

Noticing in second language acquisition: a critical review

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This article examines the Noticing Hypothesis – the claim that second language learners must consciously notice the grammatical form of their input in order to acquire grammar. I argue, first, that the foundations of the hypothesis in cognitive psychology are weak; research in this area does not support it, or even provide a clear interpretation for it. The problem of interpreting the hypothesis is much more acute in the area of language acquisition. Partly because the hypothesis is not based on any coherent theory of language, it is very difficult to determine exactly what it means in this context, or to draw testable predictions from it. In the absence of specific predictions, research on form-focused instruction and feedback provide indirect tests, the results of which create additional problems for the hypothesis. The various problems can be eliminated or greatly reduced if the Noticing Hypothesis is reformulated as a claim that noticing is necessary for the acquisition of metalinguistic knowledge but not competence.

I Introduction

Recent years have seen a growing concern with the role of conscious processes in second language acquisition (SLA). This concern is frequently centered on the Noticing Hypothesis of Schmidt (1990; 1993a; 1994; 1995a; 1995b; Schmidt and Frota, 1986), which has been adopted by a large and probably growing number of researchers (e.g., Ellis, 1993; 1994b; Fotos, 1993; 1994; Fotos and Ellis, 1991; Harley, 1993; Larsen-Freeman and Long, 1991; Long, 1991; Robinson, 1995; 1996; Zalewski, 1993). The hypothesis is a claim about how input becomes intake – that part of the input that is used for acquisition. It claims that conscious awareness (noticing) of grammar¹ plays an important role in the process. In the strong form of the hypothesis, favoured by Schmidt (1990; 1993a; 1994; 1995b), noticing is a necessary condition for learning. Other researchers might prefer a weaker version; that noticing is helpful but might not be necessary. I will assume the stronger version,

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¹ The hypothesis has been applied to areas of language other than grammar (see especially Schmidt, 1993b), but I will consider only grammar learning.

though adoption of the weaker view would require only minor changes.

The hypothesis also has strong and weak forms in another respect. In the weak version, learners need only be aware of the input in a global sense; they do not have to notice any details of its form. I will disregard this weak claim, for two reasons. First, in almost all discussion, advocates of the Noticing Hypothesis clearly favour the stronger view, that awareness of grammatical form is crucial. Second, the weak version is not interesting, because virtually no one would dispute it. Discussions of noticing are commonly directed against theories of unconscious acquisition, Krashen's (1983; 1985; 1987) in particular. But no major theories, including Krashen's, predict that learners benefit from 'input' that occurs while they are absorbed in some task that has nothing to do with the 'input'. So I will assume that the Noticing Hypothesis requires conscious awareness of grammatical details rather than simply global awareness of input.

Noticing is often associated with the influential notion of *consciousness raising* (Rutherford, 1987; Sharwood Smith, 1981) or *input enhancement* (Sharwood Smith, 1991). But despite the (old) name, the idea does not imply a commitment to any particular view on the role of consciousness in learning. The latter is the concern of this article, so I will say little about consciousness raising.

Proponents of noticing also give much attention to *noticing the gap* – learners' awareness of a mismatch between the input and their current interlanguage (see especially Schmidt and Frota, 1986). It is important to avoid confusion between this idea, which necessarily involves awareness, and the more general notion of a comparison between input and interlanguage. Theories of unconscious acquisition naturally hypothesize an unconscious comparison process. Schmidt and Frota (1986), in fact, presented noticing the gap as an adjustment of Krashen's (1983) theory, the only difference being their additional claim that conscious awareness of the gap is a requirement. Thus, arguments that learners must compare input to their interlanguage grammar (e.g., Ellis, 1994b) are not arguments for noticing.

I will argue that the Noticing Hypothesis is vulnerable in several respects. In the next section I challenge its foundations in cognitive psychology, concluding that it derives no support from research in this area. In the two following sections, I consider conceptual problems that arise in attempts to apply the concept of noticing to language acquisition. This is followed by a look at empirical problems. Finally, I suggest a reformulation of the hypothesis, the

revised version being much narrower than current versions. Throughout the discussion I will focus on the work of Schmidt (1990; 1993a; 1994; 1995b), because he provides the clearest statement and the most thorough defence of the Noticing Hypothesis.

II Noticing in cognitive research

Advocates of noticing argue that cognitive research points to the necessity of awareness for learning and therefore supports the Noticing Hypothesis. But one should be wary of strong claims about what psychology has found in regard to consciousness. Important insights have been achieved, but the role of consciousness in cognition (as well as its general nature) continues to be a source of considerable confusion. This caution is very appropriate in discussions of noticing.

1 Research on attention

To support the Noticing Hypothesis, Schmidt (1990; 1993a; 1995b) cited work on attention. He argued that research has found attention necessary for learning and that, for all practical purposes, attention can be equated with awareness. From these premises it would follow that attention research supports the claim that consciousness is necessary for learning.

These claims are difficult to evaluate, and even to interpret, partly because the notion of attention is very confused, a point explicitly made by a number of researchers (e.g., Allport, 1993; Carlson, 1991; Meyer and Kieras, 1997; for reviews of attention research, see Allport, 1993; Anderson, 1995; Shiffrin, 1988; Tomlin and Villa, 1994; Wickens, 1992). It is very difficult to say exactly what attention is and to determine when it is or is not allocated to a given task. Its relation to the notoriously confused notion of consciousness is no less problematic.

Much of the discussion of attention has relied on a poorly defined commonsensical notion, intimately associated with awareness. In such cases, the association between consciousness and attention is more an assumption than an empirical finding.

