Systemic-theoretical Instruction Vs. Discovery Learning: The Case of Iranian EFL Learners' Acquisition of Grammar

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Abstract

Although there is a myriad of theoretical and pedagogical research studies into L2 grammar, the instruction in this area remains traditional and there have been calls for more usage-based approaches that can fill the gap between theory and practice. Accordingly, this quasi-experimental compared the effects of two pedagogical frameworks, namely Systemic-Theoretical Instruction (STI), derived from Vygotsky's ideas and proposed by Gal'perin and discovery learning (DL), derived from Piaget's ideas mainly proposed by Bruner, on learning English tense-aspect system. To this end, 71 Iranian low-intermediate EFL learners, aged 12 to 19, were instructed in three groups through STI, DL (experimental) and traditional method (comparison). They took a pretest, a posttest and a delayed posttest consisting of grammar tests checking their receptive and productive grammar knowledge. Results of one-way repeated-measures analyses of ANOVA revealed that all groups improved significantly in both the entire test and its subcomponents in the immediate posttest, suggesting that the three kinds of form-focused intervention were efficient in creating immediate progress. However, significant differences were identified among the groups in the delayed posttest accounting for the inadequacy of traditional method of instruction in the long run, and for the superiority of STI over DL. These findings can have significant implications for materials developers and teacher education programs in considering the tenets of more innovative approaches such as STI through systematic representations of target language features by taking advantage of materialized tools and verbalization in teaching.

Keywords: Cognitive Grammar, Constructivism, Gal'perin, Guided Discovery Learning, Sociocultural Theory

1. Introduction

Today, there is wide acceptance among the majority of current second (L2) experts that some form-focused instruction (FFI) within the communicative framework is indispensable (Brown & Lee, 2015) with the key questions being majorly concerned with the degree of explicitness in instruction, the type of intervention and the intricacies and peculiarities of different given contexts. In this process, theory has long provided language pedagogy with instructional approaches and implications for the language classroom, two of which constitute the core of the current study, namely Vygotsky's Sociocultural Theory (SCT) and Piaget's theory of cognitive development.

Although both scholars are known as developmental psychologists and their work is categorized under constructivist school of thought, there seems to be crucial differences between the two. The main point of departure concerns how the individuals construct meaning. While Piaget believed that individuals construct knowledge *individually* (Bruner, 1997), Vygotsky assumed that development occurs in various stages of *social interaction* through tools and artifacts that are also essentially social (Vygotsky, 1987). Given this and other differences (see Lourenco, 2012), various pedagogical implications have emerged from these two viewpoints some of which have manifested themselves in two instructional approaches investigated in the current study, i.e., Systemic-Theoretical Instruction (STI) (derived from Vygotsky's ideas and proposed by Gal'perin) and Discovery Learning (DL) (derived from Piaget's ideas mainly proposed by Bruner).

Briefly speaking, STI, also known as concept-based instruction (CBI), is rooted in a pedagogical framework proposed by Gal'Perin (1989, 1992) which is by itself grounded in sociocultural theory as advocated by Vygotsky (1978, 1987). At the heart of Gal'perin's theory is the idea that at the outset of the teaching/learning process, students should be provided with the mediational support to orient themselves systematically in the subject to be studied (Haenen, 2000). For Gal'perin, concepts are the unit of instruction and only when these concepts are materialized in a concrete way (for instance through pictures and diagrams) and not merely by verbal explanation, and finally verbalized (first loud and then silently), internalization of the concepts will be fostered (Lantolf & Thorne, 2007). As Lantolf and Tsai (2018) also postulate, Vygotsky was also of the view that we should not expect the learners to *discover* complicated scientific knowledge on their own; rather, it is the role of formal education to provide the learners with such knowledge through well-organized definitions and concepts to make it as practical as possible.

On the other hand, discovery learning, rooted in constructivist approaches to teaching and learning, occurs "whenever the learner is not provided with the target information or conceptual understanding and must find it independently and with only the provided materials" (Alfieri, Brooks, Aldrich, & Tenenbaum, 2011, p. 2). But the aforementioned STI-approach to teaching "rejects, as inefficient and too tenuous, constructivist approaches to education where through discovery learning students either independently or in collaboration with their teacher or other students construct their own knowledge in a particular subject area" (Lantolf & Poehner, 2014, p. 63). This is while some believe that discovery learning, particularly when it is guided, is assumed to be effective with the justification that when we discover things for ourselves, they are better and more effectively absorbed than when we are taught (Harmer, 2000).

Like any other learning theory, the implications of these two theories have found their ways to all educational contexts, and language learning settings are no exception. Both DL and STI have been put into practice in teaching different aspects of language, including grammar (e.g., see Haight, Herron, & Cole, 2007; Lai, 2012). The existing literature on these two approaches to learning, however, abounds with controversies and arguments that keep the legitimacy of using them in L2 contexts open to question.

Since each context is replete with 'affordances' particular to that setting (van Lier, 2000), the investigation of the tenets offered by these approaches in an Iranian EFL context seems insightful and defining. Accordingly, this study seeks to compare, investigate and trace the effects of these two apparently conflicting pedagogical frameworks against traditional method of instruction in teaching some aspects of the English tense-aspect system to low-intermediate Iranian EFL learners. Thus, the research questions were as follows:

1. Do the three instructional approaches the participants received (i.e. STI, DL or traditional) have a significant effect on improving their performance in learning tense/aspect pairings?

2. Do the three instructional approaches the participants received (i.e. STI, DL or traditional) differ significantly from each other in terms of the effectiveness of the instruction in the short and long run?

2. Literature Review

2.1. Theoretical Background

According to van Compernolle and Williams (2013), Vygotsky argued that in order to understand the processes of human mental

development, we must intervene. In formal educational settings, this comprises designing pedagogical programs that create the conditions under which developmental processes may be set in motion and observed. Perhaps, one of the best programs proposed in this regard is that of Gal'perin's Systemic-Theoretical Instruction. As a contemporary and a follower of Vygotsky, Gal'perin and his colleagues argued for providing the students with means for theoretical (conceptually-based) generalizations which allow them to orient themselves in a systemic way in the studied subject (Arievitch & Stetsenko, 2000).

Gal'perin's teaching strategy comprises three general phases and two sub-phases for an action to pass through before developing into a self-sufficient mental action (Lantolf & Poehner, 2014). The first phase provides the learners with as complete a picture as possible of the concept that learners need to take on in order to guide and orient their action in a certain domain. This idea is conceptualized under the acronym SCOBA or Schema of a Complete Orienting Basis of an Action (Gal'perin, 1989, 1992). The SCOBA provides "a cognitive map that serves to orient learners whenever they engage in activities relative to the concept" (Lantolf & Poehner, 2014, p. 64). In fact, the SCOBA provides the learner with a mediating tool to orient his/her action. Lantolf and Thorne (2006) have shown that although SCOBAs can include stretches of language, they tend to be more effective if verbal accounts are kept at minimum. In short, in the first phase of Gal'perin's teaching strategy, conceptual knowledge is materialized by the help of SCOBAs, for example in the form of charts, pictures, diagrams or even physical objects.

The second phase of Gal'perin's framework includes verbalization. After the learners reach a high level of control over an action with the conceptual knowledge acquired with the help of SCOBAs, it is necessary to separate them from the concrete material level and "elevate the action to the level of overt or social speech" (Arievitch & Haenen, 2005, p. 161). According to Gal'perin, verbal action can have two subphases. Haenen (2001) characterizes one of them as "communicated thinking" and the other one is that of "dialogic thinking" (p. 163). The former is in fact the overt speech in which the learners engaged in order to make what they are doing comprehensible to others. In the second subphase of verbal action, i.e. dialogic thinking, learners are urged to speak to themselves covertly about what they are doing when comprehending and employing a concept.

