J. Child Lang. 10 (1983), 589–603. Printed in Great Britain

Imitations, interactions, and language acquisition*

ELIZABETH LOTZ STINE AND
JOHN NEIL BOHANNON III
Georgia Institute of Technology

(*Received 20 April 1982*)

ABSTRACT

The precise function of imitation in children's speech is still debated. Two hypotheses have been offered that focus on either the progressive nature of imitation to aid in the language acquisition process or the social, conversational role played by imitation in discourse. Support for these positions was sought in the imitations within the speech of a single child at ages 2;8 and 3;0. Evidence is presented for both roles of imitation in language acquisition. First, imitation aids in limiting the complexity (MLU) of the language environment. The effects of imitation in this role are compared and contrasted to the effects of the child's productions of *what?* Also, forms may appear in imitation prior to their appearance in spontaneous speech. A model is proposed in which imitation and *what?*-responses are overlapping phases of language acquisition which occur prior to spontaneous production of a given form.

INTRODUCTION

The precise function of imitation in children's speech is still debated. Is it, as Moerk (1977) and Whitehurst & Vasta (1975) have suggested, a mechanism through which new forms are first introduced into the child's productive speech? Or is imitation used to maintain performance in conversation when competence is lacking (Clark 1974, Mayer & Valian 1977)? These roles may not be mutually exclusive over the course of language development, especially if imitation is broadly defined.

One of the main problems in researching the question of imitation in language acquisition is how the term has been defined. Whitehurst (1977: 120) considered three forms of imitation: (1) topographical, which is an exact point-to-point copy of the preceding utterance; (2) partial, in which the

[*] This research was sponsored in part by Emory University through a research grant to the second author. The authors would also like to thank Ken Brooks, Amye Warren-Leubecker, John Entreken and T. J. Dyer for their extensive help in reviewing volumes of transcripts.
Address for correspondence: J. N. Bohannon, School of Psychology, Georgia Institute of Technology, Atlanta, GA 30332, U.S.A.

response is some proper subset of the preceding utterance; and (3) selective, in which the imitation is controlled by the grammatical structure, i.e. the response has the same grammatical structure, but may describe completely new events or objects. The great variety of definitions of imitation in the literature has been observed by Snow (1981), who demonstrated that the way one defines imitation may affect the empirical data. From the same set of speech transcripts from one child, she recorded the number of exact imitations, reduced or partial imitations, and expanded imitations (the child expands or elaborates another's utterance). She found that the number of exact and reduced imitations decreased with age, and expanded imitations increased with age. Thus, expanded imitations seemed to reflect the child's growing competence with syntactic and semantic forms.

Both Snow (1981) and Clark (1974) argue for a relatively broad definition of imitation which includes both expanded and deferred imitative forms. This suggestion is rejected in the present study for several reasons. First, the further removed the 'imitated' form is spatially and temporally from its exemplar, the less reliable the identification of imitation becomes. Secondly, typical time-sampling methods yield less than complete records of any child's developing language behaviour. Despite Clark's (1977) argument that imitation may be deferred for several days from its model, it is difficult to assess the occurrence of such deferred forms without knowledge of all the intervening child utterances. Lastly, all of a child's language is clearly some form of observational learning, broadly construed. Every word and syntactic rule applied to those rules was acquired from exposure to the linguistic environment. At what point do we say an utterance is 'spontaneous' or 'imitated'? Such lines must be arbitrary, as Clark (1977: 355) has pointed out.

For the sake of capturing the role of imitation in the immediate social context of conversation, the present study relies on a more conservative definition of imitation than that of Snow or Clark. An utterance was defined as an imitation if it was a subset of an utterance used by another speaker (with preserved word order), and if it occurred in the child's next conversational turn. All other utterances were counted as spontaneous. Using this classification scheme, both the progressive and social functions of imitation may be considered.

The progressive function of imitation

The 'progressive' function of imitation refers to its putative role in facilitating semantic and/or syntactic learning in children's language development. An imitated form could be said to be progressive if it is more complex than the child's spontaneous speech. Such complexity may be estimated by longer mean length of utterance (MLU), the appearance of new grammatical forms, or new vocabulary items in imitations when compared to spontaneous speech.

