Can foreign language learners discover the rules of non-salient forms?

¿Pueden los aprendices de una lengua extranjera descubrir las reglas de formas lingüísticas no sobresalientes?

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Abstract

Learners more easily notice some linguistic forms than others. This quasi-experiment investigates whether the effects of explicit-deductive instruction and explicit-inductive instruction are equally mediated by the perceptual salience level of target forms. It also examines whether each of these types of instruction promotes explicit knowledge, implicit knowledge, or both. The study was conducted with 65 university students aged 21 years old on average. Three conditions were tested: explicit-deductive instruction, explicit-inductive instruction, and a control. The results revealed minor learning effects due to explicit-inductive instruction of a target form with higher perceptual salience but no learning for a less salient target form. Explicit-deductive instruction resulted in learning both forms regardless of their salience level. The findings suggest that explicit-inductive instruction is suitable for teaching more salient forms, while explicit-deductive instruction seems necessary for teaching less salient forms. The pedagogical and theoretical implications of these findings are discussed.

Keywords: explicit instruction; deductive instruction; inductive instruction; implicit knowledge; explicit knowledge

Resumen

Para los aprendices, ciertas formas lingüísticas sobresalen más que otras. Este cuasiexperimento investiga si los efectos de la instrucción explícita-deductiva y explícita-inductiva son igualmente afectados por el nivel de sobre saliencia perceptual de las formas lingüísticas meta, y si cada tipo de instrucción promueve el conocimiento explícito, implícito o ambos. El estudio se llevó a cabo con 65 estudiantes universitarios con una edad promedio de 21 años. Se examinaron tres condiciones: la instrucción explícita-deductiva, la explícita-inductiva y una condición control. Los resultados revelan que la instrucción explícita-inductiva generó un aprendizaje menor en el caso de una forma lingüística meta perceptualmente más sobresaliente, pero no hubo aprendizaje de la menos sobresaliente. La instrucción explícita-deductiva resultó en el aprendizaje de ambas formas independientemente de qué tanto sobresalen. Los resultados sugieren que la instrucción explicita-inductiva es más adecuada para enseñar formas más sobresalientes y la explícita-deductiva para las menos sobresalientes. Las implicaciones pedagógicas y teóricas de estos hallazgos son explicadas a detalle.

Palabras clave: instrucción explícita; instrucción deductiva; instrucción inductiva; conocimiento implícito; conocimiento explícito

1. Introduction

The role of instruction has attracted the attention of researchers studying second-language acquisition (SLA) and teachers over the past four decades. Specifically, there has been wide interest in knowing whether teaching formal rules of a second or foreign language (L2) allows students to use the target language more fluently and accurately during actual conversations or whether learners must discover rules by themselves to gain spontaneous knowledge. According to Roehr (2008), explaining a target rule tends to lead learners to better understand the form-meaning mapping of target items than instructing them to discover a rule on their own. However, this type of instruction does not encourage learners to create and test their own hypotheses about L2 forms; therefore, learners could potentially be less likely to play an active role in establishing form-meaning connections (Herron & Tomasello, 1992; Vogel, Herron, Cole & York, 2011). Learners are more likely to become active and engaged in processing target forms when they are guided to pay attention to a target linguistic form within a context and try to discover the underlying rule by themselves (Cerezo, Caras & Leow, 2016). Nevertheless, this also has its drawbacks as it requires learners to make inferences (Erlam, 2003), and not all learners are equally capable of discovering rules on their own (Vogel *et al*., 2011). In addition, learners need to encounter a form many times over a long period to successfully discover its underlying rule by themselves (refer to Ellis, 1993).

2. Background literature

Basically, there are two types of explicit instruction in L2 learning: deductive and inductive. According to Decoo (1996), explicit-deductive instruction refers to the pedagogical intervention through which the language teacher explains a target form to students at the beginning of a lesson, and then the learners practice the form. On the other hand, explicit-inductive instruction entails providing

learners with examples of a target form and directing their attention to those forms while guiding them so that they can discover the underlying rules of the target form on their own.

There are two theoretical perspectives on the role of each type of instruction. One proposes that inductive instruction is more effective when teaching target forms that are difficult to explain (Krashen, 1981, 1982; Larsen-Freeman, 2009), have a higher complexity level, do not stand out much, and have many exceptions to their underlying rule (Cerezo *et al.*, 2016; Lai, Qi, Lü & Lyu, 2020: 498). If the underlying rule is too challenging for learners to understand, there is no point in teaching it; instead, learners may benefit more by engaging in input and output activities that lead them to discover the target rule. The opposing view proposes that explicit-inductive instruction is more suitable for teaching easy rules, and explicit-deductive instruction should only be adopted for difficult forms because learners may feel frustrated if they are not able to discover the target rule (Russel, 2014; Shirav & Nagai, 2022). If the rules of the target form are easy to understand and perceptually salient to the learner, there is a higher probability that learners will consciously and intentionally implement a strategy leading them to search for the target rule (Reber, 1993).

Empirical evidence has consistently shown that both types of instruction are effective at increasing learners' accuracy of target forms, but explicit-inductive instruction has been predominantly more effective than explicit-deductive instruction in cases that comprise an explanation of the target form after learners have attempted to discover its underlying rule (refer to Benitez-Correa, Gonzalez-Torres, Ochoa-Cueva & Vargas-Saritama, 2019; Cerezo *et al*., 2016; Haight, Herron & Cole, 2007; Lai *et al.*, 2020; Shirav & Nagai, 2022; Takimoto, 2008; Vogel *et al*., 2011). To our knowledge, only two studies (refer to Erlam, 2003; Robinson, 1995) have shown that explicit-deductive instruction was superior to guided-inductive instruction, but the beneficial effects were short-lasting. Additionally, two studies have revealed that explic-

it-deductive and explicit-inductive instructions are equally effective (refer to Hejvani & Farahani, 2018; Rosa & O'Neill, 1999).