More explicit studies of attention usually treat it as a limited resource, allocated to tasks as needed. One influential view postulates a number of separate pools of resources, which can be allocated to tasks more or less independently of one another (e.g., Navon and Gopher, 1979; Wickens, 1992). This approach may be necessary to account for the results of dual-task experiments, in

which participants are asked to perform two tasks simultaneously. Researchers in this area commonly judge how much (if any) attention was allocated to a task by seeing how successfully the task was performed. In other words, attention is, by definition, a requirement for success. Results of this sort cannot support claims about the necessity of attention for anything. This *multiple-resource* view of attention also creates problems for the connection with awareness: divisible attention does not fit well with the unitary, serial nature of consciousness.

Other influential work divides attention into *alertness*, *orienting* and *detection* (see Posner and Petersen, 1990; Posner and Rothbart, 1992). For learning, the important process is detection – the registration (conscious or unconscious) of stimuli. It is, by definition, necessary for learning (to say that learning can occur on the basis of input that does not register would literally be nonsense). So on this view of attention the claim that it is necessary for learning has no empirical content.

Perhaps the most prominent work on attention involves the distinction between automatic and controlled processes, the latter requiring some or all of a person's attentional resources, the former making little or no demand on them (Schneider and Shiffrin, 1977; Shiffrin, 1988; Shiffrin and Schneider, 1977). The application of this approach is limited by difficulties in characterizing – and therefore in identifying – these processes. Many characteristics have been proposed for automatic processes, but they are not consistently associated with one another; a given process can be automatic in some senses but not in others. Not surprisingly, researchers differ as to which characteristics are relevant, how many are relevant, and how many of the relevant characteristics a process must have in order to qualify as automatic (Kahneman and Treisman, 1984; Logan, 1988; Shiffrin, 1988; Zbrodoff and Logan, 1986). This problem introduces considerable uncertainty into inferences about the role of attention.

The literature in this area also raises problems for the attention–awareness connection. Consciousness is one characteristic of controlled processes, but its association with the others is far from perfect. If controlled processes are those that require attention, then, once again, the association of attention with consciousness is problematic.

It is not surprising, then, to find that the equation of awareness with attention does not represent a consensus among researchers. Anderson's (1995: 104) assessment, in fact, is that 'The field is more and more coming to recognize that the association of attention with consciousness has been unfortunate.'

A number of complex issues are involved here, issues I will not try to untangle. The essential point is that current research and theory on attention, awareness and learning are not clear enough to support any strong claims about relations among the three. This is not to say that such research is uninteresting or unimportant. Much has been learnt, and any adequate theory of SLA will eventually have to incorporate these and future findings. But they do not offer any basis for strong claims of the sort embodied in the Noticing Hypothesis.

2 Noticing vs attention to the task

The use of attention research in support of the Noticing Hypothesis has another, perhaps more serious problem. Even if one were to adopt the dubious position that attention is necessary for learning and can be equated with awareness, the research cited by noticing advocates would show only that the hypothesis is valid in its weak, uninteresting form, according to which global awareness of input is necessary for learning. The interesting version makes the much stronger claim that learners must consciously notice the particular details to be learnt.

Schmidt cited only one study – Hanson and Hirst (1988) – as evidence that attention to features of the input is necessary (see Schmidt, 1995b). Hanson and Hirst presented participants with lists of words, after directing their attention to one of two features of the words – initial letter or semantic category. Participants were then tested on their knowledge of the frequency of each feature in the list. The study did not find that the frequency of the unattended feature was not encoded, but rather that encoding of attended features was more successful than that of unattended features (i.e., that attention is helpful, not necessary). In addition, one striking result of this study was that participants oriented to initial letter were very successful at encoding semantic category. This finding does not fit well with the claim that attention to a feature is necessary for encoding of that feature. The relevance of this work to the Noticing Hypothesis is also open to question. From a study of the way people encode the frequency of semantic categories and initial letters in lists of words, how much can one infer about the acquisition of natural language grammar?

The appropriate conclusion is that the attention research cited in support of the Noticing Hypothesis does not indicate that language acquisition requires anything more than global awareness of input, even if one accepts the claims that attention is necessary for learning and that consciousness can be equated with attention. The

dubious status of these claims raises further problems for the hypothesis.

Closely related to global awareness is the notion of *attention to the task* (Carr and Curran, 1994; Curran and Keele, 1993; Dienes *et al.*, 1991; Nissen and Bullemer, 1987; Winter and Reber, 1994). On this idea, learners must work with and pay attention to materials embodying the knowledge to be acquired. This process will presumably involve awareness of the task itself, but it does not imply conscious attention to the details of what is to be learnt. Noticing advocates must show that learning requires (conscious) attention to the particular points to be learnt, not just to sources embodying those points. This requirement has received almost no attention in discussions of noticing.

The same point applies to Schmidt's (1990) observation that cognitive theories of consciousness commonly associate awareness with new information and novel situations. The latter are associated with learning, so the implication is that cognitive theories support the Noticing Hypothesis. But conscious awareness of the situation does not imply conscious awareness of the specific information to be acquired. The association between novelty and awareness is expected if learning simply requires attention to the task.

3 Consciousness and learning research

For empirical support of the Noticing Hypothesis, Schmidt (1990) cited reviews by Brewer (1974) and Dawson and Schell (1987), who rejected claims of unconscious learning. But these authors dealt with simple conditioning experiments; inferences regarding more interesting forms of learning are not legitimate. Brewer noted, in fact, that his conclusions do not apply to the acquisition of syntax, which probably occurs 'in a relatively unconscious, automatic fashion' (p. 29). Even for conditioning experiments, the evidence is unclear. Other reviewers (Maltzman, 1987; Martin and Levey, 1987) are sceptical about the claim that conditioning depends on awareness. In addition, the point made by Brewer and by Dawson and Schell was not so much that unconscious conditioning does not occur, but that research claiming to have found it did not meet the requirements for a rigorous demonstration.

