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Published in:
System

DOI:
[10.1016/j.system.2016.09.002](https://doi.org/10.1016/j.system.2016.09.002)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

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

Publication date:
2016

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Tammenga-Helmantel, M., Bazhutkina, I., Steringa, S., Hummel, I., & Suhre, C. (2016). Comparing inductive and deductive grammatical instruction in teaching German as a foreign language in Dutch classrooms. *System*, 63, 101-114. <https://doi.org/10.1016/j.system.2016.09.002>

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Comparing inductive and deductive grammatical instruction in teaching German as a foreign language in Dutch classrooms

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ARTICLE INFO

Article history:

Received 1 December 2015

Received in revised form 19 September 2016

Accepted 21 September 2016

Available online 30 September 2016

Keywords:

Grammar teaching

Effective instruction

German grammar

Inductive instruction

Deductive instruction

Subjunctive

Complex grammar

Foreign language teaching

ABSTRACT

Recent review studies show that explicit instruction is the most effective way when presenting grammar in a foreign language teaching setting. However, they do not distinguish between types of explicit instruction. This study explores what type of explicit instruction (i.e. deductive or inductive instruction) is more effective for Dutch students learning German. The participants are secondary school students from two different levels of secondary education, viz. HAVO and VWO. We investigate the learning of a complex grammatical structure, the subjunctive for reported speech (Konjunktiv I). Using a pretest-posttest design, we compare the gain scores for a grammaticality judgment test and a writing test for explicit-deductive and explicit-inductive instruction groups and a control group. One-way ANOVA analyses show that both types of explicit instruction have a positive effect on learning gain. Only the grammaticality judgment test displays statistically significant differences between inductive and deductive instruction, with better results for inductive instruction. According to our data the educational level of the participants did not influence the learning effects.

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1. Introduction

In SLA research the central notions in the discussion if, why and how grammar should be taught in second language classes are explicitness (in teaching) and awareness (in learning). The two poles in this discussion are represented by the terms explicit and implicit methods. The debate about the effectiveness of explicit vs. implicit methods for grammar teaching was initiated by Krashen's non-interface hypothesis (1994) considering complexity of grammar structures. Krashen (1994) distinguishes between simple and complex structures and argues that only simple structures can be successfully taught in foreign language education. An opposite view has been outlined in Hulstijn and de Graaff (1994). They argue that complex grammar rules are (too) hard for L2 learners to discover and for this reason they need to be presented explicitly in foreign language classes. Simple grammar, on the other hand, is easily noticeable in the input, so that implicit instruction is sufficient for these rules. Although the results of some subsequent studies confirmed Krashen's hypothesis (e.g. DeKeyser, 2005), two meta-analyses of recent empirical research demonstrate that explicit methods of grammar instruction are more effective than

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implicit ones in general (Norris & Ortega, 2000), and that this is true for both simple and complex grammatical structures (Housen, Pierrard, & van Daele, 2005; Spada & Tomita, 2010).

Recent review studies (Graaff & Housen, 2009; Norris & Ortega, 2000; Spada & Tomita, 2010) indicate a greater effectiveness of explicit types of grammatical instruction, but they do not distinguish between types of explicit instruction, e.g. between an inductive and a deductive approach (see Robinson, 1996 for the relevant instruction typology). In both instructional types, a grammar rule is formulated. Where the deductive approach conveys this rule explicitly to the learner, inductive teaching encourages learners to distill the grammar rule from the offered linguistic input. This study explores the effect of explicit grammar instruction, comparing deductive and inductive instruction for a complex grammatical structure in German. In order to see whether learner characteristics influence the effectiveness of the deductive treatment students from two selective types of secondary education in the Netherlands participated in our study.

2. Literature review

Some recent studies compare the effects of deductive and inductive types of grammar instruction (Erlam, 2003; Haight, Herron, & Cole, 2007; Jean & Simard, 2013; Shaffer, 1989; Vogel, Herron, Cole, & York, 2011). However, these studies do not offer univocal results. Some studies display better learner results with inductive treatment (Haight et al., 2007; Vogel et al., 2011), whereas other studies show that learners with a deductive instruction outperform the inductive group (Erlam, 2003). Additionally, there are researchers who do not observe any statistically significant differences in learner results for the two treatments or mention only a trend in favor of the inductive approach (Jean & Simard, 2013; Shaffer, 1989). Second, whilst the notion *deductive* seems to be applied uniformly, there is no clear consensus for inductive instruction. In all inductive approaches, the learner is encouraged to infer a grammar rule from linguistic input but the extent to which this is guided by a teacher and eventually summarized after exploration differs. Erlam (2003) considers inductive instruction to have a smaller degree of explicitness than in a deductive approach, cf. Norris and Ortega (2000), due to its focus on form with no explicit grammar instruction. Similarly, Shaffer (1989) and Jean and Simard (2013) encourage the participants to infer grammar rules but crucially omit subsequent (re)formulation of the rule by the teacher. A more guided version of inductive instruction is adopted by Haight et al. (2007). In their guided inductive approach, students receive no explicit explanation of the rule but have to construct it themselves in collaboration with the instructor instead. In addition, Vogel et al. (2011) combine this guided inductive approach with explicit rule formulation. Their so-called 'hybrid' model of guided inductive instruction consists of a meaning-based contextualized oral activity, as well as construction of the rule guided by the instructor and subsequent explicit rule explanation.

The type of inductive instruction which tends to give the best proficiency results is when grammar is introduced with guidance and with explicit formulation of the rule after exploration, see also Herron and Tomasello (1992). The positive effect of guidance is also observed in a recent meta-analysis of inquiry learning (focusing on hypothesis formulation and inducing underlying principles) in science and mathematics (Lazonder & Harmsen, 2014). This meta-analysis concludes that instruction with guidance is more effective than instruction without support. In sum, more empirical studies including clear definitions of inductive instruction are needed to draw stronger conclusions on a potential difference in effectiveness between inductive and deductive instruction.

