Classroom-oriented research: Processing Instruction (findings and implications)

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This paper firstly presents and examines the pedagogical intervention called Processing Instruction (PI). Secondly, it reviews and discusses the main findings of the empirical research conducted to measure the relative effects of PI. Current research trends within the PI research framework will be outlined. Experimental research investigating the effects of this pedagogical intervention in language teaching, and grammar instruction in particular, has primarily used listening and reading measures (so-called 'off-line measures') to elicit how learners comprehend and process sentences. On-line measurements, such as eye tracking and self-paced reading, have now been incorporated into PI research to measure language processing more directly. Finally, this paper provides specific guidelines and procedures for teachers on when and how to use PI.

1. What is PI?

PI is a pedagogical intervention in grammar instruction used primarily to facilitate understanding of the cognitive processes by which language learners connect a linguistic feature of an input to its meaning. Form-meaning connections are the relationship learners make between referential meaning and the way it is encoded linguistically. For example, when learners hear the sentence *I talked to my teacher* and understand that *talked* means the action is in the past, a FORM-MEANING CONNECTION is made. PI is predicated on a contemporary theory of second language acquisition (SLA) called the Input Processing Theory (VanPatten 2004). Input Processing Theory research attempts to address why second language (L2) learners process some elements in the input and not others when they are exposed to certain linguistic features. Input Processing Theory consists of two overarching strategies addressing two different aspects of processing.

a. L2 learners are driven to get meaning first while processing language input (Primacy of Meaning Principle).
b. L2 learners assign the role of subject to the first noun they encounter in a sentence (First Noun Principle).

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An explanation of these two processing strategies is provided below.

a. In the sentence *Yesterday, I played tennis with John in the park*, in the attempt to make moment-by-moment connection of surface form with meaning, learners need to tag *played* with the fact that it is a verb (<+V>, <−N>), that its meaning refers to playing a sport, that it is past tense not present (<+present> <−past>), and so on. However, learners initially process the first element they encounter (the lexical item *Yesterday*) to interpret the sentence as a sentence in the past. By doing this, they skip the form *–ed*, as in *played*, as it encodes the same semantic information. Learners initially rely on the lexical item to extract the meaning from the sentence and do not make a form-meaning connection. (This processing strategy is called the Lexical Preference Principle and it is a sub-principle of the Primacy of Meaning Principle.)
b. In the sentence *The police officer was killed by the robber*, learners, in the attempt to make moment-by-moment computation of sentence structure during comprehension, process the first element they encounter in the sentence as the subject of the sentence. Learners interpret the sentence as if it were the police officer who killed the robber. This causes a delay in interpreting the meaning of the sentence and therefore a subsequent delay in acquisition.

The first characteristic of PI is to help language learners process input more accurately and appropriately. In PI, learners are required to simultaneously FOCUS ON FORM to get meaning so that they improve their ability to process the right information and make the right form-meaning connections during comprehension. This is a different function from simply noticing a form in the input; it means being consciously aware that it is there. For example, learners might hear the word *played* and notice that it is different from either *plays* or *playing*. However, they might not immediately connect the ending (verbal inflection) with the concept that the action has already taken place, takes place, or is taking place (past/present). PI is fundamentally different from other input-based pedagogical interventions in grammar instruction such as input enhancement. This is because enhancing a feature in the input might help learners to notice that feature, but it does not necessarily mean that learners actually link meaning with form or that it facilitates being able to build sentence structure. PI facilitates both form-meaning mappings and parsing.

A second characteristic of PI is that it focuses on the processing of morpho-phonological units as well as sentences. The measures used to assess 'processing' are interpretation measures. In PI research, rules are not tested (e.g. through grammaticality judgement tasks or fill-in-the-gap tasks), but the ability to process is. In PI research, when production measures are used, they are not meant as a measure of production skills.

A third characteristic is that PI alters the way in which the input is processed by learners, which in turn might have an effect on their language development system. PI is not intended to assist in skill development, but it might help learners access the right information (form or structure) in order to express meaning.

To summarise, PI is a pedagogical intervention in grammar instruction that uses a particular type of input to push learners away from non-optimal processing strategies so that they are more likely to make correct form-meaning connections or parse sentences (compute basic structure in real time) appropriately during comprehension. It is mainly concerned

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with the processing of morpho-phonological units in input strings and the development of underlying linguistic representation. PI consists of two main components:

1. Learners are given explicit information about a linguistic form and the particular processing strategy that may negatively affect their picking up of the form or structure during language processing.
2. Learners are pushed to process (not produce) the form or structure during structured input (SI) tasks.