These experiments have only assessed explicit knowledge, except for the one by Erlam (2003), which additionally assessed implicit knowledge. Explicit knowledge refers to factual knowledge about the language and requires awareness and controlled attention. It can be declarative if the learner is able to explain the use of a target form; it can be used in a conversation if the speaker deliberately monitors his/her own speech. By contrast, implicit knowledge is incidental, procedural, and unconscious and requires minimal effort from the learner; thus, it is primarily used during spontaneous talk. The distinction between these two types of knowledge is important because L2 learners require both to cope with the demands of using the target language.

3. The current study

This quasi-experiment is a follow-up of a previous study that tested the effectiveness of textual enhancement and explicit-deductive instruction (refer to Moreno-Vega & Preciado-Sánchez, 2023) assessed by implicit and explicit knowledge measures. Their findings revealed that explicit-deductive instruction was superior to textual enhancement. Textual enhancement was ineffective at helping learners gain implicit or explicit knowledge of the prepositions *in*, *on*, and *by* in the context of means of transportation. The study by (Moreno-Vega & Preciado-Sánchez, 2023), therefore, sheds some light on the effectiveness of providing learners with an explanation of a non-salient form. However, it does not focus on the effectiveness of explicit-inductive instruction.

Whether inductive instruction should be implemented for more or less salient rules is still an empirical question that deserves further research, as only a few SLA studies have attempted to answer it, with inconclusive findings. Besides, there is no consensus on whether the type of instruction (i.e., deductive or inductive) mediates the knowledge (explicit or implicit) acquired by learners.

The present study addressed these issues by attempting to answer the following research questions:

1) Are explicit-inductive and explicit-deductive instruction effective at promoting either implicit or explicit knowledge, respectively, of the prepositions *in*, *on*, and *by* in the context of means of transportation? If so, does the salience level of the target forms mediate the effectiveness of either type of instruction?
2) Can learners figure out any of the two target rules because of explicit-inductive instruction?
3) Can students receiving explicit-inductive instruction improve from pre- to post-test without being able to explain any of the target rules?

4. Method

4.1. *Design*

This exploratory study had a quasi-experimental design to test the effectiveness of two pedagogical treatments over four treatment sessions: a) an explicit-deductive condition in which the target forms were explained to the students at the beginning of each training session, followed by a reading containing the target forms; b) an explicit-inductive condition in which students were instructed at the beginning of each training session to pay attention to the target forms that were colorized in a text and try to discover two underlying rules; and c) a control condition in which students received no instruction to pay attention to the target forms; they just read the same enhanced texts as in the explicit-inductive condition. Implicit and explicit knowledge was tested before and after the treatment. None of the groups was informed about the specific purpose of the study, nor were they given any information about the treatment to which they had been assigned.

4.2. *Participants*

Data collection was conducted at a public university in Sonora. A total of 65 university students participated in this study. There were 41 female and 24 male participants aged 21 years on average. All participants were Mexican native speakers of Spanish. They were all enrolled in an intermediate English course taught five times a week in 50-minute sessions, and they all had a B1 level of English proficiency according to the Common European Framework of References for Languages. The exposure of participants to English outside of class was limited, as shown by a linguistic background questionnaire. Eight intact groups were considered in this quasi-experiment. Three of the intact groups were assigned to the explicit-deductive condition ($n = 25$), two to the explicit-inductive FFI condition ($n = 15$), and three to the control condition ($n = 25$). Initially, the explicit-inductive condition included 26 students, but 11 dropped out of the course. The explicit-deductive condition included 28 students at the beginning of the study, and three stopped attending the class; the control condition initially included 27 students, two of whom did not finish the course. Thus, the explicit-inductive condition ended with an unequal number of participants, in contrast to the other two conditions. Methodologically, having a more even distribution of participants across each condition would have yielded more robust and generalizable findings. Therefore, the nature of this study is exploratory, and it attempts to shed some light on this topic, but the findings should be interpreted with caution.

4.3. *Target structures*

Following the same criteria as in the quasi-experiment by (Moreno-Vega & Preciado-Sánchez, 2023), the linguistic target of this study was the prepositions *in*, *on*, and *by* used in the context of means of transportation. These means of transportation were selected because, despite their high frequency (refer to Lindstromberg,

2010), it takes most learners many years to learn how to use them properly, and many students do not achieve this goal partially because of their low perceptual salience. Perceptual salience refers to how difficult it is to notice a target form (Goldschneider & DeKeyser, 2001). A linguistic form can be perceptually salient depending on its typographical features (typographical salience) and can also be salient depending on whether its underlying rule is present or absent in learners' L1.

Typographical salience is driven by bottom-up processing because it is related to stimulus features (Shiffrin & Schneider, 1977). For example, the target forms in this study are considered to have different levels of typographical salience depending on how much they differ from one another. In the field of Psychology, Tudge, Brandt, and Schubert (2018: 677) have noted that "if a scene is composed mostly of identical objects but contains one object that is different from the others, then we are more likely to direct our gaze to the odd one out" (also refer to Donk & van Zoest, 2008; van Zoest, Donk & van der Stigchel, 2012). In addition, Tudge *et al*. (2018: 677) also explained that "salience is greater when the differences between an object and its surroundings are greater". As such, this study was based on the premise that it is more difficult for learners to notice and understand the differences in form-meaning mapping of two target forms if they have typographical resemblance. For example, the prepositions *in* and *on* are very similar, so it is reasonable to assume that learners may not even detect that these are two different forms. However, *by* is typographically very different from *in* and *on*, making it more salient, and this may increase learners' chances of noticing its form-meaning function.