Apart from instruction type, learner characteristics such as first language and scholastic aptitude, motivation, age, cognition and learning style also seem to influence the language learning process (see Ortega, 2009 for an overview). There is some evidence pointing to the influence of learner characteristics on the effectiveness of inductive and deductive instruction. In discussing Erlam (2005, 2013) observes "tentative research evidence to suggest that 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. Other learners may do better with a more deductive approach" (p. 4). Another possible intervening factor mentioned in the studies on inductive and deductive instruction is scholastic aptitude of the learner. Shaffer (1989) refers to studies in which it is argued that "an inductive approach would be too difficult for slower students, and that only brighter students are capable of discovering the underlying patterns of a structure" (p. 396). However, this assumption is refuted in her research. We conclude that the role individual characteristics play in instruction is yet to be explored further.

Also complexity is mentioned in the literature as a potentially interfering factor in effectiveness studies (see Introduction). Spada and Tomita (2010) conclude that no generally accepted definition exists for the notion *complexity* in that various criteria have been formulated in different studies. Tammenga-Helmantel, Arends and Canrinus (2014) address this issue. They combine criteria for the categorization of simple and complex grammar structures used in previous research (Andringa, 2005; DeKeyser, 1995, 2005; Hulstijn & de Graaff, 1994) and list four aspects to define the degree of formal complexity: 1) reliability (the number of exceptions to the rule), 2) structural complexity (the number of steps to apply a rule), 3) semantic complexity and 4) transparency (relation between form and semantics). For each grammatical structure the absolute and relative complexity can be calculated by determining the number of criteria for which the structure turns out to be complex.

Two studies on effectiveness of grammar instruction have recently been executed under conditions similar to ours, i.e. in a Dutch classroom setting: Andringa, Gloppe and Hacquebord (2011) and Tammenga-Helmantel et al. (2014). Andringa et al. (2011) compare the effectiveness of explicit (deductive) and implicit instruction for two grammar structures: the degrees of comparison and subordinate clauses, simple and complex grammar, respectively. They use a pre-post-test design with a grammaticality judgment test and a free written response task. The participants are high school students in a Dutch

international school with various L1 backgrounds learning Dutch as a second language. They have participated in a computer-assisted language learning experiment. The researchers conclude that explicit and implicit instruction foster the use of the grammar structures equally. Higher effectiveness was found only for explicit grammar instruction in the grammaticality judgment test for the degrees of comparison (i.e. for the simple structure). Tammenga-Helmantel et al. (2014) investigate the effectiveness of inductive, deductive, implicit and incidental instruction, after Robinson's (1996) classification. Their participants are Dutch first-, second- and third-year high school students learning English, Spanish and German. Like in the above study, students learn the degrees of comparison, and a grammaticality judgment test and a writing test are included in the design. No gain score differences are found between the four instructional approaches. On the other hand, all four instructed groups score significantly better than the control group.

Our study and research design are inspired by these two studies and it can be considered a follow-up to the research reported on in Tammenga-Helmantel et al. (2014) but now the focus is the teaching of complex rather than simple grammar: the subjunctive for reported speech. Moreover, the present study integrates strictly inductive and deductive treatments because of the effectiveness of explicit instruction (cf. Norris & Ortega, 2000; Spada & Tomita, 2010). After all, these are the two ways of introducing new grammar commonly found in Dutch teaching materials (cf. Tammenga-Helmantel, 2012's analysis of Dutch course materials for German as a foreign language).

This investigation is conducted to gain further understanding of the effectiveness of different approaches to L2 grammar teaching. The aims of our study are both pedagogical and theoretical in nature: new knowledge of the effectiveness of grammar teaching should help L2 instructors to make experimentally and statistically grounded choices for their education. The same holds true for publishing houses who have to decide whether to introduce new grammar inductively or rather deductively in their teaching materials. Our theoretical aim is to extend existing research on (effective) teaching and learning of complex grammar rules. Our project intends to contribute to the field of language teaching research in the following ways. First, it addresses the need for a more detailed comparison between different types of explicit instruction and focuses on two types, here: deductive and inductive. Existing studies do not provide a univocal answer to the question which type is more effective. Secondly, we execute our effectiveness study regarding the teaching of a complex grammar rule. A split of opinions has been observed in the literature concerning the feasibility of introducing complex grammar explicitly (see Introduction). We hope to shed more light on this matter. Thirdly, in our study instruction types are compared in their effectiveness when applied in secondary school classrooms, whereas most research in this field has been executed with (undergraduate) students. Fourthly, we include educational level in our design in that HAVO and VWO students participate in our experiment. In doing so, we hope to find out if and how this influences the effectiveness of L2 grammar instruction. As for teaching practice, we hope that our results may serve as guidance to language teachers on how to teach complex grammar rules and that they learn whether they can expect learning differences for learners at different educational levels.

Our central research question is:

- 1) What kind of explicit instruction is more effective for learning complex grammar structures (here: subjunctive for reported speech): explicit-deductive or explicit-inductive?

To answer this question we compare the learning gain, i.e. posttest – pretest scores, of our VWO-students.

Since we offer our participants a guided inductive instruction with explicit formulation of the grammar rule after exploration as in Vogel et al. (2011) and Haight et al. (2007), we expect our results to be similar to these studies. In other words, the inductive approach is expected to be more successful than the deductive one in that it results in higher gain scores (posttest – pretest). Our hypothesis is therefore:

H1. Inductive instruction is more effective than deductive instruction when teaching complex grammar (here: subjunctive for reported speech).

Subsequently, the following question will be answered:

- 2) Does the effectiveness of the deductive instruction vary depending on level of education?

Our collected data on deductive instruction with HAVO and VWO participants will provide insight into this issue.