Within the behaviourist tradition, Skinner (1957: 56) suggested that the establishment of echoic behaviour (imitation) is useful in the process of language acquisition because it allows the 'short-circuiting of the process of progressive approximations'. Whitehurst & Vasta (1975) also argued for the necessity of imitation, and described the acquisition of syntax with a comprehension–imitation–production (CIP) hypothesis. Accordingly, a child first 'comprehends' the structure, i.e. comes under the control of the relationship between the syntactic structure produced in the speech of adults and the stimuli in the environment which are correlated with the usage of that structure. Children then begin to use this structure in their own speech. Finally, spontaneous production occurs in the absence of any discernible imitative component. The comprehension and imitation stages are assumed to overlap, with adequate performance in one stage increasing the probability of adequate performance in the other. Thus, according to the CIP hypothesis, imitations serve a progressive function in language acquisition; i.e. grammatical forms appear in imitated speech prior to their appearance in spontaneous speech. Further, once these forms appear in spontaneous speech they will tend to disappear from imitated speech.

Clark (1977) argues, however, that children do not always comprehend what they imitate. This is certainly true in terms of the comprehension of novel words. Shipley, Smith & Gleitman (1969) found that children were more likely to repeat nonsense words than English words when both were embedded in familiar sentence frames. These results suggest that imitation is one strategy useful in exploring unknown semantic items. Clark also provides evidence that children do not fully comprehend the syntactic structure of their imitations. She notes Whitehurst & Vasta's (1975: 53) definition of comprehension as 'the adult structure having acquired discriminative control over the children's responses', but claims that the child's imitative behaviour is too abstract to be mere 'discriminative control'. Yet the level of abstraction which best describes imitation is an empirical question, not a rational one, and is addressed by the present study.

The present study argues for a CIP hypothesis that is syntactically defined. That is, an imitation should occur when children recognize the syntactic function of a particular form, but need more semantic processing for the attainment of competence. Imitation after comprehension of syntax, then, is a process which enhances encoding of the semantic function of the imitated form. A similar position is taken by Bloom, Hood & Lightbown (1974: 418), who suggest that imitation allows processing of information that is necessary for the 'representation of the linguistic schemes in cognitive memory'.

The social function of imitations

McTear (1978) discussed the possible social functions of children's imitations. He demonstrated that imitation is important in the development of speech roles in question/answer sequences. Repetition may also be used to indicate attention, maintain attention in discourse, or even function as a form of verbal play. Mayer & Valian (1977) proposed a social-conversation hypothesis which states that children imitate when they have no other response available. According to this hypothesis, children imitate in order to remain in the conversation and fulfil their conversational obligation. The present study suggests a social role of children's imitations that is not in discord with the above offerings. Imitations may serve as cues to modify the adult's speech directed to the imitating child, such that the children's linguistic environment is 'fine tuned' to the children's level of competence.

One of Chomsky's (1959) arguments against a behavioural analysis of children's speech is that empiricism fails to explain the regularity of language acquisition. Chomsky argued further that a nativist approach required just such uniformity in development. On the other hand, Hegde (1980: 22) pointed out that the source of these regularities could as easily be environmental:

> When language is viewed as something people do under given environmental circumstances, and when this action is viewed as having certain consequences, including changes in oneself and others, grammar will be demonstrated to be a minor aspect of language behavior. It is possible that the order and regularity seen in language behavior are generated by the orderly arrangement of the independent variables responsible for that behavior.

One of the 'independent' variables that has been shown to be almost as regular as the child's emerging language is the speech of adults addressed to children. It has been repeatedly demonstrated (e.g. Snow 1972) that speech to children differs markedly and consistently along several dimensions from speech addressed to adults. However, it is still unclear what precise features of conversation serve to control these speech adjustments.

The present study was derived from a series of interactions between a single child Nat (aged 2;8 and 3;0) and adults. Bohannon & Marquis (1977) have already reported some of these results, which will be briefly reviewed here. Nat's responses were divided into three categories: (1) SIGNALS OF COMPREHENSION consisting of affirmative responses, answers to questions, and continuation of the subject matter broached in a previous adult utterance; (2) SIGNALS OF NON-COMPREHENSION consisting of the absence of a response addressed to Nat, an inappropriate response, imitation and reduction, and responses such as *What?* or *Huh?*; and (3) all other responses, which were considered NEUTRAL. It was found that the probability of emission of a signal of comprehension varied inversely with the MLU of the preceding adult utterance. In other words, as adult MLU increased, the probability of Nat emitting a signal of comprehension decreased. This function, however, was not strictly decreasing. The probability of Nat comprehending decreased until the adult MLU reached 8; at an MLU of 9, the curve shows an abrupt rise, and then begins to fall steadily again. This abrupt rise, roughly at the theoretical limit of short-term memory, may have represented a point at which Nat altered his strategy of comprehension.

