

The IEA studies can show us where U.S. students rank in achievement, but they can also broaden the vision of curriculum makers as to what is desirable for students.

International Evaluation and American Curriculum

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For over two decades a network of educational researchers has cooperated on a number of international studies of school achievement. Under the leadership of Benjamin Bloom, Robert Thorndike, Torsten Husén, and Neville Postlethwait, the International Association for the Evaluation of Educational Achievement (IEA) has conducted research in mathematics, reading, science, literature, English and French as foreign languages, and civics. Currently it is undertaking second studies in mathematics and science and new studies in early childhood education, writing, classroom environment, and vocational education.

IEA has a number of purposes: to look at educational systems from an international perspective, to explore major issues of educational policy, to train educational researchers, and to raise the standards of educational research and evaluation. In the course of its brief history IEA has sponsored numerous international and national technical reports and monographs; it has developed and validated new kinds of tests and attitude scales; and it has initiated a rethinking of many educational issues. In this article, we will describe what IEA has done in mathematics and language arts (reading, literature, and written composition).

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The IEA Mathematics Studies

The First International Mathematics Study. Nearly 20 years ago, IEA carried out a survey of mathematics achievement in the schools of 12 countries. This project was the first of its kind in international education, involving a dozen national research institutes, diverse languages and cultures, thousands of teachers and other school personnel, and a total of some 130,000 students. In that pioneering study, a major aim was to examine various sorts of educational systems and the accomplishments (both in terms of knowledge of and attitudes toward mathematics) of students aged 13 and in their last year of school.

The resulting international report (Husén, 1967) caused quite a stir in some circles. In the U.S., newspapers and magazines carried accounts of the excellent teaching of mathematics in Japan and the inferior state of mathematics education at home. Stephen Willoughby, Director of the Mathematics Education Program at New York University, reviewed the findings and concluded that while the U.S. was doing a commendable job with very bright pupils, there was considerable room for improving mathematics teaching in this country (Willoughby, 1968).

A finding with broader implications for policy making had to do with the relative mathematics achievement of students in specialized schools as contrasted with comprehensive schools. Husén addressed this issue by asking, "Does more mean worse?" That is, if a school system educates a broad range of students in terms of academic achievement, as in comprehensive schools, does this necessitate the trade-off of lowering the overall educational yield of the schools? The answer was twofold.

First, it was found that countries retaining higher proportions of students in the pre-university age group showed lower scores. But it was also found that the highest achieving groups of students in each country (again, at the pre-university year) performed at comparable levels. Husén concluded, "It would seem that a nation need not fear for its most talented students when it contemplates the expansion of educational opportunity at the secondary school level" (p. 123).

The Second International Mathematics Study. The idea of a second mathematics study was first floated at a small meeting of researchers in 1974. The idea soon picked up momentum and culminated in an international conference of mathematics educators in May 1976. At that session, the emphases of the study were determined. It was to begin with a careful analysis of mathematics curriculums in each country. It was to obtain data on instructional practices in mathematics. And it was to prepare cross-country profiles of student achievement in and attitudes toward mathematics in the light of information about the curriculum and how mathematics is taught.

The IEA mathematics study is organized much as other IEA projects. A representative from each of the national institutes sits on an international project council that meets annually to review the progress of the study and make policy decisions. The design of the study, the development of the international instruments, and the analysis and reporting of the study are the responsibility of a group called the International Mathematics Committee. This committee consists of nine mathematics researchers and instructors representing a variety of

international institutions and organizations. Within each represented country, a national committee is responsible for carrying out the study, including such tasks as reviewing and translating items, drawing national samples, administering instruments and preparing national reports. The preliminary results should be available in 1983.

The Focus of the Second Mathematics Study. Different countries have different mathematics curriculums that are taught to different kinds of students. The Second Mathematics Study is designed to highlight these differences, and to help us understand them. For example, if the students of a certain country do very well in geometry as measured by an international test, what factors can account for their success?