Some prepositions in L2 can be more salient than others if their meaning is relatively transparent in terms of learners' L1 and if learners can rely on their previous knowledge to understand the way the preposition is used. This type of salience is triggered by top-down processes because it is caused by "emotional, cognitive, and motivational" factors (Ellis, 2016: 343). That is, a form can also be more salient to some learners than others for reasons re-

lated to the learner and not only to the form. In the case of prepositions, L2 learners have to rely heavily on abstract concepts that are not necessarily evident contextually or available in their L1. For example, when using the target prepositions, there are basically two distinctions that should be made; the learner of English must know a) whether the means of transportation is specific or generic and b) whether the means of transportation is small or large. According to Lindstromberg (2010: 148), we can use *by* if we are referring to "a generic means of transportation… when we are not thinking of any particular machine" such as in the example: *I go to school every day by bus*. However, if we are referring to a specific means of transportation and both the speaker and the listener know it, then it is appropriate to use the prepositions *in* or *on*, as in the example: *We commuted to work in my car today*. If the learner knows that he/she is referring to a particular means of transportation, he/she must decide whether to use *in* or *on*. The preposition *in* is used when the speaker refers to a means of transportation small and privately owned. For example, it is correct to say: *in the car*. On the other hand, if the speaker refers to a means of transportation large and public, like a bus or a train, it is correct to use the preposition *on*.

There is an equivalent translation in Spanish for the use of each of the three target prepositions; for example, in Spanish, the preposition *en* can carry the same meaning as the three target forms in English, as in these examples: *en el automóvil = in the car*, *en el tren = on the train*, *by ship = en barco*. However, some rules in English that govern the use of these prepositions in the context of means of transportation are not applicable in Spanish. The rule governing the use of *by* vs. *in* or *on* exists in Spanish. It is plausible to say: *viajé en mi automóvil (I traveled in my car)* to express that you are referring to a specific car, and it is also plausible to say: *viajé en automóvil (I traveled by car)* to refer to any car. However, the rule governing the use of prepositions *in* and *on* in this context is missing in Spanish; instead, *en* is used to refer to any means of transportation regardless of its size or whether it is privately owned

or public, as in the examples: a) *voy a la playa en mi auto*, b) *voy al trabajo en el tren directo.* (For additional examples, refer to Díaz & Yagüe, 2019; Sampedro Mella & Estévez-Rionegro, 2021). By contrast, the preposition *by* has an equivalent meaning in Spanish, as shown in the following example: *I go to school by bus*, *Voy a la escuela en autobus*. The target form *by* translates to Spanish as *en* without an article before the noun that follows.

A pilot study was conducted before the present study to test the tasks and ensure that the students would have enough time to complete them during each training session. Fifteen university students (six females, nine males) aged between 19 and 23 years (mean = 20.93 years, *SD* = 1.87) participated in this pilot study. Five participants were assigned to each training condition. The training conditions and the pre- and post-tests in the pilot study were the same as those in the present study. The pilot study revealed that learners were indeed more likely to notice the preposition *by* than the prepositions *in* and *on*.

4.4. *Measures*

Reliable ways to assess explicit and implicit knowledge are currently available (refer to Elder, 2009; Erlam, 2009; Godfroid, Loewen, Jung, Park, Gass & Ellis, 2015; Loewen, 2009). One limitation to keep in mind, as Ellis (2009) points out, is that there are no pure measures of explicit and implicit knowledge. This study measured explicit knowledge by implementing the same fill-in-the-blank (FIB) test and the metalinguistic knowledge test (MKT) used in the study by (Moreno-Vega & Preciado-Sánchez, 2023) and the same timed grammaticality judgment test (TGJT) to measure implicit knowledge.

4.4.1. Fill-in-the-blank test

According to Peters (2016), the fill-in-the-blank (FIB) test allows learners to think about the form-meaning function of target forms.

It is an untimed test, potentially enabling students to think about language rules. Thus, it is considered a measure of explicit knowledge. According to Tremblay (2011), learners' lower grammar and lexical proficiency levels can be assessed through fill-in-the-blank tests. Thus, it is plausible for learners to gain some explicit knowledge of a target form even if they are not fully capable of explaining it. Learners may have a learning effect on a FIB test without having any learning effect on a metalinguistic knowledge test. This was why the FIB test was implemented as part of the explicit knowledge assessment. We wanted to ensure that leaners' explicit knowledge was tested at both lower and higher metalinguistic levels. The FIB test comprised 25 items. Fifteen were target items and ten were distractor items. Five target items assessed the use of *by* and ten items the use of *in* vs. *on*; additionally, five items evaluated the use of *in* and five the use of *on*.

4.4.2. Metalinguistic knowledge test

The participants in each condition completed the metalinguistic knowledge test (MKT) at the end of each training session. They were given a handout requiring them to write the rules of each target item found in the text they had read. More specifically, participants in the control and the explicit-inductive instruction conditions were instructed to write down the cases in which it was appropriate to use each colorized word (*in*, *on*, and *by*). They could use simple language and had no time limit to complete this test. To check whether participants in the explicit-deductive condition were able to understand the explanation of the target rules and remember them, they were told to write down the rules they had been explained at the beginning of each training session.