3. Method

3.1. Target structure

This study examines the effect of inductive and deductive instruction in a Dutch secondary school context for the German subjunctive for reported speech (Konjunktiv 1). An example is provided in boldface in (1):

- (1) Peter sagt, dass er krank **sei**
 Peter says that he ill is_subjunctive
 ‘Peter says that he is ill’

This grammar construction is rather formal and is mainly found in written language. Upper grade secondary school students encounter this grammar structure in reading texts (e.g. newspaper texts) regularly. However, Dutch teaching materials for German do not present this structure item explicitly. Although teachers in general may mention the subjunctive for reported speech in their teaching when discussing a reading text which displays this structure, the teachers participating in our experiment had not focused on the subjunctive explicitly prior to the intervention. We have chosen this grammar structure since it is a specific, localized structure which can be introduced in a short intervention. Moreover, we can assume the same pre-knowledge for all participants, i.e. no explicit knowledge of the structure but possibly receptive pre-knowledge in that they might have seen this verb form in a reading text. Although Dutch and German belong to the same language family, L1 knowledge does not help in this particular case since the subjunctive for reported speech is non-existent in Dutch.

To categorize the complexity of the grammar structure under research we use the proposal outlined in Tammenga-Helmantel et al. (2014). In this approach, formal complexity is determined by reliability, structural and semantic complexity, and transparency (see Literature review). In our calculation of the number of steps, we count the steps as they are presented to the participants in the teaching materials. This has the advantage that the result is easily accountable and ecologically valid in that it is directly related to the materials used in the classroom.

Consequently, the subjunctive for reported speech can be categorized as ‘highly complex’, as it is considered complex in respect of both structural and semantic complexity and transparency. As far as reliability is concerned the subjunctive for reported speech is not that complex, although some morphological exceptions exist. Table 1 visualizes this.

If a broader definition of complexity, including other factors like frequency and L1/L2-comparison (see Housen & Kuiken, 2009 for a more elaborate and multifaceted definition of complexity), would have been applied in the case of the subjunctive for reported speech, the results would point in the same direction. This structure is not often used and Dutch does not have it, hence the subjunctive for reported speech is to be judged as complex in this broader perspective as well.

3.2. Participants

The participants in this study are adolescent students aged 15–18 from eight different secondary schools in the Netherlands; 14 teachers cooperated. Eight of them were also involved as researchers in this project, coordinating the experiment in their schools and regularly discussing the progress of the treatment with the teachers during the experiment. All students have Dutch as their first language and all had three years of education in German at the time of research and were therefore suitable candidates for a project about complex grammar. Most participants are from the north of the Netherlands. A large number of teachers was approached, mainly through the teacher training program network of our university. Students were not selected individually but were in the classes of the teachers who wanted to participate. The groups were randomly assigned to instruction type. In total 219 students participated, see Table 2.

In the Netherlands, secondary education is offered at three different levels: VMBO (pre-vocational education), HAVO (higher general secondary education), and VWO (pre-university secondary education). High schools tend to allow their students to start in these different streams depending on their so-called CITO-score. The CITO-test is a general scholastic aptitude test for students at the age of 11 or 12 before entering the Dutch high school system. Generally, VWO-students tend to have a higher scholastic aptitude than HAVO-students but a 1:1 relation between educational level and scholastic aptitude cannot be presupposed since the brightest HAVO students may well score better than the weaker part of the VWO-population. Therefore, we assume that educational level is not identical to but at best indicative of the student’s scholastic

Table 1

Degree of complexity: Subjunctive for reported speech (Konjunktiv 1); criteria classified as complex are in grey.

Criteria	Subjunctive for reported speech (konjunktiv 1)
Reliability	High: few exceptions (modal verbs and <i>sein</i>)
Structural complexity	Relatively high: applying the rule requires at least three steps: 1) determining the verb stem 2) applying the endings of Konjunktiv 1 3) determining whether the constructed form is not identical to indicative verbal morphology 4) if identical, then Konjunktiv 2 morphology rules must be applied and five different forms in verbal morphology
Semantic complexity	High: subtle meaning difference in comparison to the indicative in reported speech
Transparency	Low: forms are partly the same as in indicative mood
Total result	3 out of 4 > highly complex

Table 2
Overview participants.

	HAVO	VWO	Total
Explicit-deductive	55	59	114
Explicit-inductive	—	63	63
Control group	21	21	42
Total	76	143	219

aptitude. Our study is executed at the highest level of Dutch secondary education: VWO. Moreover, we were able to include a group of HAVO-students in our research, who followed the deductive treatment. No VMBO-students participated in our study because of the complexity of the grammar structure. Having students from two educational levels makes it possible to explore the influence of educational level on learning outcomes for this instruction type. By thus including educational level in our design, we address a research gap which has been noted by Spada and Tomita (2010) who notice that there are hardly any experimental studies about the influence of individual characteristics of learners on the effectiveness of L2 instruction (but see some examples above).

Different from our original research design, no HAVO-students have fully undergone the inductive intervention since the teacher in question withdrew his classes during the experiment due to curriculum pressure. The implications of the lack of a HAVO-inductive group will be dealt with in the discussion section.

3.3. Classroom procedures and research design

For the experiment, a pretest-posttest design was used. At class level, participants were assigned to either inductive or deductive instruction. Control groups were added for both educational levels. These control groups only took the tests and did not receive any instruction on the grammatical issue under research. They attended regular classes instead; importantly, they received no instruction on subjunctive for reported speech.

A teacher's guide complemented each lesson series. This guide started with a short instruction for the teacher and a timetable for the lessons. The teacher's guide also included explicit instruction in that teachers must provide the students with correct answers but were not supposed to explain in addition to the instruction material offered to the students. These instructions were the same for both treatment groups. The answers to the exercises were included in the teacher's guide. Before teachers started with the lesson series they had to read the protocol which contained important information on how the lessons should be executed. The teachers were asked to make a note of any irregularities or derogations from the lesson plans. No striking irregularities or deviations from our instructions have been reported.

