Bickerton's Bioprogram Theory: Its Basis and Implications in Acquisition Theory

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In the past few decades, a great deal of emphasis has been placed on language acquisition theory and research. A wide variety of theories have arisen, the two principal viewpoints being nativist and behaviorist. Research in the field has been conducted at the very least with these theories in mind, and usually with the intent to support or disprove them.

This paper will briefly outline some of the major theories and research in the field, then present a new theory and discuss its merits and implications.

Since 1957, when Chomsky published *Syntactic Structures*, language acquisition studies have taken a new direction. Chomsky's claim is that children are born with a specific innate language-learning capacity, and that they learn language by setting up hypothetical rules of grammar and matching these rules against what they hear. They eventually deduce the correct rules and speak grammatically. Thus, as the child is developing in language, he will acquire the simpler rules first, because those will be easiest to deduce. Two arguments Chomsky used to support his theory are: 1) language is too complex to be learned so quickly without some sort of innate mechanism to help the child make the correct hypotheses; and 2) adult speech is such a mess—we speak in sentence fragments, change subjects in the middle of a sentence, etc.—that it would be nearly impossible for a child to deduce any consistent rules based on such degenerate input.

Many linguists designed studies intended to support Chomsky's theory. Others, who espoused a more environmentalist or behaviorist point of view, set out to disprove it.

Roger Brown attempted to determine the order of acquisition of grammatical features in children. Brown immediately ran into problems: he found that children do not acquire features in a straightforward manner, as Chomsky's idealization of "instantaneous acquisition" would suggest. They do not instantly acquire a grammatical feature overnight, nor do they gradually and steadily improve until they have acquired it. Rather, they vacillate back and forth between a high and low percentage of correct usage, then finally they level off at or near 100 percent correct usage in appropriate situations. Brown resolved the problem by setting an arbitrary standard. If the feature is used 90 percent of the time in obligatory contexts, it has been, by Brown's standard, acquired. Thus he was able to list the order of acquisition of grammatical features.

He found the order to be more or less universal (at least for his sample of three children), but he also found it difficult to determine whether simpler rules were acquired first. The reason is that it is difficult
to determine the criteria which define grammatical simplicity or complexity. Grammatical complexity alone (based on Chomskian theory—number of optional transformations in the derivation determines the relative complexity of it) did not determine the order of acquisition. Yet Brown still felt that grammatical complexity must be an important determinant of the order of acquisition. He believed that modifications of the criteria which define grammatical complexity on Chomsky's grammar are required before the relationship between grammatical complexity and order of acquisition can be revealed. He does not, for example, "simply count the number of optional transformations in a derivation, or any other feature of a derivation, since this procedure involves the generally unwarranted assumption that any one transformation, or some other feature, involves the same increment to complexity of knowledge as any other... we are not prepared to assume equality of units." Brown believes that other factors, such as semantic complexity, frequency (number of times adults use a feature when talking to the children), and perceptual salience (phonetic substance, stress level, usual serial position in a sentence, etc.) also play a determining role.

In 1970, he researched the influence that caretakers have in children's acquisition of morphemes. He found that parents not only do not correct errors in verb forms, plurals, etc., but in fact, they pay little or no attention to grammatical errors. His conclusion was that it is the "truth value rather than syntactic well-formedness that chiefly governs explicit verbal reinforcement by parents." Brown's next step was to determine if there be a high correlation between the frequency with which parents use the forms and the order in which they are acquired (Brown 1973). He found a very low correlation. Thus he concludes that although "a marginal role for frequency is guaranteed [because] children cannot learn what they never hear,... there is no evidence whatever that frequency of any sort is a significant determinant of order of acquisition." Although Brown's research concerning perceptual salience has been much less extensive, he maintains that "as in the case of frequency, some role for salience is guaranteed; the child will not learn what he cannot hear." Semantic and grammatical complexity, then, are what Brown considers to be the major determinants, while the other two (frequency and salience) play a more minor role in determining the order of acquisition.

Brown's research has had a large impact on acquisition theory. For instance, behaviorists such as Staats (who believe that children learn language in the same way any other behavior is learned—through classical conditioning principles) have, in light of Brown's data, had trouble demonstrating that children imitate adult speech patterns.

