

Literacy Policy and the Emerging Technology of Readability

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The procedures for predicting and adjusting the comprehensibility of printed prose have steadily progressed from the status of an art, through that of a quasi-science, and are now emerging as a scientific technology having considerable generality and precision. Of special interest is the fact that this body of knowledge has much potential for enhancing the effectiveness of a nation's efforts to achieve a desirable level of literacy in its population while, at the same time, reducing the costs of those efforts. This paper outlines some of the arguments that favor accelerating the development of this technology in the developed nations and the founding of the technology in the mother tongues of developing nations.

Modern man owes much of his material and cultural prosperity to his ability to organize diverse scientific theories into technologies that allow us to design and manage complex systems that produce abundances of the things he wants. While most of these technologies have arisen out of the physical and biological sciences, a few (chiefly those based on economic theory) have been based on theory developed in the younger social sciences. One of the latter is technically referred to as the field of comprehensibility or more commonly by the general term readability. This technology consists of a rapidly growing set of procedures for making accurate predictions, manipulations, and evaluations of the comprehensibility of printed language. The objectives of this field are to enable us accurately and economically to select and adjust prose so that it is suitably comprehensible for its intended readers. A recent series of studies (e.g., Bormuth, 1966, 1969, and 1971; Coleman, 1974, and Coleman and Miller, 1968) have shown that many of the specific objectives of this field have been attained and that many of the remainder lie within the range of our present scientific capabilities. Nearly all of this research has taken place within the United States and has studied the English language.

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As this field progressed from the status of an art and approached that of a precise technology, it attracted increasing amounts of interest from those involved in formulating and carrying out the literacy policies in both developing and developed nations throughout the world. This interest was elicited by the fact that modern readability theory provides us with a powerful tool for supplementing and greatly enhancing the effectiveness of existing and planned literacy programs and for reducing the costs of those programs. Over the past several years the author participated in some of the research that formulated modern readability theory, and he has consulted with a number of agencies and scholars from other language communities about the desirability of developing a similar technology for their mother tongues. This paper summarizes the general arguments in favor of conducting this research in developing nations and accelerating it in the developed nations.

Social Utility of Readability

The basic reasoning by which readability is justified is fairly simple. In bare outline, it is this: the wealth, cultural richness, and social stability of the developed nations of the world stem, in large part, from their ability to gather, organize, teach, and apply knowledge to the solution of problems. Printed language plays a large and indispensable role in gathering, organizing, and teaching the basic knowledge upon which the prosperity of the developed nations rests. And that prosperity depends upon nearly all of the members of the population of those nations being able to acquire large amounts of information efficiently through the use of printed language. The technology of readability provides one of the two major devices for regulating people's literacy.

Function of Language. Some philosophers like to observe that lower animals are the servants of nature while man is the master of nature. It seems clear that much of man's success arose from his ability to acquire knowledge about his natural and social environment, to communicate it to others, to accumulate large stores of it, to organize it into technologies that bear on problems, and then to apply that knowledge to solve problems. Knowledge is born in the experience and thought of a single person. If each person had to rely solely on his

own experience for his supply of knowledge, he would accumulate only the crudest understanding of his environment within his lifetime. But man has a powerful tool at his command: language. Language provides man with the ability to accumulate amounts of knowledge that far transcend his own time in history and his own personal experiences.

Limitations of Spoken Language. Early man was forced to rely almost exclusively upon spoken language, and this severely restricted his development. Spoken language provided a relatively poor vehicle for collecting knowledge from people who were widely separated in time and space. And the amount and accuracy of the knowledge collected was limited, because knowledge had to be stored in human memory, a storage device of limited capacity where knowledge is subject to distortion and, periodically, to total loss through death. Thus, the knowledge available to a whole society accumulated only very slowly.