Participants attended a series of four lessons, the first and last of which were used for pretests and posttests which consist of a grammaticality judgment test and a writing task. In between, students received instructions (in Dutch) and did exercises on the grammar subject. The instruction and testing took place during regular class hours. It was up to each teacher to select these time slots; therefore, the duration of the entire intervention including testing could vary from one to three weeks. Importantly, the posttest—being part of lesson four—was always made immediately after the last part of instruction and can thus be considered as an immediate posttest in all cases. Subjects who missed any of the lessons were removed from the data set, as were repeaters and students with an L1 different from Dutch.

3.4. Instructions

In our study, both the deductive and the inductive approach include explicit formulation of the grammar rule. Thus, we adopt Vogel et al.'s (2011) interpretation of the notion *inductive*, i.e. students are guided to discover a grammar rule and this rule is explicitly formulated after the exploring phase. We have decided to include guidance and explicit attention to the grammatical rule in the inductive type of instruction for three reasons. First, this type of inductive approach tends to give the best proficiency results since in those cases where inductive instruction is more successful than deductive instruction, grammar is introduced with guidance and with explicit formulation of the rule after exploration, see Section 2. Second, guidance and especially making the rule explicit ensures that learners induce correctly. Third, it resembles the inductive approach used in Dutch schoolbooks (see the overview of grammar instruction for Dutch school books for German as a foreign language, Tammenga-Helmantel, 2012). The intervention can be classified as focus on forms. We have opted for this approach since—again—this is how Dutch teaching materials for German present (and order) their grammar curriculum.

In the inductive method, students are first confronted with a text containing a high frequency of the grammatical structure under consideration and then construct the rule themselves with help of the written instruction:

Lees onderstaande tekst en let goed op de onderstreepte woorden. Let op! Je moet straks opdrachten over de tekst maken.

[Read the following text and pay attention to the underlined words. Attention! You have to make exercises about the text afterwards].

Wat gebeurt er met het werkwoord a

van de vormen *es* en *sie* meervoud. Vul deze in het schema. Vergelijk met de vervoeging van werkwoorden in de tegenwoordige tijd.

[What happens to the verb when used in reported speech? Find the verbal endings for *es* en *sie* plural in the text. Fill out the table. Compare these with the present tense forms]

Maak de volgende regel af [Finish the following rule]:

De vorm van de Conjunctief I wordt afgeleid van de stam van de tegenwoordige tijd + de uitgang.

[The form of the subjunctive for reported speech is derived from the verbal stem in present tense + ending.]

Ich	stam + e
Du	stam + est
Er/sie/es	stam + _____
Wir	stam + en
Ihr	stam + et
Sie/sie	stam + _____

Hierbij hoeft er geen onderscheid gemaakt worden tussen zwakke, sterke en onregelmatige werkwoorden. [No distinction is made between weak, strong and irregular verbs]

Wat gebeurt er met het werkwoord *sein* als je deze in de indirecte rede gebruikt?

[What happens to the verb *sein* when used in reported speech?]

Welke vorm verwacht je bij *sein* derde persoon enkelvoud als je de regel van de vorige pagina toepast?

[What form do you expect when you apply the rule stated above?]

Antwoord [Answer]: _____

Het werkwoord *sein* heeft in de eerste en derde persoon ev. een uitzonderlijke vorm, namelijk:

_____ Vul dit in onderstaande tabel in.

[The verb *sein* has in first and third person singular an irregular form, viz. Fill out the following table]

Ich	_____
Du	seiest
Er/sie/es	_____
Wir	seien
Ihr	seiet
Sie/sie	_____

Alleen bij *ich* en *er/sie/es* *sei* treedt er een onregelmatige vorm van de Conjunctief I op. Er **ontbreekt** de uitgang stam + e [Only with *ich* and *er/sie/es* *sei* an irregular form of the subjunctive is found. The –e ending is missing.]

After this exploration phase the grammar rule is explicitly explained/summarized to ensure the accuracy of the learned material; then, students undergo a practicing phase. For instance, students have to read the text and find and underline verbs in subjunctive mood. In another exercise, students have to analyze a number of subjunctive verbs and indicate their subject and the stem of the verb. In yet another exercise, sentences from the text have to be converted from indirect speech to direct speech. In the last lesson students make a puzzle-like exercise in which they have to find the subjunctive form of eight verbs in a word search exercise.

In the deductive approach the teaching materials start with a presentation of the grammar rule to the learner:

De vorm van de Conjunctief I wordt afgeleid van de stam van de tegenwoordige tijd + de uitgang (-e, -est, -e, -en, -et, -en). Hierbij hoeft er geen onderscheid gemaakt worden tussen zwakke, sterke en onregelmatige werkwoorden

[The form of the subjunctive for reported speech is derived from the verbal stem in present tense + ending (-e, -est, -e, -en, -et, -en). No distinction is made between weak, strong and irregular verbs].

Alleen bij *ich* en *er/sie/es sei* treedt er een onregelmatige vorm van de Conjunctief I op. Er **ontbreekt** de uitgang stam + e.

[Only with *ich* and *er/sie/es sei* an irregular form of the subjunctive is found. The -e ending is missing.]

In de directe rede worden de woorden van een ander letterlijk weergegeven. Ze staan dan tussen aanhalingstekens (citaten), zoals in (2). Maar bij de indirecte rede worden de woorden van een ander niet letterlijk weergegeven. Ze staan zonder aanhalingstekens, zie (3)

[In direct speech somebody else's words are literally reported. These are found between quotation marks (citations), like in (2). However, in reported speech other people's words are not literally reported. They come without quotation marks, see (3)].