Other research which has been conducted with Chomskian theory in mind concerns caretaker speech, or "motherese." This has been studied extensively, and the consensus is that the input children receive is far from degenerate. Snow (1979) states: "Chomsky's position regarding the unimportance of the linguistic input was unproven, since all children receive a simplified, well-formed, and redundant corpus." Some
researchers (e.g., Furrow, Nelson and Benedict, 1978) have found correlations between caretaker speech and the output of children. It was discovered that caretakers simplify their speech to a level just higher than that of their children \((L + 1)\). Some (Bruner, 1979) believe that this correlation can be interpreted as a cause-effect relationship, and that "parents teach their children to speak." In light of Brown's data, however, and also in light of the fact that even when corrected, children seem to hear adults' speech in their own terms of understanding, rather than the particular grammatical form used by their parents, it is not clear to what extent a cause-effect relationship can be inferred from the correlations found by Furrow, Nelson and Benedict.

As time has passed, it has become more and more clear that at least some of Chomsky's basic assumptions are incorrect. Though few researchers would say that there is no innate mechanism to aid in language learning, most have begun to downplay innate mechanism, as if because Chomsky's specific representation of acquisition was inaccurate, then any nativist viewpoint must be on the wrong track. Halliday (1975), however, points out that

There seems to be no necessary connection between these [nativist and environmentalist representations of language acquisition] as general positions and the particular models of the processes involved in the learning of linguistic structure that have been most closely associated with them. The nativist view lays more stress on a specific innate language-learning capacity; it does not follow from this that the child necessarily learns by setting up hypothetical rules of grammar . . . , but there has been a widely-held interpretation along these lines. Environmentalist views, by contrast, emphasize the aspect of language learning that relates to other learning tasks, and stress its dependence on environmental conditions; again, this is often assumed to imply an associationist, stimulus-response model of the learning process, although there is no essential connection between the two."10

The emphasis on the acquisition of syntax which has been associated with the Chomskian era has also faded, and recent studies show increasing interest in other facets of language such as phonology, semantics, and pragmatics, studied from many different angles.

Halliday, for instance, recognizes the sociological factors related to language acquisition. He takes a "functional" approach to language learning. He sees the learning of language as a process of interaction between the child and other human beings. As the child develops, the definition of "function" changes to meet that of the adult world. Halliday describes all of the child's stages in language development (from no grammar at all to highly advanced and abstract adult language) in terms of function. He goes so far as to conclude that language occupies the "central role in the processes of social learning."11

Eve Clark's study of semantics has also had a large impact on acquisition theory in recent years. Her interest is in how words are used to refer to or represent external objects or events appropriately. This differs somewhat from the approach of Slobin and Brown, who concentrate
on "semantic functions" of words in utterances. Clark's theory, which she calls the Semantic Features Hypothesis, is that when a child first begins to use identifiable words, he does not know their full (adult) meaning: "He only has partial entries for them in his lexicon, such that these partial entries correspond in some way to some of the features or components of meaning that would be present in the entries for the same words in the adult lexicon." Clark's theory is clear and she presents it well. But she herself admits that it does not answer the main question of semantics. Her theory assumes that "the meanings of words can be broken down into some combination of units of meaning smaller than that represented by the word. She calls these units features. The main question in semantics, according to Clark, is: "What is a feature? And its corollary: Does the child use the same features as the adult? In an ideal world where we knew what the universal semantic primitives were, we could assume these would be used by both child and adult. However, we are not in a position at present, theoretically or empirically, to (a) identify the set of universal semantic primitives postulated by Postal and Beirwisch, or (b) claim that these primitives are what the child uses when he first attaches some meaning to a word." Clearly, a great deal remains to be done in the field of semantics.

Since language acquisition has been studied from most every perspective in recent years (social, cognitive, psychological, etc.), many "acquisition strategies" have been identified. (Acquisition strategies are social or cognitive methods the child uses to decipher his environment.) Each perspective has uncovered different strategies, and it appears that the child could use all of these strategies as he attempts to learn language.

