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THE IMPORTANCE OF EVALUATING THE SYNTACTIC COMPLEXITY OF INSTRUCTIONAL MATERIAL

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One of the many problems facing educators involved in instructional programming is how to tell whether a given piece of material is likely to be readable to an individual child. Botel (1967) presented the following rationale for the necessity of matching reading materials to individual student needs:

From a psychological point of view we have evidence that the most efficient learning takes place where pupils are highly motivated, where their self esteem is enhanced and where they have rather full comprehension of what they are doing. For those who are overplaced in reading, such lack of success leads to discouragement, loss of dignity or ego support, withdrawal and often to hostility. At the opposite extreme, to the underplaced, the lack of challenge offers inadequate opportunity for involvement and the effect is to dampen the enthusiasm of these able students (p.1).

The necessity of providing each student with reading materials at his/her appropriate difficulty level in order to facilitate achievement gain has been supported by expert opinion, clinical evidence, and research findings. However, it has been reported that the majority of students comprehend printed language so poorly that they are able to gain little or no information from their instructional materials (Borrmuth, 1968).

The concern for matching instructional materials to individual student's needs and abilities is particularly significant in several situations, including: (1) when the child has previously suffered failure and frustration, which is unfortunately the case with many children, especially with certain groups of children including the exceptional child, the culturally, environmentally, or economically disadvantaged child, and the non- or limited-English-speaking or bilingual child; (2) when an individualized educational program is being developed for a handicapped child deemed in need of special education and related services; (3) when the child transfers to a new school and his/her educational records do not arrive with the child; and, (4) when instructional materials are being developed and field-tested.

Shortcomings of Traditional Analysis

A problem common to all levels of education is the selec-

tion of materials which can be read and comprehended by the student. One result of attempts to clarify or reduce the dimensions of this problem has been the development of means to judge the readability of written materials. Various linguistic factors have been suggested as increasing the complexity of written language, with major attention paid to syntactic difficulty and vocabulary (semantic) difficulty. Vocabulary difficulty has been judged primarily by the presence of words on word lists and by syllabic counts and syntactic difficulty has been judged primarily by average sentence length in words. While sentence length is a syntactic measure, it offers little indication of the grammatical complexity of a sentence. Consider two sentences of equal length, such as Chomsky's (1969) famous example: John is eager to see and John is easy to see. Both sentences have six syllables and five words. Yet, Kessel (1970) confirmed Chomsky's (1969) finding that there is an invariant developmental sequence in which the former sentence is understood before the latter. A second example can further illustrate that a word count is not sufficient for analyzing the complexity of language in reading materials. The following sentence has a word count of three—The girl skips. So has—Skipping is fun. The first sentence represents one of the most commonly used sentence constructions found in the language of young children (O'Donnell, Griffin, & Norris, 1967). The second sentence, however, has a gerund (skipping) which is found more frequently in the language of older children, suggesting that sentence number two is more difficult than the first. With only a word count the difference would not be detected.

Furthermore, increased sentence length does not necessarily result in increased grammatical difficulty. The shortcomings of using a word count to judge complexity are apparent in the examples which follow: (1) I went to the store. I bought bread for lunch.

(2) I went to the store and I bought bread for lunch. Sentence number two has more than twice the number of words than either of the sentences in number one. By word count, therefore, sentence two would be judged to be far more complex than the reading material in one. Research, however, has not found this to be true (Coleman, 1966; Drumm, 1974; Hunt, 1965). Pearson (174-75) found no support for the recommendation that the difficulty of written materials can be reduced by decreasing sentence length, while Kaiser, Neils, and Floriane (1975) found that passages of equal length are not necessarily equally complex syntactically.

Sentence length has no doubt something to do with reading difficulty. Nevertheless, one finds long sentences which are syntactically simple, and short sentences which are quite complex; thus length is, at best, a very crude measure of complexity (von Glaserfeld, 1970-71).

Blue (1965) studied the effect of increasing both length and vocabulary difficulty on seventh graders' comprehension of science materials and found that these two variables had little influence on his subjects' comprehension. Rosenshine (1969) studied students' comprehension of passages which had been found to be equivalent in difficulty according to traditional readability

variables, i.e., vocabulary difficulty, sentence length in words, and word length. Interestingly, the students exhibited varying degrees of comprehension of the passages. Rosenshine isolated five factors which influenced the readability of the passages. Difficulty was increased by: (1) Vagueness and ambiguity (e.g., excessive use of indeterminate qualifiers such as rather and quite a bit, and probability words such as might, may, and possibly). (2) Irrelevancy (e.g., digressions and unnecessary restatements). Comprehension was aided by: (1) Frequent use of explaining links (e.g., terms as because, in order to, and if...then, which call attention to a cause, result, or means). (2) Use of a rule-example-rule pattern (in which a generalization is stated, followed by one or more examples, and then by a restatement of the generalization). Harris (1974) found that the excessive use of the passive voice and the subjunctive mood increases the difficulty level of written materials, while the placement of modifying phrases and clauses close to the items they modify, and the placement of antecedents of pronouns so that they are easily identified increases the ease with which one can comprehend written materials.

