Chapter 8

Commentary: Where PI Research Has Been and Where It Should Be Going

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In this commentary, I first begin by couching Processing Instruction's importance as an instructional strategy within the larger debate on the efficacy of so-called Focus-on-Form(s) strategies for affecting grammatical development. I argue that the merits of Processing Instruction are found largely outside of this debate, and suggest that Processing Instruction's association with this debate has left an important question unanswered even after 10 years of research: What happens to grammatical development after Processing Instruction treatments? I then argue that continuing to contextualize Processing Instruction's merits within the Focus-on-Form(s) debate may ultimately be validating traditional approaches to grammar instruction. I conclude by discussing why we still do not know if Processing Instruction can achieve its ultimate goal of training learners to process input in ways that they would otherwise not do.

PROCESSING INSTRUCTION WITHIN THE FOCUS-ON-FORM, FOCUS-ON-FORMS, AND FOCUS-ON-MEANING DEBATE

The adoption of principles of communicative language instruction in foreign-language (FL) and second-language (L2) contexts in the 1980s shifted the perspectives of many researchers and instructors in terms of the importance of listening and reading. Up to that point, speaking and writing abilities were considered "active" skills whereas listening and reading were considered "passive" skills. Morley (1990) reminds researchers that learners are anything but idle when engaging in listening-comprehension activities. She argues that
listening comprehension is an active process rather than a passive state: "... listening is no passive experience in two-way communication, or in one-way communication, or in self-generated communication. All are highly active participatory experiences" (p. 330). Krashen's Monitor Model (1982) and its instructional manifestation known as the Natural Approach (Krashen & Terrell, 1983) validated the importance of the active nature of input-rich instructional environments. Indeed, Larsen-Freeman and Long (1991) imply that input is the most important means by which learners obtain data with which to build an accurate representation of the target language, affirming that there are no known cases of successful language acquisition without exposure to some form of comprehensible input.

At the same time empirical studies were raising doubts about the ability of comprehensible input to affect grammatical development. Canadian immersion programs were reporting that learners' grammars were deficient (see Sanz, 2000). Even Terrell (1991) acknowledged that comprehensible input was not sufficient for the acquisition of many structures. VanPatten (1993) subsequently posed a quite simple question that has proven difficult to answer: "What kind of grammar instruction fits with our newer context and input-rich communicative classrooms?" (p. 435).

Two principal approaches to this dilemma arose in the study of second-language acquisition (SLA). On the one hand, instruction could take a "Focus on Form" (FonF) approach to grammar instruction, providing reactive interventions to breakdowns in comprehension that encourage learners to focus on some linguistic feature (e.g., an inflection or a functor) present in input that learners are processing for meaning (Long, 1991). This approach was seen as a compromise between the two dominant strategies of grammar instruction: (1) The more traditional "Focus of Forms" (FonFS) instruction, in which language curricula carefully sequence the introduction of grammatical phenomena to learners according to the relative linguistic complexity of the phenomena to be taught, such as the Grammar-Translation approach. In FonFS, activities are mechanical in nature, asking learners to manipulate and alter structures without being mindful of whether students are making form-meaning connections: (2) "Focus on Meaning" (FonM), where learners either concentrate on the message that they are to communicate or that they are to extract from input, which was proving to be less-than-adequate for affecting grammatical development (e.g., the Natural Approach).

VanPatten, on the other hand, appears not to have concluded that the shortcomings of FonM approaches could best be solved by pure FonF approaches, which effectively required that instructors who provided comprehensible input change their reactions to breakdowns in comprehension—that is, by stopping to help learners see which form(s) is/are causing the breakdown and what the form(s) mean(s) (See Figure 8.1). VanPatten (1993) proposed that instruction change the behaviors of learners' cognitive mechanisms that extract meaning from input. VanPatten and his colleagues
demonstrated that learners' input-processing mechanisms often interpret input incorrectly or they process it in ways that make it impossible to extract linguistic information (e.g., the phonological properties of inflections and the abstract meanings that they connote) that they could use to continue to develop a representation of the target language's grammar. Consequently, VanPatten (1993, 1996; VanPatten & Cadierno, 1993) posited that learners' grammatical development would be advanced with comprehensible input if they were trained to process input in different ways:

It would seem reasonable, then, to suggest that rather than manipulate learner output to effect change in the developing system, instruction might seek to change the way that input is perceived and processed by the learner. (VanPatten & Cadierno, 1993, p. 227).