In the third phase, i.e. mental action learners finally begin to act 'in the head'. According to Haenen (2001), at the covert speech stage, learners learn to perform all the aspects of the action smoothly and quickly. At this

point, any connection with the material components wanes and the concept becomes completely mental. The learner is now able to creatively use and generalize his understanding of the concept to new contexts.

The other instructional approach investigated in this study, i.e., discovery learning is, in fact, rooted in Piagetian psychological constructivism. In this approach, meaning-making is an individualistic process in which constructivist teaching is meant to lead to higher levels of understanding and analytic capabilities (Richardson, 1997). Such self-guided learning approaches, like Piaget (1952, 1965) proposed, postulate the child/learner at the center of the learning process as he/she attempts to make sense of the world. As an advocate of Piaget's ideas, Bruner (1961) claimed that by encouraging learners to discover things for themselves, they could come to understand even the most complicated issues and relate their understanding to a coherent knowledge of the world in a meaningful way.

2.2. Empirical Studies

A good number of research studies have investigated the claims and principles of STI also known as Concept-based instruction (CBI) (e.g., Fogal, 2015; Frazier, 2013; Infante, 2016; and Tsai, 2014 among others). Two STI- or CBI-based studies conducted in Iran also belong to Fazilatfar, et al. (2017) and Lavasani and Birjandi (2015). These studies have unanimously approved of the effectiveness and practicality of the framework in teaching various linguistic features and skills. As a grammar-related study, we can refer to Lai (2012) in which figurative meaning and grammatical functions of Chinese temporal expressions were taught to English-speaking university learners. In this study, the exact stages of Gal'perin's model were followed and the results revealed the outperformance of the experimental group over control group. Moreover, qualitative analyses indicated that as the instructional program progressed, participants exhibited improvement in terms of efficiency, correctness and consistency of performance on the relevant tasks.

On the other hand, various empirical studies have also investigated the tenets of guided DL (or similar terminology) in teaching different subjects including grammar. For instance, Haight, et al. (2007) investigated the effects of what they call a guided inductive approach against deductive teaching on teaching some grammatical structures in college French classrooms. In fact, the participants in the former group did not receive explicit explanation of the rule from the instructor. Instead, they collaborated and interacted with the instructor through a series of guiding questions to construct the grammatical rule together. Results indicated a significant difference between participants' immediate and long-term test scores favoring the guided inductive approach.

In spite of the popularity of the idea in the last few decades, it has occasionally been criticized on certain grounds and there seems to be not enough solid evidence to reject or accept this method of instruction on the whole. To name just one apparent incongruity in findings and discussions, we can refer to Kirschner, Sweller and Clark (2006) who argue that discovery-based learning or what they refer to as minimally guided instruction, is ineffective. On the contrary, Alfieri et al.'s (2011) meta-analysis of the 360 research studies supported the idea that guided discovery has proved to be more efficient than other types of instruction. More directly relevant to grammar teaching, Adair-Hauck, Donato and Cumo-Johanssen (2005) promote a guided-participatory approach to rule formation in which the teacher assists the learners to discover the rules rather than providing them with explanations, or leaving the students on their own to deal with the grammar explanations. But the aforementioned STI-approach "rejects, as inefficient and too tenuous, constructivist approaches to education where through *discovery learning* students either independently or in collaboration with their teacher or other students construct their own knowledge in a particular subject area" (Lantolf & Poehner, 2014, p. 63, emphasis added). This is while some believe that discovery learning, particularly when it is guided, is assumed to be effective with the justification that when we discover things for ourselves, they are better and more effectively absorbed than when we are told (Harmer, 2000).

In sum, due to the particularities of an Iranian EFL context and motivated by the controversies and seemingly contradictory results and discussions found in the literature, the present study investigates how these pedagogical approaches manifest themselves in affecting Iranian language learners' process of learning certain grammatical forms.

3. Method

3.1. Participants

The participants in the study (N = 71) belonged to six intact English classes in two branches of a language institute in Yazd, Iran, with 24 students in the STI group (male = 10, female = 14), 26 students in the DL group (male = 14, female = 12), and 21 students in the TRAD group (all females). All the participants were registered in low intermediate classes (LI1 and LI2) of the institute based on their performance on the placement test; yet, their proficiency level was confirmed through Oxford Placement Test (OPT) before the intervention. They were all Persian native speakers, ranging in age from 12 to 19. At the outset of the study, they already had a mean of 3 years of studying English at language institutes and about 1.5 years of language learning background at school. Two of the classes in one of the branches of

the institute (one boys-only and one girls-only) were randomly assigned as DL group (instructed through discovery learning) and the other two classes (again one boys-only and one girls-only) were assigned as the STI group (instructed through systemic-theoretical instruction). The TRAD group consisted of two girls-only classes in the second branch of the institute and was instructed by a friend colleague with 12 years of experience in language teaching. The majority of the participants held a positive attitude toward English language and grammar instruction (as revealed by their answers on the questionnaire) and almost more than half of them believed the grammar instruction they received in the educational settings was not effective and sufficient.

3.2. Materials and Instruments

In this study, specific materials and treatments were used for the instructional phases. Therefore, before delineating the data collection tool, the rationale behind selection of the target forms and a description of the treatments are provided below.

3.2.1. Target Forms and Treatments

Many Iranian language teachers' first-hand experience and the existing literature approve of the fact that English language verb tense system represents one of the main sources of syntactic errors for Iranian English language learners (Dehghani, Bagheri, Sadighi, & Tayyebi, 2016; Ramezani, 2013). Yet, due to certain practical, theoretical and pedagogical constraints, the form-focused instruction in this study was confined to the teaching of certain facets of the English tense and aspect system including the progressive/non-progressive aspect, simple past/ present perfect tense and the related concepts required for teaching them. However, for space limitations, only the treatment and findings of the former pairing of verb/tenses are dealt with in this paper.

Given the aforementioned constraints and due to the fact that the students in this study had previously been exposed to the teaching of present simple and present progressive and were already familiar with certain uses of these tenses including the use of the present simple to refer to general truths and habitual activities, the current study was further restricted to teaching the present tense with or without progressive aspect to refer to action or situations occurring at the speech time. In so doing, certain other concepts such as stative/ dynamic verbs, boundedness/ unboundedness, and heterogeneity/homogeneity were also presented to the learners in a learner-accessible and pedagogically friendly way. A more comprehensive account of how this was accomplished in the three target groups is provided later.

In spite of all the distinctive features of the three types of instruction presented to the learners, attempts were made to keep the type of learner performance, feedback type, instructional input and assignments as similar as possible in all three settings. Also, while all the instructional methods were explicit in nature, attempts were made to make the presentation of the material as inductive as possible to maintain consistency. In other words, in all the three groups, the learners were first exposed to some examples and only then the rules were either presented or discovered to/by the learners. The inductive approach used in the DL group was different from the one used in the TRAD group in the sense that it was 'guided' with a series of teacher's questions and the learners were actively engaged in the process of inductive thinking. But the TRAD group mainly entailed teacher's lecturing with minimal participation on the part of the learners. Furthermore, in order to ensure consistency in the learning conditions, the materials presented to the learners in the three groups were offered not only in the form of handouts, but also through PowerPoint slides. This idea was particularly helpful to save more time in presenting the pictures and diagrams in the STI group.

