Bilingualism: Language and Cognition 10 (1), 2007, 51–55 © 2007 Cambridge University Press doi:10.1017/S1366728906002811

AUTHORS' RESPONSE

A dynamic view as a complementary perspective

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Theory building is a dynamic process. Theories develop and grow, they are dependent on initial conditions, social interactions, variation, and they are stable for some time only to move on to the next phase. They can develop gradually, but a non-linear pattern is more common. Most importantly, theories develop over time. Theories are typically based on shared cognitions and they are situated. Written descriptions by definition reflect versions of the theory that are outdated the moment they are in print, though some of the core assumptions may be more stable than other, more peripheral ones. All of this very much applies to the present discussion of our paper on a DST approach to SLA. Inevitably, we, and probably most of the commentators, will already have moved on in our thinking about DST and SLA by the time this comes into print. In particular with new approaches, we will see a great deal of variability: wild ideas flourish and the links between grand theoretical notions and empirical database to support them tend to be out of balance. That may be seen as a weakness, but it probably is an inevitable developmental stage in building a new theory, or, as in this case, the application from a theory developed in other fields to SLA.

The commentaries that have been generated in reaction to our contribution helped us to rethink parts of what we have written, and the text would have been different had we had the commentaries beforehand. Of course, it is obvious that such an iterative approach to publishing would be hardly fruitful, because the same cycle would apply to the next version. All of this means that we will not try to defend all the points we have made as cast in stone. Nor are we simply acknowledging the comments as potential weaknesses to our proposals. Rather, we enjoy the luxury of highly qualified colleagues willing to give deep comments on our writings and take all of these as relevant input for our present and future thinking.

In the commentaries, a large number of issues have been raised, and it would take another article to deal with all of them in detail. Therefore, we will limit our focus to some issues that emerged in several of the commentaries. The main issues are:

- the relation between cognitive and social factors in SLA
- the role of innate language features
- redefining variation
- formal and informal modelling
- old thinking and new terms

The relation between cognitive and social factors in SLA

Several commentators discuss the relation between cognitive and social factors in SLA. While acknowledging the relevance of many Socio-cultural Theory (SCT) notions for our thinking about a DST approach to SLA, and accepting the interesting links between SCT and DST as evidenced in the work by Van Geert, we disagree with Lantolf that SCT can claim to be equally encompassing in describing and explaining both social and cognitive aspects of SLA. Following Vygotsky, Lantolf notes that "human mental activity emerges as a result of the internalization of social relationships, culturally organized activity and symbolic and physical artifacts, in particular language" (p. 31), but what the mechanisms are for language processing and learning is unclear. Although the actual interaction between the social and the cognitive is better developed in SCT than in DST, this is more a point of work to be done than a fundamental weakness of the DST approach. It is our claim that while we are still far from a detailed account of how a DST approach can model and explain the ongoing processes of language development and change, DST will provide a more powerful formalization of such processes than SCT.

Another issue related to this is the link between the social and the cognitive, or, to use Lantolf's (p. 32) terms: Is cognition only in the head? In our contribution we point out, though only in passing, that we see cognition as embedded, situated and shared. This follows from the embeddedness and interconnectedness of systems. In a DST perspective, the cognitive system interacts with the environment (social and cultural) and development results from an interaction of characteristics of the cognitive system as represented in the head and the environment. Lantolf's formulation "the environment is the source of development" (p. 32) seems to make the environment the sole source of development. In a dynamic system the reorganization in internal knowledge is also seen as contributing to development.

https://doi.org/10.1017/S1366728906002811 Published online by Cambridge University Press

Inevitably, this line of thinking leads to deeper and more philosophical questions: the whole concept of "self" is based on the idea that there is a subsystem in the universe that we might call the individual self. What the boundaries of that system are is not so clear. Physical boundaries like the skin are not absolute boundaries, since we interact at many levels with our environment. In a complete vacuum our skin would be of little value. Also at the cognitive level no clear boundaries can be defined, and it might be argued that the degree of selfness is in itself situated, but this is clearly beyond the scope of the present contribution.

The role of innate language features

Both Ionin and Liceras comment on our views on UG and innate aspects of language. They rightly point out that we seem to be biased towards an emergentist position. It is true that several leading researchers working on DST and language development such as Thelen and Smith, and Ellis take an emergentist view, but others, such as Larsen-Freeman and Van Geert, take the position that some form of UG may play a role. A paper recently presented by Plaza Pust at the Language Learning Round Table on Dynamic Aspects of Language Development (Plaza Pust 2006) has shown that DST and UG can be compatible. She shows, as Larsen Freeman also suggested in her 1997 article, how dynamic systems principles can be commensurate with notions in UG: "Parameter settings, it seems, are the 'attractors' in grammars in that they exert a magnetic appeal for the grammatical system, seemingly pulling it toward them. Unstable states in the development of grammars reveal that

- variation is an integral part of the processes that underlie change
- the range of variation is delimited – there is order in the apparent chaos!"