Most current research on unconscious learning involves *implicit learning*, in which participants seem to acquire subtle, often complex knowledge without being aware of it. *Serial reaction time* (SRT) experiments, for example, use a series of lights, flashing one at a time (e.g., Knopman and Nissen, 1987; Nissen and Bullemer, 1987). Which light will go on next depends in a subtle way on the

preceding lights. Each time one goes on, participants respond as quickly as possible by pressing the key corresponding to that light. Their reaction times gradually decrease, indicating an increasing ability to anticipate the stimuli, but they do not show conscious knowledge of how they do it. Unfortunately, no firm conclusions can be drawn about implicit learning, due to continuing controversy (see Carr and Curran, 1994; Ericsson and Simon, 1993; Mathews, 1990; Perruchet and Pacteau, 1990; 1991; Reber, 1989; 1993; Shanks and St John, 1994). But one can safely conclude that the evidence does not show that awareness of the information to be acquired is necessary for learning.

4 Vagueness and testability

The relation between implicit learning and the Noticing Hypothesis is a complex issue. Schmidt (1990; 1993a; 1994; 1995b) questioned the validity of claims about implicit learning, but separated this issue (the possibility of abstract knowledge developing unconsciously) from that of *subliminal learning*, in which learners acquire items without consciously observing them in the input. The Noticing Hypothesis, as formulated by Schmidt, is specifically a rejection of subliminal learning. Thus, it is clear and testable only to the extent that the two types of learning can be distinguished. In practice this is difficult.

What predictions does the Noticing Hypothesis make about SRT experiments, for example? On the most interesting interpretation, participants must notice the contingencies between the lights in order to learn; but Schmidt's (1990; 1993a; 1994; 1995b) exclusion of implicit learning from the hypothesis implies that such awareness is not required. A weaker interpretation is that they must notice individual sequences of lights (e.g., that the last three flashes were lights number 3, number 1 and number 2, in that order) but need not be aware of any patterns among the sequences. This is in fact the position adopted by Schmidt (1995b).

But the logic of this position is unclear. The basic units of the experiment are the flashing lights, so the hypothesis would appear to be intact if learners simply notice that lights are flashing before them; the rest of the work can be done implicitly. This is not what Schmidt had in mind, but there is no basis for excluding this interpretation, given standard formulations of the hypothesis. Even in this simple case, the Noticing Hypothesis is too vague to make clear predictions. Problems of interpretation and testing become considerably greater when the hypothesis is applied to natural language acquisition (see below).

Even when (if) the hypothesis makes clear predictions, testability problems remain. The claim that consciousness is necessary for learning is (according to its advocates) supported by research showing awareness on the part of successful learners, but it is not refuted by research that fails to find awareness accompanying learning. When this occurs, supporters of noticing can argue (e.g., Robinson, 1995; Schmidt, 1990) that the probes were not sensitive enough to detect the awareness, or that learners were aware at the moment the learning occurred but immediately forgot. One might ask how these possibilities could ever be ruled out, even in principle.²

5 Conclusion

The foundations of the Noticing Hypothesis are weak. Cognitive research does not support the claim that conscious awareness of the information to be acquired is necessary or helpful. The hypothesis also has serious conceptual problems, which make interpretation and testing difficult.

III Noticing and linguistic theory

How one interprets and evaluates a claim about learning depends on one's assumptions about the target of the learning – natural language grammar in this case. In this section I will examine the Noticing Hypothesis in terms of mainstream linguistic theory, concluding that it has serious conceptual problems. In the following section, I will more briefly consider two alternative views of language.

1 Vagueness and testability

In discussing cognitive research, I argued that the Noticing Hypothesis is too vague to offer any principled means of determining what learners must notice. The problem becomes much greater when one moves from the relatively simple laboratory research considered above to natural language acquisition. At the heart of the problem is Schmidt's (1990; 1993a; 1994; 1995b) distinction between subliminal and implicit learning, and the related distinction (Schmidt, 1993a; 1995b) between awareness at the level of noticing (necessary for learning) and awareness at the level of understanding (probably not necessary).

² Schmidt (1995b) acknowledged that the Noticing Hypothesis is probably not falsifiable, but did not give much weight to this point.

The implicit–subliminal distinction implies a two-part view of acquisition. Learners must notice, and thereby take in, very many discrete items. Once items have been taken in, they can be transformed into the complex grammar underlying natural language use. Awareness is required for the first step but not the second. Thus, in order for the hypothesis to be clear and meaningful, its proponents must identify the items involved in the first step and explain what it means to notice them. A fundamental problem with explications of the Noticing Hypothesis to date is that none have made any serious attempt to do this.

An adequate explication must include reasonably clear distinctions between noticing and global awareness of input, and between noticing and understanding. One should probably not expect great precision in these distinctions. Borderline cases are natural and perhaps inevitable; practical difficulties of experimentation will always pose challenges for testing. But some reasonably clear, principled means of drawing the boundaries and testing them is essential. In the following discussion, I will consider the issues in more detail, with regard to syntax and inflectional morphology.

2 Acquiring syntax

What are the syntactic items that learners must notice? On one viable interpretation, they are simply words. Syntax involves the arrangement of words within phrases and sentences, so perhaps the Noticing Hypothesis simply requires learners to notice the words that make up the input. The discovery of everything normally classified as syntax can then be considered implicit learning; awareness of syntax is entirely a matter of understanding rather than noticing. Advocates of noticing clearly have something stronger in mind. But given the implicit–subliminal and noticing–understanding distinctions, this very weak interpretation of the hypothesis is entirely valid.

A more interesting possibility is that the items to be noticed are lexical categories; they make reasonable basic units of syntax. In this case advocates of noticing must explain what it means for a learner, especially an informal learner, to notice a lexical category, and what sort of awareness constitutes understanding rather than noticing. They must also offer means of testing this awareness. And, again, advocates of noticing claim that learners notice much more than categories. The Noticing Hypothesis is routinely presented as a rejection of unconscious acquisition. But if learners need only be aware of categories, then the acquisition of syntax is almost entirely

unconscious, so the hypothesis must involve much more than categories. But once again, nothing in existing formulations rules out an interpretation in which the set of lexical categories is exactly the set of items that must be noticed.