The two main areas in which explanations will be sought are the curriculum and the classroom. An analysis of the curriculums of the various countries is expected to reveal emphases on various aspects of mathematics and ways in which the subject matter is organized. The curriculum analysis should also tell us what changes have taken place in school mathematics over the past 20 years. For example, has the "new mathematics" affected what is taught in schools? What about hand calculators—

are they used or even allowed in the classroom?

The second area of study, that of the classroom, is expected to provide information about how teachers around the world teach mathematics. What strategies does a teacher in Thailand use when introducing the concept of ratio? How does this compare with the way in which ratio is taught in France or the United States? How do teachers vary in the way they teach congruence? We do not know very much about what teachers do when they teach, even in the United States. But the "portrait" of mathematics teaching that will be obtained from about 20 countries should be a very rich source of information. Furthermore, we would like to be able to say something about the "payoff" in terms of student learning associated with different teaching strategies. That is to say, given that a particular country does very well in terms of student learning of geometry during the school year, can we explain this in terms of the curriculum of that country and how that curricular content is taught by the teacher?

The criteria used in identifying important differences are also an important aspect of the study. Much has gone into developing a battery of achievement tests to cover most of the mathematics that might be known by the target

groups of students in many countries. These tests represent quite a refinement of the tests used in the first study, although many items from that study were kept to make possible some comparisons between the first and second studies. A battery of attitude tests has also been developed since this is an important component of student learning in mathematics.

Two target populations are being studied. Population A is students who are in that year of school at which the majority of students are 13 years old by the middle of the school year. This is equivalent to eighth grade in the U.S.

Population B consists of students who are in the terminal year of secondary school and who are studying mathematics as a substantial part (approximately five hours per week) of their academic program. In the U.S. this translates as students who are in twelfth-grade mathematics courses.

Comparable populations were also used in the first IEA study, so it will be possible to get an international perspective on changes in school achievement between 1964 and the present. Doubtless, there will be greater changes in some countries than in others. A probing of the wealth of information provided by the studies should help account for those changes.

The IEA Language Arts Studies

Reading and Literature. In 1973, the results of the first two studies in language arts—one in reading and one in literature—were published. The results of these studies, which tested students aged 10, 14, and 17 (end of secondary school), clearly showed the following:

1. The general lack of impact of school and teacher variables in cognitive achievement in reading and literature.
2. The relatively higher performance of girls in achievement tests in literature (and, to a lesser extent, on reading comprehension).
3. The general lack of impact of school and teacher variables on interest in literature.
4. The cross-national uniformity of reading interests among ages, sexes, and achievement levels.
5. The impact of the selection, the age of the student, and the culture of the classroom on the pattern of response to literature that students exhibit.

Both the reading comprehension report and the literature report indicated that factors such as home background and type of school play a great part in

Figure 1. Participants in the IEA Studies.

Country	First Math	Reading	Literature	Second Math	Writing
Australia	X			X	X
Belgium	X	X	X	X	X
Canada				X	X
Chile		X	X	X	X
England	X	X	X	X	X
Federal Republic of Germany	X	X		X	X
Finland	X	X	X	X	X
France	X			X	
Hong Kong				X	
Hungary		X		X	X
India		X		X	
Indonesia					X
Iran		X	X		
Ireland				X	
Israel	X	X		X	X
Italy		X	X		X
Ivory Coast				X	X
Japan	X			X	
Kenya					X
Luxembourg				X	
Netherlands	X	X		X	X
New Zealand		X	X	X	X
Nigeria				X	X
Scotland	X	X		X	X
Swaziland				X	
Sweden	X	X	X	X	
Thailand				X	
United States	X	X	X	X	X

determining the relative success of students in comprehending the written word (be it expository or imaginative). Concurrently, there seemed to be no aspect of school finance or organization, of teacher preparation, or of teaching strategy that produced notable differences in student achievement scores. This finding held true in all the developed nations in the study and also applied generally to the relative performance of developing and developed nations. Both reports indicated not that students do not learn to read in school, but that differences between student scores or school mean scores do not result from particular school practices (or at least not from practices reported in the various questionnaires given to students, teachers, and school administrators).