More information on the actual use of PI in the classroom is presented below.

2. What are the main findings in PI research?

PI has been widely investigated (Benati & Lee 2015) using a variety of languages (e.g. Arabic, French, German, Greek, Italian, Japanese, Russian, Spanish), linguistic features (e.g. word order, clitic pronouns, passive and causative constructions, tense markers, aspectual markers, mood with expression of doubt), populations (groups and individuals from eight different L1s) and contexts.

To measure the effects of PI and compare it to other pedagogical interventions, two methodological designs have been used: pre- and post-test (immediate and delayed) experimental design, and the so-called 'trials-to-criterion design'. The latter is a methodological design used to examine the possible effects of the treatment itself (number of trials needed for learners to correctly process sentences) and learners' reaction times in sentence responses.

The empirical research into the relative effects of PI has addressed the following questions:

1. Is PI more effective than other pedagogical interventions?
2. Is PI effective across different languages and populations?
3. What is the causative factor for PI's positive effects?
4. Is there an effective way to deliver PI?
5. Can we measure secondary effects of PI?
6. Can we measure discourse effects of PI?
7. What is the number of trials needed for learners to correctly process sentences?
8. Can we measure the long-term effects of PI?

2.1 Is PI more effective than other pedagogical interventions?

PI is an effective pedagogical intervention in grammar instruction which has consistently demonstrated significant improvement in learner performance on both INTERPRETATION and PRODUCTION tasks. PI studies have made use of both interpretation and production (sentence-level) tasks. Normally, in interpretation tasks, learners are asked to interpret sentences containing the target feature. In production tasks, learners are asked to put verbs in the correct form by completing a short passage or producing a series of sentences containing the

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target form. The effects of PI, investigated in a number of empirical studies, have shown that it is a better instructional intervention than traditional instruction (paradigmatic explanations of rules followed by drill and practice) for improving learners' rate of processing and for increasing their accuracy in production (VanPatten & Cadierno 1993; VanPatten & Wong 2004). The effects of PI have also been compared to other instructional interventions, such as meaning-based output instruction (Farley 2001, 2004; Benati 2005), input-based interventions (Lee & Benati 2007a) and dictogloss (Uludag & VanPatten 2012). These comparative studies demonstrate that PI is better than other pedagogical interventions for circumventing learners' processing problems. Overall, PI has a positive effect on learners' ability to process input efficiently and correctly.

2.2 Is PI effective across different languages and populations?

PI can help learners of any target language (romance and non-romance languages) develop an appropriate target-language-specific processing strategy to address a target-language-specific processing problem. PI research has examined native speakers (NSs) of English learning romance languages (French, Italian, Spanish) and non-romance languages such as English, German, Japanese and Russian. Other studies (Benati & Lee 2015) have examined NSs of Chinese, Greek, Italian, Korean and Turkish, learning English as an L2. PI seems to be effective for instilling target-language-specific processing strategies no matter the native language of the learners.

2.3 What is the causative factor for PI's positive effects?

A line of enquiry within the PI research agenda has been the effects of PI's components (explicit information and SI practice). One piece of research teasing out the main factors responsible for PI's effectiveness was carried out using three experimental groups: one receiving only the explicit information component; the second only the SI practice component; and the third both components (VanPatten & Oikennon 1996). In addition, a number of forms and structures have been investigated (e.g. Italian future tense and noun-adjective agreement, French negative plus indefinite article, Spanish object pronoun, Japanese past forms and affirmative vs negative present forms, Russian case marking, German case marking and Spanish direct object pronouns). Results from these two studies (VanPatten et al. 2013) indicate it is the SI practice component that is the main factor in the positive results generated by PI.

2.4 Is there an effective way to deliver PI?

PI is designed for delivery in the language classroom. Most studies investigating its effect have packages of instructional material for each group investigated. Lee & Benati (2007a) carried out several studies comparing classroom- vs computer-delivered PI. The results of these studies measuring different linguistic features (e.g. French subjunctive, Spanish negative

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informal commands, Spanish preterite/imperfect aspectual distinctions) indicate that PI is effective no matter the mode of delivery (in class delivered to a group collectively or via computer to individuals in a laboratory).