Though proponents of noticing have not offered any principled means of identifying the items to be noticed, Schmidt did offer a number of examples. One involved the omission of subject pronouns in Spanish. According to Schmidt (1995b), the Noticing Hypothesis requires learners to notice that Spanish speakers sometimes omit subject pronouns. It does not require them to notice that Spanish is a pro-drop language; this would be awareness at the level of understanding. A natural question to ask is whether it requires them to consciously use the concepts of subject and pronoun. If not, the lower boundary of noticing seems to disappear, leaving little more than global awareness of input. If these concepts are required, then additional questions of interpretation come up, especially regarding the noticing–understanding distinction.

Schmidt (1995b) discussed this distinction in some detail. He described noticing as the ‘conscious registration of the occurrence of some event’ and understanding as ‘recognition of a general principle, rule or pattern’ (p. 29). Thus, a learner who is aware that the input contains an instance of pro-drop is going beyond noticing. But the same can be said for awareness of an instance of ‘subject’. Like ‘pro-drop’, ‘subject’ is an abstract concept; the occurrence of a subject registers only if one understands the generalizations it involves. This is even true of individual words and sounds. Identifying a sequence of sounds as a token of a given word means recognizing a general pattern. The registration of a sound as a *t* (for instance) is possible only by reference to general principles of what a *t* is. Thus, the noticing–understanding distinction is at least in need of considerable clarification.

Further confusion arises from conflicting views held by different advocates of the hypothesis. For Schmidt, awareness of rules is a prototypical case of understanding. For others (e.g., Ellis, 1993; Fotos, 1994; Fotos and Ellis, 1991), rules are a standard target of noticing. Indeed, they are central in nearly all discussions of conscious learning.

This concern with rules raises another issue. The rules and constructions commonly discussed are taken from 1960s- and 1970s-era linguistic theory (e.g., *wh*-questions, passives, clefts, datives). Few linguists now consider these constructions genuine parts of the grammar. According to mainstream linguistic theory, they are derived from the underlying grammar very indirectly, through the interaction of various abstract principles. Thus, their use as targets

of learning requires some justification (for one approach to this issue, see Ellis, 1993).

Perhaps the appropriate conclusion is that the Noticing Hypothesis should be formulated in terms of parameter setting, a dominant theme in current linguistic theory (e.g., Chomsky, 1986; 1995; Lightfoot, 1989; 1991). On this idea, briefly discussed by Schmidt (1990), learners must notice the input they use to set each parameter. But, again, the meaning of such a claim is unclear, as was illustrated by the pro-drop example above.

For a more detailed example, consider the parameterized Binding Theory of Manzini and Wexler (1987) and Wexler and Manzini (1987). The theory states, in part, that anaphors (e.g., reflexives and reciprocals) get their reference from another element in the sentence, that this element must be in a certain structural relation to the anaphor – *c-command* – and that it must occur within the anaphor's *governing category*. The parameter involves five possibilities for defining governing category: the minimal category containing the anaphor and (a) a subject (including subjects of noun phrases), (b) an Inflection node, (c) any Tense node, (d) an indicative Tense node or (e) the root Tense node. Learners must determine which of these values applies to their language (or, more precisely, to particular anaphors in their language).

What must learners notice? The *c-command* relation between anaphor and antecedent? The locations of governing categories, or of subjects, Inflection nodes and Tense nodes? The distinction between indicative and nonindicative clauses? The parameter cannot be set if any of this information is lacking. But a claim that learners consciously notice all of it – or perhaps any of it – would be implausible. So the Noticing Hypothesis does not explain what it means for noticing to be a requirement for parameter setting, except perhaps in the trivial sense that learners must have a global awareness of input. Nor does it offer any means by which its claims could be tested.

3 Acquiring inflections

The acquisition of inflections is probably the area in which the Noticing Hypothesis has its greatest intuitive appeal. But again one must ask what exactly learners need to be aware of, and what it means for them to be aware of these things. What must they notice, for example, in order to acquire the verbal *-s* affix of English?

Schmidt's (1995b) brief discussion of this case suggested a surprising answer: learners do not have to notice anything at all pertaining to the affix; they merely need to be aware of a sentence

containing it. Anything more would constitute awareness at the level of understanding, on which the hypothesis is silent. A slightly stronger view, which fits better with general descriptions of noticing, is that learners must notice that the phonetic or orthographic form of a word in the input differs from other instances of that word.

With either of these views the lower boundary of noticing is so low that the hypothesis becomes uninteresting. Advocates of noticing repeatedly present the hypothesis as a rejection of unconscious acquisition. But if learners do not have to notice anything about an affix, or only need to notice the spelling and/or pronunciation of isolated instances (with no awareness of meaning or of the way that phonetic and orthographic forms vary according to phonological, morphological, syntactic and semantic factors), then the role of consciousness is extremely limited; the acquisition of inflections is almost entirely unconscious. One might ask if any proponents of unconscious acquisition would object to this view; it certainly does not offer any fundamental challenge to their position.

If one adopts a more interesting version of the Noticing Hypothesis – one that requires learners to notice grammar – then many questions arise. Must learners notice that the affix appears on a verb? Must they notice that the verb it occurs on is present tense or that the subject is third person singular? If so, one must also explain what it means to say that learners (especially informal learners) have these concepts and that they are consciously aware of them while processing input involving the affix. Must they notice the absence of *-s* when a modal occurs between subject and verb, or its presence when an adverbial replaces the modal?

Must learners be aware that this verbal affix is distinct from the phonologically and orthographically equivalent plural affix, or from the phonologically equivalent possessive? Such awareness would seem to depend on awareness of the meaning of each affix (which Schmidt, 1994, excluded from the Noticing Hypothesis), or possibly on awareness of lexical categories. The latter is complicated by the fact that the possessive is not restricted to words of any particular category.