Spoken language is an equally poor device for organizing knowledge. Knowledge reaches its highest level of usefulness when it has been abstracted and summarized in the form of the terse statements called laws and when those laws are organized to form connected theories. To cast knowledge into this form requires the scholar to view simultaneously large numbers of separate lists of knowledge, to assemble them into precisely related patterns, and then to preserve these patterns of knowledge. Obviously, when only spoken language is used, human memory and human mental processes prevent more than limited activities of this sort.

Invention of Writing. The invention of written language improved but did not fully remedy this situation. Writing did make it possible for man to accumulate, accurately record, and organize more knowledge. And it did make it possible for him to communicate with people widely separated in time and space. But the pen alone is but a poor tool for a task of the magnitude that man faced.

In the ancient world, centers of learning possessed meager libraries. The process of copying books by hand simply made publication too expensive and too slow to permit the rapid accumulation, communication, and organization of knowledge. The later medieval

“universities” in Italy and France were no better at this task, for the same reason. Throughout pre-modern times technology advanced at a pace that was only slightly faster than when man could rely only on spoken language.

Mass Publication. The development of inexpensive paper in Spain and of typography in Germany facilitated what some have called the knowledge explosion, the rapid increase of knowledge that has provided the basis for the technologies that produce the wealth of our modern societies. Printed language has become an integral part of man’s daily activities. It has become an indispensable part of the communications systems by which modern societies organize and coordinate much of their industrial, cultural, and political activity. Goods and services are produced by organizations that are far too complex to be managed solely by spoken language; hence the business letter, the memorandum, the purchase order, the production manual, and the advertisement have become standard items among the multitude of different kinds of printed communication employed in most industries. The book and the magazine have similarly replaced spoken language as a principal means of communicating human cultural heritage. And the newspaper, news journal, and books on topical issues play a central role in providing people with the information and ideas on which to base their decisions about how to govern themselves.

Alternative Media. The manufacturers of electronic communications devices have periodically offered their machines as replacements for printed media. But so far they have been only modestly convincing. The invention of radio, motion pictures, and television, for example, scarcely affected the use of newspapers, journals, and books. The rates of publication of all three have continued to grow steadily. The electronic media have failed to sweep printed media aside because of their extremely high costs, inflexibility, and ineffectiveness in most of the new applications proposed. For example, to justify expenses a television program must be shown to very large audiences. As a result, it must deal with content that is of broad interest—primarily light entertainment and superficial coverage of news. This is not to say that electronic media do not perform some tasks superbly well, but

in those activities where information must be given in depth, where it must be referred to and repeatedly used by a small number of people, where it must be studied at a time selected by the user, or where only a part of the content may be of interest at a given time, the electronic media usually fail to compete successfully with the printed word. Consequently, unless there is some radically new invention that cannot presently be foreseen, printed language will continue to provide the basic means by which developed societies collect, process, and teach the information on which their existence depends. And the members of those societies will have to continue to attain a high degree of literacy.

Mounting Importance of Print. There is evidence that literacy is becoming more, rather than less, important as the so-called developed societies develop even further. In most democratic societies of an earlier time, literacy was essential for obtaining knowledge of political events and, therefore, for performing a person's duties as a responsible citizen. Nonetheless, man's economic productivity was not seriously limited if he was unable to read. Technology changed very slowly, so he could acquire a high level of skill through apprenticeship, and could feel confident that those skills would serve him throughout his life. His work required little or no reading. The only people for whom literacy was essential were the handful of people in service professions

Today, however, unskilled jobs are increasingly being taken over by automated machines and are being replaced by jobs requiring higher levels of skills. Moreover, it appears that even these new skilled jobs will change or disappear as technologies continue their rapid pace of change, replaced by jobs that require even higher levels of skills. Thus, new skilled jobs require high levels of literacy for two reasons: the jobs themselves usually require some reading skills, and a person cannot be trained efficiently by apprenticeship alone. He must learn much of the job by reading. It appears, therefore, that in the future technically advanced societies will have to devote more of their resources to raising a large proportion of their citizens to levels of literacy heretofore achieved only by a small proportion of their populations. Evidence that this is actually a trend in modern societies can be seen in the high levels of unemployment

among the poorly educated while labor shortages occur in jobs that call for high levels of training. As additional evidence, a recent survey (Sharon, 1972) showed that roughly 42% of the people in the United States spend over 60% of their time on the job reading.

