

awareness and practice with behaviorist theories of learning, dismissed from the field several decades ago.

Yet most SLA researchers who apply cognitive theories to inform their questions and methods, do so under the assumption that SLA is indeed a largely implicit process. For them, cognitive theories are not alternate views on SLA. Instead, they are applied to research in order to better understand, and to possibly explain, why it is that, for many learners, an implicit experience of transacting L2 message meaning is not sufficient for achieving L2 grammatical competence.

Many L2 learners, for example, struggle with linguistic features that are difficult to notice in the messages they hear. These are often outside the scope of UG principles and parameters, and therefore can be affected by any number of internal and external factors, or never acquired at all. Other learners report that they can understand the meaning of a message without the need to focus on the many forms that encode it. Even young learners have been shown to have strong L2 comprehension, but lack grammatical proficiency. Some learners have internalized versions of the L2 that are functionally adequate for communicative purposes, but developmentally incomplete in form and structure. The consequences of this are non-standard, stable, immutable, "fossilized" interlanguage varieties. These varieties were introduced to the field by Selinker in 1972 and have continued to challenge researchers, teachers, and of course, fossilized L2 learners, to date.

Many of these concerns about SLA have been expressed as research questions about the quality and accessibility of L2 input that can best serve learners as data for their learning. Therefore the remaining discussion of cognitive processes will focus primarily on research about their role in assisting learners to notice L2 input and apply it to their learning.

Cognitive Processes, Input and Interaction. That samples of L2 are needed by learners as a source of input for their learning has long been a basic assumption of SLA research. Corder (1967) distinguished between the input that is available to L2 learners and that which individual learners can actually use as intake for building interlanguage grammar, given their stage of development. Decades ago, Krashen argued that 'comprehensible input' was necessary and sufficient for successful SLA (see, for example, Krashen 1977). He described such input as understandable in its meaning, but slightly beyond the learner's current level of development with respect to its linguistic form. Both "intake" and "comprehensible input" were conceptually intriguing, but they did not lend themselves to testable hypotheses about SLA processes.

Long (1981, 1985) also argued that comprehensible input was crucial to SLA, but his research revealed that it was the learners' interaction with interlocutors that mattered as much as the input directed to them. Thus, when input was no longer comprehensible during interaction between L2 learners and interlocutors, they would modify the flow of the interaction

and repeat, rephrase, or request help with the input until comprehension was achieved. It was claimed that the modified input directed toward the learners could assist their comprehension as well as their L2 learning.

Follow-up studies of such interaction, which Long referred to as the "negotiation of meaning," were carried out by Long and others (for example, Gass & Varonis 1994; Mackey 1999; Pica, Holliday, Lewis & Morgenthaler 1989; Pica, Holliday, Lewis, Berducci & Newman 1991). Their analyses revealed that, as learners and interlocutors attempted to achieve comprehensibility, they repeated and rephrased initial messages and extracted and highlighted words and phrases in patterned ways that often had developmental consequences. Pica et al. (1989, 1991) showed that the extent to which learners worked at these manipulations was directly related to the open endedness of the questions they were asked. Gass and Varonis (1994) showed that interlanguage items negotiated in an initial conversation would be accurately encoded in the learner's later production. Mackey (1999) revealed that learners' active participation in negotiation was closely connected to their development of L2 English question forms.

An analysis by Pica (1994b) showed that these extractions often revealed L2 grammatical relationships as they encoded message meaning. For example, in response to the learner's initial utterance which encoded a noun phrase in subject position, a listener might extract the noun phrase, topicalize and repeat it in object position. Thus, the listener might ask about the initial utterance, *the students watch the movie*, by recoding it as *the students? what did you say about the students?* Such modifications appeared to give learners repeated access to L2 form as it encoded message meaning. This was the very kind of L2 input that could be used as intake for grammar building, restructuring, and internalization.

Since SLA was considered to be a subconscious, implicit process in terms of the learner's mental involvement, there did not seem to be a push to explore the cognitive side of the input-intake-internalization progression. SLA models based on information processing theory and cognitive processes (see, for example, McLaughlin 1978) were rejected by Krashen for their emphasis on the role of consciousness, which Krashen considered unnecessary for SLA and possibly detrimental to the learner's progress.

Cognitive Processes and Evidence. Increasingly, researchers have come to observe that L2 learning is a much more conscious experience than was heretofore believed. Drawing on his own experience as a Portuguese L2 learner in and out of classrooms in Brazil, Schmidt and Frota (1986) found that cognitive processes such as attention and noticing were crucial to his L2 learning. The frequency with which he heard complex features of Portuguese, and the salience of their form or position in input were two factors that helped Schmidt to notice them. Schmidt also found that in

order to incorporate many features of Portuguese into his developing L2 grammar, he needed to "notice the gap" between such features as they were used by other speakers, and his own interlanguage encodings. Here, too, his noticing was aided by the frequency and saliency of a feature, the communicative and cognitive demands of the situation in which he found himself, and his readiness to "notice the gap."