2.5 Can we measure secondary effects of PI?

Benati & Lee (2008) examined the transfer-of-training effects of PI. 'Transfer-of-training effects' was defined as the effects of the PI treatment used to help learners process a particular form affected by a specific processing principle that is transferred to another linguistic form affected by the same processing principle. For instance, they provided PI training to L2 learners on Italian noun-adjective gender agreement and found that it transferred to the future tense. Benati & Lee (2008) found that training on the English past tense marker *–ed* is transferred to the third person singular present tense marker *–s*. They also trained L2 learners to process imperfective verb morphology in French and found that it transferred to subjunctive forms. PI therefore seems to have primary and secondary effects on similar morphological or syntactic constructions.

2.6 Can we measure discourse effects of PI?

Positive results of PI have been observed on sentence-level tasks (interpretation and production). Can we find similar results when we measure PI using discourse-level tasks? Benati & Lee (2010) found positive effects of PI using discourse-level interpretation tasks (e.g. English past tense, Japanese passive constructions). Benati & Batziou (2017) have demonstrated that PI has an effect on discourse-level production tasks (oral and written video-based retellings, and oral and written structured interview).

2.7 What is the number of trials needed for learners to correctly process sentences?

PI research has evaluated learners' performance based on accuracy scores, for example, how many sentences did the learners interpret correctly?; how many forms did they produce correctly? Fernández (2008) shifted the focus from the outcome (accuracy scores) to the learning process by introducing the measure of TRIALS TO CRITERION. She defined 'trials to criterion' as the number of items that participants completed up to the point when they correctly answered three target items and one distractor item in a row. She compared the effects of full PI (PI group) to SI only (SI group), focusing on Spanish direct object pronouns and the Spanish subjunctive. She measured four aspects of performance: trials to criterion, response time, accuracy after criterion, and the proportion of participants who reached criterion. She found different results for the two target items. For Spanish direct object pronouns, she found no significant differences between the PI and SI groups on any of the four measures. For the Spanish subjunctive, she found that the PI group significantly outperformed the SI group on all four measures. She concluded that the benefits of explicit

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information depended on the nature of the task or the aspect of performance measured and the processing problems presented by specific linguistic items. Thus, the effects of PI can be approached from a process perspective as well as a product perspective.

2.8 Can we measure the long-term effects of PI?

The study by VanPatten & Cadierno (1993) demonstrated that the effects of PI were retained one month after instruction. Many subsequent studies have included delayed post-testing that shows learners retain the benefits of PI, with the post-testing taking place one week after instruction (Lee & Benati 2007b), after two weeks (Benati 2013), after three weeks (Benati 2005), after four weeks (Keating & Farley 2008), after six weeks (VanPatten, Farmer & Clardy 2009), after six months (Benati & Batziou 2018) and after eight months (VanPatten & Fernández 2004). The effects of PI were measured using a variety of tasks including aural interpretation, oral or written production, form selection and guided composition.

Overall, the main findings from research measuring the relative effects of PI on the interpretation and processing of target forms or structures has revealed that it is an effective pedagogical intervention. Learners with different first languages (L1s) and backgrounds make consistent gains in interpretation and production tests at sentence- and discourse-level. The effects of PI are consistent, durative, and measurable for different languages and processing problems. Learners with different L1s seem to benefit equally from PI. Learners who receive training in one type of processing strategy for one specific form transfer the use of that strategy to other forms without further instruction in PI (Leeser forthcoming).

Despite the large database, investigation within the PI research framework has primarily made use of listening and reading measures (so-called 'off-line measures') to elicit how learners comprehend and process sentences. On-line measurements such as eye tracking and self-paced reading have now been incorporated into PI research to measure processing more directly (Wong forthcoming; Lee forthcoming).

3. What are the current research trends in PI?

The main goal of PI is to alter learners' processing to facilitate more appropriate and accurate moment-by-moment computation of sentence structure (parsing) and connection of SURFACE FORMAL FEATURES with meaning (form-meaning connections). To date, experimental studies within the PI framework have examined the effects of PI at sentence- and discourse-level using off-line tasks (interpretation and production). Now we are entering a new stage of PI research where researchers are turning their attention to other issues and raising other key questions, for example:

1. Is there a correlation between PI and individual differences?
2. What are the effects of PI when examined using on-line measures?