Of all these characteristics, which must learners notice in order to acquire the affix? What sort of awareness would constitute understanding rather than mere noticing? Depending on which version one adopts, the Noticing Hypothesis is either too vague to offer any principled answers or offers relatively clear, but uninteresting ones. The question also arises of how the predicted awareness can be tested.

IV Noticing and other views of language

Evaluations of hypotheses about language learning necessarily make assumptions about what language is. In the above discussion I took linguistic theory as the source of those assumptions. But Schmidt (1990; 1993a; 1994; 1995b) expressed scepticism about mainstream linguistic theory. So one must also consider the Noticing Hypothesis in terms of other views. In particular, what view of language underlies standard discussions of noticing? Given a clear answer, one can then evaluate the hypothesis in terms of its clarity and testability.

But proponents offer nothing more than hints of possible answers. For an alternative to linguistic theory, Schmidt (1990; 1993a; 1994; 1995b) sometimes appealed to connectionism; at other times to specific-knowledge approaches, in which learning is said to involve the storage of specific instances rather than the creation or discovery of abstract principles.

1 Connectionism

Connectionist models of language (see Bechtel and Abrahamsen, 1991) might be seen as an alternative to linguistic theory, and this seems to be the point of Schmidt's (1990; 1994) discussion of connectionism. Some of the more enthusiastic supporters of the approach have claimed that it can make rule systems like those of linguistic theory obsolete. But this strong view is not widely endorsed. The more popular view is that both connectionist and traditional symbolic approaches have value and that research should seek ways to integrate them (e.g., Bechtel and Abrahamsen, 1991; Dinsmore, 1992; MacWhinney, 1993; Pinker, 1991; Seidenberg, 1994; Sun and Bookman, 1995). So connectionist models of language, however valuable they may turn out to be, do not render linguistic theory irrelevant.

Even if one is willing to assume that connectionism will do away with linguistic theory, the Noticing Hypothesis remains problematic. One must still explain exactly what must be noticed. The essence of a connectionist model is its connections between units; the essence of learning is changes in the strengths of those connections. What exactly is the relation between these strengths and the items that learners notice? Does a connectionist noticing approach have a place for those elements of old linguistic theories that appear in discussions of conscious learning? Does it offer any grounds for predicting that these or any other specific items must be noticed?

More generally, the place of consciousness in connectionist

models is unclear. Until it has been made clear, the adoption of a connectionist perspective cannot possibly make the Noticing Hypothesis clearer or less problematic.

2 Specific knowledge

Critics of implicit learning research have argued that learners in the experiments actually do not make unconscious generalizations, but rather acquire a collection of individual cases (e.g., Brooks and Vokey, 1991; Perruchet and Pacteau, 1990; 1991; Whittlesea and Dorken, 1993a; 1993b). For example, in SRT experiments they might store individual sequences of lights. Anticipating the next light means comparing the current sequence to one or more stored sequences. Perhaps the application of this view to language could produce an alternative to linguistic theory, an alternative in which the Noticing Hypothesis makes sense.

But the application is problematic. Natural language is highly systematic and extremely complex. Any competent speaker (native or otherwise) can use this complex system fluently, accurately and creatively. How these characteristics could emerge from a collection of consciously observed items is at best unclear. If proponents of noticing wish to use a specific-knowledge theory as an alternative to standard linguistic theories, they must show what such a theory would look like, how it can account for the major characteristics of language, and exactly how it fits with the Noticing Hypothesis. Until they have done so, the specific-knowledge approach does not offer an alternative to linguistic theory or a credible basis for the Noticing Hypothesis.

3 Conclusion

The central conceptual problem with the Noticing Hypothesis is that it is not based on any coherent notion of what language is. In the absence of a theory, its proponents rely on a hodgepodge of ideas from connectionism, specific-knowledge approaches, old linguistic theory and commonsensical views of language. Until they offer a coherent view of language, show how the Noticing Hypothesis fits with it, and use it to make clear predictions about learning, the hypothesis is too vague to be of much value.

V Noticing and SLA: the evidence

Partly because of its vagueness, the Noticing Hypothesis defies direct testing. So one must rely on indirect evidence, coming from

studies on the effects of teaching practices designed to engender awareness of form in learners.

Problems arise in the interpretation of such evidence. If benefits come from form-focused instruction, they need not be the result of increased noticing; they could, for instance, result from improved comprehension. In addition, the Noticing Hypothesis is about input processing, but most empirical work on form-focused instruction has sought to affect learners' interlanguage through a combination of direct explanation and output practice; these attempts no doubt influenced input processing, but in a manner difficult to predict. For work that does deal directly with input, other problems occur. Much recent work is called *consciousness raising*, but its relation to consciousness, and especially to noticing, is unclear. Instructors or researchers enhance the input learners receive, making selected grammatical characteristics more salient. But, as Sharwood Smith (1993) noted, one must be cautious in making claims about how learners are actually affected by these alterations in the input.

With these caveats in mind, any findings that form-focused instruction is successful would at least offer encouragement to supporters of the Noticing Hypothesis. A general failure of such instruction would create problems for the hypothesis. In this section I will examine extensive evidence on form-focused instruction and feedback. I will conclude that it points to the general ineffectiveness of form-focus and therefore poses a problem for the Noticing Hypothesis.

The evidence I deal with is specifically about grammar instruction, not about formal instruction in general. So it does not directly challenge the value of instruction in other areas, or the application of the Noticing Hypothesis to those areas. One possible example is pragmatic knowledge (Schmidt, 1993b). Another is lexical learning: Schwartz (1993) argued that it can benefit from explicit instruction, even though the acquisition of syntactic competence cannot.

