THE "WHO" IN THE HIGH SCHOOL SCIENCE PROGRAM*

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All of you are aware of the structure of the Illinois Secondary School Curriculum Program. It is sponsored by the State Superintendent of Public Instruction, Vernon L. Nickell, in cooperation with colleges and universities and 38 lay and professional organizations. Among the cooperating organizations are the Illinois Association of Chemistry Teachers, represented by T. A. Nelson of LaGrange, the Illinois Association of Teachers of Biology, represented by J. S. Tucker of Centralia, and the newly organized or re-organized Illinois Council of Mathematics Teachers represented by Miss Gertrude Hendrix of Eastern Illinois State College.

Numerous unanswered questions regarding "The Who in the High School Science Program" and other similar items were largely responsible for the decision by the steering committee of the Illinois Secondary School Curriculum Program that assistance and encouragement should be given to every participating school and community to get the facts about itself that are basic to curriculum revision. The committee correctly insisted that we have, for too long, made curriculum changes on the basis of hunches or as a result of super-salesmanship by someone.

The implementation of this decision to ferret out the facts called for the structuring of a series of local factual studies designed to locate answers regarding "Who?", and in addition, "What?", "When?", and "How?". Four studies concerned largely with the "Who?" and "What?" were variously conducted in 135 Illinois high schools during the past year.

Before turning to an analysis of these studies, it may be apropos to state that we are not unmindful of the many accomplishments of our schools. The high schools have increased their holding power; virtual equality obtains among the educational opportunities afforded to boys and girls and men and women; teachers are better trained; physical plants have been improved; better textbooks are available; improved instructional equipment is used, including many audio-visual aids; the instructional program has been enriched by the addition of work in such areas as health, physical education, art, music, agriculture, home economics, work experience, social and personal relationships, and conservation; advances have been made in relating the subjects taught to

* Portions of this article are quoted from the following reference: Sanford, Charles W. "Challenging Developments in the Illinois Secondary School Curriculum Program", *The Bulletin of the National Association of Secondary-School Principals*", Volume 33, Number 162, April, 1949, p. 57-65.

life; and education is now generally looked upon as a continuous process lasting throughout life, with few persons regarding education as completed when a certain age has been reached.

These accomplishments, and others which might be cited, show that change is possible. All of us are well aware of the forces that have operated in producing these changes; moreover, all of us realize that many of these same forces, and others, are presently pointing to the necessity for further changes. These accomplishments demand our admiration, but we must, if we are realistic, look long and hard at certain problems that now obtain and at certain facts which we now have.

One such problem is this: "Is the holding power of our schools satisfactory in terms of accepted democratic goals?" Let us look first at some national figures.[1] For every 1000 pupils in the fifth grade in 1932-33, 786, or about 78 per cent, entered the ninth grade in 1936-37. Thus, our 4-year high school consisting of grades 9-12 had no chance at all to work with 22 per cent of the youth of high school age. Of the original 1000, 664, some 66 per cent, found their way into the tenth grade; 570, or 57 per cent, entered the eleventh grade; 510, 51 per cent, started the twelfth grade; and 455, approximately 45 per cent, were graduated. Certainly we can clearly see in these data substantiation for Provost Griffith's recent statement that American education ". . . has given too little to too few." Of the original 1000 fifth grade pupils 160, or 16 per cent, entered some college and 47, about 4 per cent, were graduated in 1944.

In the belief that national figures of this type ordinarily do not, and should not, convince persons connected with a local school that its holding power is deficient, the steering committee for the ISSCP decided to conduct a holding power study in a number of Illinois schools. The committee correctly reasoned that evidence must be obtained regarding local withdrawals if reasons for these withdrawals are to be examined and corrected. As a consequence, during the past year, a holding power study was conducted in 76 representative Illinois high schools. Three assumptions underlay this study:

1. That the secondary school is expected to serve all the children of all the people, and that the school can serve most adequately those children who are in school.

2. That the types of children who have dropped out of school in the past are the types most likely to drop out in the future, if present practices remain unchanged.