Certainly the field of language acquisition has advanced in many areas over the past 25 years. No acquisitionist would say that all the questions concerning child language development have been answered, but most in the field believe it has progressed. As Moskowitz puts it, "In general a great deal of progress has been made in understanding child language . . . the study of language acquisition has come of age." There is at least one linguist, however, who does not totally agree with this viewpoint. Derek Bickerton, the author of Roots of Language (1981) feels that acquisitionists have been sidetracked and are still missing the point. This section will present Bickerton's reasoning and point out the problems he finds with recent acquisition studies.

Bickerton's viewpoint stems from his thorough study of creole languages. Creoles are languages created by the first generation of pidgin speakers. (Pidgin languages are contact-languages, native to none of the speakers.
Their existence stems back to European colonial expansion. Large masses of non-European laborers, drawn from many different language groups, were brought together to work as slaves under the ruling European minority. A contact vocabulary developed among them, usually because they found it necessary to communicate as they worked. Each speaker would set the pidgin vocabulary to the syntax of his own native language. This allowed sufficient communication for them to work together, but by no means could the pidgin compare in communicative capacity to their native languages.)

The children of these pidgin-speakers, growing up in an environment in which the linguistic input was ill-formed and incomplete, actually invented a language which was as adequate for communication as any natural language. Bickerton has made the remarkable discovery that creole languages consist of many syntactic structures which are not found in any of the languages to which the children were exposed. And, even more remarkably, creole languages throughout the world are very similar to one another structurally. Bickerton believes that these similarities among creole languages can only be explained by some kind of innate blueprint for language possessed by all human beings. He calls this the language bioprogram. He also reasons that: "If it is the case that the creole child's capacity to create language is due to such a bioprogram, then ... it would be absurd to suppose that this bioprogram functions only in the rare and unnatural circumstances [like those of the first generation creole speakers] in which the normal cultural transmission of language breaks down. Forces that are under genetic control simply cannot be turned off and on in this way." His bioprogram theory, if accurate, must then apply to language acquisition under normal circumstances as well as in the creole situation. Thus, according to the theory, by studying the syntax of creole languages we can determine the characteristics of the innate bioprogram languages.

Since we have already noted a tendency to relate all innatist viewpoints to Chomsky's specific theory, it is imperative that at this point we discuss the major differences between the two theories. First, the child is not supposed to "know" the bioprogram language from birth, "any more than we would suppose that a child at birth, or even at six months, 'knows' how to walk." The bioprogram language unfolds in preprogrammed sequences, just as the physical bioprogram unfolds in stages. If a feature of the bioprogram were similar to a feature of the target language, then it would follow that that feature would be learned more quickly, earlier, and with little effort. If, on the other hand, a feature of the target language differed greatly from the bioprogram, the child would simply speak the bioprogram and ignore the data presented by the target language until he was ready to handle it. In such a case, Bickerton predicts that the child would produce "common or even systematic errors" in his speech. Bickerton's theory precisely specifies a particular potential language which, as we will see later, is helpful when one attempts to design research to test the theory. But before investigating the research implied by the bioprogram theory, let us first look at the major objections Bickerton raises concerning present acquisition theory.
First, of course, he refutes the idea that mothers teach their children to speak. This view is based on the assumption that all children "receive a simplified, well-formed and redundant corpus" of data from their mothers, which is simply not true. First generation creole children do not receive such input, yet they still learn language. It would be impossible, in fact, for their parents to have taught them the language, since it previously did not exist; the parents (pidgin speakers) and children (creole speakers) share the same vocabulary, but their syntax is not the same.

Bickerton concedes that "if mother did not teach her child English, that child might have a much harder time learning it . . . the child might never acquire a perfected form of the language." The point is, however, that we will get no closer to understanding how children learn language if we continue to believe that language acquisition requires motherese-type input. "Just as the child does not need mother in order to learn, so he could not learn even with a myriad of mothers if he did not have the genetic program that alone enables him to take advantage of her teaching." Thus he believes that studies drawing parallels between caretaker speech and children's acquisition of syntax (such as Furrow, Nelson and Benedict, 1975) are interesting, but they do not concentrate on the central issue. That is, although caretaker speech undoubtedly influences child language acquisition, it is not essential to the learning of language.

