductive Assimilator/diverger vs Incidental Converger/accomodator	2.427(0.585)	4.15	.003	.020
Explicit-inductive Converger/accomodator vs Incidental Assimilator/diverger	2.782(0.663)	4.19	.002	.018
Explicit-inductive Converger/accomodator vs Incidental Converger/accomodator	2.211(0.553)	4.00	.003	.025

[1] Standard errors between parentheses

Table 8

Fixed effects of instruction groups and learning style on performance on the semi-free writing test with standard errors in parentheses (Top) and random parameters (Bottom)

	Empty model	Covariate model	Main effect model	Interaction model
	Fixed effects			
Intercept	2.992 (0.224)	3.020(0.178)	2.533(0.309)	2.757(0.407)
explicit-deductive[a]			0.735(0.395)	0.196(0.522)
explicit-inductive[a]			1.293(0.499)	1.690(0.646)
implicit[a]			0.550(0.455)	0.162(0.571)
incidental[a]			-0.195(0.430)	-0.169(0.556)
Learning style category				
Convergers and accomodators[b]				-0.330(0.418)
Interaction between instruction and learning style				
explicit-deductive* learning style category				0.912(0.578)
explicit-inductive* learning style category				-0.840(0.761)
Implicit* learning style category				0.627(0.617)
Incidental* learning style category				-0.043(0.564)
Pretest GJ test[c]		0.495(0.060)	0.460(0.062)	0.468(0.062)
	Random parameters			
Variance at class level	0.495	0.291	0.116	0.093
Variance at student level	2.801	2.171	2.241	2.222
Log-likelihood	-468.15	-441.82	-436.88	-432.58

[a] 0=control group 1 =this instruction type. [b] reference group: divergers and assimilators

[c] pretest was grand mean centered

between the two learning style groups in the explicit-inductive group and the learning style groups in the incidental instruction group and the control group. Table 7 summarizes the results of these comparisons.

From table 7 we can deduce that students in both learning style groups in the explicit-inductive group achieved significantly higher scores than students in the implicit instruction group. Convergers and accommodators in the explicit-inductive group also achieved significantly higher scores on the posttest than students in the control group. However, the posttest scores of the assimilators and diverger in the explicit inductive instruction group did not differ significantly from those of both learning style groups in the control group.

Table 8 presents the outcomes of the analysis procedure for the semi-free writing test. Model 1 is again a null model estimating only random intercepts. The intraclass coefficient under this model is 0.15. Model 2 includes the pretest as covariate. The comparison between model 2 and 3 by means of a chi-square difference test indicates evidence of a treatment effect ($\chi^2 (4) = 9.87$, p = .04). Post-hoc comparisons based on model 3, using Bonferroni correction, reveal no significant differences between the various instruction forms. The comparison between model 3 and 4, evaluated by testing the drop in the log-likelihood value between the models, further indicates no evidence of possible interaction effects between treatments and learning style ($\chi^2 (5) = 8.60$, p = .13).

Our main conclusions are as follows:

There is only limited evidence of differences in the effectiveness of various forms of instruction when teaching English comparatives, which are considered grammatically complex. Moreover, the differences in effectiveness only relate to the judgements of the correctness of constructions and not to their production. We could only conclude that explicit-inductive instruction is more effective than providing incidental instruction and offering no input concerning comparatives (control group). To the extent that there are differences between instructional forms, it is likely that they apply to all students, irrespective of their learning style.

5 Discussion

In this study we found limited evidence suggesting differential effectiveness of divergent instruction types for a complex grammatical structure (RQ1). The results indicate that explicit-inductive instruction leads to slightly better overall performance by students on the Grammaticality Judgment task, but not on the semi-free writing task. Observing minor differences in effectiveness between instruction types contradicts review studies, which generally find better results for explicit grammar teaching (De Graaff & Housen, 2009; Norris & Ortega, 2000; Spada & Tomita, 2010), but accords with recent studies in Dutch secondary education such as Andringa et al. (2011), Tammenga-Helmantel et al. (2014a; 2016). Small differences between the treatment groups might be related to the participants' pre-knowledge concerning English conditionals. Based on our analysis of the EFL curriculum and teacher consultancy, pre-knowledge was not expected but the receptive proficiency level was so high – about 2/3 of the sentences in the GJ-test were correctly identified as grammatical or ungrammatical – that reaching a significantly higher level was rather unlikely. Low gain scores might also be related to the density and duration of our intervention since grammar learning takes time (Celce-Murcia & Larsen-Freeman, 1999) especially under implicit conditions (Spada & Tomita, 2010) or when the tested grammar is complex (Ellis, 2002). On the other hand, our experiment has high ecological validity since brief consideration of a grammar structure is what we see in teaching practice and the Dutch EFL teaching materials.