Readability and Literacy

Many people can be easily persuaded that literacy is essential to individuals and to nations that seek cultural, social, and material well-being. Moreover, they seem generally willing to sacrifice time and resources to attain an adequate level of literacy. There is little difficulty in obtaining agreement on these matters—as long as we confine ourselves to broad generalities. But when we focus attention on a specific situation, we find evidence of a growing skepticism about the value of the programs that attempt to produce literacy. In the so-called developed countries we are observing many instances of resistance to spending tax moneys for instruction in reading skills. And in the developing countries we find that large numbers of parents are not enthusiastic about enrolling and keeping their children in schools, and we also find that governments are sparing in their support of literacy programs. This lack of support may be interpreted in a number of ways, but it is clear that the results of the literacy programs, themselves, have not produced enough benefits to enlist a vigorous demand for those services (Bormuth, 1968). An important explanation is that literacy has been conceived so narrowly that literacy programs have been almost certainly doomed to failure.

Faulty Conceptions of Literacy. Two major misconceptions have dominated most policy that attempts to deal with the literacy problem. The first is the proposition that *a person is literate as soon as he can merely speak the words he sees in printed form.* The second is that *the best, and perhaps the only, method of increasing people's literacy is to teach them more skill in reading.* These are by no means the only conceptual problems that have plagued literacy programs. For example, much effort has been expended on teaching people to read only to discover that in their society there was almost nothing available for them to read and no mechanisms for producing and distributing materials. However, only the first two misconceptions about the nature of literacy are of direct interest here.

Consider the proposition that a person has automatically achieved literacy if he has learned merely to decode printed words into spoken words. Nearly everyone would agree that the mere decoding of words, if that were the only skill a person learned, has little utility. Only radio and television announcers and perhaps a few others could find any use for that isolated skill. The rest of us must employ our reading skills to obtain information, and we do not consider ourselves as literate unless our skills serve effectively to help us obtain that information. However, this popular misconception probably arises from different and more seductive reasoning: all normal school children understand their native language before they enter school, and have mastered the comprehension skills necessary to learn what they are told in that language; writing is nothing more than an encoded form of their language; therefore, when people have been taught merely to decode written language into spoken language, they will thereafter be able to understand and learn whatever information they encounter in printed language.

The chief problem with this reasoning is that neither its major nor its minor premise is universally true. Few people understand all of the spoken language they hear. And written language is usually far more elaborate, complex, and difficult to understand than spoken language. Although research lends support to the assertion that most people fail to understand all of the spoken language they hear, this point can be sustained without recourse to a technical discussion of that literature. If the reader reflects for a moment on his own experience, he may recall numerous instances in which he failed to understand spoken language that seemed to be understandable to others, and he may also recall instances of others failing to understand speech that seemed perfectly clear to him.

Similarly, written and spoken language are not merely different encodings of a single form of the language. It is true that written language evolved from spoken language and it is equally true that spoken and written language continue to share much in common. However, the demands that face a writer differ from those faced by a speaker. The demands faced by a speaker place a high premium on immediacy and responsiveness to the listener; the demands faced by a writer place a high premium on organization, clarity, and precision. The writer has at his disposal, also, resources that are not available to

a speaker; he has the time to ponder, organize and polish his statements. As a result, written language contains highly complex sentences organized into still more complex paragraphs, sections, and chapters. By contrast, spoken sentences tend to be short, and rarely does one hear a speaker in ordinary conversation string together more than two or three sentences before one of his hearers speaks to clarify, modify, or extend what he has said. Thus, written language certainly differs in major respects from spoken language. It is highly unlikely that a person who has been taught only the simple word-naming skills will automatically, without further instruction, be able to comprehend everything he reads. Accordingly, reading must be seen as a socially useful process, a process that includes not only decoding printed language but also comprehending the information contained in the language people need to read.