The finding of the IEA literature study that girls perform better than boys at the end of secondary school, and the parallel finding that boys do better than girls in the sciences, has been a source of concern in several countries. That sex differences in reading are less great, and that they are also less great in literature and science at earlier ages leads to the inevitable conclusion that the cause is not genetic, but lies either in the school

or in the culture of the nation. Common sense would indicate that the cause probably lies in the culture and that cultural values are transmitted subtly or blatantly in the schools. A school can hardly avoid transmitting general cultural values, be they those of which one approves or disapproves. In the United States there has been a recent outpouring of criticism of the sex-role stereotypes portrayed in the schools and particularly in reading texts. Disregarding some of the more strident demands, one can still see how early readers give credence to the popular notion that men belong in the laboratory and women at home reading books. Despite the predominance of male authors and critics, literature and literature study have long been considered effete, and curriculum makers can do a lot to portray both the possibilities of women in science and men in the literary world through the selections they offer children and through the kinds of questions and issues that accompany them.

The idea of changing material to affect comprehension is also attractive to those who would change material to affect interest. The IEA literature study, however, indicates that the interested reader is what one might call a self-

enclosed type: "One is left, then, with a somewhat circular finding: a student who is interested in literature can be marked by reading a lot, reading a variety of selections, being involved in (his or her) reading, and coming from a book-oriented household. The only variable that stands outside this circular pattern is sex, but its unique contribution to the variance is negligible." From this finding, it would seem that the IEA study turned up no sure stimulant to interest in literature and reading. Access to material is the only possible candidate, but it would seem that such access must lie outside of the traditional institutions (libraries and schools) more than within them. The child's observation of and participation in family readings for enjoyment appears to be of paramount importance.

The finding of the IEA study with respect to reading preferences offers a clue as to what kinds of books might go into a classroom library. The major finding of the IEA studies in mother tongue relevant to reading preferences was that there were few if any differences between countries. The main determinants of reading preference are age, sex, and reading ability—one of the more surprising findings of the

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study, because in so many other areas national differences played an important role. Among 14-year-olds, students prefer humor, adventure, mystery and detective, sports, and romance. With students in the last year of secondary school humor and current events are popular, as are adventure, travel, and history. Readers tend to become more interested in nonfiction as they progress through secondary school.

The findings clearly indicate that students' preferences change as they go through secondary school, that boys and girls have many preferences in common and a few differences, and that more able students tend to have more "mature" preferences. What can a curriculum builder make of these findings? Certainly they can be a guide in the selection of materials, warning of any simplistic catering to stereotypes of preference. A preferable construction to place on these findings would point to the eclectic tastes of boys and girls, able and less able students, younger and older students. Any teacher of mother-tongue studies knows that within a class, tastes vary greatly and that a student's taste varies over time. Variety in subject, mood, genre, degree of fantasy, and even complexity, is an impor-

tant part of any reading program; the IEA results would tend to support this impression and raise it to a universal principle.

The study of response preferences that was reported in the IEA literature study bears with it the most profound implications for curriculum in mother tongue of any of the findings of the two reports. For it is here that one may see most clearly the impact of the school on the student. The students were asked to indicate which five of 20 questions about each of two stories they thought were most important. They were also asked to select five out of 20 questions they thought were most important to ask about literature in general. Teachers were also asked to indicate their preferences among the questions.

To summarize the analysis of the results: there were differences in patterns of preference according to age, according to selection, and according to country. Students aged 14 tended to be less consistent in their choice of questions over the three opportunities to express preference. They also tended to choose five questions more frequently than the older students:

- Is this a proper subject for a story?
- Has the writer used words or sen-

tences differently from the way people usually write?