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3.1 Is there a correlation between PI and individual differences?

Benati & Lee with McNulty (2010) examined the role of language background to address whether having one or more languages might have an effect on the positive results generated by PI. They examined NSs of English who had studied only Spanish as an L2, NSs of English who were studying Spanish as a third (L3) or subsequent language, and non-native speakers of English (NNSs) studying Spanish as an L3 or subsequent language. In this study it was demonstrated that language background did not have an effect on how learners interpret and produce Spanish subjunctive/indicative contrast after the adverb *cuando*.

VanPatten & Borst (2012) carried out an empirical study exploring the variable of grammatical sensitivity, a component of language aptitude, in relation to PI. They provided learners with PI on German accusative case definite articles in OVS (object-verb-subject) word-order patterns. Grammatical sensitivity was weakly correlated with trials-to-criterion and post-test scores and did not reach a level of statistical significance. In a second study, VanPatten et al. (2013) found that grammatical sensitivity does not significantly correlate with trials-to-criterion or post-test scores for Spanish object pronouns in OVS word-order patterns, German accusative case definite articles in OVS word-order patterns and French causative constructions with *faire*.

The role of age in PI has been investigated using different types of participant. VanPatten & Oikennon (1996) examined the effects of PI on high-school students, aged 15–16 years. Benati (2005) measured the positive effects of PI with 12–13-year-old Chinese and Greek children, as did Marsden (2006) with 13–14-year-old NSs of English. Benati & Lee (2008) examined middle-school-aged Korean children and Benati & Lee (2010) found positive effects for PI on English simple past tense with NSs of Chinese who were primary-school-aged children.

Benati (2013) examined secondary students and adults. Mavrontoni & Benati (2013) compared the performance of pre- and post-puberty adolescents. Cox & Sanz (2015) have addressed the age question by going in the other direction and examining older learners. In all these studies, older learners were as successful as younger learners at changing their processing strategies in a new language after being exposed to PI.

Benati & Ayah (forthcoming) explored the role of motivation on results generated by PI. In particular, this study focused on measuring the effects of this pedagogical intervention on the acquisition of gender agreement in Modern Standard Arabic. Two experimental groups were formed (high motivation vs low motivation) through using two questionnaires to capture the different variables that determined learners' motivation (individuals scoring either high or low were assigned to the two groups, whereas individuals with 'middle scores' were excluded). Both groups received PI. Interpretation and production sentence-level tasks were used in a pre-test and post-test design (immediate and delayed effect) to measure the instructional effects. The results indicated that both groups improved equally from pre-test to post-test in all assessment measures and they both retained the positive effects of the training in the delayed post-tests. PI was proved to be the main factor for the improvement in performance no matter the learners' level of motivation.

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3.2 What are the effects of PI when examined using on-line measures?

The use of on-line measurements to investigate the effects of PI might offer us the possibility of more fine-grained information and analysis about moment-by-moment sentence comprehension and even a way to measure implicit knowledge. In the last few years, PI studies have included self-paced reading measurements (Dracos 2013; Henry 2015; McManus & Marsden 2017) to investigate how L2 learners interact with input in real time. Henry (2015) compared PI with traditional instruction on the acquisition of German accusative case markers. The main results of this study showed that the PI group outperformed the traditional instruction group on an off-line comprehension task, but there were no differences between the two groups on the self-paced reading measure.

More recently, eye tracking has been used in PI research to measure the location and duration of eye gazes while speech unfolds. Wong (forthcoming) compared changes in processing patterns between learners receiving PI and traditional instruction on the acquisition of the French causative. In this pre- and post-test experimental study, a dichotomous scene selection eye-tracking task was used to measure eye movement patterns and accuracy in picture selection while learners were processing auditory sentences. The results from this study indicated that the PI group gained higher scores for accuracy than the traditional instruction group. A change in eye movement was also observed in learners after the PI training, but not after the traditional instruction training.

Lee (forthcoming) is currently investigating bidirectional transfer-of-training effects on the acquisition of English causative and English passive constructions. His thinking is that the PI treatment on one form might influence processing another form among Chinese learners. In this study he is comparing NNS performance to NS performance on a pre-test to post-test design. Eye tracking is used to measure learners' processing while reading the target sentences, looking at two pictures (images), and clicking A or B as the correct answer.