Nonetheless, the key difference between pure FonF approaches and that of VanPatten's Processing Instruction is what each attempts to alter within the mind of the learner: Whereas FonF is concerned with altering the elements of language that reside in the learner's developing system (e.g., particular inflections, their interrelationships, particular lexemes), Processing Instruction is concerned with the cognition that supports development (e.g., general principles for interpreting words and inflections when they reside in working memory).

In a sense, the merits of Processing Instruction should be considered outside of the Focus-on-X debate because its primary purpose appears not to be to make direct changes to the developing system, which advocates of FonF, FonFS, and FonM believe occurs within each of these three strategies. Processing Instruction attempts to alter the processing mechanisms so that the grammatical system might be better ready to respond to comprehensible input and therefore grow. In fact, all of the studies in this section show that this novel approach to grammar instruction is effective. This association of Processing Instruction with the Focus-on-X debate has produced two consequences. First, the primary difference between pure FonF and Processing Instruction has not been obvious to many researchers assessing the potential merits of Processing Instruction. Most efforts to replicate (e.g., Collentine, 1998; DeKeyser & Sokalski, 1996; Salaberry, 1997) the findings of VanPatten and his colleagues have not adequately focused on changing some processing mechanism relevant to a given grammatical structure. Instead they have probably provided learners with opportunities to notice forms to which they would not otherwise adhere, like pure FonF.
**Focus on Form:** Draw attention to forms causing comprehension breakdowns.

![Diagram showing the flow of input, intake, developing system, and output.]

**Processing Instruction:** Focused practice to alter processing mechanisms.

FIG. 8.1. The Relationship Between Focus-on-Form, Processing Instruction, and Grammatical Development (adapted from VanPatten & Cadierno, 1993).

Second, and as a result of the first consequence, VanPatten and his colleagues have concentrated their efforts on testing the efficacy of Processing Instruction by continuing to compare its merits to FonFS, which has left a basic question unanswered after almost 10 years of research. As the chapters in this section reveal, much effort continues to be invested in comparing the relative benefits of Processing Instruction to so-called traditional grammar instruction, which is essentially FonFS. Research efforts would be more productive if investigators were now to simply assert that Processing Instruction is a proven beneficial strategy for promoting grammatical development in an input-rich environment. Given the research on Processing Instruction’s efficacy to date, such an assumption would be quite reasonable (see VanPatten, 2002). With such an approach, the following pressing question might begin to be addressed in earnest:

What is it that Processing Instruction trains students to do? Make form-meaning connections during Processing Instruction treatments and/or afterwards (i.e., in the input they encounter after Processing Instruction treatments)?

Before commenting further on the need and on the how to address this, it is important to discuss further why it might be time to abandon comparisons between the efficacy of Processing Instruction and traditional methods of grammar instruction.
PROCESSING INSTRUCTION VERSUS TRADITIONAL GRAMMAR INSTRUCTION

In a sense, a good deal of Processing Instruction research has served to validate FonFS approaches to grammar instruction. VanPatten and Wong (this volume) provide a clear motive for examining Processing Instruction’s efficacy relative to traditional grammar instruction:

Our reason for the selection of TI (traditional grammar instruction) for the experiments was (and still is) that TI is the dominant form of grammar instruction in foreign languages in the U.S. We were thus exploring PI vs. TI in order to couch our research within some kind of ecological validity. In this way, we could speak to researchers as well as practicing instructors regarding our results. We are aware that in some circles (most notably ESL in the U.S. and Canada) that TI may not be prevalent and that focus on form may be entirely meaning-oriented. But we are also aware that TI is still used around the world in a number of FL contexts and that a good deal of practitioners believe passionately in the use of drills and mechanically-oriented activities. (this volume, p. 104)