Now consider the second proposition: that the way we should approach the problem of increasing people's literacy is to teach them additional reading skills. Assuming that reading skills include both decoding and comprehension skills, most would agree that such instruction is certainly an essential ingredient of any literacy program. But increasing numbers of scholars are now taking the position that other methods are also essential if we are to achieve the goal of literacy programs without sacrificing exorbitant amounts of our resources. Indeed, they argue that the goals of a literacy program can be achieved successfully and economically only by using some combination of methods.

Pragmatic Concept of Literacy. To understand this position it is necessary to begin with a reasonably clear concept of what societies and people within them are trying to buy when they devote large portions of their lives and large amounts of other resources to attain literacy. Most people will acknowledge that there are many things written in their language that they cannot comprehend. Moreover, they are likely to ridicule the notion that it is desirable for them or anyone to reach a state of perfect literacy. Consequently, people probably have some rather pragmatic concept in mind when they use the term literacy. In this paper we employ the concept that *a person is literate when he can satisfactorily comprehend whatever written materials it may be socially or personally desirable for him to read.*

We can gain at least two important advantages by viewing literacy in this way. The obvious advantage is that it potentially provides literacy programs with a goal that is closely tied to human needs. And it makes obvious the fact that we can influence a person's literacy in *two* ways. We can either provide him with more instruction or we can provide him with materials that are more comprehensible to him. In either case, the result is the same: he comprehends at a desirable level the materials he needs to read; we say *he becomes literate on those materials*.

Instruction Versus Readability. Readability deals with the methods by which we regulate the comprehensibility of written language. It should be understood that reading instruction and readability are complementary approaches, and that neither approach is fully viable without the other. Their fundamental relationship might be explained in this way: language is a system of symbols that performs the function of signalling information. We encode information into language and others decode language to obtain that information. This signalling system consists of words and other lexical features that signal concepts, and it consists of syntactic features that tell us how and in what order we should combine the meanings of those concepts. A person's reading ability is determined by the extent of his knowledge of these features; the readability of materials is determined by the difficulty of the features it contains. Therefore, a person's literacy is determined by the degree to which his reading skills match the skills demanded by the linguistic features contained in the passage. The object of reading instruction, then, is to teach people to interpret all the linguistic features they are likely to encounter, and the object of readability is to regulate materials so that they contain only those linguistic features that the intended reader is likely to know how to interpret.

Neither readability control nor reading instruction, taken alone, provides a very sensible or economical way to deal with society's literacy problems. Consider the instructional approach first. To begin with, we know from research (Bormuth, 1968) and experience that we do not yet have the technical and scientific knowledge necessary to teach people all of the comprehension skills they would have to learn if we were to use instruction as our only approach. And the

instructional approach inevitably involves providing large amounts of instruction for large numbers of people. Finally, this approach affords us with no way to limit costs. The costs are determined by the number of skills we set out to teach; the number of skills that we need to teach is determined by the linguistic complexity of the materials people need to read; and the instructional approach provides no way to help us limit linguistic complexity.

Now consider the readability approach. There are some costs associated with developing a technology of readability. Scholars have to be trained to do the research, the research itself has to be conducted, and editors and educators must be trained to use some of the techniques. However, the costs associated with developing a technology of readability are trivial compared to the costs of not developing one. Into the latter we must reckon the moneys wasted on materials that cannot be understood, the moneys that must be spent on added instruction, and the personal and national development that must be forgone because of a failure to acquire the knowledge necessary to cope with the modern world. Consequently, readability control and reading instruction must be seen not as alternatives but as mutually complementary approaches, each capable of supplementing and enhancing the efficiency of the other.