- (2) Der Pressesprecher sagt: „Er verbannt seit Monaten Fremdwörter aus seinem Ministerium.“
‘The press spokesman says: “He has banned foreign words from his ministry for months”’
- (3) Laut seines Pressesprechers verbanne er seit Monaten Fremdwörter aus seinem Ministerium.
‘According to his press spokesman he would ban foreign words from his ministry for months’

This is followed by the same practicing phase as for the inductive participants, with identical exercises and the same amount of time. The differences between the two approaches are summarized in Table 3. The different characteristics are clarified with examples when presenting the teaching materials, see below.

The main difference between the two approaches is the role learners play in the learning process. In the deductive approach they are passive recipients of the rule and the correctness of the rule is guaranteed by the instructor, whereas the inductive approach stimulates not only the knowledge of the rule but also the skill of language observation and independent rule detection, taking into account the possibility of false paths.

Instruction materials were developed for three lessons: two lessons of 45 min (lessons two and three) and a brief one of approximately 15 min (first part of lesson four). One authentic text is used as a basis for the lessons and exercises in both the inductive and deductive instructions to ensure the same linguistic input for both treatment groups. The text, “Klapprechner statt Laptop?”, from the German newspaper Bild is slightly modified to improve readability, see Appendix 3. The text contains multiple instances of subjunctive verb morphology, which makes it suitable for use in this study. The classroom activities are inspired by the exercise types in Andringa et al. (2011) and Tammenga-Helmantel et al. (2014), and comprise both receptive and productive exercises.

3.5. Instruments

In the present study two types of tests are applied to examine the effectiveness of explicit grammar instruction: a receptive grammaticality judgment test and a productive semi-guided writing test. Since the subjunctive for reported speech is mainly found in formal, written language we have decided not to test production in a speaking test. The participants had approximately 30 min to complete both tests. We intended to provide the students with enough time for the tests (non-timed), and issues concerning time were not mentioned on the teachers' evaluation forms. The tests vary with regard to the degree of awareness and targeted attention to form.

The grammaticality judgment test (GJ-test) consists of 20 sentences: eleven with subjunctive and nine fillers. Students were to judge sentences as either grammatically correct or grammatically incorrect. The fillers (about case marking and subject-verb agreement) serve to distract the students from the grammatical structure tested, especially in the pre-test. In addition, the fillers may boost the confidence of students who have no knowledge of the complex grammatical structure but do know other things about the language. The writing test consists of six situations. Students write a semi-guided response to six situations in minimally 50 words eliciting the production of the subjunctive for reported speech in three of these. The tests have been included in Appendices 1 and 2. Both the GJ-test and the writing test were used twice: as pretest and—slightly altered—as posttest.¹ Cronbach alpha for the grammaticality judgment test and the writing test indicating the tests' overall reliability are as follows. Grammaticality judgement test 0.59 and 0.52, in pre- and post-test, respectively (medium). Writing

¹ Different nouns were used in the tests to prevent recognition and motivation problems.

Table 3
Deductive and inductive treatments in this study.

Deductive	Inductive
	Language observation
	Hypothesing and rule formulation by learner
Rule presentation by teacher	Rule check by learner and teacher
Practicing phase	Practicing phase

task: 0.77 and 0.81, in pre- and post-test, respectively (good). Values around 0.70 are considered good for ability tests (Field, 2013: 715).

3.6. Data analysis

Scoring of the tests was done according to a protocol formulated in advance. Scoring the GJ test was a matter of evaluating whether students had adequately identified the eleven sentences containing subjunctive for reported speech as correct or incorrect. This resulted in a score ranging from 0 (i.e. all items incorrectly identified as correct/incorrect) to 11 (i.e. all items correctly identified as correct/incorrect). For three out of six situations in the writing test, the subjunctive for reported speech was elicited. It was determined for three situations whether students had selected this grammatical form and used it correctly. Focus was on the morphologically correct use of the subjunctive. Scores for the writing test could range from 0 to 3 (i.e. one point for each correctly triggered subjunctive construction).

To see which type of grammatical instruction results in the best gain scores, a one-way ANOVA was conducted. The gain scores of the VWO-students were used as a dependent variable and instruction type (explicit-inductive, explicit-deductive, and control) as independent variable. For the deductive instruction we can determine the influence of level of education (here: HAVO and VWO) on learning gain. A one-way ANOVA with educational level as independent variable and gain scores as dependent variable was used. The analysis was run for the two grammar tests separately. In all analyses, the level of significance was set at $\alpha < 0.05$.

4. Results

In this research project our main aim is to find out whether explicit instruction about a complex grammar structure results in students' adequate recognition and use of the grammar structure and what type of explicit instruction, deductive or inductive, is more effective. Before presenting our research findings related to this research aim, we first consider the issue of the comparability of the research groups concerning their language proficiency before the intervention took place. Even though the descriptive data show slight differences between the research groups in the average scores on the grammatical judgment pretest and writing pretest, a one-way ANOVA reveals that these differences are not significant ($p > 0.05$). Levene's test statistic further indicates equality of variances in the three conditions groups concerning differences scores on the grammatical tests ($F(2, 216) = 0.702, p = 0.497$) and the writing/productivity test ($F(2, 216) = 2.665, p = 0.072$). In other words, these results indicate that the students in all three groups had comparable baseline levels of written language proficiency and pre-knowledge of the studied grammar structure.

RQ1: What kind of explicit instruction is more effective for learning complex grammar structures?

The effectiveness of the explicit instruction interventions was investigated by means of a one-way ANOVA analysis on the gain scores. The results are shown in Table 4. This analysis shows a significant difference between groups in the GJ test gain scores ($F(2,140) = 2.83, p < 0.05$), although the effect is weak ($\eta^2 = 0.04$). Post hoc tests for the grammaticality judgment test scores reveal that the inductive treatment group has higher gain scores than the deductive and control groups ($p < 0.05$); furthermore, no significant differences are found between the latter two groups ($p > 0.05$). For the writing test no differences in gain scores are found between the three groups ($F(2,140) = 0.68, p > 0.05, \eta^2 = 0.01$). Our first research question can thus be answered as follows: Inductive instruction is more effective than deductive instruction; however, this effect is weak and could only be observed in the grammaticality judgment test and not in the writing test. Based on earlier studies on the effectiveness of deductive and inductive grammar instruction conducted under similar conditions (i.e. Haight et al., 2007;

Table 4
Mean gain scores for grammaticality judgment test and writing test; standard deviation between brackets (VWO-population).