Every complaint Bickerton has with acquisition theories and research is related to this very problem: they are not answering the most important and fundamental question. He explains:

In the absence of the insights provided by creolization, the current paradigm has provided us with much information that we lacked before—on the nature of input to the child and of child-caregiver routines, and the kind of social appropriateness summed up under Hymes' concept of "communicative competence"; on acquisition strategies based on contextualization, semantic and pragmatic clues to the function of novel structures, etc., etc.—and yet, as more and more thoughtful scholars are realizing, the gathering of this information has merely served to conceal the fact that the central question of acquisition, the question with which the early generativists did at least struggle, however unsuccessfully, is simply not being answered:

How can the child acquire syntactic and semantic patterns of great arbitrariness and complexity in such a way that they can be used creatively without making errors?

Let us at this point make it clear that Bickerton in no way denies the importance of the above-mentioned findings. His is an evolutionary theory. The bioprogram is an adaptive evolutionary device. No such device would force a species into dependence upon it and it alone. "Learning strategies and problem-solving routines which are applicable to a range of situations also apply to language." In Bickerton's view, these routines interact with the innate language component. His point is that these strategies and routines have received "far more than
equal time" in acquisition research, and that the "time of hard-core syntax and semantics is here."  

It is clear that acquisitionists have indeed not been addressing Bickerton's central question. They have, in fact, been answering most every question except this one.

Roger Brown, for instance, set out to determine the order of acquisition of features, presumably to see whether or not, as Chomsky suggests, simpler features are acquired first. But when he realized that children do not acquire features in a straightforward fashion, but rather, that they alternate and zigzag up and down the graph until they finally level off at or near the 100 per cent mark, Bickerton suggests that the logical question would have been, "Why does this happen?" This deals with the central question posed above. But Brown chose to create an arbitrary standard which would help him to overlook the problem, since it was necessary to determine the order of acquisition. Bickerton counters that it was a "necessity" created only by current theory.

Brown's work has been considered very important, but Bickerton claims that although it may have been useful in some ways, it has served to sidetrack the stream of thought away from the central issues of language acquisition.

Bickerton's theory may also shed some light on the field of semantics. Perhaps by knowing the bioprogram, researchers can come closer to answering Clark's unanswered questions. Clark's assertion that we are not in a position to answer those questions may not continue to be true.

The time has come to investigate possible areas of research which would be applicable to Bickerton's theory.

First, and most difficult, would be to question his basic assumption that first generation creole children receive inadequate input. While this assertion seems logical, it is difficult to prove, since there are no active pidgin to creole transitions available to observe first-hand at present. If anyone would be qualified to draw this conclusion, it would be Bickerton, for he has over 20 years' creole research experience.

Second (and this is much easier because of Bickerton's very specific description of the proposed bioprogram language), one could study children's errors to determine the differences between the bioprogram language and the target language. For example, Bickerton found double negatives to be common among all creole languages. He believes this explains the fact that many children raised in an English-speaking environment use double negatives during a certain stage of development, even when the children have never been exposed to such usage. The child is "programmed" to use double negatives according to the theory.

There are many more features which could be investigated, but since this paper's purpose is not to describe the bioprogram language but rather to outline the bioprogram theory and its possible implications in acquisition theory, only a brief and incomplete list of features of
the bioprogram language are given below. This is actually Bickerton's list, taken from the summary of the "Acquisition" chapter of his book.

1) Specific-nonspecific. Evidence: universality of creole zero versus indefinite article; errorless English acquisition of \( a_1 \) versus \( a_2 \).
2) State-process. Evidence: "skewing" of creole verbal systems; distribution of nonpunctuals in creoles; errorless acquisition of English -ing distribution; errorful acquisition of Turkish -dI/-mls distinction.
3) Punctual-nonpunctual. Evidence: universality of nonpunctual marking in creoles; mode of acquisition of past tenses in French and Italian.
4) Causative-noncausative. Evidence: \( N_1V/NVN_4 \) alteration in creoles and English acquisition; errorless acquisition of causative marking in Turkish and Kaluli; problems of English Italian, and Serbo-Croat learners with "generative-semantics-type" causatives.\(^{20}\)

Notice that all of the evidence given above is based on data from experiments done for other purposes. He realizes that this is not ideal, and suggests that all of it needs substantiation with research designed specifically with his theory in mind.