In summary, Bohannon & Marquis (1977) demonstrated that Nat differentially responded to differing MLUs (and probably differing levels of syntactic complexity) in adult speech. There are several questions that remain, however. Since imitation was grouped with other non-comprehension signals in the Bohannon & Marquis analysis, the precise function of imitation in the system could not be differentiated from the other signals. For the same reason, the features of the adult speech which prompted the use of imitation could not be described. The present examination of these interactions was to separate imitations from the other signals and explore the interactive and semantic characteristics of imitations as special cues in discourse and as a part of the process of language development.

METHOD

Subjects

Interactions were recorded between Nat and 21 adults (15 undergraduates, 5 graduates and Nat's mother). Twelve of these interactions took place when Nat was age 2;8 (MLU = 3·59); five took place when Nat was 3;0 (MLU = 3·73). Nat is the son of a college professor and a college graduate and is probably verbally precocious.

Equipment

All interactions were recorded on Realistic Super tape by means of a Realistic CTR-29 cassette deck. Interactions took place in Nat's home where play materials, e.g. blocks, stuffed animals and books were available.

Procedure

The students were given minimal instructions and simply told to converse with Nat and to try to engage him in conversation. The students were sent to Nat's home in seven teams of two students and two teams of three students. During each interaction one of the team members took contextual notes while the others interacted. The students were also accompanied by an assistant who operated the tape recorder. Interactions generally lasted about 15 minutes, with one group going for a full hour. The transcripts were checked against the tapes for accuracy by the mother.

RESULTS AND DISCUSSION

The present analysis is based upon 651 intelligible utterances by Nat at 2;8 and 392 utterances at 3;0. Of these utterances, 135 imitations were observed at 2;8 and 24 at 3;0. Thus, 8% of Nat's utterances were imitative at 2;8 and 6% at 3;0. Bloom *et al.* (1974) found that there were individual differences in the tendency to imitate, and that these differences were consistent across time. Nat's levels of imitation were comparable to those of the least imitative child in the Bloom *et al.* study. Because Nat was not an extremely imitative child, the following analysis is offered with the caveat that the sample of imitations is relatively small. Therefore conclusions are, of course, tentative.

Fig. 1 shows the MLU of uninterrupted clusters of adult utterances preceding and following two different signals of non-comprehension. The panel on the left shows the analysis of imitations. Both imitations and instances of *what?* are emitted from Nat following a rise in adult MLU over the average, again demonstrating the child's sensitivity to adult sentence complexity (as estimated by MLU).

The subsequent effect of these signals on the length of adult utterances is quite different, however. After emission of *what?*, adult MLU drops slightly and then continues to drop as discourse proceeds. The adult response to imitation, on the other hand, was an immediate drop of almost two morphemes followed by a climb to a higher MLU than was produced before the imitation was emitted. It may be noted that imitation seemed to control the complexity