Although it was also ideal to keep the instruction time correspondingly similar, due to the discrepancies in the teaching approaches, this goal was not accomplished and the STI instruction took on average 45 minutes in each session, the DL was carried out in approximately 30 minutes and the TRAD group received 20 minutes of instruction in the pedagogical session.

3.2.1.1. TRAD Treatment

As it was already pointed out, the comparison group in this study received a typical traditional type of instruction common in Iranian language learning contexts, i.e. a teacher-centered lecturing type involving grammatical rules and examples. Based on the handout the learners received and the PowerPoint slides, they were initially presented with examples from three categories of verbs demonstrating different uses and interpretations of simple present and present progressive when referring to a situation or state occurring or existing at the utterance time. These three categories of examples led to the presentation of three general grammatical rules as follows:

1. When we talk about a situation happening or existing at the time of speaking, we use the present simple tense with stative verbs (referring to states), and the present continuous with dynamic verbs (referring to actions).

2. Certain verbs are called stative-dynamic verbs in the sense that they can refer to a state or an action in different situations.

Accordingly, they are used in present simple form in the former and present continuous in the latter case.

3. There is a third set of verbs when we talk about a situation taking place at the speech time (such as promise, suggest, thank, etc.) for which the present simple is always used.

After familiarizing the students with these rules and examples for each category, they were given some tasks and exercises (in the form of common grammar-check questions) to practice the learned forms individually both in class and as home assignments.

3.2.1.2. DL Treatment

In the DL group, the learners were presented with the same set of examples; however, instead of being told about the rules by the teacher, they were encouraged to discover the rules by themselves and only when the learners' attempts to guess the rules failed, the teacher presented the rules to them. In short, the learners were encouraged to use their problem-solving ability to find the answer to the questions proposed by the teacher for each of the three sets of examples. As the learners received questions to answer, the teacher provided them with "hints, direction, coaching, feedback, and/or modeling to keep the student on track" (Mayer, 2004, p. 15). Later, the learners exchanged their guesses and hunches with the teacher and after some negotiation of ideas, the teacher recapitulated and summarized the whole discussion with the help of the learners. Just like the TRAD group, the instruction was followed by practice tasks and assignments.

3.2.1.3. STI Treatment

As it was previously mentioned, Gal'perin's proposed teaching strategy begins with providing the learners with the required SCOBAs to guide and orient their action. It is common practice in STI to borrow the required concepts from the area of cognitive linguistics, and more precisely in this case from the teachings of cognitive grammar (Langacker, 1987, 1991). The SCOBAs used in teaching the target forms in this study were mainly adapted from Bielak and Pawlak's (2013) study with certain modifications to better suit the target instructional context. A detailed presentation of CL accounts and findings is beyond the scope of the present study. However, the concepts presented to the learners and the relevant SCOBAs are briefly reviewed here.

In the first slides, the learners were provided with the same set of examples the other two groups received and were told about the fact that both present simple and present continuous tense can refer to actions or states

happening at the speech time and that they cannot be used interchangeably. At this point, they were told that in the following slides, they would learn about the appropriate use of the target verb tenses with the appropriate verbs. In this slide, they were also told that the present tense in general refers to the time of speaking and is therefore very short, perhaps as long as a few seconds only and for the same reason it could be likened to a keyhole (as proposed by Niemeier, 2005, as cited in Bielak & Pawlak, 2013) (Figure 1).
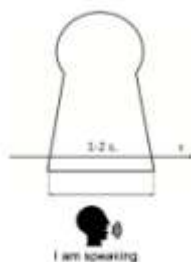

Figure 1. The Present Tense as a Keyhole

In the next few slides, learners were familiarized with CG-based concepts of perfective/ imperfective verbs and their interaction with tense and also the concept of boundedness/ unbounded ness and contractibility/ expansibility in a simplified and learner-accessible way. In doing so, the teacher drew the learners' attention to an example of a verb, namely, *hate*, referring to a situation occurring at the speaking time and used with present simple tense.
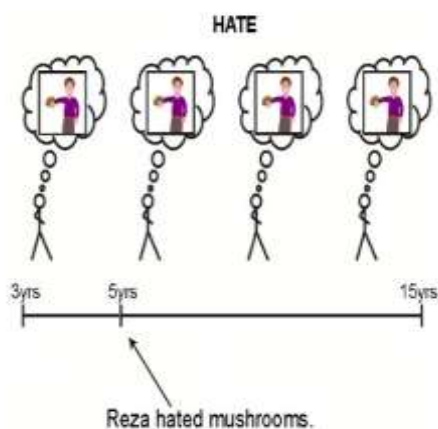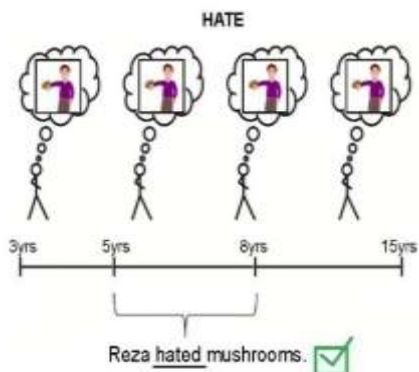

Figure 2. The Verb 'Hate' (1)

Figure 3. The Verb 'Hate' (2)

Assuming that Reza started hating mushrooms at the age of 3 and continued to do so up to age of 15, the figure picturized this feeling to be consistent at different developmental fragments of the action at any shorter
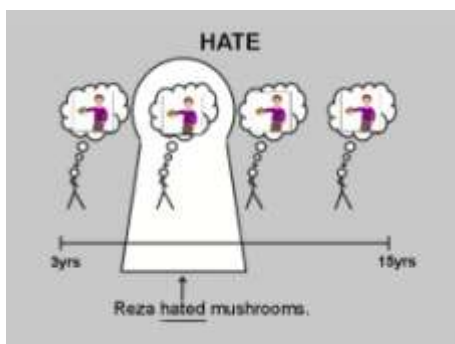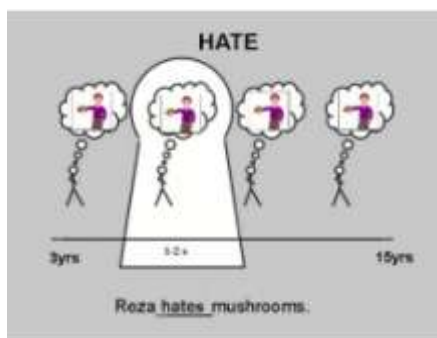
Figure 4. The Keyhole View of 'Hate'

Figure 5. The Verb 'Hate' in Present Simple

time period (homogeneous quality of the verb). In other words, the students were told that the sentence *Reza hated mushrooms* can be applied to any short subperiod as well as the whole activity (being contractible/expansible) (Figures 2 & 3). Therefore, such shorter periods could be presented through the keyhole view since a restricted view of the subpart was possible (Figure 4).

In the next slide, the learners were acquainted with the concept of imperfective verbs being inherently unbounded and identical in their constituent states. To make the idea more learner-friendly they were shown that the actual initial and ending configuration of the process were not important and in fact, the process between them included no change. Thus, they were told that the timeline representing the process should better begin and end with dotting, and not with vertical lines, to represent the insignificance of the endpoints of the process (Figure 5).