Schmidt's observations, along with findings on communicative, content-based classroom contexts, considered rich in L2 input (Pica 2002; Swain 1985), have revealed that comprehensible input, however modified, might not be efficient, or even sufficient, for SLA. Thus, new questions have emerged about the kinds of input learners need to achieve a successful L2 outcome. Long addressed these questions in several publications, including Long (1996) and Long, Inagaki, and Ortega (1998). Drawing from not only Schmidt's arguments and findings, but also from FLA theory and research, and from studies of L2 form-focused instruction (such as those of Spada & Lightbown 1993; White 1991; White, Spada, Lightbown & Ranta 1991) and experimental intervention (Oliver 1995), Long distinguished between input that provides positive evidence of relationships of L2 form, function and meaning, and input that supplies negative evidence on forms and structures that are used by learners, but are not consistent with the L2 they are learning.

According to Long, sources of positive evidence include spoken and written texts that are in their authentic state, as well as those that have been modified for comprehensibility in ways described above. Learners can access negative evidence through explicit corrective feedback, or implicit feedback. Included among this latter are requests such as *could you say that again?* and expressions such as *Inih?* which ask learners to clarify or repeat utterances that can't be understood. Also included are "recasts," which essentially repeat what a learner has just said in a more accurate way. For example *I need pencil* might be recoded as *you need a pencil*. The most effective recasts appear to be those which focus on only one grammatical feature over the course of a conversation or lesson (Doughty & Varela 1998). When teachers recast of a range of student misproductions, the students fail to distinguish them from other follow up moves that teachers use to conduct their lessons (Lyster 1998).

Among the cognitively-oriented interventions that appear to heighten the learner's access to L2 input for both positive and negative evidence are instruction on how best to process input for form and meaning (Van Patten & Oikkenon 1996; Van Patten & Sanz 1995), the learner's interaction with meaningful materials, enhanced both graphically and linguistically to highlight form and meaning relationships (Doughty 1991), problem solving, information exchange and other goal oriented, task based activities (Pica, Billmyer, Julian, Blake-Ward, Buccheit, Nicolary, & Sullivan 2001; Pica, Kanagy, & Falodun 1993), and activities that foster learners' communication about grammar. (Fotos 1994; Fotos & Ellis 1991;

Loschsky & Bley-Vroman 1993; Pica, Billmyer, Julian, Blake-Ward, Buccheit, Nicolary, & Sullivan 2001).

In addition to the positive and negative evidence that comes from modified input, feedback, and formal instruction, Swain has argued that learners' own production can provide a basis for learning L2 relationships of form and meaning (Swain 1985, 1995, 1998). Based on extensive observational data of learner exchanges, she has identified several ways in which this can occur. First, she found that when asked to modify their message production toward greater comprehensibility or precision, learners moved from their rudimentary interlanguage grammar, in which relationships among sentence elements were often characterized by simple juxtaposition of relevant words, to more advanced, syntactic processing and message organization. Thus learners might modify *Philadelphia live* to *I live in Philadelphia*, when asked to clarify their message meaning.

In addition, learners' conversations would often engage them in discussion of the linguistic dimensions of their interaction, a process Swain refers to as "metatalk." Finally, Swain claims that learners' production can also help them to "notice the gap" between their output and input. Swain has placed her work within a collaborative, sociocultural perspective, while other output-focused researchers have found results consistent with hers, and have been able to explain them in terms of cognitive processes (see, for example, deBot 1996). Thus there is strong support for the role of production in SLA, across social and cognitive perspectives.

Cognitive Perspectives on L2 Knowledge. Theoretical claims that L2 learning is a much more conscious process than was heretofore believed, and an experience that can benefit from both input and feedback, have reactivated the long standing debate in the field regarding L2 learning and its relation to L2 knowledge. This debate, once known almost exclusively, as Krashen's "acquisition" vs. "learning" distinction (see again, Krashen 1977, 1981 as well as Krashen's recent writings, for example, Krashen 1994), centers on three positions regarding the interface of implicit and explicit L2 learning and resultant L2 knowledge.

The first position is a non-interface position, that is, that SLA is an altogether implicit activity. While explicit L2 learning and explicit L2 knowledge are possible, they remain separate from the L2 competence that learners come to acquire. This position is consistent with nativist perspectives drawn from theories on linguistic universals (for example Schwartz 1986) and with Krashen's Monitor Theory (Krashen 1977, 1981), which have been used to account for the regularities of L2 development. However it does not account for the incomplete acquisition experienced by fossilized learners.

A very different position is the strong interface position, supported through studies by DeKeyser (1997), N. Ellis (1993, 1994), and Robinson (1997). This position, motivated by information processing theory (see McLaughlin 1978, 1996; O'Malley, Chamot, & Walker 1987), holds that

explicit L2 knowledge, attained through explicit learning, can become implicit L2 knowledge. This is generally achieved through practice in which learners deliberately focus their attention on L2 form as it encodes message meaning and work toward understanding and internalization. Many studies have shown support for this view. Carefully controlled in design, they tend to focus on very specific features and highly experimental conditions. Additional support has come from the meta-analysis and comparison of experimental and quasi-experimental studies on the effect of L2 instruction (Norris & Ortega 2001) on L2 learning. Together, individual studies and the meta-analysis of different kinds of studies indicate that the strong interface position is indeed a valid one, but might apply to context-specific dimensions of SLA.