This study further revealed no significant differences between students with an inclination towards learning from active experimentation and those who learn from reflective observations (RQ2). Thus, our outcomes diverge from earlier studies that predict assimilators and divergers to benefit more from inductive instruction than convergers and accommodators (cf. Coffield, Moseley, Hall & Ecclestone, 2004). However, our results are line with a study similar to ours; Tammen-

ga-Helmantel et al. (2014b) examined the relation between the learning style and the effectiveness of deductive and inductive instruction for German subjunctives, also a complex structure. They did not find a significant correlation between learning style and grammar instruction. Future research should reveal whether these findings can be extended to teaching complex language structures in general.

We observed some limitations in our study. First, curriculum pressure negatively influenced our research design; although teachers had committed themselves to the experiment, practical reasons such as cancelled classes and final exams made some teachers withdraw their classes from the experiment, so that group sizes were, especially for assimilators, relatively small. Likewise, a planned extended posttest, which could have revealed long-term effects of grammar instruction, had to be cancelled for the same reason. Other reasons, such as having the extended posttest just before the summer holidays, made administering this test unrealistic for teachers. Second, general low (adjusted) posttest scores for all instruction types in our study might indicate that the exposure to the grammar structure was not intensive enough. A longer intervention with more opportunities to practice might have resulted in better observable differences between the treatment groups. However, the teachers were only able to participate in our classroom interventions when these had only little impact on their regular teaching and would not consume too much of their teaching time. Although the FoFs approach generally adopted in Dutch EFL teaching materials and classrooms (see also West & Verspoor, 2016) legitimates brief interventions, further research should, wherever possible, attempt to lengthen the exposure to the structure since language learning takes time (Robinson, 1996). Also building repetition into the treatments could lead to clearer and better learning outcomes, e.g. Lynch and Maclean (2000) for EFL.

Inherent to this type of intervention studies is that the results primarily provide insights into the context studied. In this case, our research shows the impact of inductive, deductive, incidental and implicit treatment when teaching English comparatives to Dutch students at upper secondary schools. The large number of participants increases the generalizability of our study, though. Reduplication studies or similar studies with other simple and complex grammar structures, not only for English, would broaden our perspective on grammar instruction. Future research could also include students with lower English proficiency levels hence without prior knowledge of the structure. Their expected lower pretest scores, especially on the GJ test, might lead to higher gain scores and eventually clearer differences between the instruction groups.

6 Conclusion

Our study has shown that based on a comparison between grammar instruction types no strong conclusions could be drawn regarding the effectiveness of divergent types of instruction. Explicit-inductive instruction seems to be somewhat more effective in improving students' application of complex grammar structures than other types of instruction, but the difference in effectiveness in this study appeared to be small. These results hold for all students, irrespective of their learning style.

Notes

[1]Retrieved from: http://www.ego4u.com/en/cram-up/grammar/conditional-sentences/cat-and-mouse

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Auteurs

Marjon Tammenga-Helmantel werkt als curriculumontwikkelaar voor de moderne vreemde talen bij SLO. **Sharon Steringa** is docent Engels en i-coach (Noorderpoort, Winschoten). **Iryna Bazhutkina** is werkzaam als docent taalvaardigheid Duits bij de Faculteit der Letteren van de Rijksuniversiteit Groningen. **Cor Suhre** is als senior onderzoeker verbonden aan de Lerarenopleiding van de Rijksuniversiteit Groningen.

Correspondentieadres: Marjon Tammenga-Helmantel, Stationsplein 15, 3818LE Amersfoort. E-Mail: m.tammenga@slo.nl

Samenvatting

Complexe grammatica onderwijzen in Nederlandse EFL-klaslokalen: een onderzoek naar verschillen in de effectiviteit van deductieve, inductieve, impliciete en incidentele instructie.

Deze studie onderzoekt de effectiviteit van vier soorten grammatica-instructie voor leerlingen met verschillende leerstijlen. De focus ligt op een complexe grammaticale structuur, namelijk de Engelse *conditionals* of voorwaardelijke zinnen. In totaal namen veertien bovenbouwklassen met Nederlandse middelbare scholieren van 15-17 jaar en hun docenten deel aan het onderzoek. De klassen werden willekeurig verdeeld over de impliciete, incidentele, inductieve en deductieve behandelgroepen en een controlegroep. Een pre-posttest design inclusief een grammaticale beoordelingstest en een semi-vrije schrijftest is gebruikt om de effectiviteit van de verschillende instructievormen voor leerlingen met leerstijl die vertrekt vanuit reflectie of actief experimenteren. Een multi-level covariantieanalyse toont de beste resultaten voor expliciet-inductieve instructie. Post-hoc vergelijkingen laten zien dat de leerstijl van de leerlingen de bovenstaande effectiviteitsuitkomsten niet beïnvloedt.