1 Research on form-focused instruction

The SLA literature contains many claims that research has found form-focused instruction beneficial (e.g., Brown, 1994; Celce-Murcia, 1992; Ellis, 1990; 1993; 1994a; Larsen-Freeman and Long, 1991; Lightbown and Spada, 1993; Long, 1990; 1991). Advocates of the Noticing Hypothesis point to these sources as evidence for their view. But, in order for a study to support such claims, it must meet two general requirements. First, its tests must be plausible measures of competence rather than metalinguistic knowledge. Second, it

must show that benefits are not restricted to the period immediately following the instruction; otherwise the benefits may be, in the words of Lightbown *et al.* (1980: 166), 'knowledge temporarily retained at a conscious level but not fully acquired.'

a Form-focused instruction and metalinguistic knowledge: There is abundant evidence that form-focused instruction helps learners acquire metalinguistic knowledge. It comes from studies in which learners who had received such instruction were tested on their ability to perform linguistic tasks having little relation to authentic use of language. The tests used in these studies included sentence manipulation, word manipulation (adding affixes to words), sentence combining, fill-in-the-blank in isolated sentences, multiple choice problems, statement of grammar rules, use of explicit rules to judge the grammaticality of sentences, and translation of isolated words, phrases or sentences. Using such tests, researchers have repeatedly found significant beneficial effects of form-focused instruction (Buczowska and Weist, 1991; Cardelle and Corno, 1981; Carroll and Swain, 1993; Carroll *et al.*, 1992; Eckman *et al.*, 1988; Gass, 1982; Herron and Tomasello, 1988; Master, 1994; Robinson, 1996; Robinson and Ha, 1993; Scott, 1989; 1990; Scott and Randall, 1992; Seliger, 1975; Tomasello and Herron, 1988; 1989). Such instruction clearly can impart metalinguistic knowledge to learners.

But this sort of knowledge is distinct from actual knowledge of language, as shown by studies that tested learners both on metalinguistic tasks, such as those described above, and in more natural, uncontrolled contexts (Ellis, 1987; Frantzen, 1995; Fuller, 1978, as described by Pica, 1985; Green and Hecht, 1992;³ Kadia, 1988; McDonald *et al.*, 1977, as described by Chaudron, 1988; Schumann, 1978a; 1978b; Terrell *et al.*, 1987). In each of these studies, performance dropped significantly (even dramatically) with a switch from artificial, nonspontaneous situations to normal spontaneous use.

Thus, learners' success on tests of metalinguistic knowledge does not imply that they have acquired any actual knowledge of language. A large percentage of the studies routinely cited as evidence for the value of form-focused instruction did rely on tests of this sort, so they do not constitute evidence for the value of instruction (or noticing).

b Form-focused instruction and long-term follow-up: The need for long-term follow-up is shown by studies that found benefits

³Green and Hecht (1992) described previous research of theirs that found a sharp distinction between the two types of learning.

immediately following instruction but none when follow-up testing was done (Harley, 1989;⁴ Lightbown, 1983; 1985; 1987; Lightbown *et al.*, 1980; Weinert, 1987; White, 1991;⁵ and the one participant retested by Pienemann, 1989). These results indicate a failure of instruction to affect the underlying language system, a failure that was only apparent some months after instruction was completed, so the need for follow-up is clear. It is not clear how much time is required for superficial benefits to disappear. The best clue is that White (1991) found beneficial effects five weeks or more after instruction, but not after a year, suggesting that five weeks is not an adequate delay.

Of the studies that reported beneficial effects for form-focused instruction, very many did not use any follow-up testing. Many others did such testing, but after a delay of five weeks or less (often much less). None of these studies provides evidence for form-focused instruction.

c Remaining studies: With the elimination of work that measured only metalinguistic knowledge and of that which included no follow-up or used too short a delay, the field is reduced to a fairly small number of studies. In most of these, the initial benefits of instruction had disappeared by the time of the follow-up tests, as described above, so these must also be removed, leaving only three serious candidates.

Lightbown (1991) studied a class in which the teacher spent a great deal of time teaching ESL students to use *be* rather than *have* in presentational sentences. These students did learn to use the form correctly in spontaneous communication and, of the ten students interviewed a year later, seven or eight continued this correct use. This work led to an inconclusive debate between Krashen (1992b; 1993) and Lightbown and Pienemann (1993) in regard to whether or not learners' competence was actually affected by the teaching. More important perhaps, the target of the instruction was an extremely simple point, one that learners could well treat as an idiom rather than an integral part of the grammar. The researchers also looked at other, more clearly grammatical points emphasized by this teacher, but failed to find comparable effects. So even if Lightbown's findings represent a genuine success for form-focused

⁴ This study is sometimes cited as evidence for the effectiveness of form-focused instruction, though the logic of this claim is usually obscure. Ellis (1994a) pointed out that the experimental group's performance did not decline, in absolute terms, from post-test to follow-up. But it did decline relative to the control group. At the end of the study there were no significant differences between the groups.

⁵ For long-term results of White (1991), see Schwartz and Gubala-Ryzak (1992) and White (1992).

instruction, the implications are limited.

Spada and Lightbown's (1993) research, investigating the effects of instruction on question formation, is more interesting, but is difficult to interpret. On the initial post-test, the comparison group was significantly better than the experimental group, prompting the researchers to look at the instruction more closely. Their eventual conclusion was that the group that was not supposed to receive instruction on questions had actually received more than the experimental group. As the authors noted, this makes interpretation of the findings difficult, as there is no genuine control group and no follow-up testing was done on the superior group. Questions also exist about whether the testing procedures allowed the use of metalinguistic knowledge (see Krashen, 1992b; 1993; Lightbown and Pienemann, 1993).