It is reasonable to assume that many L2 and FL educators will not retreat from the use of explanation plus output practice. It is my suspicion, however, that, in an important yet subtle way, the research agenda to investigate whether Processing Instruction is superior to traditional grammar instruction has served to validate the latter as much as the former. I show here that, while the so-called “effect size” (a standardized statistical measurement of a group’s improvement within some treatment) of Processing Instruction treatments has been large, the effect size of traditional grammar instruction has been large as well, indicating that students learn much from such traditional approaches to grammar instruction. The consequence of this pattern may be that teachers and curriculum designers are yet to be convinced that their traditional practices will not adequately meet their objectives.

According to VanPatten, traditional instruction is defined as “explanation plus output practice that moves learners from mechanical to communicative drills” (VanPatten, 2000, p. 54; see also VanPatten & Cadierno, 1993, p. 498). The fact that this particular approach is careful to focus students’ attention on the properties of individual forms, how those forms might change paradigmatically, and that this approach does not emphasize the need to make form-meaning connections suggests that traditional instruction is a type of FonFS. Processing Instruction, on the other hand, is constantly attentive to the need to make form-meaning connections and students make such connections in the context of meaningful communicative acts. Structured input exercises force students to make form-meaning connections with respect to a given grammatical
phenomenon so that they can comprehend the message of the input they receive. Thus, Processing Instruction is a type of FonF, which VanPatten acknowledges: “It is important to note that Processing Instruction is not just another comprehension-based approach to language instruction [i.e., FonM] such as TPR or immersion; Processing Instruction is a focus on form that serves as a supplement to existing communicative and acquisition-oriented approaches…” (VanPatten, 2000, p. 52).

In the larger context of SLA, both FonF and FonFS approaches in general have proven to be effective agents of learning and neither has proven to be more effective than the other in the short term. Norris and Ortega (2000) examine the relative benefits of FonF and FonFS approaches in a meta-analysis of 77 research studies conducted between 1980 and 1998, concluding:

...although both FonF and FonFS instructional approaches result in large and probabilistically trustworthy gains over the course of an investigation, the magnitude of these gains differs very little between the two instructional categories. (p. 210)

Norris and Ortega calculate the benefits of any particular treatment with an assessment of the treatment’s effect size, which represents the magnitude of a treatment’s impact (or lack thereof) on learning. Mathematically speaking, Norris and Ortega calculate effect size with a statistic known as Cohen’s (1988) $d$, which indicates the effect of a treatment on a scale of standard deviations (e.g., a treatment producing an effect size of 2.0 indicates that the learners’ average improvement was two standard deviations based on the study’s assessment measured).

$$d = \frac{\text{mean}_{\text{pretest}} - \text{mean}_{\text{posttest}}}{\text{pooled standard deviation}}$$

This formula allows a researcher to compare the effect sizes for a number of treatments across studies without having to resort to “vote-counting” procedures for comparing the overall relative effectiveness of different treatments.

Two of the four studies reported in this section lend themselves to a comparison of the overall effect size of Processing Instruction and traditional instruction. VanPatten and Wong (this volume) provide data from two different universities. VanPatten and Cadierno (1993) provide another data set that compares Processing Instruction and traditional instruction. To increase the size of the data set, I have included the results reported in Cadierno (1995), who examines Processing Instruction’s efficacy with the Spanish preterite as compared to the efficacy of traditional instruction. A comparison of the pretest-posttest data sets from these studies (disregarding delayed posttest effects) appears in Table 8.1. Two important patterns emerge from this analysis. First, Processing Instruction obviously has a greater overall effect size than traditional instruction, and its efficacy is particularly obvious in interpretation tasks. An
analysis of variance (ANOVA) examining the main effect for group (i.e., Processing Instruction versus more traditional strategies) indicated that the greater effect for Processing Instruction approached significance, $F(1, 12) = 3.29, p = 0.095$. The ANOVA found no effect for task type (interpretation versus production task), $F(1, 12) = 0.96, p = 0.347$ and no interaction between group and task, $F(1, 12) = 2.55, p = 0.136$, which is more than likely due to the fact that Processing-Instruction interpretation tasks varied greatly ($M = 8.04; SD = 7.51$). Clearly, Processing Instruction affords learners a significant advantage in adhering to grammatical phenomena that they might otherwise overlook in listening and reading tasks.