Readability and reading instruction are complementary in another important sense. We are experiencing very little success in teaching people language comprehension skills. That is, we have not been able to find evidence that our teaching has much effect on students' comprehension abilities that could not be attributed merely to learning that takes place without instruction in those skills (Bormuth, 1968). Scientists have not yet developed workable theories of the nature of the comprehension processes and how they may be taught. Since readability research attempts to identify the kinds of language features that are involved in the comprehension processes, people who know how to do readability research have mastered many of the skills necessary for research on comprehension theory. And their skills will be essential for adapting that theory to the design of instruction for teaching the comprehension of their native language.

Two comments should be made about the limits of readability control. First, it attempts to control only the comprehensibility of what is said in print; it in no way deals with subject matter. Second,

readability, at least in the present state of that science, is not suitable for use with works having literary and aesthetic pretensions. It merely provides a set of techniques for altering the ease of materials, and it assumes that subtle nuances, connotations, meter, and the like can be sacrificed in this process.

Readability in Developing Nations

Now let us examine the main reasons why a developing nation might wish to embark on an effort to develop a technology of readability for its mother tongue. At this point it is necessary to exercise caution. Developing nations differ enormously in both resources and goals, so any general assertion about what will be good for them will almost certainly be wrong in specific nations. Hence, the following arguments might be said to be typical of the ones that are usually relevant in the formulation of national policies. But they must be carefully examined before they can be regarded as valid for a particular nation.

Three considerations stand out clearly. First, many developing nations seem to have firmly committed themselves to a democratic form of government, a form of government in which all power is ultimately reserved to the citizen and in which the citizen ultimately makes all important decisions. Second, many peoples seem to have decided to secure a higher standard of living for all of their people by mastering the technologies of modern industry. Third, with productivity comes wealth and with wealth comes the surplus of time that people need to participate in arts and cultural activities. And many nations appear to be determined to provide as many people as possible with the opportunity and background necessary to participate in the pleasure of their cultural heritage.

Many developing nations have done much to initiate universal education and to improve publicly financed education at all levels. One of these improvements is a plan to modernize instructional methods of supplying students with free textbooks. In the past, nearly all instruction has followed traditions similar to those established in the Middle Ages before the invention of printing: the "lecture-notebook" method in which the teacher reads to students a book he has written (he was called a *lecturis*, the latin word for "one who reads"), and the student's task is to obtain the teacher's knowledge by copying verbatim the lecturis' words. This is too slow

a method to transmit the large amounts of information necessary for citizens of modern societies; it is probably often ineffective because the lecturers' explanations are frequently incomprehensible; and it does not provide students with practice in the necessary reading skills. Consequently, the carefully prepared textbook is fast replacing much of the lecture function of the teacher, and the teacher is moving into the role of a diagnostician of learning problems and the role of a mentor who helps the student evaluate, integrate, and apply his knowledge.

However, this shift in educational objectives and methods presents a complex of problems to be solved. In developing nations the transition has meant that new curriculum guides have to be planned and written; teacher training has to be revised; and, because textbooks have seen only limited use throughout much of the world, guidelines have to be developed to insure that the textbooks are of high quality. Many of the textbooks presently available, for example, often omit a clear organization of the content, an index and glossary of terms, and so on; their contents are sometimes ill-chosen, inaccurate, and poorly coordinated with national needs and national curricula: and they are often written in language that is too abstract, too complex, and too poorly organized to be comprehended by students.

In the English-speaking nations there is a substantial body of research on the question of what makes a material comprehensible and a technology has been developed that permits us to effectively predict and control the comprehensibility of materials. Recent research in the French, Finnish, Spanish, and Russian languages has shown that this technology can be developed and applies with equal precision in any language; the cost of doing this is nominal compared to the costs of failing to develop that technology.