Finally, Day and Shapson (1991) found that students instructed on French conditional verb forms significantly outperformed those who had not received the instruction. But their tests looked only at uses of the forms in obligatory contexts; inappropriate uses were not considered. Thus, students could get high scores simply by using conditionals all the time, even if they had no understanding of their proper use. Research has shown that students tend to overuse the forms they have been taught (Lightbown, 1983; 1985; 1987; Lightbown *et al.*, 1980; Pica, 1983; Weinert, 1987). So Day and Shapson's tests, which included no measures of overuse, say little about the value of form-focused instruction.

Thus, no empirical studies have provided good evidence that form-focused instruction helps learners acquire genuine knowledge of language. Moreover, many studies have found such instruction ineffective. This is the topic of the following section.

d Evidence against form-focused instruction: Some studies mentioned above found benefits in the short term, but none in the long run (Harley, 1989; Lightbown *et al.*, 1980; White, 1991; and the one subject given a delayed post-test by Pienemann, 1989). Three other studies mentioned above – Kadia (1988), Schumann (1978a; 1978b) and Terrell *et al.* (1987) – also failed to find any genuine benefits, despite substantial gains in metalinguistic knowledge.

Spada (1986; 1987) and Liou (1989) carried out large numbers of measurements and found a tiny fraction of them significant, some favouring form-focus and some indicating harmful effects. Such results fit well with the null hypothesis, that instruction had no effect, because a large number of measurements carried out on random data are likely to produce a small number of significant results (positive and negative), purely by chance.

Clyne (1985; 1991) compared immersion students, with no form-focused instruction, to students who had received a great deal of it. He found the latter clearly inferior in both communicative skills and grammatical ability. The significance of this contrast is reduced, though, by differences in the amount of time the groups were exposed to the target language (5 to 5.5 hours per week for the immersion students compared to 1 hour per week for the formal-instruction group).

Failure of instruction was also found by Ellis (1984), Plann (1977) and Sciarone and Meijer (1995). The status of several additional studies is uncertain, because they found harmful effects but explained them in terms of timing problems (e.g., Pienemann, 1989).

The evidence considered here is limited somewhat by the factors considered in the discussion of results supposedly favouring form-focused instruction. Some of the studies that produced negative results used questionable tests, but most included communicative measures, so this is only a limited problem. In addition, one could reasonably argue that, when instruction is designed to engender conscious knowledge in students, if it fails to produce any metalinguistic knowledge then it is not likely to produce any more profound gains either.

Some of the studies also lacked long-term follow-up; the possibility that such testing would have found benefits cannot be ruled out. But I am not aware of any reason to expect such a phenomenon. Moreover, many of the studies did look for long-term effects but consistently failed to find any. Similarly, some of the studies involved only a limited amount of instruction; one cannot rule out the possibility that more extensive instruction would have produced results. But again there is no apparent reason to think that this is the case.

The conclusion, then, is that research on form-focused instruction has produced essentially no evidence that it is helpful, and has produced considerable evidence that it is ineffective (though the latter is not entirely conclusive). These results create further problems for the Noticing Hypothesis.

e Nonarguments for the value of form-focused instruction: Higgs and Clifford (1982) claimed that learners who do not receive form-focused instruction develop fossilized bad grammar. If true, this would constitute evidence that awareness of form is necessary for learning. But Higgs and Clifford offered no evidence other than their own impressions, and the general claims regarding fossilization and grammar training have been forcefully criticized by Krashen (1985) and VanPatten (1988).

Some researchers have also argued for the value of form-focused instruction on the basis of shortcomings in immersion students' grammar (e.g., Hammerly, 1987; Harley, 1993; Swain, 1985, 1993). But such arguments never include meaningful comparisons; there is no evidence that immersion students' grammar is weak relative to that of students who receive form-focused instruction. These arguments also ignore alternative explanations for the problems, such as shortcomings in the input or the very limited opportunities immersion students have to use their knowledge productively (Harley, 1993; Swain, 1985).

Long (1983; 1988) is frequently cited as evidence for the value of form-focused instruction, and sometimes specifically for the value of noticing (Brown, 1994; Ellis, 1990; 1993; Long, 1991; Schmidt, 1994). Long surveyed studies investigating the effects of instruction and natural exposure on learners' proficiency, concluding somewhat tentatively that instruction is helpful. He did not attempt to distinguish form-focused instruction from other types, so inferences about the former are not valid. In addition, four major criticisms of Long's survey have been offered (see Doughty, 1991; Ellis, 1990; Pienemann, 1985; VanPatten, 1988). The various studies Long reviewed may have tested only metalinguistic knowledge; could not control for extraneous differences between instructed and naturalistic learners, such as motivation, social class and degree of integration with the native community; relied on questionable measures of exposure; and could not separate effects of instruction from effects of exposure to the target language in the classroom.

Each of the studies considered in this section was based, in part, on a valid observation: that naturalistic learners rarely approach native ability. The fallacy lies in the assertion that form-focused instruction can alter this situation. The reasons for the limited success of second language learners (formal and informal) are open to debate, and I will not speculate on them here. But available evidence strongly suggests that they have nothing to do with grammar instruction, and that learners who receive such instruction have no better prospects than those who do not.

2 Research on form-focused feedback

In grammar correction, the goal is for learners to become aware of gaps between their grammar and the target grammar. So research on correction provides further evidence regarding the value of noticing, and especially noticing the gap.

The studies commonly cited in support of correction share a flaw with similar research on form-focused instruction: They relied on

tests that measure metalinguistic knowledge (Cardelle and Corno, 1981; Carroll *et al.*, 1992; Herron and Tomasello, 1988; Ramirez and Stromquist, 1979; Robinson and Ha, 1993; Tomasello and Herron, 1988; 1989). In contrast, studies that look at the actual speech/writing of learners who have undergone correction have consistently failed to find any benefits (Cohen and Robbins, 1976; Dvorak, as described by VanPatten, 1986b; 1988; Hendrickson, 1981; Kepner, 1991; Lightbown, 1983; Robb *et al.*, 1986; Semke, 1984; Sheppard, 1992; Steinbach *et al.*, 1988, as described by Carroll and Swain, 1993; for reviews, see Krashen, 1992a; Truscott, 1996; VanPatten, 1986a; 1986b).⁶ These results further challenge the Noticing Hypothesis, and especially noticing the gap.