Instruction	N	GJ-test mean scores			Writing test mean scores		
		Pretest	Posttest	Gain score (SD)	Pretest	Posttest	Gain score (SD)
Inductive	63	2.92 (2.06)	6.41 (2.23)	3.49 (2.98)	0.37 (0.63)	0.62 (0.77)	0.25 (0.78)
Deductive	59	3.71 (2.11)	5.51 (1.79)	1.80 (2.54)	0.27 (0.61)	0.49 (0.80)	0.22 (0.89)
Control	21	1.95 (1.75)	3.24 (1.97)	1.29 (2.53)	0.48 (0.68)	0.48 (0.68)	0.00 (1.10)

Vogel et al., 2011) we have formulated the hypothesis that students benefit more from inductive than deductive treatment. Our results confirm this hypothesis.

RQ2: Does the effectiveness of deductive instruction vary depending on level of education?

Even though this study has not found evidence in favor of deductive instruction over inductive instruction, it could be that deductive instruction is more beneficial to students of a particular level, in this case HAVO or VWO. The descriptive data are portrayed in Table 5. The ANOVA analysis shows that HAVO and VWO participants who received deductive instruction do not significantly differ in their gain of grammatical knowledge (on the grammaticality judgment test, $F(1,112) = 0.39, p > 0.05$ and on the writing test $F(1,112) = 2.76, p > 0.05$). In other words, our second research question must be answered negatively. Hence, it seems deductive grammar instruction is not more beneficial to either level under investigation in the current study.

5. Discussion

In this study we have tried to shed light on a controversial issue in L2 teaching, namely the effectiveness of different explicit methods of teaching complex grammar. Our study was guided by two questions. The first question concerned the effectiveness of two types of explicit instruction for complex grammar structures. In line with our hypothesis we observed the inductive teaching method proved to be superior to the deductive method. The second question pertained to a possible variation in effect of the deductive instruction method due to the level of education of the participants. Our study shows that HAVO and VWO students that have received deductive grammar instruction display similar learning gains; hence, the effectiveness of deductive instruction is not influenced by the educational levels under investigation here. Our findings on educational levels thus seem to point in the same direction as Shaffer's observation that scholastic aptitude does not influence (inductive) learning results. In essence, scholastic aptitude and educational level, which are related learner characteristics (see Section 3), do not interact with learning gain after explicit grammar instruction in both studies.

Our observation that the inductive teaching method is more effective than the deductive method is consistent with the findings of previous studies comparing deductive and inductive types of instruction using a similar definition of inductive treatment, i.e. studies which include guidance and subsequent explicit attention to grammatical rules (Haight et al., 2007; Vogel et al., 2011). Nonetheless, an argument against strong claims about the superiority of the inductive method is that this difference was found in only one of the two tests and the effect was weak, which is in line with Jean and Simard's (2013) and Shaffer's (1989) findings of no statistically significant differences between inductive and deductive instruction for grammar teaching. Shaffer merely signals a positive trend for inductive instruction results. Similar conclusions are found in a meta-analysis in science education which compares inductive and deductive teaching showing that no differences are found between the two approaches (Lott, 1983). Hence, we tend to refrain from strong claims in favor of inductive instruction, all the more since an originally planned extended posttest, which would measure and compare the long-term gain scores of the two types of instruction with the short-term ones from the posttest, could not be executed. Unfortunately, the timing of the experiment late in the school year and the pressure on the classes to finish their regular curriculum rendered this goal impossible.

The effectiveness of the inductive treatment might be partly related to the test which displays significant learning gain differences, i.e. the grammaticality judgment test. More than in the deductive treatment, the learner in the inductive treatment was asked to pay attention to a linguistic form in that they start the treatment with focused language observation (to notice, in the sense of Schmidt, 1990, Schmidt, 2010). Language observation is an essential part of the GJ-test as well. According to the idea of Transfer of Appropriate Processing (Lightbown, 2007) a match between the cognitive activities in the learning process and the retrieval process fosters transfer (see Nairne (2002) for a review study on the necessity of matching between learning and retrieval process). The cognitive process in the inductive instruction and the grammaticality judgment test seem to match better than the deductive instruction and the test. In other words, the inductive group seems to be slightly better prepared for the grammaticality judgment test than the deductive group.

As indicated above, the results differ depending on the test used. This difference may be attributed to the nature of the tests: receptive and productive, respectively. In the productive task, the students must focus on both form and meaning; this is clearly more complex than the grammaticality judgment test, which focuses on form only. Prolonged systematic practice has been claimed as a prerequisite for explicit knowledge to be gradually automatized (DeKeyser, 1997; 2003; Ellis, 2008: 445). Hence, the duration of the intervention may have been too short to use the subjunctive for reported speech in spontaneous L2 thus explaining the low results of the writing task. This conclusion seems reasonable since our study involves

Table 5

Mean gain scores for grammaticality judgment test and writing test; standard deviation between brackets (deductive treatment group).

Educational level	N	GJ-test mean scores			Writing test mean scores		
		Pretest	Posttest	Gain score (SD)	Pretest	Posttest	Gain score(SD)
HAVO	55	3.76 (2.06)	4.93 (2.33)	1.16 (2.67)	0.13 (0.34)	0.13 (0.39)	0.00 (0.43)
VWO	59	3.71 (2.17)	5.51 (1.80)	1.80 (2.54)	0.27 (0.61)	0.49 (0.80)	0.22 (0.89)

complex grammar which probably needs more time to become 'available' to the learners in a productive task. However, Andringa et al. (2011: 894) refer to studies with brief interventions which do show significant knowledge gains.