4.4.3. Timed grammaticality judgment test

The timed grammaticality judgment test (TGJT) mainly assesses implicit knowledge according to several psychometric studies that

have tested its construct validity through factor analysis (refer to Bowles, 2011; Ellis, 2005, 2009; Gutiérrez, 2013; Kim & Nam, 2017). However, Suzuki (2017) has claimed that TGJTs assess explicit procedural knowledge because they attract attention to form. Nevertheless, even if learners relied partially on explicit procedural knowledge to make their judgments, this does not mean they are not using their implicit knowledge to some extent. In addition, implicit and explicit procedural knowledge are functionally similar, and either approach can enable learners to cope with the demands of using L2 in real time.

The rationale for using the TGJT instead of other measures of implicit knowledge was that, according to Kim and Nam (2017), it is cognitively less demanding on students than other tests, such as the oral elicited imitation test (OEIT), and students at Beginning or Lower Intermediate stages are usually developmentally ready to use the automatic cognitive processes needed to complete a TGJT. Our participants had an intermediate proficiency level but had limited opportunities to practice the L2 outside the classroom. Therefore, we considered that the OEIT would be too challenging for them as it would have likely required higher L2 processing levels compared to those normally used by students when they practice English in the classroom.

The TGJT contained 26 items, 16 of which were target items and ten were distractors. Six items (three grammatical and three ungrammatical) evaluated the use of *by*. Similarly, ten items (five grammatical and five ungrammatical) assessed the use of *in* vs. *on*; five items assessed the use of *in* and the other five the use of *on*. Distractor items (50% grammatical and 50% ungrammatical) assessed the use of tag questions, yes/no questions, simple present conjugation, and the past progressive tense. We recorded the voice of a native English speaker while he read each TGJT item. We decided to use an aural TGJT because, according to Kim and Nam (2017), this modality triggers stronger implicit knowledge than written TGJTs. Also, a factor analysis conducted by Spada, Shiu, and Tomita (2015) revealed that aural TGJTs correlate strong-

ly with implicit knowledge, whereas written TGJTs tend to correlate closer with explicit knowledge.

Participants were given six seconds to listen to each target item and judge whether it was grammatical or ungrammatical. We decided that six seconds were sufficient based on a previous pilot study with five native English speakers. In addition, we followed the criteria implemented by Ellis (2005) and Zhang (2015), who established the time limit for the TGJT based on the mean number of seconds it took a group of native speakers to make a judgment, plus an extra 20% of time. In our pilot study, participants took an average of five seconds to listen to each sentence and select one of two options: grammatical or ungrammatical. Following the same procedure as in the studies by Ellis and Zhang, we agreed that we would give the participants one extra second for each item, considering that they were not native English speakers like the participants in the pilot study. Besides, we pilot-tested the TGJTs a second time with L2 learners to ensure that six seconds would be a reasonable time. We found that, on average, six seconds enabled learners to listen to a sentence and make a judgment while limiting their access to linguistic rules.

4.5. *Procedures*

The data collection process was completed in six sessions. Each session lasted twenty minutes and was separated from the others by a one-week interval. The participants were given an information sheet and a consent form at the beginning of their first training session, and every participant read and signed it. Next, the participants were given a pre-test, which included a fill-in-the-blank (FIB) test and a timed grammaticality judgment test (TGJT). Participants were unaware that they were completing a test. Instead, they were told that they were going to complete an exercise. In the four sessions that followed, participants in the control and explicit inductive groups were given a text with the target forms colorized. Each text included seven instances of *in* or *on* and seven instances of *by*.

The prepositions *in* or *on* in the context of means of transportation were marked in red, and the preposition *by* was marked in blue. To know whether participants had focused primarily on the meaning while reading the texts, they had to write down a summary after reading each text. The only difference between the control and the explicit-inductive condition was that in the latter, participants were told at the beginning of each training session to discover two rules for using the colorized forms. The participants in the explicit-deductive group were given a brief explanation of the target forms at the beginning of each training session before they read each text. The target forms in the texts given to the explicit-deductive group were not colorized. After the participants in the three groups had read the text, they were asked to write down the target rules. In session six, all participants completed a post-test FIB, a TGJT, and a background questionnaire about their English acquisition process.

5. Results

The pre- and post-test score datasets for each group were tested for data distribution with the Shapiro-Wilk test. Participants' FIB scores of the target items *in* vs. *on* were tested separately from the target item *by*. The pre- and post-test FIB datasets corresponding to the target items *in* vs. *on* of the three groups were normally distributed, except for the pre-test dataset for the target items *in* vs. *on* of the control group. The pre- and post-test FIB datasets for the target item *by* were not normally distributed for any of the three groups. The same procedure was followed with the TGJT scores. The Shapiro-Wilk tests revealed that for the target items *in* vs. *on*, the pre- and post-test datasets for the control group and the post-test TGJT datasets for the inductive group were not normally distributed. By contrast, pre- and post-test TGJT datasets for the target item *by* were normally distributed for the three groups.

5.1. *Within-group comparisons*

To discover whether there were significant gains from pre- to post-test scores, the data of items corresponding to the *in* vs. *on* rule were analyzed separately from the items that tested the *by* rule. The FIB test comprised 15 items; of these, ten tested the *in* vs. *on* rule and five the *by* rule. A Wilcoxon signed-ranks test was conducted with the pre- and post-test FIB scores corresponding to items *in* vs. *on* for the control group, and paired samples *t*-tests were conducted with the scores for the inductive and the explicit-deductive groups. Within-group contrasts were analyzed with a Wilcoxon signed-rank test with the pre- and post-test FIB scores corresponding to the items *by* for the three groups. Tables 1 and 2 and Figures 1 and 2 illustrate the results of the FIB test for each target form.