We would like to reposition ourselves by taking an agnostic view: for language development to take place, UG is not necessary, but it may well be possible that there are aspects of human cognition, social behaviour, and interaction with the environment that help bring about common or universal features in language. However, this does not automatically mean that language, and grammar or syntax specifically, is innate.

Ionin further argues that UG-based models of SLA are concerned with phenomena like reflexive binding, article semantics and question formation. She then continues by saying: "It is not at all clear how social and cognitive factors influence the acquisition of these phenomena on a specific level" (p. 28). We disagree. For instance, research on the acquisition of English articles by South-Asian ESL students has shown that cultural, experiential, and cognitive factors play a crucial role in acquisition (Thu, 2005). And as long as in UG grammar and syntax are considered as autonomous and closed systems, this is by definition incompatible with a DST perspective.

Yet, as Ellis points out, we do need to have an explanation for universals in language acquisition. With so many variables playing a role in first and second language acquisition, language development could easily lead to totally random behaviour, but it doesn't. There are clear universal tendencies. At the same time, language development is not fully predictable. As we just mentioned, the explanation for commonalities in language development must lie either in characteristics of human communication (a spoken language with only voiceless consonants and no vowels will have limited communicative power) or in characteristics of the cognitive system (processing capacity, perception, memory resources, or the interaction between these).

Redefining variation

Most of the commentators seem to agree that DST and the tools developed in that framework are relevant for our understanding of variation in SLA. Lantolf sees the recognition of inter-individual variation as the most important contribution of DST and also draws the most far-reaching conclusions:

> at the group level, L2 development may appear to be gradual, even and to pass through developmental sequences, in the domain of the individual it manifests a great deal of variation and instability. This clearly represents a profound challenge to one of the most widely held views within the information-processing approach to SLA and its experimentally grounded research which statistically averages out the variable performance of individuals. (p. 32)

Indeed, what a DST perspective has to offer is that by looking at the patterns of variation in different sub-systems of one individual, we may gain insight into the developmental process and discover pre-cursors and connected growers. However, this is not to say that we should ignore general trends that can help us discover different factors that may play a role in affecting change. While the balance may have been too much on the group level in many studies, we do not argue for a shift that limits our interest to individual data exclusively, but what is needed in our view is more longitudinal research aimed at gathering dense data on development.

Ellis argues that it is not enough to point out that there is individual variability: there are regularities and a theory of SLA should be able to explain them. He points (p. 24) to the meta analysis on morpheme orders by Goldschneider and DeKeyser (2001), which shows that a considerable part of the variation in accuracy can be explained by the cumulative effects of three factors:

https://doi.org/10.1017/S1366728906002811 Published online by Cambridge University Press

perceptual saliency, frequency and morpho-phonological regularity. Even though this analysis is useful in factoring out variables, what is missing from a DST perspective is how these variables interact over time. For example, Table 4 in the Goldschneider and DeKeyser article shows that there are fairly high correlations between the factors: the correlation between perceptual saliency and frequency is 62. From a DST perspective, the question would be what that high correlation between two of the explaining factors actually means. If language development is a dynamic process, it would mean that the interaction between the variables has changed and continues to change over time. What are the precursors and successors? It is possible that frequency is dependent on saliency? In that case, salient entities may be detected and processed first and then contribute to frequency of use. Similarly, morphophonological regularity may be dependent on saliency and frequency. Findings from this cross-sectional group data studies can be useful for longitudinal case. The factors discovered in the static data can be used to help model a more dynamic approach in which the changes in interactions of variables over time can be included and then tested against the data. In that sense the field of morpheme order studies may be worth a revival.

Three commentators, Ionin, Liceras and Pienemann, take issue with the fact that we failed to discuss relevant SLA research that deals with the shortcomings of the Dulay and Burt study. Pienemann points out (p. 44) that Meisel et al. (1981) argued that one has to distinguish between different groups of learners who may follow different paths on their way to their variety of the target language and that this process is non-linear, in that some new rules are acquired, others are dropped after a certain period of time, and some are changed. They argue that a complex mix of L1 characteristics, sociological and psychological factors interact with the acquisition process. In a sense, this study can be seen as an early example of the awareness of the dynamics of variation, though it is not cast in the terms now used in a DST approach.

Liceras suggests that we are not interested in the general findings from the morpheme order studies and that we ignore the fact that there are also linguistic explanations for the orders found. However, we used the morpheme order studies as an example to illustrate a "traditional" line of argumentation, rather than ignoring the progress that has been made in this field. After Dulay and Burt, much has been said about variation and some "grand sweep" order has now convincingly been demonstrated. Our point is that the focus on that order can show us the stages a process may go through, but not how these stages are reached. Similarly, Ionin's point that the focus is "no longer on particular sequences of acquisition, but rather on an understanding of the different linguistic factors that underlie the acquisition of specific morphemes" (p. 27) still focuses on linguistic factors only, while we argue that this is too small a scope to represent real language use and development.