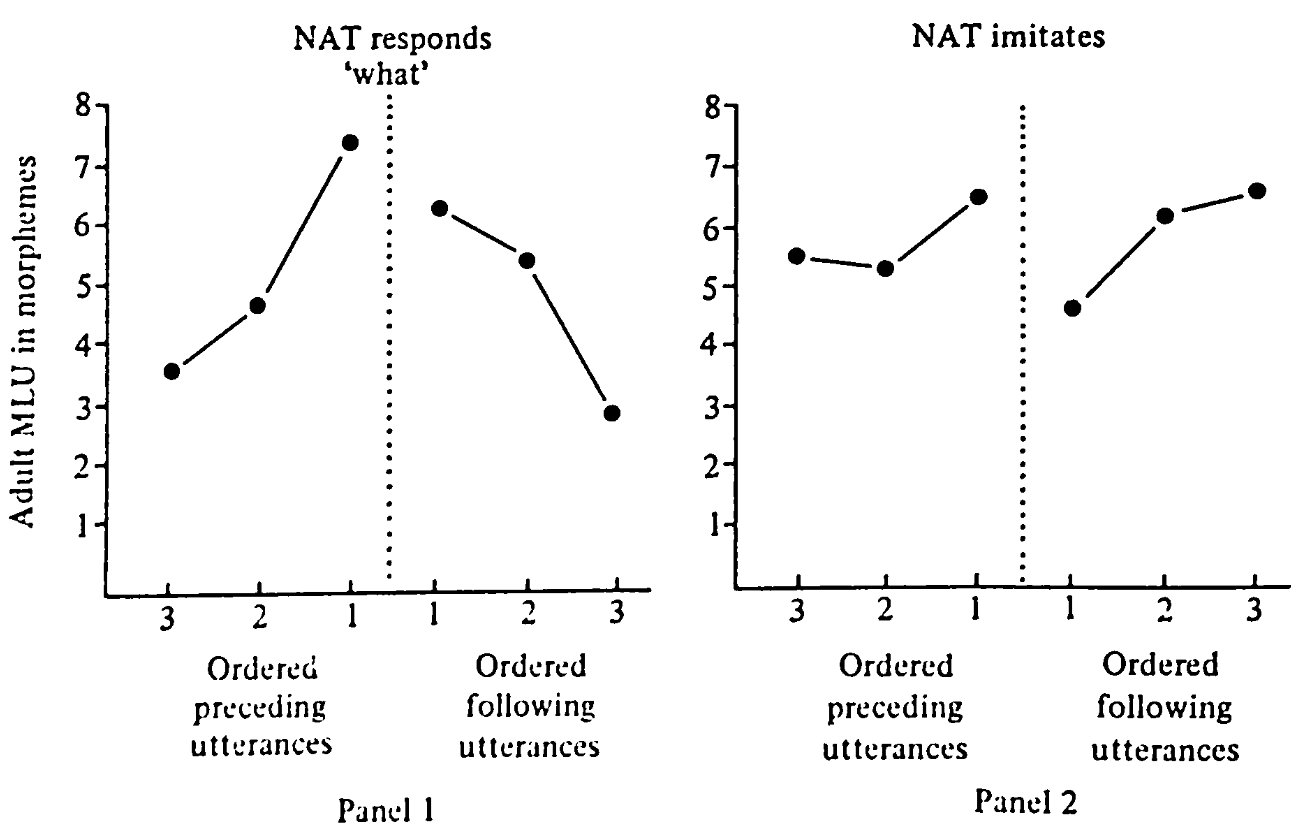

Fig. 1. Adult MLU preceding and following Nat's *what?*s and imitations.

of adult speech with much tighter limits than did the *what?* response. The application of Garvey's contingent query proves useful here.

Garvey (1977, 1978: 3), in the tradition of Searle (1969), has analysed the sequential and functional relationships in discourse by looking specifically at the 'contingent query'. A contingent query was defined as

> a jointly produced modular component that may occur at any point within a discourse. It is jointly produced in that a minimum of two speakers construct it... Its privilege of occurrence within discourse is... unlimited, i.e., there are no restrictions on the utterance content or speech act which it may interrupt. It is generally embedded, in the sense that the query and its response can often be excised leaving the sequence in which it is embedded structurally and semantically intact.

The contingent query is composed of a 'selectivity function', the 'query proper' and a 'determining function'. The selectivity function is a specification of the utterance which begins the sequence. A query that is contingent on the precision of the selectivity function occurs next in the sequence. The response which follows the query proper (the determining function) may be controlled by very subtle properties of the query proper.

In Garvey's scheme the query may be a demand for repetition, confirmation, specification or elaboration. In this context, Nat's production of *what?* is an obvious example of a contingent query. In so far as the essence of the query is its function as a demand for repair, the imitation may also be analysed in this way. The point to be noted here is that the query proper exerts control not only over the immediately following determining function, but also on the discourse as it progresses. Thus a *what?* may be viewed as a demand for general simplification. An imitation, on the other hand, signals that immediate simplification is required, but that the discourse may proceed. In fact, this is the exact reflection of the data displayed in Fig. 1. It seems that imitation signals some comprehension, or at least attention, on Nat's part. Perhaps, then, an imitation may be aptly labelled a 'signal of partial non-comprehension'.

The qualitative similarities and differences between the functions of *what?* and imitations may be evaluated in the responses they evoke from adults. Table 1 describes the kinds of response adults gave to Nat's imitations and queries. The categories of adult responses are defined as follows: AFFIRMATION occurred when the adult expressed agreement, e.g. *Right*, *O.K.* A REPETITION consisted of all or a subset of the utterance prior to the *what?* or imitation. A REPHRASING was similar to a repetition in that no new information was added, but the arrangement of the words was modified or some redundant phrase was added. An ELABORATION, however, added new information to the utterance prior to the *what?* or imitation. A CHANGE OF TOPIC occurred when the content of the utterance prior to the *what?* or imitation was not addressed

TABLE 1. *Relative proportions of adult response types to Nat's imitations and 'What?' responses*

	Imitations			'What?'s		
	2:8 $N = 135$	3;0 $N = 34$	Overall $N = 159$	2;8 $N = 86$	3;0 $N = 16$	Overall $N = 102$
Affirms	22	13	21	0	0	0
Repeats	13	8	12	19	6	17
Rephrases	5	8	5	38	82	45
Elaborates	14	13	14	18	6	16
Changes topic	15	8	14	8	0	7
Answers question	14	25	16	0	0	0
Nat continues	15	25	16	6	0	5
Specification	0	0	0	4	0	3
Unclassified	2	0	2	7	6	7

in the following utterance. Sometimes when the adult asked Nat a question and was met with a *what?* or an imitation, the answer would be supplied by the adult, i.e. the QUESTION WAS ANSWERED. If the utterance following a query was produced by Nat, this was classified as NAT CONTINUING. The SPECIFICATION category contained utterances which made a general attention-getter more specific, e.g.