Wong (forthcoming) and Lee (forthcoming) are the first two studies using eye tracking as an on-line measure of input processing within the PI research framework. Further research observing learners' eye movement patterns during real-time input processing should attempt to investigate whether PI does indeed change the way learners process the target form or structure.

4. When and how do we employ PI?

PI is a pedagogical intervention in grammar instruction that uses a particular type of input to push L2 learners away from non-optimal processing strategies so that they are more likely to make form-meaning connections during comprehension. PI tasks should only be designed and used to shift learners away from resorting to processing strategies based on, for example, the Lexical Preference Principle or the First Noun Principle. The first is a strategy used by L2 learners to process lexical items before grammatical items when they both encode the same semantic information. The second is a processing strategy used by L2 learners to assign the role of subject to the first noun they encounter in a sentence.

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Wong (2004) has argued that for an activity to be PI, that activity must somehow push learners to circumvent an inefficient processing strategy. Language instructors therefore need to determine first what the processing problem (if any) is.

PI consists of two basic components:

1. Learners are provided with explicit information about a specific form or structure and, in particular, about the processing strategy that may negatively affect their picking up of the form or structure during language processing.
2. Learners are pushed to process (not produce!) the form or structure during SI tasks.

During SI tasks, learners are pushed to process the targeted form or structure through tasks in which the input is manipulated in particular ways to push learners to become dependent on the form or the structure to get meaning.

VanPatten & Sanz (1995) have developed the following guidelines for the construction of SI tasks:

1. Present one thing at a time
2. Keep meaning in focus
3. Move from sentences to connected discourse
4. Use both oral and written input
5. Have the learner do something with the input
6. Keep the learner's processing strategies in mind.

I will now describe these six main components for developing effective SI tasks.

4.1 Present one thing at a time

There is a temptation for teachers to teach as much as possible and as early as possible. In SI tasks, rules are broken down into smaller parts and taught one at a time during the lesson. Learners have limited capacity for processing information, and presenting them with a smaller and more focused amount of information would clearly help learners pay more focused attention. Focusing on one form at a time will help learners to map one form to one meaning or parse syntactic structures correctly.

4.2 Keep meaning in focus

SI tasks are not only intended to practise grammar. Through these, learners are encouraged to make form-meaning connections. Keeping meaning in focus is crucial when we develop SI activities. A good SI task is one in which learners can extract the meaning of the sentence from the form or the structure in the input. In the example given below, learners must listen to a number of sentences and indicate whether the action occurred last weekend or is part of a series of actions oriented towards the present. The processing problem here is the so-called 'Lexical Preference Principle', which states that if grammatical forms express a meaning that can also be encoded lexically (i.e. the grammatical marker is redundant), then learners will

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not initially process those grammatical forms until they have lexical forms to which they can match them.

Step 1 Listen to each statement about your teachers and decide when the event takes place.

Now	Last weekend
❑	❑
❑	❑
❑	❑
❑	❑
❑	❑
❑	❑

Sentences heard by learners:

1. . . . played tennis in the park with his friends.
2. . . . corrects exams.
3. . . . cooked Italian food.
4. . . . watched the football match.
5. . . . teaches a class. (The task continues in a similar fashion.)

Step 2 Now decide in pairs whether your teacher's weekend was interesting or boring.

4.3 Move from sentences to connected discourse

Learners are first exposed to sentences. However, at a later stage we should be able to move from providing learners with short sentences to exposing them to connected discourse. This should happen only when learners have already had opportunities to process the new form or structure. Here is an example.

Step 1 Listen to the following story that a student told about his first day in London and decide which statements accurately described what happened.

(Instructor's script)

I really wanted to see Madame Tussaud's, so early in the morning I took a quick shower and got washed, and travelled by train to Baker Street station. I had my picture taken with David Beckham, well the wax model, that is. I also visited Trafalgar Square and saw Nelson's Column. There were so many pigeons there I think they owned the place! In the afternoon I waited for ages for a train to take me to Covent Garden. I really hate London trains; they are awful. Covent Garden was fantastic: I watched the different street performers, and I really enjoyed listening to the musicians. I finished my exploration and sunbathed for a bit in Hyde Park – London's most famous and largest open space. I arrived home quite late and called my parents back in China and talked about my day. All in all, I had a wonderful time today.