At this point, the learners were informed that other stative verbs can also be applied in the simple present because their endpoints are not essential (the verbs do not describe change), so we can view their situations through the keyhole of the present tense.
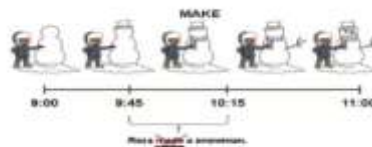

Figure 6. The Verb 'Make' (1)

Figure 7. The Verb 'Make' (2)

Following this discussion, the learners were shown a pictorial representation of the verb *make* as shown in the second column of the examples representing dynamic verbs (Figure 6). Briefly speaking, the same treatment with the verb *hate* was applied with this verb conveying that perfective verbs include a series of developmental segments of each activity and are thus perceived as inherently heterogeneous. Moreover, unlike the imperfectives, the subpart of the whole activity of building the snowman could not be captured by a single sentence such as *He made a snowman* construing that such verbs are inherently heterogeneous and not contractible/expansible (Figure 7). The bounded nature of these verbs was also suggested through drawing the learners' attention to the significance of the endpoints of the activity and the change occurring between the initial and end of the process (Figures 8 & 9).
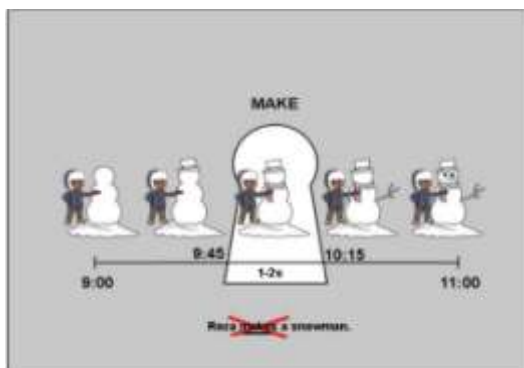

Figure 8. The Incompatibility of the Verb 'Make' with Present Simple
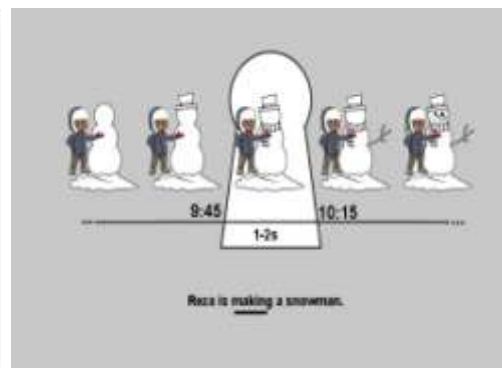
Figure 9. The Verb 'Make' in the Present Progressive

In the second set of verbs in the handout, the learners were reminded of the fact that it is possible for some verbs to have two different senses: stative and dynamic. Therefore, depending on the sense they construe, they can be used either with present simple or present progressive when reference is made to the speech moment. Finally, the learners looked at the third set of verbs such as *apologize* referring to actions which consist in speaking and they were told that when reference is made to the time of speaking with these verbs, they are used in the present simple, because these actions are as long as the time it takes to utter one sentence (Figure 10).

I apologize for being late.

Figure 10. The Verb 'Apologize' in Simple Present

After finishing the instructional phase, and in order to compile with the second phase of Gal'perin's framework, the learners were required to engage in verbalization. As already pointed out, this phase of instruction was intended to encourage learners to verbalize their understanding of the concepts presented to them in new contexts to through collaborative dialogue (dialogic thinking) in groups of two or three while doing the first few items in practice tasks following the instruction. Subsequently, as the learners got involved in the process of doing practice tasks individually, they were encouraged to verbalize their understanding of the concepts covertly for themselves about what they were doing when comprehending and employing a concept. This was supposed to account for the communicative thinking phase proposed by Gal'perin. Finally, the learners were required to do assignments at home and this was supposed to account for the third phase of STI framework.

3.2.2. Instruments

Apart from the Oxford Placement test used to confirm the proficiency level of the learners and a questionnaire devised to gather demographic information, a grammar test was given to the students which is exhaustively delineated below.

Based on Purpura's (2004) argument, a mixture of various grammar tasks can present a holistic, multifaceted manifestation of the learners' language behavior. He classifies grammar tasks into selected response, limited-production and extended-production tasks. Accordingly, the current study made use of a number of binary-choice test items, a gap-filling task, and an oral elicited imitation test to represent the three mentioned task types, respectively.

The first section of the test consisted of eight binary-choice test items in which the students were required to choose between a present simple and a present continuous verb phrase as part of a sentence or a longer exchange. This section was supposed to assess the learners' receptive knowledge of the target forms while the other two sections tested mostly their productive knowledge (Bielak & Pawlak, 2013). The second section included eight gap-filling items in which the learners were required to provide the correct form of the base form of the verb given as the clue in parentheses, again as part of a sentence or a longer exchange. The final section of the test compromised an elicited imitation test devised to tap the learners' extended productive and implicit knowledge of grammar. However, the latter function of this test is not addressed in the current paper. Inspired by Bielak and Pawlak's (2013) application of the same test, the imitation test used in this study consisted of eight statements, half of which were grammatical, with the rest being

ungrammatical. Evidently, all the sentences included the target verb tenses, and the error in ungrammatical sentences concerned the inappropriate use of tense/aspect pairing, given the semantic aspect of the main verb. After a short briefing session with the learners, they were informed that this part of test was in fact a questionnaire including 8 statements about themselves and their parents. After hearing each sentence, they had to first decide whether the sentence was true or not true for them, or whether they were not sure about that and then mark their answer on the answer sheet and only then they could repeat the sentence in correct English. In this way, it was supposed that the learners primarily attended to the meaning of the sentence, rather than its form and also they were given the time lapse required to hinder rote repetition.

In order to minimize practice effect, two similar versions of the test were used for posttest and delayed posttest. The validity of the grammar tests was established by the assessment of content and criterion validity of the tasks (Dörnyei, 2007; Purpura, 2004). Content validity was established with the help of one other language teacher and one TEFL university professor, each with at least ten years of experience in their field. This panel was supposed to make sure all the items constructed for the test complied with the details of test-task specifications. The test-task specifications contained "a detailed list of task characteristics, which form the basis for writing the test tasks" (Purpura, 2004, p. 166). They were in fact an important part of the operationalization phase because they provided a means of creating parallel forms of the grammar test as well. Based on the experts' critical examination of the content and their comments, only those test items that required the use of the learners' grammatical knowledge and ability in the area of target forms were selected. Finally, in order to check the internal consistency of the test items, the finalized test was piloted on 10 low-intermediate language learners in the same institute and Cronbach's alpha coefficient was found to be 0.84.

3.3. Procedure

This study adopted a quasi-experimental approach with a pretest-posttest-delayed posttest design, involving two experimental groups and one comparison group. Prior to taking the pretest, the learners were required to sit for the OPT test on the very first session of the class and they were given a questionnaire to be filled out at home. One the following session, they were required to take the pretest. One week later, the treatment began and lasted for a week (two successive sessions, one for instruction and one for practicing the learned material). One week following the treatment, the posttest was administered. And finally, three weeks after the posttest, a delayed posttest was conducted.

3.4. Data Analysis

The maximum possible score for the written test was 40 points. Each correct answer in the first section of the test was given 1 point for a maximum score of eight points. For the other two sections, partial-credit scoring was used in the sense that two points were awarded if the answer was formally correct and appropriate. If the form was wrong but the choice of tense-aspect was clearly appropriate, one point was given. No point was awarded for a clearly wrong choice in terms of tense-aspect.

It is worth mentioning here that this article reports on part of the findings of a more comprehensive research project. Due to space constraints, only the quantitative data obtained from one of the instruments, i.e., the grammar test is reported here. Both descriptive and inferential statistics were applied on the scores to analyze this data. The descriptive statistics included calculating means and standard deviations. The inferential statistics were mainly one-way ANOVA and repeated measures ANOVA with the treatment (DL, STI and traditional) as the main independent variable and time (pretest, immediate posttest, and delayed posttest) as the repeated measure.