3. That the school, by changing its practices, can influence children to remain in school.

In each school, information was obtained to help us determine what proportion of all enrollees dropped out of school, at what times they dropped out, and what kinds of students they were in terms of such factors as economic status, I. Q., school success, course of study pursued, extent and nature of participation in extra-curricular activities, distance of the home from the school, behavior problems, and out-of-school

[1] Statistical Summary of Education, Ch. I, U. S. Office of Education, Biennial Survey of Education, 1942-44, p 31.

employment. Perhaps it is significant to note that all of these 76 schools had stated that they wanted to participate in this study. This same policy operates in all phases of the ISSCP. The program is in every respect voluntary; a school may participate or not, as it wishes.

Our composite findings from this study revealed that in Illinois boys dropped out in larger proportions than girls; that almost all of the drop-outs were receiving, when they withdrew, very low marks; that children from lower-income families dropped out in much larger numbers than those in the middle- and upper-income groups; that there was no appreciable difference in the holding power of small and large high schools, and so on. They also revealed that while Illinois schools have a better holding power than was cited for the country as a whole, there is still much to be done to increase holding power in Illinois. The range in drop-outs was from less than one to as many as eight for every ten who were graduated. On the average, for every ten who received diplomas, approximately three had dropped out. Since the study included only those pupils who started in the ninth grade, we can safely say that, for every ten who were graduated, considerably more than three youths of secondary school age were not in school. These state-wide summaries and others, together with data for each local school, have been returned to participating schools for use in the formulation of hypotheses regarding local curriculum changes which may lead to an increase in holding power. Certainly the data for each school furnish convincing evidence regarding vulnerable points for intensive study looking toward promising change.

With these drop-out figures for Illinois and the United States before us, let us look at the picture in science. Three sources provide a fairly good picture, though we must say that the picture needs to be defined even more clearly. First, we cannot offer high school science to youth who are not enrolled in any type of private or public secondary school.

The national picture was presented earlier. It indicated that, in round numbers, between 30 and 40 percent of the youth of high school age are not in school, and as a consequence, are receiving no instruction in science. "In 1940-41, the best year of our history as far as high-school enrollments are concerned, only 73 per cent of our youth of high-school age were enrolled in high schools."[2]

In addition to these data and those presented for 76 high schools in Illinois, we might look at the summaries in the annual statistical reports of the Office of the Superintendent of Public Instruction. They indicate that during the year of July 1, 1939 to June 30, 1940,[3] there were 103,239 pupils in the fifth grades of our public schools; in the period of July 1, 1946 to June 30, 1947,[4] there were 62,841 in the twelfth grades. Thus, 40,398 were lost between the fifth and the twelfth grades.

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[2] *Life Adjustment Education for Every Youth.* Federal Security Agency, U.S. Office of Education, Washington, D.C., 1948, p. 11.

[3] *Annual Statistical Report of the Superintendent of Public Instruction,* State of Illinois for the Year Ended June 30, 1940. Office of the Superintendent of Public Instruction, Springfield, Illinois, No. 328, p. 252.

[4] *Annual Statistical Report of the Superintendent of Public Instruction,* State of Illinois for the Year Ended June 30, 1947. Office of the Superintendent of Public Instruction, Springfield, Illinois, Circular Series A, No. 47, p. 352.

Second, a random sample of 114 Illinois public high schools ranging in size from 32 to 2,018, with a proportionately larger number of schools included below 250, in accordance with the proportion which obtains between small and large high schools in Illinois, indicated that in 1947-48, 19 percent of all high school students were taking general science, 19 percent biology, 6 percent physics, and 7 percent chemistry. The population of these 114 schools was 27,878, approximately 9 percent of those attending all Illinois public high schools.

Third, college-bound students probably take more work in science than those who do not enter some university. In an effort to discover how many students entering the University of Illinois had completed courses in science in high school, a study was made of the high school records of 100 students who entered the University in September 1948. Of this group, 63 had completed one unit in biology; 70, one unit in physics; 62, one unit in chemistry; and 80, one unit in some other science, usually general science. Thirteen students had completed a total of one unit in science; 28, two units; 31, three; and 28, four. The average number of units of science taken by these 100 students was 2.74.