Pienemann, in addition, points out (p. 44) that a great deal of work has been done previously on variation in SLA. As we have pointed out elsewhere (Verspoor, Lowie and van Dijk, 2006), the main differences between most SLA approaches to variation (including Tarone's) and DST is that SLA studies tend to see interlanguage as a fixed system and tend to focus on explaining or finding the causes of variation (such as the psychological processing constraints mentioned by Pienemann), whereas in a DST approach a system will never be fixed and it is not the possible causes but the degree of variability in itself (which may include systematic, free and unsystematic variation) that is taken as providing insight in the developmental process.

The one clear exception we are aware of is Ellis (1994), who looked at variation not so much to discover its systematicity, but to discover what variation could tell us about the developmental stages in the acquisition of the L2. After eliminating factors that would contribute to "systematic" variation, he argued that there was still some degree of "free" variation, variation that could not be attributed to any known linguistic, situational or psychological factor. For example, he pointed out that Cancino, Rosansky and Schumann (1978) found that their subjects made use of a variety of forms to express negation at each stage of their development. Ellis concludes as follows:

> A general finding of theses studies is that free variation occurs during an early stage of development and then disappears as learners develop better organized L2 system, a view of acquisition first put forward by Gatbonton (1978). (Ellis 1994, p. 137)

Ellis points out that such variation cannot be studied in data collected cross-sectionally from learners with different levels of proficiency because only individual case studies can show how a particular learner's behaviour changes over time in similar situations. It is this type of variation that we wish to look at in more depth from a DST perspective, which assumes that the degree of variation can tell us more about the developmental process. Periods of high variability are transitional phases and by examining when transitional phases occur for different sub-systems we can discover precursors, successors and connected growers in the developmental process.

As we have argued above, the point we wanted to make with the Dulay and Burt example is that group information may go at the expense of individual patterns, which are also worth studying in their own right to gain insight, not so much into developmental stages, but the process

https://doi.org/10.1017/S1366728906002811 Published online by Cambridge University Press

itself. However, given that several commentators have taken issue with what we said, we should have formulated this more clearly.

Formal and informal modelling

As Van Geert points out in his commentary, there is a possible tension between formal and informal dynamic systems models. "An informal model is one that applies certain dynamic systems properties by analogy or similarity" (p. 47). He gives the persistence of certain errors in SLA as an example of an attractor. The set of variables that lead to this attractor and their interaction is not known and cannot be formalized. With respect to formal modelling Van Geert poses the question whether we have enough information to set up the formal models and equations typical of DST: "Are formal models at all feasible in this highly complex domain of inquiry, second language acquisition? Do we know enough about the underlying processes of first and second language acquisition to specify and empirically test mathematical models?" (p. 48) His argument is that we do not need to know every detail to set up equations; the main point is to come up with a "combination of hypotheses that are more plausible than their alternatives" (p. 48). Van Geert knows how to make life look easy, but his own work shows that a thorough knowledge of the relevant literature and a body of more traditional empirical research is needed to generate such hypotheses with sufficient accuracy. This is in our view a crucial point, also stressed by Larsen-Freeman and Cameron in their presentation at the Language Learning Round Table meeting mentioned earlier: it is the interplay between traditional empirical research of various types and the development of formal models that will lead to a better understanding of the process of SLA.

Simulations showing change over time in an iterative process will contribute significantly to our understanding of various processes of language development (see, for instance, Meara's (2004) work on lexical networks). While simulations may be very enlightening in showing how iterative processes lead to change over time, we have to keep in mind that computer models are not theories. At the same time it is sometimes hard to argue against a computer model, because "Modellers become quite invested in their models and usually can account for most new data, if not through the central assumptions of the model then through tangential assumptions that have been conveniently added" (Cowan, 2003, p. 442). In a sense this is not yet an issue from our present perspective, because no such simulations have been done to test DST hypotheses on SLA.

Old thinking and new terms: dynamic and static

We all have our histories that are reflected in how we approach things new. It is difficult to part from one's own history and ways of thinking when entering a new arena. Despite our intentions to think in dynamic terms, we tend to relapse in using terms that don't fit anymore. Larsen-Freeman nicely points out that the expression "state of knowledge" is a case in point: "This static depiction is just one example of the lexical challenge researchers have when it comes to trying to reconceptualize SLA in dynamic terms, where old static divides such as that between performance and competence no longer obtain" (p. 36). This is one of many examples that could be addressed under this heading. In an earlier version of the article we had included a full section on the status of representations from a DST approach. Most psycholinguistic models are based on operations on static representations. One of the tenets of a DST approach to language is that use equals change, but as we have argued, even non-use may lead to change. That means that the element (word, phoneme, particle) that is activated at a given point in time is not exactly the same entity as the one activated earlier or later on, as the entity is bound to change as a result of its activation. How the selection mechanisms that are crucial in processing models can deal with such dynamic representations is unclear. It is even unclear to what extent the whole idea of "representations" can be fitted into a DST approach: what is it that is represented? A treatment of this issue is well beyond the present discussion, but the impact of a dynamic perspective on language use and language development on processing models is likely to resurface in the near future as one of the core issues to be solved.

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