4. Results and Discussion

4.1. Results

4.1.1. Pretest Results

In the first place, one-way ANOVAs were conducted on pretest scores to ascertain that there were no significant differences among the three groups and to make sure that all the possible subsequent effects were the result of pedagogical interventions and did not occur due to primary intergroup differences. The results indicated no significant difference among the three groups in terms of the entire test score (F (2, 67) = .29, p = .74), as well as the three subcomponents of the test, i.e., the receptive knowledge test (F (2, 67) = 1.38, p = .25), limited productive knowledge test (F (2, 67) = 1.78, p = .69) and the extended productive knowledge test (F (2, 67) = .35, p = 0.69).

4.1.2. The Entire Grammar Test

Table 1 presents the means and standard deviations of the three groups on the whole test. For easier comparison of the groups at the pre-, post- and delayed posttest measurements, a graphic plot is also presented (Figure 11).

The data revealed that all three groups had an improvement in their performance from the pretest to the posttest. However, the STI group outperformed the other groups.

A number of ANOVAs and repeated measures ANOVAs were run to further investigate the differences among the three groups with regard to the three tests, the summary of which is presented in Table 2. Moreover, Scheffe post hoc test was applied to obtain additional exploration of the differences among means and to provide specific information on means which are significantly different from each other.

Table 1

Mean and Standard Deviation of the Entire Test for All Groups

	Groups					
	TRAD		DL		STI	
	M	SD	M	SD	M	SD
Pretest	20.76	4.86	21.28	6.66	20.08	4.42
Posttest	24.05	3.94	26.92	4.85	28.58	3.98
Delayed Posttest	22.87	2.88	26.3	4.43	29.2	3.7

As the information in Table 2 suggests, all three groups performed significantly better in their posttest than their pretest. However, this progress was more noticeable in the STI group than the other two groups.
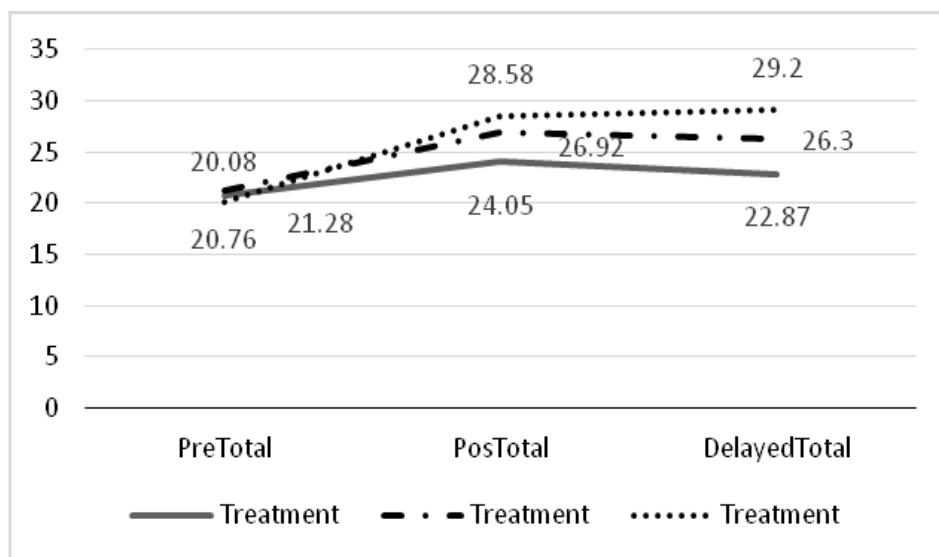

Figure 11. Means for All Groups on The Entire Test

Moreover, the result of a One-Way ANOVA among the posttest mean scores of the three groups revealed that there was a significant discrepancy between the performance of the three groups. Also, the result of post hoc test showed that while there seemed to be no significant discrepancy between the DL and STI group, they both significantly outperformed the TRAD group.

On the other hand, an investigation of the delayed posttest results revealed different results in the sense that both the TRAD and DL groups' delayed posttest scores deteriorated from the posttest (Table 1). However, this trend is different in the STI group in that they kept to improve minimally by 0.62 points. In other words, although both TRAD and DL groups maintained their gain compared to their pretest scores, this maintenance of achievement was more recognizable for the STI group for not only did they not decline in their performance in the delayed posttest, but also they slightly improved. However, only the decline in TRAD group's delayed posttest mean score reached statistical significance compared to their posttest and the deterioration in DL group and progress in STI group was not statistically significant. The comparison of delayed posttest scores with pretest scores revealed that in the long run while the TRAD group improved by 2.11 points in their delayed posttest, this gain was as high as 5.2 points for the DL group and 9. 12 points for the STI group. Statistically speaking, all three groups performed significantly differently from each other. Also, the post hoc results indicated that the STI group significantly outperformed the DL and TRAD groups and the difference between DL and TRAD group was significant as well.

Table 2

Summary of Statistically Significant Between- and Within-Group Differences on the Entire Test

		Between-group	Within-group
	Pretest		
	Post-test	STI= DL>TRAD	
	Delayed post-	STI>DL>TRAD	
test			
	TRAD		Pretest <Post-test
			Post-test > Delayed post-test
	DL		Pretest<Post-test
	STL		Pretest < Post-test

Furthermore, in order to check the effect of treatment throughout the time of test, a repeated-measures ANOVA with the *treatment* as the between-subjects variable and *time of test* as the within-subjects variable was

performed on the scores of the three groups, the result of which is presented in Table 3.

Table 3

Repeated Measures ANOVA of the Entire Test Scores

Source	Df	F	*p*	η_p^2
Between subjects				
Treatment	2	7.04	0.002	0.122
Error	64			
Within subjects				
Time	2	100.65	0.0001	0.767
Time × Treatment	4	16.60	0.0001	0.285
Error	136			

The results revealed significant main effects for the interaction of treatment group with the time of test $F(4, 136) = 16.60$, p= 0.0001, ηp^2= 0.28, as well as the time with $F(2, 136) = 100.65$, *p*= 0.0001, ηp^2= 0.767 and treatment with $F(2, 64) = 7.04$, *p*= 0.002, ηp^2= 0.12.

These data indicated that various instructional treatments instigated significantly different test results at different time intervals, which was also predictable by the different mean scores obtained by the three groups. One more point to take into consideration is the effect size (ηp^2) in all the three cases. According to the obtained values, the interaction of time and treatment predicated %28 of the total variance in the test scores. While this number was only %12 for the treatment, the time factor accounted for %76 of the variability in test results.

4.1.3. Results of the Receptive Knowledge Test

As it was already pointed out, the binary-choice items in the test were intended to address the receptive knowledge of the learners. As the data in Table 4 display, while the DL group did slightly better than the STI group in their posttest, when compared with their pretest score, their gain score in this section of the test was approximately similar to that of the STI group (about two points). Yet, this value was less than a point for the TRAD group, which can be partly contributed to the fact that the pretest mean score of the TRAD group was larger than the other groups in the first place.

Moreover, as the summary of ANOVA and repeated measure ANOVAs in Table 6 signifies, while there was no significant difference among the three groups in their pretest scores, the improvement from pretest to posttest was statistically significant for all the three groups. Yet, here again, a significant difference was observed among the three groups'

performance in the delayed posttest. Similar to the results obtained from the entire test scores, while the STI group continued to progress in the delayed posttest, the DL and TRAD groups' scores depreciated in the delayed posttest. Whereas the STI group's advancement and the TRAD group's decline were statistically significant in the delayed posttest, the DL group's performance did not statistically alter. However, all three groups significantly differed from each other in this section.