These data indicate clearly (1) that all of us are confronted with a major task in trying to keep in school a larger proportion of the youth of secondary school age and (2) that all of us need to examine very critically our present science offerings, especially the work in the 9th and 10th grades. Is the traditional course in general science adequate for the large number who will receive no more? If not, what should be offered? How may we be reasonably sure that what we propose is adequate? Certainly all of us will take every step within our power to decrease the number of drop-outs; but while we are doing so, we have to be realistic and work with what we have.

Let us look at both of these questions. It was stated earlier that many Illinois high schools are attempting to increase their holding power through self-study projects followed by the testing of locally formulated hypotheses. One of these projects was concerned with the question, "Are the costs connected with certain phases of the school's program depriving some youth of the very experiences they need?" Also, we might ask whether or not the facts indicate that costs are the cause of some of our drop-outs. Many Illinois high schools attempted to obtain, during the past year, the facts concerning the identity and the amount of the full range of these costs. For want of a better name we called them "hidden tuition costs." Our composite findings in 79 representative schools, and here I am including grades 7-12, indicated that science textbooks were most commonly rented to pupils, that pupils purchased their books in from about a third to somewhat over half of the schools, and that it was only in the two lower grades, grades 7 and 8, that over 10 percent of the institutions provided free textbooks. Two out of every five high schools required eleventh and twelfth grade pupils to pay a special fee, assessment, or deposit in science courses, but this practice was much less fre-

quent at the lower grade levels. From about two-thirds to over nine-tenths of the schools, depending upon the grade level of the course, required pupils to purchase special materials or items of equipment in science. The median costs to pupils who attended schools in which textbooks were purchased by the pupils was $2.50 for seventh grade science, $2.40 for eighth grade science, $3.10 for ninth grade science, $3.90 for tenth grade science, $3.60 for eleventh grade science, and $3.75 for twelfth grade science. The lowest costs reported were nothing in grades 7, 8, 9, 10, and 11, and $0.50 in grade twelve. The highest costs to pupils who attended a school in which textbooks were purchased by the pupils was $2.76 for seventh grade science, $2.90 for eighth grade science, $3.85 for ninth grade science, $7.50 for tenth grade science, $6.60 for eleventh grade science, and $10.25 for twelfth grade science. The median costs of belonging to the biology and science clubs were $2.50 and $1.25, respectively; the highs were $7.50 and $39.90 respectively. Similar data were obtained for all subjects and extra-class activities offered in these schools.

Obviously, these state-wide summaries have relatively little significance except as they may serve as a basis for comparisons and as they may serve to stimulate local investigations leading to adjustments and corrections. Each school, then, must analyze the implications of cost facts of the type mentioned. Do high costs lower the holding power of the school? Do the costs of certain activities and of certain subjects mean that some pupils who need those activities do not participate in them? If so, how can we answer the charge that the school is not serving equally well all of the children of all of the people? One of my colleagues at the University of Illinois, Professor Harold C. Hand, has very neatly pointed, in the following words, to answers for these questions:

1. The school is by definition an *educational* institution.
2. As such, it cannot legitimately permit, much less sponsor, any activity (whether class or extra-class, formal or informal) which is not educative in nature.
3. If the activities permitted or sponsored are educative in nature, no public school in a democracy can justify making the accident of birth in an economic (or any other) sense determine who shall and who shall not benefit from said educative activities.[5]

Next, let us examine briefly the questions posed earlier, namely, "Is the traditional course in general science adequate for the majority who will receive no other work in science?" "If not, what should be offered?" "How may we be reasonably sure that the 'what' we propose is adequate?" Means are suggested for obtaining answers to these questions in the *Guide to the Study of the Curriculum in the Secondary Schools of Illinois.* I quote from the *Guide.*

The first and most fundamental policy being followed in the ISSCP is that curriculum improvement is a *grass roots* job, that any changes which may take place should be the result of the work of teachers, administrators, and lay persons in local schools. Although consultants from outside local schools will be available to provide assistance as needed, the real source of power in the operation will come from local schools rather than from outside.

[5] Hand, Harold C., *Principal Findings of the 1947-1948 Basic Studies of the Illinois Secondary School Curriculum Program.* Circular Series A, No. 51, Illinois Secondary School Curriculum Program Bulletin No. 2, Office of the State Superintendent of Public Instruction, Springfield, Illinois. May, 1949, p. 64.