Within-group contrasts of pre- to post-test TGJT scores for the *in* vs. *on* items were also analyzed using Wilcoxon signed-rank tests with the datasets for the control and explicit-inductive groups, and a paired samples *t*-test was used with pre- to post-test datasets for the explicit-deductive group. Paired samples *t*-tests were also used to test pre- to post-test scores corresponding to the target items *by* for the three groups. Tables 3 and 4 and Figures 3 and 4 illustrate the results of the TGJT for each target form.

5.2. *Between-group comparisons*

Since the datasets of pre- and post-test FIB mean scores for target items *in* vs. *on* failed to meet the assumption of a normal distribution, a Kruskal-Wallis test was conducted. No significant difference was found on pre-test datasets between any of the three groups ($X^2_{(2, 65)} = 0.464$, $p = 0.793$), nor on the post-test ($X^2_{(2, 65)} = 4.491$, $p = 0.106$). The datasets of pre- and post-test FIB mean scores for items *by* were also not normally distributed; again, a Kruskal-Wallis test was conducted. Pre-test scores were not significantly different between groups ($X^2_{(2, 65)} = 1.292$, $p = 0.524$), but the opposite was found for post-test scores, i.e., a significant difference be-

tween groups ($X^2_{(2, 65)} = 8.215$, $p = 0.016$). Mann-Whitney U tests were conducted to identify the specific groups that differed. After performing a Bonferroni adjustment for pairwise comparisons, alpha was set at < 0.016. No significant difference was found between the control and the inductive groups ($U = 181.50$, $z = -0.176$, $p = 0.860$, $R = -0.021$, $r^2 = < 0.001$) nor between the inductive and the deductive groups ($U = 120.00$, $z = -1.93$, $p = 0.053$, $R = -0.239$, $r^2 = 0.057$), although in the latter case, the difference approached significance. A significant difference was also found between the control and the explicit-deductive instruction groups ($U = 174.00$, $z = 2.75$, $p = 0.006$, $R = -0.341$, $r^2 = 0.116$).

The dataset of TGJT mean scores for items *in* vs. *on* did not meet the normality assumption either; therefore, a Kruskal-Wallis test was conducted. No significant difference was observed between groups regarding pre-test scores ($X^2_{(2, 65)} = 1.84$, $p = 0.399$) or post-test scores ($X^2_{(2, 65)} = 4.808$, $p = 0.090$).

Since the dataset of TGJT mean scores for the target item *by* met the normality assumption, a repeated-measures MANOVA was conducted to test for differences between groups. A significant difference was found over time between the groups (Wilk's Lambda = 0.870, $F_{(2, 65)} = 9.230$, $p = 0.003$). A post-hoc Tukey's HSD test showed that the pre- and post-test mean scores were significantly higher ($p = 0.045$) in the inductive group versus the control group. However, mean scores did not increase significantly ($p = 0.111$) in the deductive group versus the control group.

5.3. *Answers to the research questions*

R1. Are explicit-inductive and explicit-deductive instruction effective at promoting either implicit or explicit knowledge, respectively, of the prepositions *in*, *on*, and *by* in the context of means of transportation? If so, does the salience level of the target forms mediate the effectiveness of either instruction?

Explicit-inductive instruction did not promote either implicit or explicit knowledge of the target form *in* vs. *on*, but explicit-de-

ductive instruction was effective at significantly increasing learners' implicit and explicit knowledge of this target form. Table 1 shows that neither the control group nor the explicit-inductive group significantly increased the learners' explicit knowledge of the underlying rule for *in* vs. *on* from pre- to post-test on the FIB test, and their effect sizes were small in contrast to the significant increase in the explicit-deductive group, with a moderate effect size. Moreover, the explicit-deductive condition attained a larger standard deviation of post-test scores than the other two conditions, indicating that not all students benefited equally from the explanation given by the teacher.

TABLE 1. Pre- to post-test FIB scores for the *in* vs. *on* rule

Condition	Pre-test		Post-test		Pre- to post-test			Min. score	Max. score	Test
	N	*M (SD)*	*N*	*M (SD)*	*P*	*z-score*	*d*			
Control	25	4.44 (1.71)	25	4.92 (1.63)	0.248	-1.16	0.26	1	9	B
Inductive	15	4.80 (1.52)	15	5.40 (1.72)	0.346	-0.91	0.25	2	8	A
Deductive	25	4.36 (1.63)	25	6.20 (2.4)	0.001	-3.01	0.76	1	10	A

** Confidence interval = 95% * A =Paired-samples t-test B = Wilcoxon signed-rank test; max. score = 10 points*

In the case of the preposition *by*, Table 2 illustrates how both explicit-inductive and explicit-deductive instruction led to gains of explicit knowledge of this form on the FIB test, but the explicit-deductive instruction had a larger effect size, and only the gains by the explicit-deductive group were significantly greater than those by the control group. In addition, since the control group also promoted a significant increase of explicit knowledge of the target form *by* with a moderate effect size, these results suggest that the preposition *by* can be learned through mere exposure over four sessions without requiring any type of form-focused instruction. An important observation shown in Figure 2 is that most participant scores of *by* in the three conditions had a floor effect on the pre-

test FIB, confirming that participants had no explicit knowledge of this form at the beginning of the study.