The results of one additional study, by DeKeyser (1993), were more complex, but consistent with this conclusion. DeKeyser found oral correction unhelpful for students in general, but helpful for one subgroup. But these students improved in both accuracy and fluency, arguing against any claim that the benefits resulted directly from correction. The likely explanation is that the correction simply pushed uninterested students to become more involved in the class. If, on the other hand, one attributes the improvements in accuracy to increased attention to form (and therefore increased noticing), the accompanying improvement in fluency is mysterious. It may even be contradictory, because a conscious focus on form should lead to reduced attention to the use of already-acquired knowledge and should therefore hinder the development of fluency (see the noticing-oriented account of fossilization given by Ellis, 1994b).

VI Noticing and metalinguistic knowledge

1 *Metalinguistic knowledge and related concepts*

Researchers in various areas routinely distinguish types of knowledge, in part by their relation or lack of relation to consciousness. Parallel distinctions are often made in regard to learning. In linguistics, the standard view is that knowledge of language (competence) is unconscious, as is its acquisition (e.g., Chomsky, 1975; Jackendoff, 1993). The conscious knowledge people have about language is therefore entirely distinct; it is a form of metalinguistic knowledge, representing speakers' ability to talk about the language. The idea of metalinguistic knowledge, closely associated with consciousness and distinct from linguistic

⁶Lalande (1982) found benefits for one variety of grammar correction relative to another variety. But he did not include a control group that received no correction (or less correction). In absolute terms the gains were negligible.

knowledge, is also prominent in SLA (e.g., Carroll *et al.*, 1992; Day and Shapson, 1991; Hulstijn and Hulstijn, 1984; Sharwood Smith, 1993). Many parallel distinctions also exist, examples being Krashen's (1987) *acquisition-learning* distinction, Schwartz's (1986) idea of *competence vs Learned Linguistic Knowledge*, and Cook's (1994) distinction between implicit learning through a specifically linguistic system and explicit learning through a general problem-solver.

2 Reformulating the Noticing Hypothesis

Thus, distinctions between two types of knowledge, one primarily conscious and the other primarily unconscious, play an important role in the study of language. They potentially provide a natural dividing line between the area in which noticing is relevant and that in which it is not. I propose that the Noticing Hypothesis be reformulated, using this division, as follows: the acquisition of metalinguistic knowledge is tied to (conscious) noticing; development of competence is not.

The reformulated hypothesis has the potential to eliminate or greatly reduce each of the problems found in the original version. One problem was identifying the items learners must notice in order to acquire grammar. The revised version dissociates noticing from competence, so there is no such set of items. The central task of a theory of SLA – explaining the development of competence – is thus freed from this problem. Empirical distinctions between competence and metalinguistic knowledge are not always easy to draw, but the distinction is real – and important – regardless of one's view of noticing. And it can usually be made on principled grounds, especially if the notion of competence is closely tied to an existing linguistic theory. This connection provides a reasonably coherent and developed account of what knowledge is part of competence (and therefore what is not). Another problem for the original version involved instruction designed to increase learners' awareness of form. The evidence indicates that it does not help learners acquire language. But it does help in the acquisition of metalinguistic knowledge. The same is true for form-focused feedback, the clearest test case for noticing the gap.

3 Research on the revised hypothesis

The revised Noticing Hypothesis is considerably weaker than the original, but by no means uninteresting, as metalinguistic knowledge represents an important research area. One possibility

is that such knowledge could, in certain circumstances, serve as a supplement to competence. As it becomes automatized, speakers might come to use it fluently, possibly making up for weaknesses in competence. There is also a dark side to this possibility. Once automatized metalinguistic knowledge has gained automatic access to the speech organs, it could block the use of competence. The full consequences are not clear, but one can easily imagine negative effects for fluency and accuracy.

Some authors have also argued that metalinguistic knowledge can lead to improved comprehension, which will then assist in the development of competence (Terrell, 1991; VanPatten, 1993). Another possibility is based on the idea, variously referred to as *auto-input*, *virtual input* or *back-door learning*, that learners' own output becomes input for them (Schmidt and Frota, 1986; Sharwood Smith, 1981; 1996; Terrell, 1991). If this is the case, then they can use their metalinguistic knowledge to make their output more grammatical, thereby creating improved input for themselves. These are just some of the research issues related to the revised Noticing Hypothesis.

VII Conclusion

Research on the general nature of learning, including work on its relations to attention and awareness, constitutes an important source of information and ideas, a source that SLA theory cannot afford to ignore. Advocates of noticing have done a service to the field by giving this work a prominent place in discussions of language acquisition. The problem is in their specific claim that the research points to a view of learning like that embodied in the Noticing Hypothesis.

SLA theory must be concerned not only with learning in general, but also with the ways in which the nature of the learning is affected by the nature of the target – natural language grammar, in this case. Accounts involving noticing have so far failed in this regard, because they have largely ignored the issue of what language is. The result is that it is extremely difficult to determine exactly what claims they actually make about language learning.

The hypothesis is further weakened by empirical work in SLA, which not only fails to support it but poses serious challenges. The implication of this work and of the problems noted above is that the hypothesis should be greatly weakened, to cover only the acquisition of metalinguistic knowledge.

Throughout the discussion, I dealt with the stronger version of

the hypothesis, according to which conscious awareness of form is a necessary condition for its acquisition. If one adopts the weaker version – that noticing is helpful but not necessary – only minor adjustments are needed in the arguments. The application of cognitive research remains problematic, and vagueness continues to be a problem. Research on form-focused instruction and feedback suggests that awareness of form is not only unnecessary but also unhelpful.

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VIII References

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