Let us look in detail at just the first feature listed above, the specific-nonspecific distinction. Examine the following sentences (all taken directly from Bickerton's book).

1) If you're sick, you should see the doctor (NS).
2) Call the doctor who treated Marge (S).
3) The doctor may succeed where the priest fails (NS).
4) Dogs are mammals (NS).
5) A dog is a mammal (NS).
6) The dog is a mammal (NS).
7) A dog just bit me (S).
8) Mary can't stand to have a dog in the room (NS).
9) Bill bought a cat and a dog, but the children only like the dog.
10) Bill wanted to buy a cat and a dog, but he couldn't find a dog that he really liked.

In creole languages, the distinction between specific and nonspecific referents is always made. Therefore, Bickerton proposes that this distinction is part of the bioprogram language. As evidence, he sites Maratsos' studies (1974, 1976), which "confirm by means of ingenious experiments . . . that the article system is acquired at a very early age."\(^{22}\) Maratsos found that the specific-nonspecific distinction (henceforth SNSD) is handled virtually without error by three-year-olds,
"well ahead of the earliest date by which the child masters the definite-nondefinite distinction."\textsuperscript{23}

Bickerton finds this discovery quite remarkable, since there are no definite clues as to which referents are specific, and which are non-specific in English. Looking at the above examples 1-8 we see that in fact the article does not at all signal whether the referent is specific or non-specific. Only in longer, series-type sentences (e.g. 9 and 10) are there any consistent signals. Example 9 shows that if a referent is named twice in a sentence, first we use the indefinite article, then we use the definite, if the referent becomes specific. However, if the referent remains non-specific throughout the sentence (e.g. 10), we use the indefinite article in both slots.

The fact that children learning English master the SNSD at such an early age without concrete signals is in itself remarkable, but it is even more remarkable when we realize that "specific and non-specific reference are connected in no way with external physical attributes or relations of perceived objects."\textsuperscript{24}

Thus we see that although children are exposed to no clear signals to the SNSD in English, and although the SNSD is an abstract concept which cannot be observed or experienced concretely, they still are able to make the distinction at an incredibly early age. If we attempt to explain this phenomenon by suggesting that children always form the correct hypothesis the first time, we are really saying that the child is programmed to make the distinction. Thus Bickerton believes his assertion that the SNSD is universal is supported.

Bickerton makes similar claims (although always with second-hand data, remember) for each of the distinctions listed above, and therefore there are a great deal of specific assertions which can be tested readily.

We must keep in mind that even if every assertion Bickerton makes proves false, his original finding (that creole languages are similar throughout the world, and also that the creole syntax differs from the parent-language syntax) still presents itself for explanation; so, if nothing else, Bickerton has given acquisitionists some new information which must be accounted for, and which may prove to be one of the most important discoveries ever made in this field. At first reading, he comes across quite arrogantly, and it would be tempting for acquisitionists to become very defensive. But if one looks at what he is claiming, rather than at the manner in which he is claiming it, he cannot help but be impressed. Bickerton's purpose is not really to condemn acquisitionists, but rather to open their eyes to some new ideas, and help them to look at their field from a fresh perspective. He is not discounting the fact that social and environmental factors have an impact on language acquisition. Rather, he is pointing us in the direction of new questions in hope that these will be studied with as much vigor as other, less central ones have in the past.
END NOTES

2 Ibid., p. 303.
5 Cazden and Brown, p. 303.
6 Ibid.
7 Derek Bickerton, Roots of Language (Karoma Publishers, 1981) p. 139. (Quotes Snow, 1979, p. 367.)
11 Ibid, p. 264.
13 Ibid.
15 Bickerton, p. 134.
16 Ibid.
17 Ibid., p. 139.
18 Ibid., p. 140.
19 Ibid., p. 144.
20 Ibid., p. 212.
21 Ibid., pp. 147-148.
22 Ibid., p. 147.
23 Ibid.
24 Ibid., p. 151.

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Brown, Cazden, and Bellugi-Klima, 1969.


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