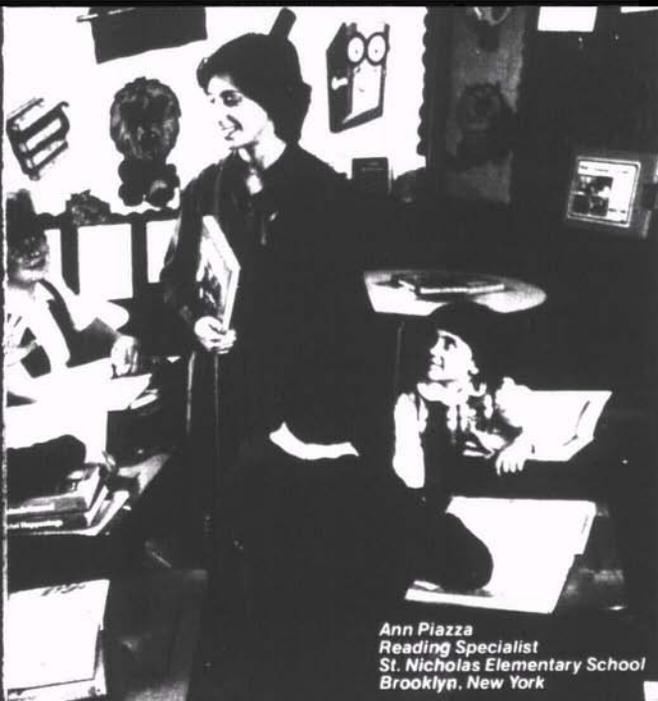
—What happens in the story?

—Is there any one part of the story that explains the whole story?

—Is the story well written?

At the end of secondary school students tend to prefer the questions: Has anything in the story a hidden meaning? When was the story written? What is the historical background of the story and the writer? To a certain extent the difference in questions reflects a difference in development of the students, the younger ones being more concerned with surface and immediate content, the older ones with background and abstract meaning. One inference a curriculum maker might draw from this would be to ensure that questions and study aids for younger students do not leap to the abstract before those students are able to handle it.

That students' response preferences varied from selection to selection—one story eliciting more personal responses, another more formal ones—leads one to infer that it is important to select texts in light not only of their literary properties but also in light of the kinds of questions and observations they might evoke. The field testing of materials



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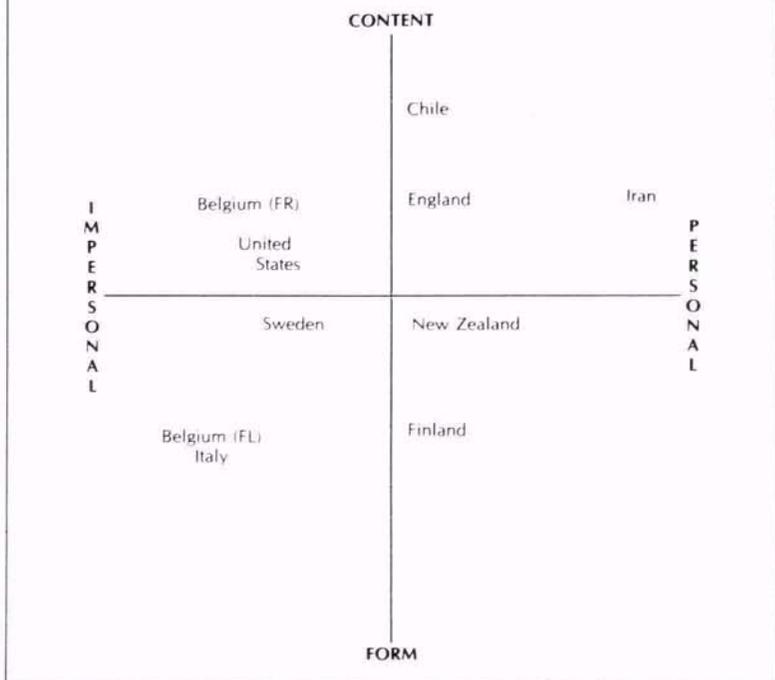
with something like the response preference questionnaire would be of great service to the curriculum developer who wanted to sequence selections so that questions of form might occur in one bloc, questions of meaning in another, and questions of value in a third.