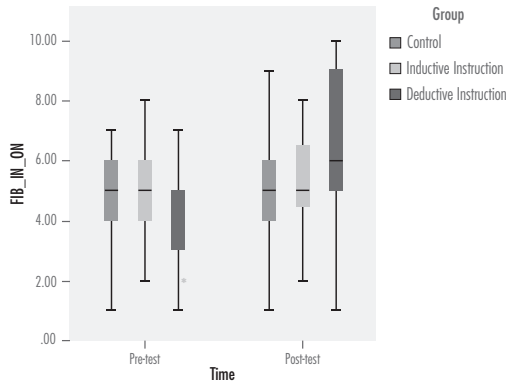

FIGURE 1. Comparison of pre- and post-test FIB scores for items *in* vs. *on*

TABLE 2. Pre- to post-test FIB scores for the *by* rule

Condition	Pre-test		Post-test		Pre- to post-test			Min. score	Max. score	Test
	N	*M (SD)*	*N*	*M (SD)*	*P*	*z-score*	*d*			
Control	25	0.68 (1.22)	25	1.52 (1.85)	0.013	-2.47	0.55	1	5	B
Inductive	15	0.60 (1.40)	15	1.80 (2.08)	0.035	-2.11	0.6	0	5	B
Deductive	25	0.52 (1.23)	25	3.12 (1.81)	<0.001	-3.89	1.33	0	5	B

**Confidence interval = 95% *A =Paired-samples t-test B = Wilcoxon signed-rank test; max. score = 10 points*

The salience level of target forms appears to mediate the effectiveness of inductive and deductive instruction, as illustrated in Tables 1 and 2. Evidence of this is that explicit-inductive instruction did not promote explicit knowledge of the *in* vs. *on* rule, but explicit-deductive instruction did. Further evidence is that both types of form-focused instruction (inductive and deductive) were effective at promoting explicit knowledge of the preposition *by*. Howev-

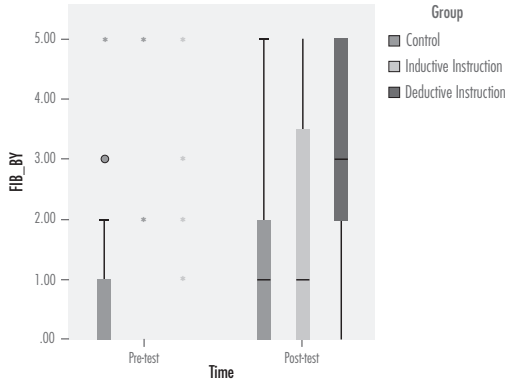

Figure 2. Comparison of pre- and post-test FIB scores for items *by*

er, only explicit-deductive instruction facilitated the acquisition of implicit knowledge of the preposition *by*, as shown in Table 4. In this study, the less salient target rule (*in* vs. *on*) required explicit-deductive instruction for learners to pick it up. Furthermore, for learners to gain explicit knowledge of the more salient target form (*by*), they required neither grammar explanation nor any guidance from the teacher to discover the underlying rule; instead, they just needed to receive meaning-based input containing the target form over four training sessions.

A similar pattern occurred with the acquisition of implicit knowledge. Table 3 and Figure 3 show no learning effect on the TGJT from pre- to post-test in the control group or the explicit-inductive condition. By contrast, the explicit-inductive condition significantly improved the learners' scores with a moderate effect size. As in the post-test FIB, the post-test TGJT scores by the explicit-inductive group yielded a higher standard deviation than the control and the explicit-inductive groups, indicating that the score range was broader than for the other two conditions.

TABLE 3. Pre- and post-test TGJT scores for the *in* vs. *on* rule

Condition	Pre-test		Post-test		Pre- to post-test			Min. score	Max. score	Test
	N	*M (SD)*	*N*	*M (SD)*	*P*	*z-score*	*d*			
Control	25	4.84 (1.28)	25	4.83 (1.06)	0.96	-0.05	0.01	2	7	B
Inductive	15	4.93 (1.22)	15	5.00 (1.46)	0.68	-0.41	0.03	3	7	B
Deductive	25	4.44 (1.30)	25	5.92 (2.14)	0.008	-2.48	0.58	2	9	A

** Confidence interval = 95% * A =Paired-samples t-test B = Wilcoxon signed-rank test; max. score = 10 points*

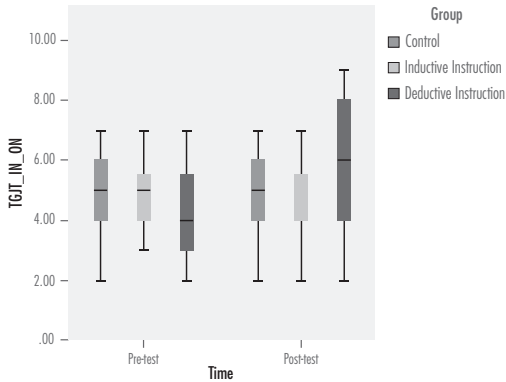

FIGURE 3. Comparison of pre- and post-test TGJT scores for items *in* vs. *on*

In the case of the preposition *by*, Table 4 and Figure 4 show that only the explicit-deductive group significantly improved its TGJT scores from pre- to post-test. However, the gains by the explicit-deductive group had a small effect size, indicating that the explanation by the teacher may not always result in increased implicit knowledge of the target form.