Second, Norris and Ortega report from their meta-analysis that the overall effect size for FonF treatments is about one standard deviation. The analysis presented here speaks well for Processing Instruction, since its effect size seems to be about six standard deviations. Note, however, that the traditional grammar instruction groups have effect sizes that are double what Norris and Ortega report for FonF studies. To be sure, Norris and Ortega explain that FonF is not overall more effective than FonFS because both produce an average effect size of 1.0. Thus, it is even more interesting to note that traditional instruction treatments of Cadierno (1995), VanPatten and Cadierno (1993), and VanPatten and Wong (2003) have an average effect size of about two standard deviations.¹

¹The Farley study (this volume, chap. 7) was not included because the modified output group is most likely a FonF rather than a FonFS: the Farley modified output treatment appears to keep learners focused on meaning at all times. Still, to verify the trend reported in Table 8.1, I ran another analysis including the Farley groups, producing a

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**TABLE 8.1.**

<table>
<thead>
<tr>
<th>Task and Group</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpretation PI</td>
<td>4</td>
<td>8.04</td>
<td>7.51</td>
</tr>
<tr>
<td>TI</td>
<td>4</td>
<td>1.56</td>
<td>.69</td>
</tr>
<tr>
<td>Production     PI</td>
<td>4</td>
<td>3.15</td>
<td>.67</td>
</tr>
<tr>
<td>TI</td>
<td>4</td>
<td>2.74</td>
<td>.58</td>
</tr>
<tr>
<td>Total          PI</td>
<td>8</td>
<td>5.59</td>
<td>5.59</td>
</tr>
<tr>
<td>TI</td>
<td>8</td>
<td>2.15</td>
<td>.86</td>
</tr>
</tbody>
</table>
This limited analysis indicates the Processing Instruction produces very large effect sizes, and so it is inarguably a powerful instructional strategy for affecting grammatical development. However, given that non-Processing-Instruction treatments have consistently produced large effect sizes in and of themselves, it is not surprising that some researchers question the "superior" nature of Processing Instruction. The data unequivocally indicate that both Processing Instruction and traditional grammar instruction do a better than adequate job at helping learners to internalize new grammatical information, which is consistent with Norris and Ortega's (2000) finding that FonFS may be equally as effective as FonF. The reasons with which Norris and Ortega conjecture to explain this finding largely relate to the effect of individual learner differences. They posit that the 77 studies that they surveyed do not adequately consider factors such as language aptitude in general, age, learning style, and developmental readiness as well as the structural complexity of the targeted grammatical phenomenon (e.g., What is the relative effectiveness of Processing Instruction with grammatical phenomenon X at stages A, B, C, D, etc.?)

The stakes in conducting psychometric research are very high. If a carefully designed study does not control for the effects of an agent that could have sufficient importance on the outcome so as to compromise the goal of obtaining a sample that adequately represents the target population, the results are questionable regardless of whether the null hypothesis is accepted or rejected. For instance, if a researcher controlled for general language aptitude and learning style, we might see the overall effect size for Processing Instruction increase. It is my opinion that the incorporation of such considerations requires students of SLA to retool themselves by considering research methodologies and statistical tools allowing for multivariate analyses. The analysis of variance (ANOVA) tool is appropriate for highly controlled experiments. However, multivariate tools, such as discriminant analysis, regression analysis (and other structural equation modeling techniques), allow a researcher to isolate the effects of a given treatment while partialing out the effects of other potential mitigating factors, such as a whole set of individual variables (e.g., aptitude, age, L1 literacy, etc.) and curricular factors (e.g., number of reading/listening activities versus production activities across a semester, contact with the L2 outside of class, etc.). These sorts of techniques have been considered for a long time in the social sciences. The field of SLA has not reached this level of maturity, and to have important effects on curricular design researchers and FL educators may need to explore acquisition from a broader perspective.