Finally, there is a position known as the "weak" interface position, although it is much more robust than the other two positions in its number of supporters and supportive studies. Here, SLA is viewed as a predominantly implicit activity. However, it is believed that L2 knowledge can be built up through both explicit instruction and other interventions that enable learners to notice crucial relationships of L2 form and meaning that are difficult, if not impossible, for them to learn without such intervention. This is a view held by not only those who carry out research strictly within the cognitive perspective but also among researchers associated with strategies of consciousness raising (Rutherford & Sharwood Smith 1985) and those who work within a perspective that has come to be known as "focus on form." This work was initiated by Long (1991) and has been sustained by studies gathered in a volume edited by Doughty and Williams (1998) (see, for example, chapters by Harley; Lightbown; Long & Robinson; Swain; Doughty & Varela; Williams & Evans).

The evidence in support of this "weak" position illustrates ways in which all three positions are correct, as each is conditioned by factors that are learner-related, stage-specific, or language-related. Many of these factors need further exploration. Others have yet to be identified. Taken together with other issues across the field they augur well for a solid future for SLA research. The paper will close with a brief look toward that future.

Conclusions and Future Directions

This paper has aimed to highlight the ways in which SLA research, across the past three decades, has retained its original applied and linguistic interests, and enhanced them through greater attention to questions on acquisition processes. New research, carried out from the perspectives of linguistic and language universals and cognitive activities, has shed much light on the complexities of L2 development and the input and interactional needs of L2 learners. Application of findings from this research has rekindled old debates on the role of consciousness in L2 learning, and uncovered new and necessary ways to study corrective

feedback and L2 practice, beyond a behaviorist point of view.

Many questions remain unanswered. Others are in need of more complete answers. The three positions on the role of UG remain unresolved. Is each correct, according to linguistic feature studied? Is one more relevant to UG, the others, more reflective of peripheral grammars? Continued research along these lines can contribute to a theory of L2 learning and inform theoretical linguistics as well. The study of the learner's L1 in relation to markedness and language universals has shown much promise. The classroom relevance of this research is already apparent, and that in itself should motivate additional studies.

Researchers need to continue to identify form-meaning relationships that defy the learner's grasp, and yet are outside of UG, and therefore not learnable from unmodified input or positive evidence alone. The construct of markedness can play a role in their identification. Those forms whose encodings of meaning are not salient, are infrequent or highly complex, or are embedded in specialized registers such as academic or professional discourse, are likely to require focused practice and repeated positive evidence, or various kinds of negative evidence to stimulate their learning. Future studies will need not only to identify the forms whose meaningful encodings are difficult to acquire, but also to design activities that help learners to notice them through focused input and negative evidence.

Researchers must also develop ways to operationalize and study processes of restructuring and internalization that occur after learners have noticed input and processed it as intake. The interventions designed to stimulate these processes will not only provide data on the input - intake - restructuring - internalization progression, but will serve as a basis for materials and activities that can be applied to classroom needs.

As new findings emerge on the role of consciousness and attention in the learning process, their relevance to the classroom is evident. However, there is an urgent need to operationally define these processes, lest they be mis-applied to classroom practice in behaviorist rather than cognitive terms.

A consistent theme throughout SLA research has been the need for longitudinal data. The handful of longitudinal studies that have been carried out have made an impressive impact on the field, the most recent being that of Schmidt and Frota (1986). The kind of longitudinal research needed at present must take the form of follow-up studies that check retention of features learned through instructional intervention and practice. Although it is clear that feedback and focused input can make a difference in the short term, their trusted application to classroom practice will require confidence in their long term impact.

The relevance of classroom practice in informing SLA research and in being informed by its results will find SLA researchers and SLA practitioners working together to design studies and interpret their findings.

This has already become apparent among classroom studies. Lingering linguistic questions, as described above, suggest a need for teamwork with linguists as well. Opportunities for such research teams to collaborate by sharing and exchanging roles and responsibilities and to work together in complementary roles will bring greater efficiency as well as theoretical and pedagogical relevance to SLA research.

The field has increased in size and scope, yet it is still sufficiently focused on questions of learning and teaching for many voices and perspectives to be acknowledged. The fact that corrective feedback and focused practice are now viewed as cognitive processes, and are at the forefront of research interest, suggests that the field is still open for a fresh look at processes once discarded or nearly forgotten, as long as the evidence to support them is abundant and convincing. That is how learner errors came to be seen as learning processes rather than bad habits, and how communication and comprehension came to be acknowledged as insufficient for L2 competence. Lingering questions and concerns at present will continue to lead the way to future studies. New and currently unforeseen directions will be taken. The richness and complexity of SLA as a learning process and a field of study suggest that there are many perspectives to apply and many more applications to be found.

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