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The student . . .		True	False
1. . . .	wanted to see Buckingham Palace.	❑	❑
2. . . .	showed pictures of Hyde Park to his parents.	❑	❑
3. . . .	stayed in bed most of the morning.	❑	❑
4. . . .	liked Covent Garden.	❑	❑
5. . . .	phoned his parents.	❑	❑
6. . . .	liked English trains.	❑	❑
7. . . .	visited Madame Tussaud's.	❑	❑
8. . . .	travelled on the bus.	❑	❑
9. . . .	really liked the clowns in Oxford Circus.	❑	❑
10. . . .	arrived home early.	❑	❑

Step 2 Now read the text you have listened to and check your answers. Would you like to change any of your answers? Then ask your teacher to give you answers.

Step 3 Read the text again. Do you know any of the famous places mentioned above? Would you like to go to any of them?

4.4 Use both oral and written input

SI tasks should combine oral and written input as some L2 learners respond better to one mode of input than to the other. Hearing the forms allows for sound-meaning connections, whereas written form-meaning connections are made via reading.

4.5 Have the learner do something with the input

SI tasks should be designed to make learners do something with the input they receive (e.g. agree or disagree; state true or false; think something is likely or unlikely). Nothing is more meaningless than listening or reading language simply because it is required. During these tasks L2 learners should be encouraged to make form-meaning connections. Learners must be engaged in processing the input (having a specific reason for processing input) and they must respond to the input sentence in some way (see example below where the SI task is used to process the third person singular *–s* in English). This form is affected by the Preference for Non-Redundancy Principle (learners are more likely to process non-redundant meaningful grammatical markers before they process redundant meaningful markers).

Step 1 Read each sentence and then decide whether or not it is right in relation to your class teacher. Indicate your answer with an 'X'.

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My teacher . . .

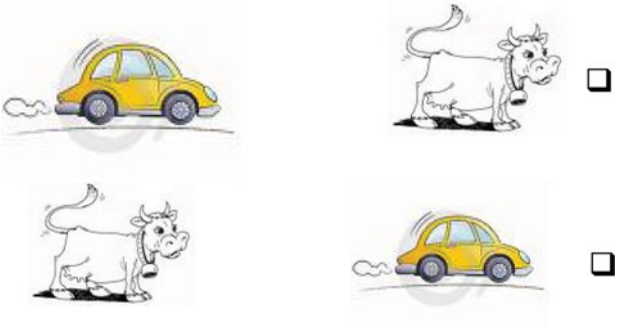
	Right	Wrong
1. . . . arrives at school early.	❑	❑
2. . . . wears colourful clothes.	❑	❑
3. . . . drinks coffee before each lesson.	❑	❑

(The tasks continue in a similar fashion.) (Adapted from Lee & VanPatten 2003.)

Step 2 Do you think your teacher is different from other teachers in your school? Why?

4.6 Keep the learner's processing strategies in mind

Learners' attention should be guided so as not to rely on natural processing strategies. Tasks in which the input is structured to alter learners' reliance on one particular processing principle should be created. This is the main goal for SI tasks: correcting inefficient processing strategies in L2 learners and instilling in them more efficient ones. In the example below learners hear a sentence containing the passive construction (affected by the First Noun Principle) and are asked to indicate the picture which they think represents the meaning of the sentence heard: *The car was chased by the cow.*



(The activity continues in a similar fashion.)

4.7 Different types of SI tasks

SI tasks are of two types: referential and affective. Referential activities are those for which there is a right or wrong answer and for which the learner must rely on the targeted grammatical form to obtain the meaning. In the sentence *I walked with John in the park*, learners must decide whether this refers to the past or the present. In the example below, learners are asked to listen to each sentence and select the appropriate time-related adverbials that can be added to the sentence they hear.

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Learners hear *John deposited money in the bank*
Last Monday ❑
Later this week ❑
Right now ❑
Not sure ❑

Affective SI activities are those in which learners express an opinion, belief, or some other affective response and are engaged in processing information about the real world. Given the sentence *I visited Rome with my friends*, learners might be asked what they think about this activity and express an opinion on whether they think it is interesting or boring, for example. Affective activities reinforce form-meaning connections established during referential SI activities. In the example below, learners first read a list of activities and they need to indicate whether they did similar or different things at the last New Year celebrations (Step 1). In Steps 2 and 3, learners use the input data to establish whether they celebrated this event in a similar or different way and who had the most interesting and enjoyable time.