A[1]: Hey Nat!
N: What?
A: Look at this.

Utterances were not classified if the tape was inaudible, or in such awkward sequences as the following:

N: What?
A: Hmm?
N: Hmm?
A: What?

The two authors independently classified a subset of those utterances used for this analysis. Initially, there were 14 disagreements out of 126 classifications (i.e. 89% agreement). A subsequent discussion of category placement produced agreement in every case. These final category placements were used for the final analysis. Note that there is a great deal of overlap between the kinds of responses given both to instances of *what?* and to imitations. The probability of a given type occurring, however, varies with the class of the query proper.

[1] Where discourse is reported, N = Nat, M = Mother, and A = Adult other than Nat's mother.

From Table 1 it can be seen that adults tend to affirm imitations, something that never happened in our sample of occurrences of *what?* Also, with imitations, adults may answer their own question; this never happens in response to a *what?* If a question to Nat was met with an imitation, there was a much greater chance that the question would be rephrased. Certainly, this has its pedagogical advantages. If children cannot meet the demands in discourse by answering a question, they are given a rephrasing of the question so that they may try again with another form which is perhaps more familiar. If children can perhaps demonstrate some comprehension, then they are helped out by being given a complete answer. Another point to be noted about imitations is that Nat was much more likely to continue speaking following his imitation than he was after producing a *what?*, thus suggesting that the imitation is not always a demand for repair. In such a case it may be assumed that Nat understood enough of the conversation to continue his participation. This function of the imitation to indicate at least partial comprehension is again seen in the adult's greater tendency to change the topic of conversation following an imitation.

Adults repeated and elaborated an equal proportion of the times to imitations and instances of *what?* One curious point here is the tendency for adults to elaborate following a *what?* If the *what?* is a signal of general non-comprehension, then why would the adult add new information? It may have been that adults added new information to what was said before, but old information relative to what Nat knew. Thus this new information may have provided Nat with 'hints' of how to approach an answer. It may have been an attempt to embellish a prior adult utterance with enough detail to make the statement more specific. Intuitively, it seems that these responses are designed to bring the original statement closer to the child's own phenomenal field. Consider the following examples, noting the use of indexical utterances to direct Nat's attention, and the tendency to be more concrete in the determining function:

A: Let's see. We could put that one on top.
N: What?
A: Right there and make it look like a roof – the top of a house.

M: Looked out of the airplane.
N: What?
M: You looked out of the airplane and saw the moon and the clouds.

A: Try the other one.
N: What?
A: Over there.

A: They're not going to fit.
N: What?
A: There's too many people in that truck! Do you think they'll all fit?

TABLE 2. *Classification of imitations*

Types of imitation	2;8 No.	%	MLU (A)	MLU (N)	3;0 No.	%	MLU (A)	MLU (N)
Lexical	52	38·5	4·33	2·18	8	33·3	2·63	1·86
DO questions	15	11·1	5·27	2·67	2	8·3	6·50	6·00
Noun clauses	18	13·4	8·28	4·33	1	4·2	8·00	6·00
Adverbial clauses	5	3·7	16·80	6·80	0	0·0	—	—
Adjectival clauses	0	0·0	—	—	2	8·3	16·50	4·00
DO+Noun clause	6	4·4	10·17	6·00	0	0·0	—	—
Indexical	6	4·4	4·83	3·67	0	0·0	—	—
Unclassified	30	24·5	6·18	3·73	11	45·8	7·55	5·45
Total	135	100·0	6·13	3·02	24	100·0	6·55	4·13

Given that the child's language is a controlling variable of adult production, the other side of the system may be examined: what are the features of adult utterances that control the production of Nat's *what?* and imitations? Table 2 shows a formal classification of Nat's imitations. These categories may be defined as follows. A LEXICAL imitation occurred when Nat imitated a noun plus its modifiers or a deictic. A word was judged to be a noun if it referred to a person, place or thing, or if it occupied a noun position in the sentence. A DO-QUESTION is a question which contained an inflected form of *do*, a subject, and a predicate. The definitions of NOUN CLAUSE, ADVERBIAL CLAUSE and ADJECTIVAL CLAUSE follow standard grammatical definitions. The distinction between the DO-QUESTION category and the DO+NOUN CLAUSE category rests on the portion of the sentence which Nat imitated. Consider the following examples:

A: Do you know what he does at school every day?
N: What he does at school.