Table 4. Pre- and post-test TGJT scores for the *by* rule

Condition	Pre-test		Post-test		Pre- to post-test			Min. score	Max. score	Test
	N	*M (SD)*	*N*	*M (SD)*	*P*	*z-score*	*d*			
Control	25	2.12 (1.27)	25	2.85 (.97)	0.89	-2.03	0.46	0	5	A
Inductive	15	2.93 (1.71)	15	3.73 (1.87)	0.27	-0.89	0.3	0	6	A
Deductive	25	2.72 (1.54)	25	3.48 (1.48)	0.046	-1.82	0.42	0	6	A

** Confidence interval = 95% * A =Paired-samples t-test B = Wilcoxon signed-rank test; max. score = 10 points*

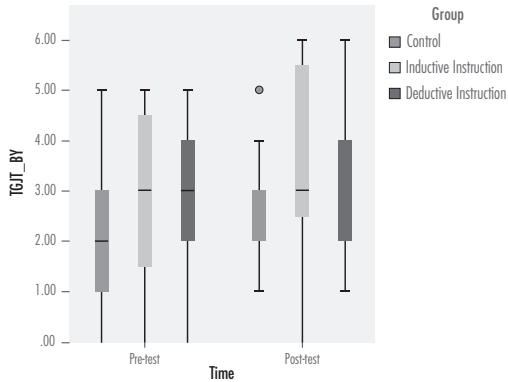

Figure 4. Comparison of pre- and post-test TGJT scores for items *by*

R2. Can learners figure out any of the two target rules through explicit-inductive instruction?

As illustrated in Tables 5 and 6, none of the learners who received explicit-inductive instruction was able to discover the target rule for the prepositions *in* vs. *on* as measured by a metalinguistic knowledge test, and only one-third of the learners in this condition were able to discover the target rule for the preposition *by*. This indicates that both rules are challenging for learners. The underlying rule for *in* vs. *on* is particularly difficult to discover by

students without previous assistance. The rule for preposition *by* is more likely to be discovered by learners; however, even then, only a few students receiving explicit-inductive instruction on this target form were able to figure it out, as shown in Tables 5 and 6.

Table 5. Learning patterns of explicit knowledge and metalinguistic knowledge

Condition	*N*	Scores	FIB test *in* vs. *on*			FIB test *by*		
			Number of participants	Able to explain the target rule	Not able to explain the target rule	Number of Participants	Able to explain the target rule	Not able to explain the target rule
Control	25	Increased	9	0	9	12	0	12
		Decreased	7	0	7	2	0	2
		Didn't change	9	0	9	11	0	11
Inductive	15	Increased	6	0	6	6	4	2
		Decreased	3	0	3	2	1	1
		Didn't change	6	0	6	7	0	7
Deductive	25	Increased	18	16	2	20	18	2
		Decreased	5	3	2	1	0	1
		Didn't change	2	2	0	4	2	2

Table 6. Learning patterns of implicit and metalinguistic knowledge

Condition	*N*	Scores	TGJT *in* vs. *on*			TGJT *by*		
			Number of participants	Able to explain the target rule	Unable to explain the target rule	Number of Participants	Able to explain the target rule	Unable to explain the target rule
Control	25	Increased	8	0	0	12	0	12
		Decreased	9	0	0	6	0	6
		No change	8	0	0	7	0	7
Inductive	15	Increased	8	0	0	9	3	6
		Decreased	6	0	0	5	1	4
		No change	1	0	0	1	1	0

(continued)

Table 6. Learning patterns of implicit and metalinguistic knowledge

Condition	*N*	Scores	TGJT *in* vs. *on*			TGJT *by*		
			Number of participants	Able to explain the target rule	Unable to explain the target rule	Number of Participants	Able to explain the target rule	Unable to explain the target rule
Deductive	25	Increased	17	15	2	15	12	3
		Decreased	6	5	1	6	5	1
		No change	2	1	1	4	3	1

R3. Can students receiving explicit-inductive instruction improve from pre- to post-test without being able to explain any target rules?

Tables 5 and 6 show 15 learners that received explicit-inductive instruction. Six of them had gains in the test items *by* from pre- to post-test on the FIB test and nine on the TGJT. Two of the former and six of the latter were not able to explain the target rule during any of the sessions. This result shows that it is plausible for explicit-inductive instruction to enable learners to gain some explicit and implicit knowledge of target prepositions without being able to verbalize them. However, as previously mentioned, salience probably plays a role. Evidence of this is that most participants who increased their FIB and TGJT test scores for items *by* were able to explain the target rule, but none of those who increased their FIB and TGJT test scores for *in* vs. *on* was able to express the underlying rule. This suggests that they were aware of the target forms at the noticing level but probably not at the understanding level.

6. Discussion

The lack of a significant increase in the score of prepositions *in* and *on* obtained by the control group in both tests indicates that not all forms can be learned without explicit instruction. By contrast, the significant increase in the score of the preposition *by* on the FIB

test by this same group indicates that it is plausible for learners to pick up some forms through repeated exposure. Our results showed that it was easier for L2 learners to understand when *by* is needed in the context of means of transportation instead of *in* or *on*. One plausible explanation is that the forms *in* and *on* are typographically very similar, making the distinction between the two forms not salient for the learner. If learners cannot notice the distinction between the two forms, this may prevent them from engaging in syntactic processing. Instead, they may rely on semantic processing only. Since the difference in the meaning of the prepositions *in* vs. *on* does not affect the overall meaning of the sentence, it does not seem to be plausible for students to discover their referential meaning of the rule governing the use of *in* vs. *on* without receiving assistance or instruction from the teacher.

Another plausible reason could be that the rule for *by* is present in learners' L1 and L2 whereas the rule for *in* vs. *on* is not. Students could have had potentially greater concept availability of the meaning conveyed by the preposition *by* than by the prepositions *in* and *on*. As Russel (2014) stated, learners can pick up the rules of linguistic forms with a very transparent form-meaning connection simply by receiving abundant input containing the forms.