Step 1 Read the following statements and establish whether you did the same or not.

	Yes	No
1. I visited my relatives.	❑	❑
2. I celebrated in the street with friends.	❑	❑
3. I danced at a club.	❑	❑
4. I watched TV all night.	❑	❑
5. I decided on a New Year resolution.	❑	❑

Step 2 Compare your results with your partner to find out how many things you did that were similar.

Step 3 Decide who had the most interesting and enjoyable New Year celebrations.

Referential and affective activities have different functions. The main role of referential activities is to push L2 learners to pay attention to form and make decisions (for example, right or wrong, present or past, likely or unlikely). Referential activities should precede affective activities in terms of practice. This is to allow L2 learners to become aware of the target form through the referential activity first.

The input in these activities is structured and manipulated in particular ways to push learners to become dependent on form and structure to obtain the meaning and/or privilege the form or structure in the input so that learners have a better chance of processing it. With PI, learners get two-for-one. That is, learners not only improve in interpreting sentences or discourse correctly but also get the benefit of being able to produce correct sentences or discourse containing the target linguistic features. As stated previously, research findings have also shown that PI is effective no matter the mode of delivery (computer, instructor, or on paper). Most computer assisted learning programs provide a web platform to deliver and evaluate SI activities.

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Research in instructed SLA has addressed, among other things, the question of whether certain types of pedagogical interventions are better than others, and whether they could be incorporated successfully into a more communicative framework of language teaching. PI is a pedagogical intervention in grammar instruction that can, in certain cases and conditions (such as features affected by specific processing problems), enhance and speed up the way certain linguistic features and structures are learned. The input in SI tasks is 'structured' or manipulated in particular ways to push learners to become dependent on form and structure to get meaning and/or privilege the form or structure in the input so that learners have a better chance of processing it. However, PI is not the only effective type of grammar instruction available for teachers. Input flood, for example, is an alternative pedagogical intervention to grammar instruction that assumes that frequency of appearance in the input is a facilitative factor in acquiring a form. Input enhancement is another effective intervention in grammar instruction which involves changing the appearance of a written form so that it is perceptually more salient. Input enhancement provides learners with access to comprehensible input and helps them to notice grammatical forms in the input. Because acquisition is 'input-dependent' and classroom teaching should be 'communicatively rich', input-based pedagogical interventions in grammar instruction are effective ways to ensure L2 learners attend to grammatical features in the input. However, I am not suggesting that L2 learners should not engage in output practice and should not produce grammatical items.

Benati & Schwieter (forthcoming) have suggested some principles that language instructors might consider when developing grammar tasks. The tasks should:

a. be developed to ensure that learners process input correctly and efficiently
b. be designed for learners to notice and process forms in the input and eventually make correct form-meaning connections
c. include both a focus on form and on meaning
d. move from input to output practice.

SI tasks, for instance, should be followed by structured output tasks to promote language production. Structured output tasks enable L2 learners to access forms and structures in their internal system to communicate an idea.

5. Concluding remarks

PI is predicated on a model of input processing. This theory attempts to identify the main strategies responsible for how learners connect grammatical forms with their meanings as well as how they interpret the roles of nouns in relationship to verbs during real-time comprehension. PI is about helping learners with the processing of morpho-phonological units in input strings. It does not aim to develop learners' skills, but it is concerned with the development of underlying linguistic representation.

Empirical research has demonstrated that the effects of PI are consistent; long-lasting; measurable for different languages and different linguistic features affected by processing problems, with learners of different ages and background; and that these positive effects seem to be transferable. An area of current PI research is using on-line measurements (e.g.

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self-paced reading, self-paced listening, eye tracking) to examine moment-by-moment processing. Future studies would also need to continue to consider the individual characteristics of the learner and the language under investigation. Are the benefits of PI in L2 learning confined to the L2 or are they extendable to the learning of third (L3) or fourth languages, for example? Does the target L2 modulate the effectiveness of PI in an L3?

PI is not the only effective approach to grammar instruction, but it is the most effective pedagogical intervention, using a particular type of input, to push learners away from non-optimal processing strategies and to facilitate form-meaning connections during comprehension.

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