A: What's he doing there? Do you know what he's doing there?
N: Know what he doing there?

The first example was grouped with noun clauses since only that part of the sentence was imitated. However, the second one was classified as DO+noun clause because the verb of the question was lifted as well as the subordinate clause. INDEXICAL imitations were 'pointing utterances', e.g.

A: What else about the house. Look, look.
N: Look, look. Childwa.

One striking result is the high percentage of imitations which are lexical. This indicates that one thing that controls Nat's production of imitations is the noun quality of the model utterance. This is particularly interesting in the following example:

N: Where sk-sk-sky?
A: Sky's up there somewhere uh-uh-up. Always look for the sky up. Never can fail.
N: Sky up-p.
M: What colour's the sky?
N: Blue.
A: That's right. That's right.

In this student's attempt to tell Nat where the sky is, *sky up* is used in a noun position of the sentence. Nat promptly imitates. This is the only example of a lexical imitation which is not clearly a noun, but it is a compelling example in that it perhaps indicates the processes through which such a large number of imitations came to be nouns. Nat used the grammatical context of the sentence to isolate objects to which, according to the data just discussed, the adult would respond. This interpretation is further supported by the number of noun clauses imitated by Nat (see Table 2).

Approximately the same proportion of imitations were lexical at both ages. At 2;8 Nat tended to imitate DO-questions, noun clauses, adverbial clauses and indexical utterances. At 3;0 Nat was no longer imitating adverbial clauses or the DO-questions with noun clauses intact, or indexical utterances. Yet he did imitate a couple of adjective clauses. Here the issue of progressiveness may be addressed by looking at the MLU of Nat's imitations. If the MLU for Nat's imitations as a category (3·02 at 2;8; 4·13 at 3;0) is compared to Nat's overall MLU (3·59 at 2;8; 3·73 at 3;0), it may be concluded that Nat's imitations are probably not more complex than his spontaneous speech. The authors realize that MLU is not a perfect measure of complexity, yet the correlation between MLU and other measures is quite high and it will serve for the purposes of the present study.

However, as was discussed earlier in this paper, imitation may serve different functions, depending on its form. For example, lexical imitations were less complex as measured by MLU. But when Nat imitated adverbial clauses, for instance, the utterances he produced were nearly twice as long as his overall MLU. In this example is seen the importance of a flexible set of criteria for progressiveness. Lexical imitations were separately coded and analysed. Of the 52 tokens of lexical imitations at 2;8, there were 42 types. Eight of these were names of the students to which Nat had just been introduced, and four more of these were the names of people in photographs shown by one of the students. So, clearly, over a quarter of the lexical imitations are the names of novel objects. Furthermore, 16 of the lexical imitations Nat also used spontaneously in his productive speech. So Nat demonstrated mastery for nearly a third of these imitations. At 3;0 the seven types consisted of four storybook characters, 'Santa', and two nouns which Nat subsequently used spontaneously, but only when first emitted by someone else. One of these occurred while a student and Nat were building boats, and provides an amusing, but enlightening example.

A: That's a wild boat!
N: You, you make a wild boat!
A: I'll make a wild boat, too. Let's see.
N: *Wild boat.* I need a blue one for my wild, my wild boat.
A: O.K. We're gonna make one like this.
M: Hey Nat, you know what a wild boat is?
N: Wha, wha a wild boat is, Mommy?
M: What do you think it is?
N: It's a ferry boat?

It may be concluded that the form we have identified as 'lexical' may sometimes be in advance of spontaneous production and hence sometimes serves a function in acquisition of vocabulary items. However, this form is not a reliable indicator of such a function.

An attempt to classify the utterances to which Nat responded with *what?* in the same fashion as the classification of imitations in Table 2 produced little success. At 2;8, 67·1 % of the 79 classifiable utterances remained unclassified; at 3;0 this percentage was 42·9. Especially at 2;8, it is evident that the substance of the specifying function for imitations and *what?* can be different. The question of progressiveness may be examined in Table 3. The first half of this table shows Nat's responses to four of the remaining structures. The second part of this table shows the number and quality of these structures produced by Nat relative to his total production.