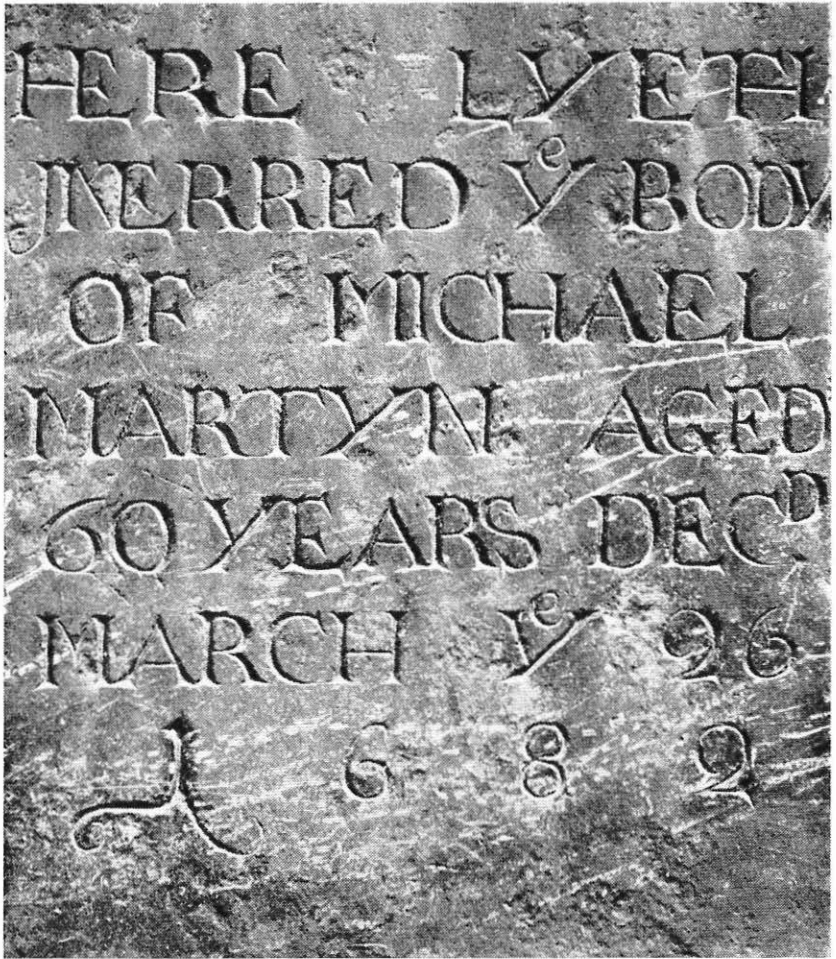
Summary

The rationale for developing a technology of readability can be summarized in this fashion: First, the developed nations of the world have been able to achieve their material wealth, political stability, and cultural affluence because nearly all of their people are literate. They are literate not merely in the narrow sense that they can decode printed language into spoken language, but they are literate in the broader sense that many of their people can adequately

comprehend the language in the materials that they need to read. Second, there are two complementary ways to influence a person's literacy. On the one hand, we may instruct him in the skills necessary to read more of the materials he needs to use. Reaching an acceptable level of literacy in a nation unavoidably involves a considerable investment in instruction of this sort. But this approach always places a heavy burden on the financial resources of a nation because it involves financing a massive educational effort. On the other hand, we can greatly moderate these costs by developing a technology of readability and then employing that technology to reduce the number of skills a person must learn in order to adequately comprehend the materials he needs to use. The result of this approach is that more people can obtain more information from more printed materials and do so at great savings to themselves and to the nation. Third, many hitherto backward nations have embarked on programs of development. Both they and the more advanced nations would be well advised to build a science of readability as one element that will contribute to that development.

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Typical of the way the Boston area stone cutters inscribed the late seventeenth-century gravestones. Charlestown, Mass., 1682.