In theoretical studies it has been doubted whether complex information could be successfully offered in an inductive approach (Fischer, 1979; Hammerly, 1975; Krashen, 1981, 1985, 1994). We have empirically shown that the subjunctive for reported speech, which is considered complex grammar, can be successfully introduced inductively. Our findings are in line with Shaffer (1989) who has observed the effectiveness of inductive instruction for complex verbal constructions in Romance languages. We have observed that complex grammar can be successfully offered explicitly. This is in accordance with the claim of Hulstijn and de Graaff (1994) who argue that complex grammar must be taught explicitly, and contra Krashen (1994) who claims that complex grammar is too complex to be taught and can only be acquired.

Tammenga-Helmantel et al. (2014) have executed an effectiveness study for grammatical instruction of grammar with a relatively low degree of complexity but with a research design similar to our project. They do not observe significant differences between inductive and deductive treatments in the GJ-test and the writing test. The same is observed in our writing task. Our GJ-test, however, did show a difference between inductive and deductive instruction in that inductive teaching has been more successful than deductive instruction. We are not sure whether this difference between the studies should be attributed to the difference in complexity since it is observed in the GJ-test only. Moreover, recent review studies by Housen et al. (2005) and Spada and Tomita (2010) find indications for the effectiveness of explicit instruction independent from the degree of complexity.

5.1. Limitations of our study

We have observed some limitations in our experiment. Our original research design consisted of two instructional treatments and both were to be executed at two levels of education, viz. HAVO and VWO. Unfortunately, the HAVO-inductive group was withdrawn from the experiment so we do not know how HAVO students would respond to inductive grammar instruction. The success of different types of instructional training, i.e. deductive and inductive, could therefore be determined for the VWO-students only, which means that our findings are more restricted than intended at the start. In our research, we have shown that the educational level of the participants does not have a significant influence on their learning results after deductive instruction. Again, the absence of a HAVO-inductive group does not allow us to make any definite comments on possible differences in case of inductive instruction. Future research should ideally include the two instruction types at both HAVO and VWO level. Moreover, we consider it relevant to extent such research to foreign languages other than German and see whether our conclusions hold for these languages as well. In particular, English foreign language teaching is interesting in this respect since English seems to be developing towards a second language in the Netherlands.

Another point of concern is the motivation of the participants: Dutch secondary school students. The tests and lessons of the experiment material were not part of the official curriculum and the results were not graded. The gain scores would probably have been higher if the experiment tests had been part of the official curriculum that students would be graded on. This is an advice for later studies conducted in class settings with participants with low or no intrinsic motivation.

6. Conclusions

Recent review studies have shown that explicit instruction is more effective than implicit teaching but they do not differentiate between different types of explicit instruction. Our study has further explored this domain, comparing inductive and deductive treatment. Another research gap that has been addressed in our large-scale study concerns the influence of learner characteristics on teaching results; therefore, educational level was included in our design. The study was executed in a language teaching context which has not been studied much, viz. not with university students but with secondary school students. In so doing, we have contributed to the knowledge base and discussion of effective foreign language acquisition and teaching.

The current study puts forward a number of findings. First, complex grammar is not too complex to be taught successfully. Second, the inductive approach seems slightly favored when teaching the complex grammatical structure subjunctive for reported speech, at least when we take the receptive task into account. The most obvious implication that can be drawn from the present study is that although both types of explicit instruction have a positive effect on learning gain, SLA teachers and developers of teaching materials are advised not to restrict grammar instruction to the (traditional) deductive type but to offer inductive grammar instruction to their students as well.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Acknowledgments

The authors are grateful to Marjolijn Verspoor, Hilde Hacquebord and Joyce Haisema for comments and suggestions on an earlier version, and to the teachers who cooperated in this project.

Appendices

1 GJ-pretest

Is de zin goed of fout? [Is the sentence correct or not?]

	Juist/Onjuist
Voorbeeld: Unserer Tochter hat schöne Kleidung.	Onjuist
1. Am liebsten spricht meiner Mutter Englisch.	
2. Der Politiker habe gesagt, er sei nicht verantwortlich.	
3. Ohne Butter könne man nicht kochen, meint der Koch.	
4. Seien wir doch vernünftig!	
5. Könnt wir solche Probleme lösen?	
6. In der Zeitung stehe Kühe hätten zu wenig Raum.	
7. Unsere Katze könne vielleicht die Maus finden.	
8. Der Polizist habe keine Menschen gefunden, stand in der Zeitung.	
9. Sei es Sommer oder Winter, er trägt immer Lederhosen.	
10. Die Verkäuferin hat gesagt, dass meine Größe leider ausverkauft ist.	
11. Seine Frau ist Krankenschwester.	
12. Der Sänger klagte ständig, dass sein Hals schmerze.	
13. Der Maler sagte, er wisse nicht wo er sein Pinsel gelassen habe.	
14. Mein Vater ist einen Lehrer.	
15. Meine Mutter meinte, Tomate seien Obst und kein Gemüse.	
16. Sonntags schlief meine Eltern immer aus.	
17. Der Lehrer brüllte, jetzt reiche es aber.	
18. Der Minister behauptete die Renten seien sicher.	
19. Morgen hatten wir keine Lust zu schwimmen.	
20. Die Braut ist immer der Schönste!	

2 Writing pretest

Beantwoord de vragen in het Duits. Gebruik voor elke antwoord tenminste 50 woorden [Answer the questions in German. Each answer should consist of at least 50 words].

1a

Stel je voor: je wint een talentenjacht en wordt in een klap wereldberoemd. Wat zou je als eerste doen? Begin je zin met “Wenn ich berühmt wäre, dann ...” [Imagine you have won a talent show. What would be the first thing you would do? Start your answer with “Wenn ...”]