TABLE 3. *Nat's responses to and productions of imitated forms*

	DO ques.		Noun cl.		Adj. cl.		Adv. cl.	
	2;8	3;0	2;8	3;0	2;8	3;0	2;8	3;0
Imitated (% of adult total)	10·2	4·5	15·5	2·2	0·0	25·0	6·7	0·0
What? (% of adult total)	6·3	6·7	2·8	0·0	4·5	12·5	2·7	8·3
Answers correctly (% of adult total)	55·1	57·8	37·4	47·8	27·3	25·0	37·3	29·1
Percentage of Nat's utterances	0·71	1·50	0·66	0·26	0·30	0·77	0·42	1·30
Complete construction	0·12	1·50	0·30	0·26	0·06	0·77	0·42	1·30
Incomplete construction	0·59	0·00	0·36	0·00	0·24	0·00	0·00	0·00

Using these measures, the following observation may be made with regard to change over age. (1) Imitation of the DO-questions, noun clauses and adverbial clauses dropped in relative frequency, while imitations of adjective clauses increased. (2) *What?* responses to the modifier clauses increased; those to noun clauses decreased; those to DO-questions remained unchanged. (3) Nat was more likely to respond appropriately at 3;0 to DO-questions and noun clauses, and less likely to respond appropriately to adverbial and adjectival clauses at 3;0. (4) Nat's usage of these structures relative to total production increased for all but noun clauses, which decreased. (5) Among these spontaneous productions, the percentage of complete constructions increased in frequency for all but the noun clauses, which remained unchanged.

These trends may be summarized by a model with the following assumptions. Comprehension and production are separable but interacting processes, which rise from a zero point over age. Comprehension is measurable by appropriate responses to a given form; i.e the form in question becomes effective as a discriminative stimulus. Production with respect to this form includes three overlapping phrases: (1) *what?* production, (2) imitation production to that form in the linguistic environment, and (3) spontaneous production. The probabilities of *what?* and imitation production increase to distinct peaks and then decline to some asymptote value, with the increase in *what?* productions preceding that of imitation. The capacity for spontaneous production increases as the probability of *what?* and imitative responses decline. These probabilities are relative to the total production of