Sentence length has been found to be more dependent on the presence and difficulty of transformations than on vocabulary difficulty (Fagan,1971; Fodor & Garrett,1967; Gough,1966). This finding has been explained in light of the redundancy of the language. Information which a child may miss in one sentence may be acquired in some other sentence in the passage. For example, suppose the sentence "The girl wasn't allowed to go to school" were part of a story. If a child misses the negative within the sentence, the information derived would doubtless be incorrect. Further in the story there may be some statement telling what the girl did while her brother was in school, allowing the child to gain the information previously missed.

In addition to the fact that traditional readability analysis provides only a superficial evaluation of the complexity of the written language, several researchers (Bradley,1973; Jongasma,1972; Pauk,1969) found that different readability measures often provide different estimates for the same reading materials.

Moir (1970) also questioned the simplistic notions on which traditional readability analysis is based. He suggested that the ease with which a reader can identify and use the syntactic context of a passage in the reading process directly influences the degree to which the reader can gain comprehension from the material. Smith (1971) found a correspondence between his subjects' levels of syntactic maturity and the syntactic levels of the material they read, and concluded that syntax does make a difference in reading difficulty.

Harris (1975) found that the attainment of certain syntactic competencies was significantly related to reading achievement in a sample of second graders. She found that the correlation between reading achievement and score on measures of oral and written syntax was .70. The specific syntax items which were most

clearly related to reading achievement were compound subject transformations, noun marker modification in noun-verb-noun statements, auxiliary verb questions, and adjective and adverb modification in noun-verb statements.

The importance of evaluating the syntactic complexity of reading materials is heightened by the research findings which have indicated that the syntactic patterns in written material significantly affect the reader's comprehension of the material (Bormouth, Carr, Manning & Pearson, 1970; Fagan, 1971; MacKinnon, 1959; Robertson, 1968; Ruddell, 1965; Stoodt, 1972; Tatham, 1970). Fagan's (1971) research indicated that the following transformations were most difficult for children to comprehend: 1) Appositive (Mary Jones, a student, is in the library studying.) 2) Deletion (The dog seemed hungry and thirsty.) 3) Ing-nominalization (Bill's motorcycling worried his parents.) 4) Negative (He did not notice the ice on the path.) 5) Genitive pronoun (He broke his leg.) Christie (1978) investigated the effect of later appearing syntactic structures on the oral reading performance of seven and eight year old children. He constructed two passages which were equated in terms of average sentence length, vocabulary difficulty, characters, setting, action, and readability level determined by two frequently used measures. The major difference between the two passages was the ordering of words. One passage was composed of syntactic structures that are frequently used by young children while the other passage was primarily composed of later appearing structures (i.e., appositive phrases, gerund phrases, nominal absolutes, nominalized subjects, and participle phrases). Subjects were screened to assure that they were unfamiliar with these later appearing syntactic structures. Christie found that his subjects made significantly more errors (as analyzed by a modified version of the Goodman and Burke Reading Miscue Inventory) and a higher percentage of detrimental errors (defined as errors that were grammatically unacceptable and/or did not make sense in the context of the preceding words in the sentence) on the passage composed of unfamiliar later appearing syntactic structures. Christie's results indicate the importance of matching the syntax of beginning reading materials with the syntax used in children's oral language and the need for more sophisticated readability measures.

Complexity of Syntactic Structures

It was not until very recently that grammatical complexity of sentences was even considered in readability prediction although the reading process has been described as a visual language system imposed on an already acquired aural language framework (Johnson & Myklebust, 1967; Kolers, 1969). This apparent lack of concern with syntactic elements as a determinant of reading complexity may be due, at least in part, to the widely accepted assumption that the child has mastered the basic structure of his native language by the age of four (McNeill, 1970). Recent research, however, has questioned this assumption and has indicated that children's understanding of syntactic structures, which develops in an orderly sequence as a function of cognitive maturity and experience, continues to develop through the primary grades (Capron,

1975; Chomsky, 1969; Cromer, 1970; D'Asaro, 1974; Entwisle&Frasure, 1974; Frasure&Entwisle, 1972; Hunt,1965; Kramer, Koff & Luria, 1972; Loban, 1963; O'Donnell,et al,1967; Smith, 1921). There are certain later appearing syntactic structures which are rarely used by children under ten years of age. These structures include: 1) Appositive (Rusty, my dog, got lost.) 2) Gerund (You should try running on that track.) 3) Nominal absolute (The phone being locked, no one could dial.) 4) Nominalized subject (Jumping rope is fun.) 5) Participle phrase (Tired of running, he gave up the race.) While research findings indicate that some children have specific deficits in comprehension and production of syntactic structures (Semel&Wiig,1975; Slegman,1974; Vogel,1974), there is empirical evidence to suggest that all children acquire the rules of language in a similar order. For example, it has been shown that exceptional children develop similar linguistic systems to normal children but with a marked delay in the onset and in acquisition time (Kelleher,1973; Lackner,1968; Lenneberg, Nichols, and Rosenberger, 1964; Morehead & Ingram,1973; Vogel,1974; Wiig and Semel,1973). Thus the continuing development of syntactic structures in all children, and especially in those with language disorders or differences and/or with cognitive disabilities, during their early school years and possibly extending into adolescence (Wiig & Semel, 1974, 1975) must be recognized and attended to in the assessment process and in the planning of language and reading instruction. Yet after examining four published series of readers for sequential patterns of increasing syntactic complexity from first through sixth grade, Kachuck (1975) reported that patterns of increases were irregular, showing no evidence of systematic planning. Pflaum (1975) reported similar findings in intermediate level readers.