Kernwoorden: grammaticale instructie, complexe grammatica, Engels als een vreemde taal, leerstijl, expliciete instructie, voorwaardelijke zinnen

Appendices
APPENDIX A
Once upon a time the cat bit the mouse

1. If people do not eat, they get hungry. Cats also get hungry. And if a cat gets hungry, she hunts mice. This is what happened next:

2. Once upon a time the cat bit the mouse's tail off. "Give me back my tail," said the mouse. And the cat said, "Well, I would give you back your tail if you fetched me some milk. But that's impossible to do for a little mouse like you."

3. The mouse, however, went to the cow. "The cat will only give me back my tail if I fetch her some milk." And the cow said, "Well, I would give you milk if you got me some hay. But that's impossible to do for a little mouse like you."

4. The mouse, however, went to the farmer. "The cat will only give me back my tail if the cow gives me some milk. And the cow will only give me milk if I get her some hay." And the farmer said, "Well, I would give you hay if you brought me some meat. But that's impossible to do for a little mouse like you."

5. The mouse, however, went to the butcher. "The cat will only give me back my tail if the cow gives me milk. And the cow will only give me milk if she gets some hay. And the farmer will only give me hay if I get him some meat." And the butcher said, "Well, I would give you meat if you made the baker bake me a bread. But that's impossible to do for a little mouse like you."

6. The mouse, however, went to the baker. "The cat will only give me back my tail if I fetch her some milk. And the cow will not give me milk if I don't get her hay. And the farmer will only give me hay if the butcher has some meat for him. And the butcher will not give me meat if you do not bake him a bread." And the baker said, "Well, I will give you bread if you promise never to steal my corn or meal."

7. The mouse promised not to steal, and so the baker gave the mouse bread, the mouse gave the butcher bread. The butcher gave the mouse meat, the mouse gave the farmer meat. The farmer gave the mouse hay, the mouse gave the cow hay. The cow gave the mouse milk, the mouse gave the cat milk. And the cat gave the mouse her tail back.

8. But imagine what would have happened otherwise: If the mouse had not promised never to steal corn or meal, the baker would not have given the mouse bread. If the baker had not given the mouse bread, the butcher would have refused to give her meat for the farmer. If the butcher had refused her any meat, the farmer would not have been willing to give the mouse hay. If the farmer had not been willing to give the mouse hay, the mouse would not have received milk from the cow. If the mouse had not received milk from the cow, she would not have got back her tail.

APPENDIX B
GJ pretest (selection)

a. Indicate for each sentence whether it is grammatical or not. It is not relevant wether you think it is true or not.
b. Underline the error in ungrammatical sentences.

Example:
After a long search, I finally finded my wallet again yesterday.   Juist/onjuist

If Dan weren't so nice, he will not tutor you in math tonight.	Juist/onjuist
I feel quite sympathy towards her.	Juist/onjuist
It wasn't my husband that send the bill.	Juist/onjuist
I would be the happiest man on earth, if she came back.	Juist/onjuist
They would have found the killer, if they had searched for a longer time.	Juist/onjuist
My girlfriend has long brownly hair.	Juist/onjuist
The post office is closed on Saturday afternoon.	Juist/onjuist
They will cancel the test match, if it will rain.	Juist/onjuist
I wouldn't advise you to take the car.	Juist/onjuist
If I see the sun coming up, I knew where the east is.	Juist/onjuist
I am preferring the seaside to the mountains.	Juist/onjuist
If I find her address, I'll send her an invitation.	Juist/onjuist
Can you do the shopping for me?	Juist/onjuist
If I see him, he's always in a hurry.	Juist/onjuist
I'm going home, if my blind date has glasses.	Juist/onjuist
Last year I went on a holiday to Spain with my friends.	Juist/onjuist
If Charles were more careful, he wouldn't have so many accidents.	Juist/onjuist
If I'd known you were coming, I had bought more food.	Juist/onjuist
I have once heard him give a talk on Japanese politics.	Juist/onjuist

Semi-free writing pretest (selection)

1. Imagine winning €100.000. What would you do? Would you buy a house, a car or something entirely different? Write down your answer, starting with: 'If I would win €100.000, …' ...……………………
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2. You arrive at the bus stop, just in time to see the bus leaving. You call home to explain that if you had left earlier, you would have made it in time for the bus. Write down what you would say on the phone, starting with 'if I had left earlier, …'
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3. A friend of yours has fallen off a ladder. You advise him about what he could have done to prevent this. Start your sentence with 'if'.
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4. Imagine that there were no bars between the girl and the lion. What would happen? Start your sentence with 'if'.
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5. What happens if you heat ice? Start your English sentence using the   words   'if   you   heat   ice,   …'.
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6. What happens if you speak in class without raising your hand first? Start in English with 'if I speak in class, …'.
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