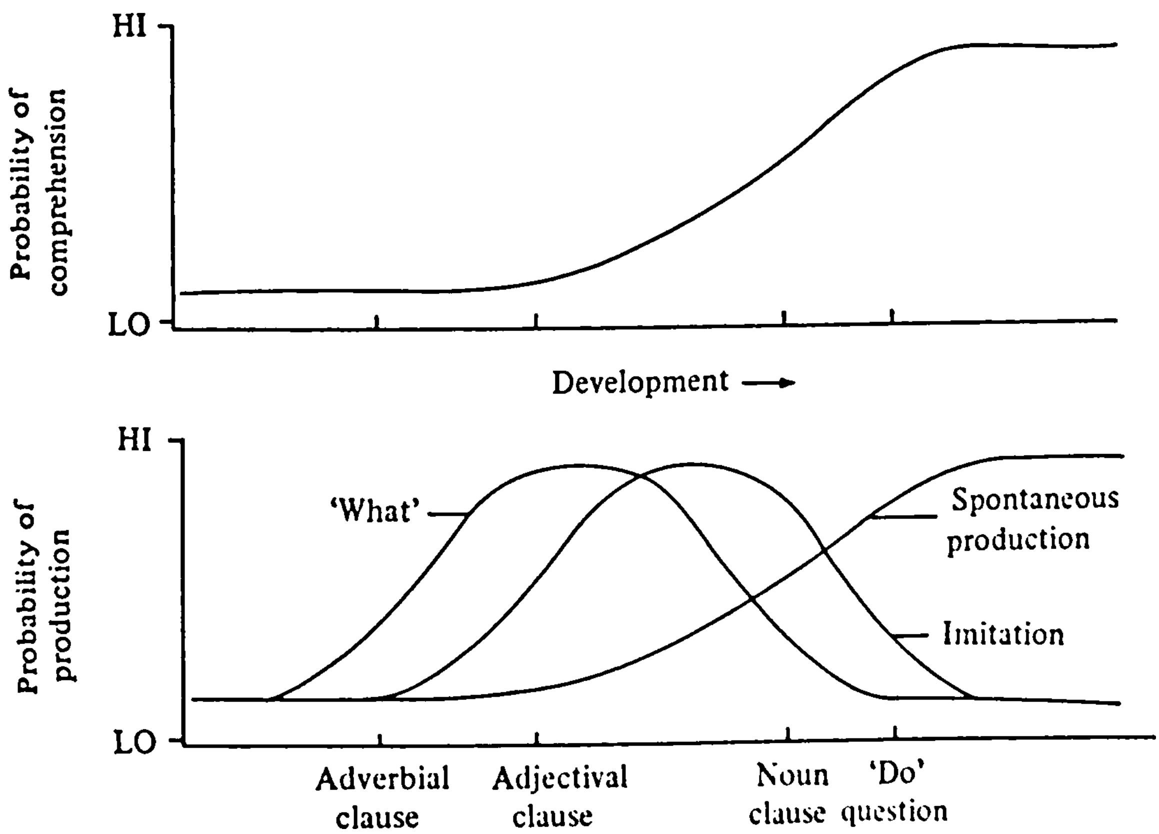

Fig. 2. Model of comprehension and production of various syntactic forms.

the given form (noun clause, copula, etc.) such that it is not assumed that the frequency of these different kinds of responses can be legitimately compared. Further, it is assumed that the overlap of these phases may vary with the form. Fig. 2 shows this model as it is applied to the data obtained on four of the forms studied here. The intervals along the X-axis represent the points in time at which we caught Nat in his development through the sequence. The reader may wish to check this figure against Table 3 to verify that all of the data are accounted for, except for three points. (1) For noun clauses, the quality of the spontaneous production increased (i.e. there were fewer incomplete constructions), but the quantity of spontaneously produced noun clauses decreased. With respect to adverbial clauses at 3;0, Nat was (2) less likely to respond appropriately and (3) less likely to imitate. The first point may be indicative of an independence of quantity and quality of spontaneous responses. With more data, this model, might be revised to incorporate two curves of spontaneous production, one for each. The data here, however, do not support such a revision.

CONCLUSIONS

It has been demonstrated that imitations and *what?* are response classes emitted by the child that both exert an effect upon and are correlated with features of the linguistic environment of the child. Production of imitations and *what?* are to some extent differentially paralleled by the MLU progression of the ongoing discourse, and have different effects on this progression. Further, these forms are differentially controlled by the grammatical cues in the discourse. Imitations seem to be related to the 'nounness' of the preceding utterance to a greater extent than do productions of *what?* A model has been proposed in which imitation and *what?* responses are overlapping phases of language acquisition which begin prior to spontaneous production of the given form.

REFERENCES

Bloom, L., Hood, P. & Lightbown, P. (1974). Imitation in language development: if, when, and why? *CogPsychol* 6. 380–420.

Bohannon, J. N. & Marquis, A. (1977). Children's control of adult's speech. *ChDev* 48. 1002–8.

Chomsky, N. (1959). Review of *Verbal Behavior* by B. F. Skinner. *Lg* 35. 26–58.

Clark, R. (1974). Performing without competence. *JChLang* 1. 1–10.

—— (1977). What's the use of imitation. *JChLang* 4. 341–58.

Foppa, K. (1978). Language acquisition: a human ethological problem? *Social Science Information* 17. 93–106.

Garvey, C. (1977). The contingent query: a dependent act in conversation. In M. Lewis & L. A. Rosenblum (eds), *Interaction, conversation, and the development of language*. New York: Wiley.

—— (1978). Contingent queries and their relations in discourse. In E. O. Keenan (ed.), *Studies in linguistic pragmatics*. New York: Academic Press.

Hegde, M. N. (1980). Issues in the study and explanation of language behavior. *JPsycholingRes* 9. 1–22.
Mayer, J. & Valian, V. (1977). When do children imitate? When imitate? When necessary. Paper presented at the Boston University Conference on Language Acquisition, Boston, October.
McTear, M. F. (1978). Repetition in child language: imitation or creation. In R. Campbell & P. Smith (eds), *Recent advances in the psychology of language*. New York: Plenum.
Moerk, E. (1977). Processes and products of imitation: additional evidence that imitation is progressive. *JPsycholingRes* 6. 187–202.
Searle, J. R. (1969). *Speech acts : an essay in the philosophy of language*. Cambridge: Cambridge University Press.
Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.
Shipley, E., Smith, C. & Gleitman, L. (1969). A study of the acquisition of language: free responses to commands. *Lg* 8. 322–42.
Snow, C. (1972). Mother's speech to children. *ChDev* 43. 549–69.
—— (1981). The uses of imitation. *JChLang* 8. 205–8.
Whitehurst, G. J. (1977). Imitation, response novelty, and language acquisition. In B. C. Etzel, J. M. LeBlanc & D. M. Baer (eds), *New developments in behavioral research : theory, method and application*. Hillsdale: Erlbaum.
Whitehurst, G. J. & Vasta, R. (1975). Is language acquired through imitation? *JPsycholingRes* 4. 37–59