The third finding, that of differences in response patterns between countries, is the most important of all the findings of the IEA mother-tongue studies in its implications for the curriculum. To summarize those findings briefly: students of both populations systematically selected different sets of questions and rejected others, so that there was at least one pattern of response for each country (Figure 2); these patterns of response become most pronounced at the end of secondary school when the students' preferences among questions tend to be more consistent across selections and tend to portray a more homogeneous group; the patterns chosen by students at this age tend to coincide more with the patterns preferred by their teachers than is the case with younger students (in New Zealand, the students' patterns conformed with that of the examination system).

Two sets of questions form the coordinates on which one could plot the major differences between countries: the first coordinate would include an emphasis on point of view and personal interpretation (what does the story tell me about people like people I know?), as opposed to evaluation of the meaningfulness of the work, and the historical background. The second coordinate includes a strong emphasis on interpretation (character, motivation, thematic interpretation, and moral interpretation), and a de-emphasis on form and structure. This coordinate could be said to form a form-content continuum; the first a personal-depersonal coordinate. Belgium and Italy are countries that emphasize the impersonal and the formal; Chile, England, and Iran emphasize the personal and content-oriented response. The United States students are concerned with content but not from a personal point of view.

The IEA studies in various subjects show the importance of the variable "opportunity to learn"; given a chance to learn a concept, students will do so. The notion of opportunity to learn is an extremely powerful one and pervades each of the subsequent issues as it does this one. National, state, and local curricula can prescribe what students learn, but it is the individual teacher who is most important. If a teacher does not

Figure 2. Position of Countries Relative to Continua of Personal-Impersonal and Form-Content Responses.



provide the opportunity for a student to discover the workings of metaphor, to learn to write a coherent and precise descriptive paragraph, or to grasp a concept about a myth, the student is left to the laws of chance, and chance is greatly influenced by the family and other extra-scholastic factors. Opportunity to learn clearly operates to affect the response preferences of young people. Students learn the modes of response that are presented them; they may learn to perform them with greater or lesser proficiency, but they learn them and accept them or rebel against them and literature.

Written Composition. In 1980, IEA authorized a new study in language arts, this time in written composition. The teaching of written composition is a good example of a research area where both theoretical and empirical work is very much needed. The domain of writing is not well defined and, therefore, test construction is also at an early state of development. In addition, there is

clear-cut agreement neither on the criteria of good writing nor on the methods of scoring. In this respect the Study of Written Composition differs clearly, for instance, from the Second Mathematics Study or the Second Science Study. During the first International Study Committee meeting it also became evident that the content and methods of instruction in written composition are to some extent unknown even in participating countries themselves.

Thus, an important aim of the study is to provide a *conceptualization* of the domain of writing in general and of school writing in particular. This is a necessary step for the construction of a set of writing tasks that can be justified both theoretically and in terms of curricular validity.

Another important aim of the study is the *exploration and description* of (a) what is being taught in the instruction of written composition, (b) how written composition is being taught, (c) what kinds of exercises and assignments students are given in tests and examinations, (d) how much time is devoted to

written composition, and (e) what characteristics are valued and what criteria are used in assessing performance in written composition.

A third major aim of the study is to describe how students in different countries respond to the assignments. This will include an attempt to score compositions using an internationally agreed upon scoring scheme as well as a more qualitative description of general patterns and variations in response that might be associated with certain schools of thought and/or certain cultural variation.