comparison of Processing Instruction and other types of instruction. The results were very similar, with Processing Instruction having an average effect size of 5.1 and the other treatments an average effect size of 2.2. Again the difference approached significance $F(1, 16) = 3.26, p = .090$.
THE GOAL(S) OF PROCESSING INSTRUCTION

Of course, VanPatten and colleagues would take issue with the statement above that both Processing Instruction and traditional grammar instruction do a better than adequate job at helping learners to internalize new grammatical information. They would counter that Processing Instruction does not intend to help learners to internalize new grammatical information; rather, its purpose is to affect changes in the cognitive tools with which the learner filters out what is and what is not important in the input with respect to the comprehension of messages and with respect to acquisition. In other words, referring again to Figure 8.1, Processing Instruction seeks primarily to alter the *processing mechanisms* relevant to grammatical structure X and secondarily to draw attention to forms and inflections that might enhance comprehension (and so advance acquisition).

Two general principles regarding how learners process input predict the types of strategies learners will use when processing input (VanPatten, 1996, 1997, 2000, this volume). The first principle relates to the interaction between grammar and communicative value, and it leads to a number of corollaries. First, there is the *Primacy of Meaning Principle*: Learners process input for meaning before they process it for form. As mentioned in chapter 1 of the this volume, this principle entails corollaries such as the *Primacy of Content Words Principle*, the *Lexical Preference Principle*, the *Preference for Non-Redundancy Principle*, the *Meaning-Before-Nonmeaning Principle*, the *Availability of Resources Principle*, and the *Sentence Location Principle*. All told, the *Primacy of Meaning Principle* predicts that if a form does not present a targeted grammatical phenomenon in such a way that its meaning (however concrete or abstract) is not important to interpreting a sentence's meaning or if the form is not locationally salient, learners will not intake that form and its grammatical properties.

The second principle relates to grammar and propositional arguments (i.e., Who did what to whom?), a notion that is best captured by the *First Noun Principle*: learners tend to process the first noun or pronoun they encounter in a sentence as the subject/agent. Its corollaries are the *Lexical Semantics Principle*, the *Event Probabilities Principle*, and the *Contextual Constraint Principle*. The implication of this principle is that learners do not tend to look at grammatical cues to interpret the roles of arguments (e.g., agent, patient, beneficiary) when processing input, which can have important implications for how students process and learn from input representing languages whose basic word order is different from that of their first language.

With these principles in mind, processing instruction employs *structured-input tasks*, which are sequences of carefully crafted input sentences that, coupled with a given task demand (i.e., the information that learners must extrapolate from that input), attempt to cause learners’ processing mechanisms to fail to interpret a sentence, to cause the learner to become cognizant of such a
failure, and finally to encourage the learner to adopt a processing strategy that does not affect such a failure. These tasks help learners make form-meaning connections in one of two ways: by raising the communicative value of a targeted structure or by raising its acoustic salience. In either case, processing instruction’s goal is “to train the nonnative ear to perceive and utilize the target forms during on-line processing” (Lee, 2000, p. 36, emphasis mine). The key implication is: after working with structured-input tasks, learners should be able to discern more readily the semantic/pragmatic information that a grammatical phenomenon provides (however abstract) when they encounter the phenomenon in authentic input. To understand the importance of this statement, a distinction must be made: learner response during an experimental treatment and learner response after an experimental treatment. Processing Instruction purports to have an effect on the learner not only during Processing Instruction treatments but also after such treatments. After all, the goal is to alter the underlying processing mechanisms (relating to some grammatical phenomenon) so that intake (of forms and inflections representing that phenomenon) will occur as the learner continues to learn the target language in an input-rich curriculum (e.g., a classroom setting) or environment (e.g., study abroad).