1b

Een vriend vertelt je wat hij zou doen als hij een talentenjacht zou winnen. Vertel je moeder wat hij verteld heeft, gebruik in elk geval het woord “behaupten” (=beweren) [A friend tells you what he would do if he were to win a talent show. Tell your mother what he told you; your answer should include the word “behaupten” (= to claim)]

2a

Je mist net de bus. Je belt naar school om te zeggen dat je het eerste uur zult missen. De telefoniste gelooft je niet: zij denkt dat je gewoon nog wat langer op bed wilt blijven liggen. Schrijf op wat zij je vertelt, gebruik het werkwoord “lügen”. [You just missed the bus. You phone school to tell them you are going to miss the first class. The receptionist doesn't believe you and thinks you are merely trying to stay in bed a little longer. Write down what she tells you, using the verb “lügen”.]

2b

Je vriend naast je bij de bushalte valt het wel op dat je gesprekje niet zo goed verloopt. Leg na afloop van het gesprek aan hem uit wat de telefoniste gezegd heeft, gebruik in elk geval het woord “sagen”. [Your friend, who is standing next to you at the bus stop, notices that your conversation isn't going too well. After ending the conversation, explain to him what the receptionist said, using at least the word “sagen”.]

3a

Je moeder heeft een oude auto met vaak motorpech, daarom gaat ze heel vaak naar de garage. Je vindt dat een beetje overdreven, leg haar uit waarom. Begin je verhaal met: “Ich finde es übertrieben, dass ...” [Your mother has an old car which breaks down regularly, which is why she often visits the garage. You think that's a little overdone, and explain to her why. Start your explanation with: “I think ... is overdone.”]

3b

Je moeder heeft echter een goede reden, vindt ze zelf. De monteur heeft gezegd dat een oude auto nu eenmaal veel onderhoud nodig heeft. Ze vertelt wat hij gezegd heeft, schrijf haar verhaal op. Gebruik in elk geval het woord: “meinen”. [However, your mother thinks she has a good reason. The mechanic has told her it's a fact that old cars need extra maintenance. She tells you what he said; write down her reply using at least the word “meinen”.]

3 Reading text

Klapprechner statt Laptop?

Bye bye English! Willkommen zurück, deutsche Sprache! Bei diesem deutschen Minister darf man ab jetzt nur noch Deutsch sprechen: englische Wörter und Begriffe werden nicht mehr benutzt.

Verkehrsminister Peter Ramsauer (56, CSU) setzt seinen Kampf gegen Anglizismen fort. Laut² seines Pressesprechers **verbanne** er seit Monaten Fremdwörter aus seinem Ministerium: Er **sage** Klapprechner statt Laptop, Reisestelle statt Travel-Management, Tafelschreibblock statt Flipchart. Mehr als 110 englische Begriffe **habe** der Bayer schon zusammengetragen und für seine Mitarbeiter zurück ins Deutsche übersetzt.

Der Minister hat Erfolg!

Die Kampagne habe ihm „Tausende Zuschriften und Anrufe“ auch aus der Bevölkerung eingebracht, sagte Ramsauer dem Berliner „Tagesspiegel“ – und zwar mit „100 Prozent Zustimmung“. Es freue ihn besonders, dass er jetzt die Möglichkeit sehe, sehr viel Menschen zu erreichen, so der Minister. „Normale“ Leute könne man viel besser erreichen, wen man sie auf Deutsch anspreche und nicht auf Englisch. Das Benutzen von zu viel englischen Begriffen sorge für Undeutlichkeit über die Botschaft, die man vermitteln³ möchte.

Die Einsicht daraus sei für ihn als Politiker: „Dem Volk aufs Maul geschaut⁴! Und schon weiß ich, was die Nöte, Sorgen und Probleme der Menschen sind. Und vor allen Dingen, was ich zu tun habe, um Abhilfe zu schaffen.“ Dank seiner Maßnahmen habe der Minister also jetzt ein besseres Bild von den Fragen und Problemen der deutschen Bevölkerung und könne er ihnen besser helfen. Aber wie sieht so was denn aus? Wie verdeutscht man Begriffe, die wir fast alle nur auf Englisch kennen und benutzen? So spreche man bei Minister Ramsauer, laut seines Pressesprechers:

- Rechner statt Computer
- Besprechung statt Meeting
- Projektgruppe statt Task Force
- Ideensammlung statt Brainstorming
- Auftaktveranstaltung statt „Kick-Off-Meeting“

Seine Initiative habe ein „landesweites Aufatmen bewirkt“, ganz viele Leute seien sehr erfreut über seine Idee, hatte Ramsauer bereits im März in der „Sächsischen Zeitung“ resümiert.⁵ Die deutsche Sprache sei vom Englischen nicht länger bedroht, sondern könne sich wieder zu wichtigster Kommunikationssprache entwickeln.

Der Minister damals: „Ich kann das Hinterherhecheln⁶ nach dem so genannten neuesten Stand der Sprach-Mode weder verstehen noch gutheißen.⁷ Wir haben für jeden Bereich unseres Lebens auch deutsche Begriffe. Die gilt es zu erinnern und anzuwenden.“ Der Minister verstehe also nicht warum so viele Menschen englische Begriffe benutzen. Er meine, es gebe in der deutschen Sprache Begriffe für alles und es sei deshalb nicht notwendig, English zu benutzen, nur weil es jetzt gerade modisch sei.

<http://www.bild.de/politik/2010/peter-ramsauer/feiert-ersten-sieg-im-anglizismen-krieg-15244928.bild.html>.

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² volgens.

³ overbrengen.

⁴ Een heel goed beeld van wat het volk (=de Duitse bevolking) wil.

⁵ samengevat.

⁶ achternalopen.

⁷ goedkeuren.

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