Table 4

Mean and Standard Deviation of Binary Choice Test (Receptive Knowledge) For All Groups

	Treatment					
	TRAD		DL		STI	
	M	SD	M	SD	M	SD
Pretest	5.33	1.59	4.84	1.72	4.66	1.46
Posttest	6.09	1.44	6.80	1.08	6.65	1.23
Delayed posttest	5.57	1.19	6.67	1.13	7	0.89

The same information is presented graphically in Figure 12.
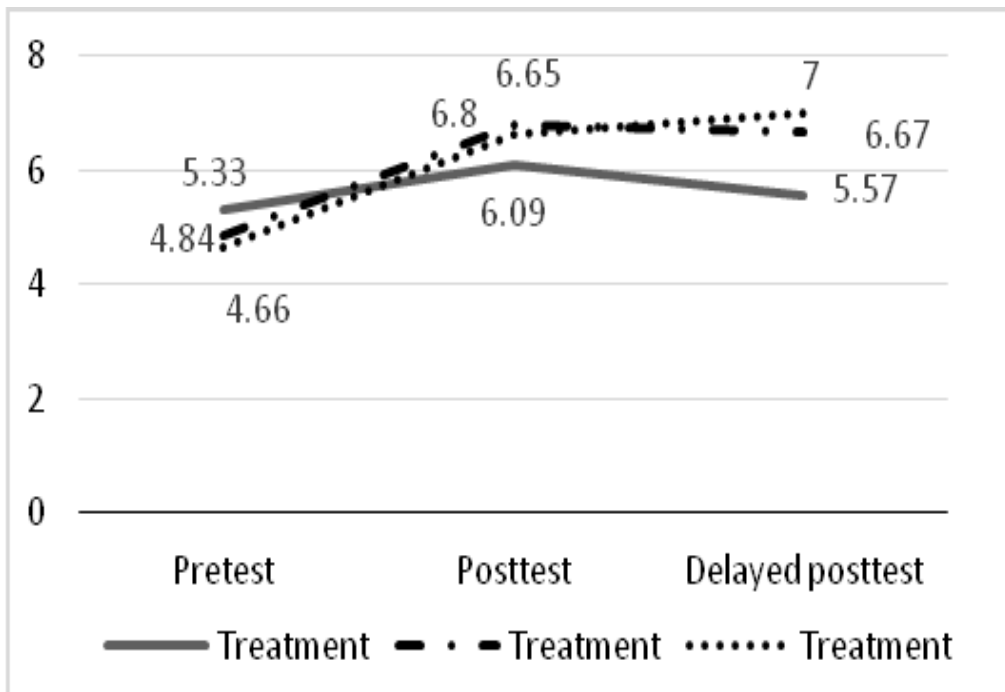

Figure 12. Means for All Groups on the Receptive Knowledge Test

Table 5

Summary of Statistically Significant Between- and Within-Group Differences on the Binary Choice Test (Receptive Knowledge)

	Between-group	Within-group
Pretest		
Post-test		
Delayed post-test	STI>DL>TR	
	AD	
TRAD		Pretest < Post-test
		Posttest > Delayed post-test
DL		Pretest<Post-test
STL		Pretest < Post-test
		Post-test < Delayed post-test

4.1.4 Results of the Limited Productive Knowledge Test

Learners' limited production knowledge about the use of simple present and present continuous with reference to the time of speaking was tested through gap-filling question items in the written test.

Table 6

Mean and Standard Deviation of Gap-Filling Test (Limited Productive Knowledge) for All Groups

	Treatment					
	TRAD		DL		STI	
	M	SD	M	SD	M	SD
Pretest	8.28	2.57	9.08	2.76	8.09	1.95
Posttest	10.14	2.01	11.36	2.17	12.38	1.86
Delayed posttest	10.19	1.72	11.28	1.74	13.47	1.36

As it can be inferred from the mean score of the three groups provided in Table 6 and the schematic representation of the results in Figure 13, here again all the groups improved their scores from the pretest to the posttest, with the most progress belonging to the STI group (4.29 points) and the least progress belonging to the TRAD group (1.86 points). Moreover, as Table 7 reveals, this improvement was found to be statistically significant for the three groups. Also, as far as the intergroup differences are concerned, a

significant difference was found between the STI and TRAD groups in the posttest.
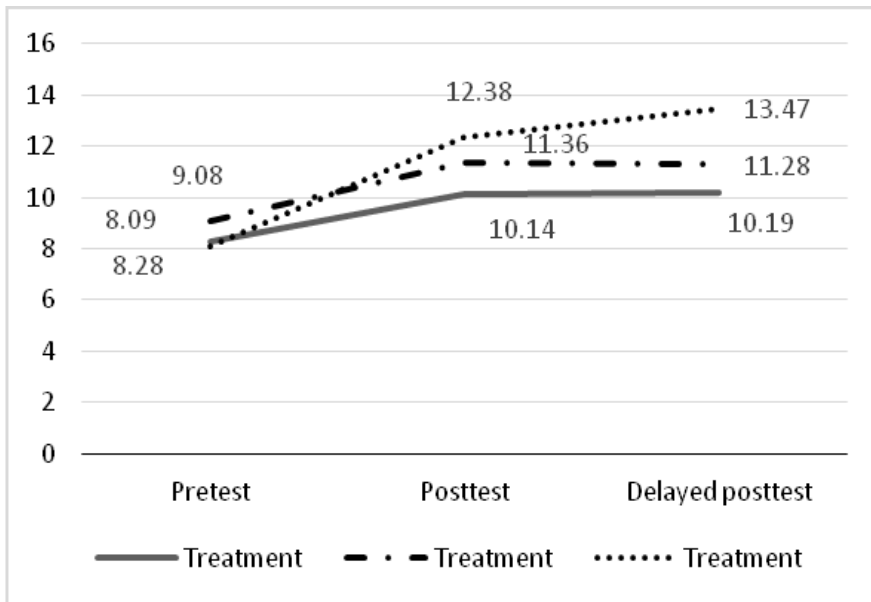

Figure 13. Means for All Groups on the Limited Productive Knowledge Test

       However, when it comes to the delayed posttest, not only did the STI group significantly outperformed the other two groups, but also this included a significant progress from the posttest scores. In other words, while the DL group slightly deteriorated in their performance in the delayed posttest, the TRAD group experienced only a minor improvement which was statistically insignificant. Yet, it is worth mentioning that apparently, all the three groups retained their gain from the posttest to the delayed posttest.

Table 7

Summary of Statistically Significant Between- and Within-Group Differences on the Gap-Filling (Limited Productive Knowledge)

	Between-group	Within-group
Pretest		
Post-test	STI=DL>TRAD	
Delayed post-test	STI>DL=TRAD	
TRAD		
DL		Pretest<Post-test
STL		Pretest < Post-test
		Post-test < Delayed post-test

4.1.5 Results of the Extended Productive Knowledge Test

As it was already pointed out, the learners' productive knowledge in extended scale was measured through an oral elicited imitation test. As the mean score of the three groups in Table 8 shows, here again, all of them improved their scores from pretest to posttest.