A fourth aim of the study is to test some hypotheses about factors that are assumed to affect performance in written composition. These are based on a model developed for the study.

The IEA Study of Achievement in Written Composition intends to explore these issues by creating a series of national portraits within an international framework in order to examine the following:

1. How various countries organize the curriculum in writing in the schools in order to deal with mass education and comprehensive schooling

2. Relationships between the intended curriculum, the teachers' use of that curriculum, and student performance and attitude in different curricula

3. Other factors of the society, schools, and students in different countries that affect performance in and attitudes toward writing

4. Differences among teachers and students of various countries in respect to how they organize their writing, how they respond to writing tasks, and how they view writing.

The study will focus on the curriculum in the primary and secondary school and on student performance at three points in schooling in order to get as comprehensive a picture as possible of educational processes and outcomes. The three populations include:

A. Students at or near the end of primary education and the self-contained classroom. Through studying this population, one can explore question 3 and see the differential effects of home background, particularly the language of the home, and one can have a basis from which to examine developmental change and the effect of further schooling. The primary focus will be on students.

B. Students at or near the end of comprehensive education. Through

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studying this population one can explore questions 1 and 2 and examine the outcomes of the system of education at the point of its greatest diversity. The primary focus will be on classes and teachers.

C. Students at or near the end of academic secondary school. Through studying this population one can best answer question 4 and examine the performance of students who have mastered the "system." Again the primary focus will be on students.

The study will survey national or regional curricula, teachers, and students, and will include standardized writing assignments as well as questionnaires and other scales. Although standardized assignments written in class do not necessarily represent the absolute achievement of students, they form a fair indi-

cator for the purposes of comparing groups of students. The writing assignments will be scored according to an internationally agreed upon scale as well as according to national standards. For the purpose of comparative analysis, however, the international scale scores will be used. These scores will form the main dependent variable of the study.

At this point, the writing study has completed a series of theoretical position papers, a draft of the major hypotheses of the study, and draft versions of the writing tasks and questionnaires. One major task has been the development of an internationally valid description of the domain of school writing (Figure 3), a description that may enlighten curriculum makers as to the variety of writing tasks that might well be included in a school curriculum. The

main testing for the writing study will take place in 1983.

Conclusion

Both the mathematics and the language arts studies provide American schools with a sense of how well students do; more important, they broaden the vision of curriculum makers as to what is desirable for students. Too often we are victims of limited vision. Research like the IEA studies can expand that vision. ■

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Figure 3. General Model of Written Discourse.

Cognitive Processing		Reproduce	Organize/Reorganize	Invent/Generate
Dominant Intention/Purpose	Primary Content	Facts	Events	Things, facts, mental states, ideas
	Primary Audience	Ideas		Ideas, mental states, alternative worlds
To learn (metalingual)	Self	Copying Taking dictation	Retell a story (heard of read)	Note Resume Summary Outline Paraphrasing
To convey emotions, feelings (emotive)	Self Others	Stream of Consciousness	Personal story Personal diary Personal letter	Reflective writing —Personal essays
To inform (referential)	Others	Quote Fill in a form	Narrative report News Instruction Telegram Announcement Circular	Directions Description Technical description Biography Science report/experiment
To convince/persuade (connative)	Others	Citation from authority/expert	Letter of application Statement of personal views, opinions	Advertisement Letter of advice Argumentative/persuasive writing —Editorial —Critical essay/article
To entertain, delight, please (poetic)	Others	Quote poetry and prose	Given an ending—create a story Create an ending Retell a story	Word portrait or sketch Causerie Entertainment writing —Parody —Rhymes
		Documentative Discourse	Constative Discourse Narrative Descriptive Explanatory	Exploratory Discourse Interpretive (Expository/Argumentative/Persuasive) Literary

The traditional literary genres and modes can be placed under one or more of these four purposes.

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