It is evident that educators need a means of determining the syntactic complexity of written materials before they can intelligently select appropriate reading materials for individual children. Recently, efforts have been made to develop readability measures which do take syntactic complexity of sentences into account (Endicott,1973; Granowsky,1971). When further validation is completed, these efforts may prove extremely useful in the evaluation of the difficulty of written material.

Evaluation of Materials to Determine Syntactic Complexity: Preparation for Instruction

Research has clearly shown the need for educators to consider the syntactic complexity of instructional materials when judging whether a given book is appropriate for a student or students. Knowledge of the syntactic complexity of the material will, no doubt, aid the teacher in deciding whether or not to select given materials. In addition, an examination of the syntactic complexity of materials will allow the teacher to anticipate the comprehension difficulties a particular child may encounter. Teachers might check to ascertain whether a child understands the syntactic structures present in the instructional material previous to introduction. If the child does not comprehend certain structures, the teacher should consider providing instruction in those structures

before introducing the selected material in order to minimize the possibility of failure and frustration for the child. Some activities which can be used to introduce syntactic structures are:

1. Presentation of oral paragraphs containing the appropriate syntactic structures followed by open-ended, yes-no, or multiple choice questions to be answered by the child.
2. Oral presentation of a sentence containing a conjunction (without deletion). The child is to identify the two coordinated ideas. Example: Mary is tall and Jane is short. Child gives the two simple sentences - Mary is tall. Jane is short.
3. Oral presentation of a sentence containing a conjunction (with deletion). The child is to identify the two coordinated ideas. Example: Bill drives a car and rides a motorbike. Child gives two simple sentences - Bill drives a car. Bill rides a motorbike.
4. Oral presentation of a sentence with a subordinate clause. The child is to identify the component sentences. Example: I don't want to eat, but I'd like something cold to drink. Child gives the two sentences - I don't want to eat. I'd like something cold to drink. (A similar activity can be used to teach relative clauses.)
5. Oral presentation of a paragraph with omitted conjunctions, etc., using a cloze procedure.
6. Presentation of several sentences. Child indicates for each sentence whether it is complete or incomplete. Examples: The girls who are reading. The boys who had been in the library went home.
7. Presentation of kernel sentences which can be combined into a single sentence. Child is to combine kernel sentences to form a single sentence. Example: Today it is slippery outside. The remaining snow froze last night. Child gives one sentence - The remaining snow froze last night so it is slippery outside today.
8. Presentation of sentences which contain referents (i.e., relative pronouns). Child is to replace all referents by the words to which they refer. Example: The man who called left his telephone number. (Fagan, 1971)
9. Presentation of several words, each on an individual flash card. Child is to arrange the words into a sentence. (Johnson and Myklebust, 1967)
10. Presentation of scrambled phrases. Child is to rearrange the phrases into a sentence. Example: the boy—the ball—threw —into the yard. The child gives the sentence: The boy threw the ball into the yard. (Wiig & Semel, 1976)
11. Presentation of scrambled phrases which the child is to rearrange into interrogative, passive, and negative sentences. Examples: a. the boy—the ball—did—kick (question) Response; Did the boy kick the ball? b. by the boy—was kicked—the ball (passive) Response; The ball was kicked by the boy.

c. did not kick—the boy—the ball (negative) Response; The boy did not kick the ball. (Savin & Perchonock, 1965)

12. Presentation of scrambled phrases and words. Child is to rearrange phrases and words into sentences with relative clauses
Example: the girl—ate—the apple—who—saw—Mary. Response; The girl who saw Mary ate the apple, or, Mary saw the girl who ate the apple, etc.

13. Presentation of scrambled phrases and a conjunction. Child is to rearrange into sentences. Example: the paper—forgot—the pencil—the girl—but—remembered. Response: The girl forgot the pencil but remembered the paper.

14. Presentation of incomplete sentences. Child is to finish the sentence. Examples: (a) Yesterday the man...(requiring a specified verb tense)

(b) The woman put the plant...

(requiring a prepositional or adverbial phrase)

(c) The teacher handed... (requiring direct-indirect object sequence or a direct object and a prepositional phrase)

15. Presentation of an elaborate transformation. Child is to abstract the kernel sentence. Example: The shot for distemper was given by the veterinarian to my dog. Child abstracts—My dog got a shot. (Wiig & Semel, 1976)

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