During carefully crafted structured input activities, learners receive feedback early on that their processing is incorrect. They realize that what they thought they understood does not match the intended meaning of the speaker. Their internal mechanisms, then, are literally forced to adopt a new strategy and/or abandon the old one. The result is that the accommodation and restructuring mechanisms receive better (in this case, correct) data for internalization. (VanPatten & Fernández, this volume, p. 277)

For heuristic purposes, we could simplify this relationship by distinguishing between two types of input (see Fig. 8.2). Input type A is the structured input that students receive during a Processing Instruction treatment. In various ways, learners are sensitized to the semantic/pragmatic importance of the targeted grammatical phenomenon or to why learners might not attend to the phenomenon. Consequently, input type A (and all of the task demands associated with it) ultimately modifies the underlying processing mechanisms relevant to the phenomenon. It is my assumption, at least, that what is secondary in importance is the effect of Input type A on the developing system. Naturally, there should be some positive effect, but VanPatten and his colleagues appear to be more concerned with the cognitive abilities that learners walk away with after a Processing Instruction intervention, namely, the processing strategies that they adopt as a result of Processing Instruction. If so, input type B—the authentic input that learners process after input type A—should have a strong effect on the status of the targeted grammatical phenomenon within the learner’s underlying
**Bolded items** have a strong response to input. **Italicized items** have a weaker (although potentially significant) response to input.

- Input Type A → **Processing mechanisms** → Developing system (specialized intervention)
- Input Type B → **Processing mechanisms** → Developing system (authentic input)

**FIG. 8.2. Predicted Outcomes of PI.**

Developing system: input type A has served to alter the processing mechanisms relevant to the phenomenon and so intake of the phenomenon when it is present in input type B should increase thereafter. It is the effects of input type B that have not been investigated to date in the research on Processing Instruction. In other words, we do not know if learners respond to forms constituting the targeted grammatical phenomenon in normal input conditions (i.e., authentic input) once they have left the Processing Instruction laboratory. Using an analogy from the field of genetics, the “expression” of the processing mechanisms should be significantly different after some Processing Instruction under normal environmental pressures than would be their “expression” in the absence of Processing Instruction.

It is possible to retort that Processing Instruction research has addressed this generalizability issue since astute researchers have examined the long-term effects of Processing Instruction. However, at the most, the delayed posttests that these investigators have administered only reveal whether learners’ processing mechanisms remain altered as a result of the Processing Instruction intervention; delayed posttests do not reveal whether the learner’s developing system is responding differently to authentic input. This should be a key challenge for researchers in the future.

VanPatten and Fernández (this volume) is a first attempt at seriously evaluating whether Processing Instruction truly meets its goal of providing learners with new strategies for processing input. They report that Processing Instruction can cause learners to interpret sentence-initial pronouns correctly up to eight months after treatment time. Indeed, a calculation of the effect sizes of the VanPatten and Fernández experiment indicates that, although the immediate posttest effect sizes for the interpretation and production tasks were low as Processing Instruction goes, $d$(interpretation) = 2.34; $d$(production) = 1.57, these effect sizes were still quite respectable eight months later, $d$(interpretation) = 0.70; $d$(production) = 0.76. Nevertheless, it is still important to note that
VanPatten and Fernández do not indicate whether the new processing strategy helped learners to properly interpret instances of object pronouns in Input B in their day-to-day curriculum. One way to determine whether the students had adopted a new strategy would be to examine whether the amount of Input B that individual learners engaged (which presumably contained instances of object pronouns, such as dialogues) in and outside of class was a predictor of gains (or maintenance of gains) at that eight-month post-posttest.

CONCLUSION

Processing Instruction is a unique solution to the conundrum that VanPatten raised in 1993: In an absolutely input-rich environment, how can we remain attentive to learners’ grammatical development? Processing Instruction is a powerful solution, with impressive effects on learning. Structured-input tasks challenge learners to make form-meaning connections that they might not otherwise make when they process authentic input whose grammatical information they have not been properly trained to extrapolate. It may be time to abandon comparisons between Processing Instruction and traditional approaches to grammar instruction perhaps until we learn whether it can meet its ultimate objective of retraining the learner’s input processing mechanisms.

REFERENCES


The reader is reminded that for the purposes of their study, VanPatten and Fernández "sanitized" the curriculum and removed as much exposure to object pronouns and OVS order as possible during the eight-month lag between treatment and final posttest. Thus, learners may not have had much opportunity to use new processing strategies while engaged with authentic input.