Table 8

Mean and Standard Deviation of Oral Elicited Imitation Test (Extended Productive Knowledge) for All Groups

	Treatment					
	TRAD		DL		STI	
	M	SD	M	SD	M	SD
Pretest	7.19	1.88	7.52	3.001	8.14	1.79
Posttest	7.80	1.54	9.16	1.84	10.14	1.74
Delayed posttest	7.28	1.31	8.76	2.24	10.18	1.60

However, as it is implied in Figure 14 and can be confirmed by the results in Table 9, this improvement was more noticeable and in fact statistically significant for the STI and DL groups. Moreover, while the DL and STI group did not differ significantly in this regard, the TRAD group's performance was significantly less successful than the other two groups.
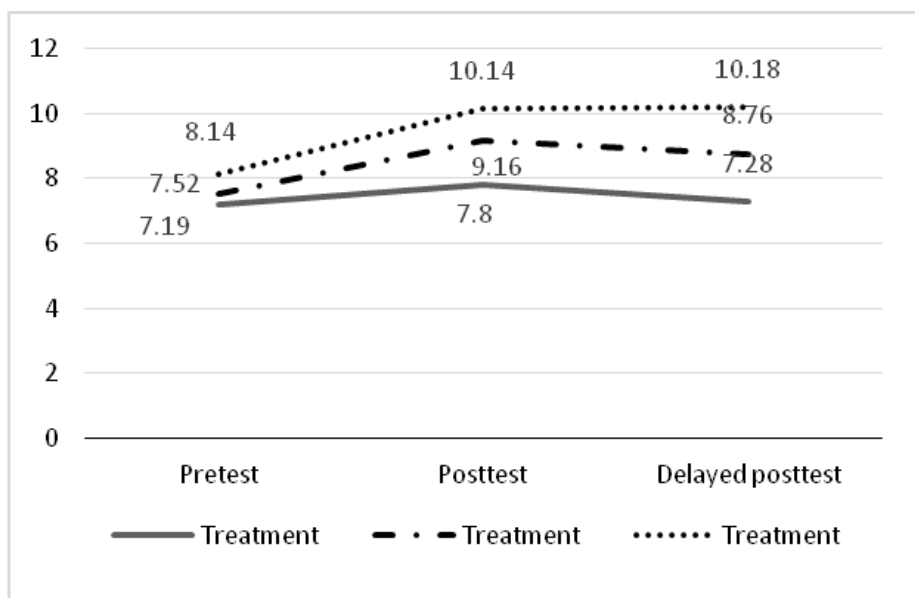

Figure 14. Means for All Groups on the Extended Productive Knowledge Test

Yet, rather different results were obtained in delayed posttest. While the STI group had a negligible progress in their scores (0.04 point) which can be contributed to practice effect, the other two groups' performance declined in the delayed posttest. Moreover, while the DL and TRAD groups performed relatively similarly with no substantial difference observed between their mean scores, the STI group's performance was significantly different from them.

Table 9

Summary of Statistically Significant Between- and Within-Group Differences on Oral Elicited Imitation Test (Extended Productive Knowledge) for Groups

	Between-group	Within-group
Pretest		
Post-test	STI=DL>TRAD	
Delayed post-test	STI>DL=TRAD	
TRAD		
DL		Pretest < Post-test
STL		Pretest < Post-test

4.2. Discussion

As it was already pointed out, the performance of all three groups in the current study improved on the immediate grammar test intended to assess their formal knowledge of simple present and present progressive when referring to the time of speech. This finding actually answers the first question proposed in this study. This implies that these three kinds of form-focused intervention can be of help and positive influence in a typical Iranian EFL context when it comes to teaching grammatical forms at least accounting for their short term learning. This idea has already been largely supported by research confirming that interventionist approaches to teaching grammar are effective (Ellis, 2014; Larsen-Freeman, 2014; Nassaji, 2017; Norris & Ortega, 2000), and that in general explicit instruction has an advantage over implicit instruction (Norris & Ortega, 2000).

In an attempt to answer the second question, a closer scrutiny of the mean scores revealed that this progress was less noticeable in the TRAD group than the other two experimental groups. In fact, there was a significant discrepancy between the TRAD group's performance and the other two groups in the posttest indicating that teaching grammar through lecturing can have the least influence on the learners' learning. This is not surprising since as research also confirms, traditional approaches to teaching grammar with mere focus on accuracy of form and rule learning, and mechanical practice without meaningful learning and active involvement of the learner in the

process of instruction do not seem to have profound, lasting and applicable effects on learners (Larsen-Freeman, 2015; Simard & Jean, 2011).

Moreover, when it comes to the comparison of the two experimental groups' performance on the posttest, it was revealed that except the slightly better performance of the DL group on receptive knowledge test which could easily be contributed to their slightly better performance in the pretest, the STI group outperformed the DL group both on the entire test and on its subcomponents. Nevertheless, it should be borne in mind that the difference between STI and DL group was not statistically significant in all the above cases. This is to imply that in spite of the ostensible superior performance of the STI group, this discrepancy can be statistically disregarded, and both STI and DL can be introduced as prominently more effective methods of instruction than traditional method of grammar teaching at least when the immediate improvement of the productive knowledge of the learners is considered.

Yet, as far as the receptive knowledge of the learners is concerned, i.e. when no production is required on the part of the learners and they only need to choose from among the available choices, all three methods, even the traditional method of instruction can prove effective at least when durability of learning is not an issue.

Although no other piece of research has ever investigated these two approaches to teaching grammar together, there are a good number of studies that have examined these two approaches independently, the findings of which can be compared with the present research. As it was already discussed before, there is enough support in the literature for the efficiency of STI methods of instruction, especially when it comes to grammar and this confirms the findings of the current study. For example, Infante (2016) used an STI-informed pedagogical framework to teach the English tense-aspect system to a group of Polish ESL learners and he found the approach helpful in supporting the learners' contingent cognitive and emotive needs and transforming the pedagogical materials into a tool for thinking that participants successfully employed in their L2 English writing.

In a most recent and most similar study in terms of context, Fazilatfar et al. (2017) used STI to teach some features of English tense-aspect tense to Iranian high school students. They compared the performance of the STI group to a traditional group using three sets of data including definition of the concepts of tense and aspect before and after treatment, concept verbalization data during STI, written discourse performance plus responses to a set of grammatical questions before and after STI. It was found that although both groups improved significantly after receiving the instruction, the students

who received STI performed significantly better than those in the traditional group. The former students also produced a significant definition of the concepts and their written discourse performance and responses to the grammatical questions improved after STI. These findings are exactly in line with the results of this study.

Yet, there is also supporting evidence for DL-based studies in grammar. For instance, problem-solving grammar tasks in which learners get involved in activities that require them to "reflect on language form and try to discover the grammatical rules underlying the structure" (Nassaji, 2017, p. 215) are found to be a more efficient alternative than traditional methods (e.g., Fotos & Ellis, 1991) since they can help learners arrive at a better understanding of form–meaning relationships (Nassaji & Fotos, 2010). Similarly, Ellis (2002b) affirms that "a discovery-based approach to teaching explicit knowledge has much to recommend it" (p. 166), including increased motivation, greater memorability of rules that learners have 'discovered' on their own, active student engagement in terms of forming and testing hypotheses about L2 grammar, establishing "powerful insights about the grammar of a language that cannot be found in and published descriptions" (ibid), development of problem-solving and critical thinking skills, and helping learners become 'field linguists' who can investigate language autonomously. These are the kind of skills that Ellis believes a good language learner needs to be successful in language learning.

It should also be borne in mind that the type of discovery learning practiced in this study was that of collaborative nature which as Gijlers and De Jong (2005) maintain, while discovery learning motivates learners to express and explore their own conceptions, collaborative discovery learning encourages them to share these plans and ideas with their partners. Borrowing the same ideas, Eskanadari and Soleimani (2016) put the tenets of collaborative discovery learning into practice for teaching grammar to Iranian EFL learners and found that their experimental group registered a significant improvement and insignificantly outperformed the control group. In general, the comparisons carried out in this study confirm the findings of the mentioned studies in the sense that both DL and STI almost similarly resulted in the immediate improvement of the learners' receptive and productive knowledge of grammar.