The results indicate that no participant in the inductive group was able to explain the rule governing the use of *in* vs. *on* at the end of any of the four training sessions. Four of the six participants who improved their scores of *by* in the FIB from pre- to post-test were able to explain the rule for *by* at the end of at least one of the training sessions. The remaining two participants were not able to explain the rule. This indicates that almost one-half of the students gained explicit knowledge of the form *by* due to explicit-inductive instruction, and more than half of these students acquired metalinguistic knowledge. One potential explanation as to why none of the students in the inductive condition was able to gain metalinguistic knowledge of the rule *in* vs. *on* is that there are no semantic cues that lead students to interpret the difference in use between *in* and *on* in this context. By contrast, when to use *by* instead of *in* or *on*

appears to be more obvious for students. The participants may have faced greater subjective difficulty when trying to identify the rule for *in* vs. *on* than for *by*. According to DeKeyser (2016), subjective difficulty refers to "the degree of difficulty experienced, for a given structure in a given context, by different learners". Perhaps the participants lacked the semantic cues or background knowledge to engage in the top-down processing required to understand the underlying rule for *in* vs. *on*.

These results suggest that although it is plausible for inductive instruction to help learners figure out some target rules, there is no guarantee that all learners will identify them even if these rules have bottom-up and top-down salience. Additionally, inductive instruction does not seem to help learners gain metalinguistic knowledge of a rule governing a low-salience form (the use of *in* vs. *on*).

In the present study, explicit-deductive instruction was more effective than explicit-inductive instruction. Tables 1–4 illustrate that explicit-deductive instruction had larger effect sizes in all the tests. In addition, explicit-deductive instruction led to significant gains of explicit and implicit knowledge of both target forms from pre- to post-test, whereas explicit-inductive instruction only caused significant explicit knowledge gains of the more salient form *by*. Further evidence is that a larger percentage of the participants in the explicit-deductive group improved their mean scores from pre- to post-test. Eighteen participants (of 25) in the explicit-deductive group increased their FIB mean score of *in* vs. *on* items from pre- to post-test, and 20 increased their FIB scores of *by*. These results support Morgan-Short, Sanz, Steinhauer, & Ullman (2010), who highlighted that a particular type of instruction can be successful partly because of the characteristics of the target form. However, these findings should be interpreted with caution. Since the inductive group was much smaller than the deductive and control groups, these findings cannot be extrapolated to the teaching of other forms in different settings. Instead, this study is exploratory, and as such, it underscores the sometimes-necessary role of deductive instruction. Our findings also seem to indicate

that the type of instruction can be mediated by the salience level of the target forms.

These findings are partially consistent with those by Robinson (1995) in that explicit-deductive instruction was superior to explicit-inductive instruction. However, in our study explicit-inductive instruction was partially effective for one of the forms, whereas in Robinson's study it was not.

In this study, the finding that explicit-deductive instruction was superior to explicit-inductive instruction contrasts with those by Shirav and Nagai (2022), Lai *et al*. (2020), Cerezo *et al*. (2016), Vogel *et al*. (2011), Haight *et al*. (2007), Benitez-Correa *et al*. (2019). One likely reason is that in our study, explicit-inductive instruction consisted only of asking students to find the underlying rule of the colorized forms, and the instructor never gave learners an explanation of the target rules. By contrast, in the aforementioned studies, except for those by Haight *et al.* (2007) and Benitez-Correa *et al*. (2019), the participants received information on the target rules after trying to figure them out. In the study by Haight *et al.* (2007), participants were given feedback by the instructor, which also helped them to discover the target rules. Similarly, in the study by Benitez-Correa *et al.* (2019), students received indirect feedback in the form of recasts. By contrast, in our study, participants had to rely entirely on their ability to discover the underlying rules.

Therefore, the results of this exploratory quasi-experiment suggest that explicit-inductive instruction may be more effective than explicit-deductive instruction only if learners are given an explanation of the target rules at the end of the task or lesson or if students get feedback to help them know whether their discovery of the target rule is accurate. This type of inductive instruction is deemed guided-inductive instruction. These findings strongly emphasize the important role of explaining target rules of forms with low perceptual salience because they do not stand out typographically and their rule is nonexistent in learners' L1. Future research

could focus on other target forms that vary in their salience level and should ensure that all groups be of similar size.

7. Limitations

This study has some limitations. Although a timed grammaticality judgment test was used to assess learners' implicit knowledge, it would have been helpful to include confidence rating tests such as those used by Rebuschat (2013). However, it was not possible to implement them due to time restrictions. Also, having a larger sample size and giving learners a longer treatment would have been beneficial, likely yielding more robust results. Nevertheless, it was not possible because not all the groups in the Foreign Languages department were able to participate in the study, and those who did, had limited available time. Also, in the present study, it was not possible to determine which of the two factors — typographical salience and the existence of a rule in learner's L1 and L2 — has a greater impact in each type of instruction. Future studies may address this aspect by isolating these constructs.

8. Conclusion

The findings of the present study suggest that explicit-inductive instruction was less effective at enabling learners to determine the underlying rule of a form with low perceptual salience driven by bottom-up and top-down processing. Students were more successful at discovering a form with higher salience for being typographically different from other forms and governed by a rule available in learners' L1, such as the preposition *by*; even then, only very few of them did. With forms that lack these characteristics, explicit-deductive instruction is probably necessary. Also, there are instances when explicit-deductive or explicit-inductive instruction may be unnecessary, as some forms do not require the teacher's intervention beyond simply providing learners with comprehensible input.

However, because of the lower number of students in the explicit-inductive instruction condition, these findings cannot be extrapolated to the teaching of additional target forms in other settings. Further research is needed to confirm whether these findings transfer when teaching additional target forms in other languages to learners with diverse L1 backgrounds. This exploratory quasi-experimental study suggests that the salience level of target forms appears to be an important factor for L2 teachers to consider when deciding on the type of instruction to implement.

9. Supplementary material

The readings and tests used in this study can be requested at the following email address: joseluis.moreno@unison.mx

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