On the other hand, a relatively different pattern was observed among the three groups when the delayed posttest means of the three groups were scrutinized and compared and these findings could relatively demonstrate the durability of the learning obtained by each of the instructional methods. In general, the STI group was not only the single group that demonstrated a

significantly better performance in both the entire test and all the test subcomponents when compared with the other two groups, but it was also the only group which did not show any deterioration in their performance on the second posttest. On the contrary, they experienced a progress in their scores in all the cases although this gain score was not significant on the entire test and the extended production test results. The DL group's performance declined on this posttest both in the entire test and in all its subcomponents. However, this deterioration was not significant in any of the cases. In other words, in spite of this minor depreciation in test scores, one can claim that the learners who were instructed through DL relatively maintained their acquired knowledge in the long run. The existing significant difference between the STI and DL group in the delayed posttest, however, displayed that although both the experimental groups were successful at retaining the knowledge they had acquired through the course of instruction they received on the delayed posttest, the STI group's better performance is indicative of the superiority of this method of instruction in the long run.

There are a number of features in the STI method than can virtually justify this preeminence. The first factor is concerned with using SCOBAs in the materialization or visualization phase of Gal'perin's pedagogical framework. As Tyler and Ortega (2018) point out, "[i]f much of language reflects our visual experience with the world, much of meaning can be captured through visual representations of conceptual-linguistic meaning" (p. 7). That is in fact why visual images of linguistic concepts are substantially used in CL theory (Langacker, 1991; Tyler, 2012). As Lantolf and Tsai (2018) also discuss, the visualization of conceptual knowledge in any domain can account as a powerful mediating tool in the process of learning. Likewise, according to dual-coding theory (Paivio, 2006), human memory consists of two independent but interconnected coding systems including the visual and verbal systems. While the former handles visual codes such as concrete objects, pictures, images, and events, the latter deals with non-visual codes such as language. On the whole, each of the systems functions independently but most information processing requires connections and reinforcement between the two systems (Lai, 2000). In general, visuals are more likely to be processed in both verbal and visual systems, and therefore the retention of the information in the working memory and its future retrieval from long-term memory is more likely than when the presentation contains verbal information alone (Kobayashi, 1986).

Yet, another factor which can be said to have contributed to the effectiveness of STI was the verbalization phase the learners engaged in during the treatment. This phase helped them better internalize the concepts and notice their problematic areas. Verbalization is in fact based on

"Vygotsky's theoretical principle that speaking (or writing) is the optimal means for the appropriation of culturally developed knowledge, whether it is of the everyday or scientific variety" (Lantolf & Tsai, 2018, p. 37). This idea is also reflected in the concept of *languaging* proposed by Swain (2006) according to which this act of producing language to make meaning mediates cognitive ability. As G´anem-Guti´errez and Harun (2011) also maintain, engagement in this kind of collaborative activity and interaction with physical and psychological objects such as charts and diagrams helps humans develop their thinking. They also believe that in the context of second language learning, languaging or verbalization "objectifies thought and language" (p. 100) and renders them "available for scrutiny" (Swain, 2000, p. 104).

5. Conclusion and Implications

In brief, the findings of the current study provide further evidence for the role of interventionist approached to language learning, confirming the fact that grammar instruction can have facilitative and positive effects on learning (Loewen, 2015; Nassaji & Fotos, 2010; Nassaji & Simard, 2010) and that explicit instruction can yield significant results (Spada & Tomita, 2010). In other words, as De Bot, Lowie and Verspoor (2005) maintain, what explicit method of instruction offers is "to 'prime' for *noticing* and to make clear those rules that cannot be deducted easily without instruction" (p. 85). This positive effect can also be explained in terms of Schmidt's (1995) two levels of awareness (i.e., noticing and undemanding). According to Schmidt, noticing is a necessary step towards acquisition, while understanding can result in greater and deeper learning. Since traces of problem-solving and metacognition, as the two features that Schmidt (1990) believes to exist in the level of understanding can be readily identified in DL and STI, it can be assumed that DL and STI can both tap the level of learners' understanding better than traditional method of instruction.

However, the most important conclusion drawn from this study is that although a good body of research supports the use of STI in teaching and in spite of the fact that SCT refuses methods such as DL, this study showed that in practice, DL can also account as an approach that can bring about not only the immediate improvement of the learners' grammatical knowledge at least in tense-aspect system, but also as one that can help learners retain their gained knowledge in the long run. In other words, although Piaget and Vygtosky's ideas seem to have diverged on certain grounds, in practice they may both lead to the same destination. Yet, the existence of a significant difference between the outcome of the two approaches and the outperformance of STI invites us to reconsider this widely-neglected

pedagogical framework and its premises more seriously. STI draws on cognitive linguistics theory and Vygotskian educational theory to present a pedagogical framework that can generate positive outcomes and attitudes both in the eyes of language teachers and learners. As Lantolf and Tsai (2018) maintain, STI is an innovative approach to L2 instruction that by drawing on the findings of cognitive linguistics is both usage-inspired (see Tyler & Ortega, 2018) and incorporates mature, higher-order capacities of the adult mind. Larsen- Freeman (2015) believes that CL and conceptual grammar are areas of research which can add fruitful perspectives to inform pedagogy. Likewise, SCT conceives of language as a social practice the implication of which is that what teachers need to incorporate into their teaching is not the discrete points of grammar but rather "the conceptual meanings that are being expressed that denote ways of feeling, seeing, and being in the L2 world" (Johnson, 2009, p. 24).

Given the fact that traditional methods of grammar instruction still seem to prevail in language teaching (Simard & Jean, 2011), the conceptual learning opportunities that approaches such as STI can offer seem to have significant implications for materials developers and teacher education programs. Materials developers can find ways to incorporate the findings of CL into language course-books and teaching materials in a learner-friendly and accessible way. Teacher education programs can also offer courses in which concept-based instruction and STI-based tenets such as verbalization and internalization are encouraged. Larsen-Freeman (2015) believes that one of the most important contributions of research to practice can be challenging teachers to think differently and to experiment with new practices. Perhaps STI can offer such an opportunity in a practical way.

In light of the positive implications of the findings, there are some limitations that might open new ways for further research. One of these limitations is concerned with practical shortcomings arising primarily from the concrete circumstances in which the instructional program was implemented. In the first place, certain administrative limitations did not permit the researcher to instruct the TRAD group herself and another teacher was recruited to do this. Although the researcher tried to maintain the required quality and quantity of instruction by both holding briefing sessions with the teacher and by observing the classroom during instructional phases, one cannot deny the probable different effects the teacher characteristics and qualities might have caused. The other limitation concerns the gender of the participants in the TRAD group that was confined to females only. This limitation was again imposed by the administrative considerations. Although gender does not seem to impose any significant impact when it comes to teaching grammar, cautions have to be made in generalizing the findings to

males. Also, as it was already pointed out, the instructional phase lasted for different lengths of time in the three groups due to the different nature of the three instructional treatments. While no study has been found to confirm the possible effects of the length of instruction on learners' acquisition, it may still be considered as a limitation requiring further investigation. Finally, despite the longitudinal nature of the present study, the development of learners' grammatical knowledge was tracked only within a two-and-a-half-month period of time. This was due to the fact that the researcher had to conduct the treatment and data collection procedures within the scheduled timetable of the institute to avoid participant mortality and term break dates. Accordingly, further investigation that would track grammatical competence over longer periods and under fewer constraints would offer more insights and refine our understanding of L2 grammar acquisition processes.

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