The purpose of the school is to provide learning experiences so that the needs of youth and the requirements of society may be met effectively. The means of accomplishing that end, that is, the selection of what learning experiences may best meet youth and societal needs, constitutes a basic task of curriculum makers.

Curriculum construction might, therefore, be viewed in part as a sifting process wherein a selection from all possible learning experiences is made. What youth need and what society seem to require may constitute the sieve. All of the accumulated social and cultural heritage is available to those who teach. The teacher must select those experiences which will be most profitable to youth and adults.

Since all youth have certain needs in common and the social setting presents certain requirements common to all citizens in a democracy, a portion of the school day may be devoted to these "common learnings" of all youth. This would not change the policy of providing a wide offering of other subjects on an elective basis.[6]

The *Guide* suggests certain basic needs of high school youth, and it presents several statements of the purposes of the high school. In the Follow-Up Study which is presently underway in 100 high schools, we have defined 55 problems of high school youth which stem from these needs. Needs, purposes, and problems must be considered, but they only introduce us to the "specifics" to be used in the classroom. Certainly the introduction is a basic one, but it points only to the kinds of pupil activities which go on in the classroom. At this point we have found that the consultants from the colleges and universities who are cooperating with the Illinois Secondary School Curriculum Program render their greatest service.

[6] Houston, Victor M., Sanford, Charles W., and Trump, J. Lloyd, *Guide to the Study of the Curriculum in the Secondary Schools of Illinois.* Circular Series A, No. 51, Illinois Secondary School Curriculum Program Bulletin No. 1, Office of the State Superintendent of Public Instruction, Springfield, Illinois. August, 1948, pp. 9 and 10.

At the present time, as most of you know, the ISSCP is cooperating with 33 selected school systems in attempting to develop 58 projects. These projects are concerned with the improvement of existing courses in English, mathematics, science, social studies, etc.; with enrichment in broad fields; with development of common learnings courses; and with projects which cut across subject lines.

The ISSCP does not suggest any one type of curriculum improvement project as best for a given school. Decisions of this type should be made by teachers, administrators, and others working together to improve the curriculum in local schools. Each school is encouraged to start where it is, with what it has, and on that in which it is vitally interested.

A team of consultants from the colleges, universities, State Department, and other high schools cooperate with persons affiliated with local schools in attempting to develop superior programs. If and when superior programs have been developed, the local teachers and administrators will help other schools on similar projects. Moreover, as the local projects are being developed, teachers and administrators from other schools are encouraged to study what is going on.

The findings from the basic studies conducted in these schools are of inestimable value in building a broadly based local concensus regarding what needs to be done and in furnishing numerous "specifics" which merit attention.

It would be premature, after only one and a half years of work, to try to relate many of the emphases and

re-directions that are taking form in these projects. However, several have become crystal clear. They are:

1. The energies of our faculties and of others who are interested in secondary education must be directed toward meeting more adequately the needs of all youth, not the needs of one or two or three groups of youth.

2. In those schools in which developmental projects are underway, emphasis is being placed on real-life problems.

3. Whenever such problems are stressed, we find in the schools more and more emphasis on good work habits, how to work with others, understanding ourselves, developing a zeal for the democratic way of life, conservation, health, problems of community, state, national, and international concern, and the choice of appropriate school subjects.

4. Whenever such problems are stressed we also find more and more attention given to sharpening the guidance program to the end of identifying as early as possible the interests and abilities of students so that there may be provided learning experiences which will be of greatest value.

I wish that time permitted a development of this problem as it relates to locating youth with superior abilities, keeping them in school, and providing curricular experiences of maximum value.

5. It is becoming increasingly obvious that curriculum change is a "grass-roots" proposition. Persons from outside a given school system may be ready and anxious to cooperate with local schools, but little is accomplished unless the dynamic for local projects obtains within the local group.

6. Curriculum work which is effective calls for a high order of cooperation. At the local school level, this cooperation means participation by many members of the faculty; ideally, by all members of the faculty. It also means participation by school board members, by parents, by laymen who are not parents, and by pupils.

7. I hope I am correct in the observation that the schools, at least most of them, which have developmental projects underway have agreed that meeting the needs of all youth of secondary school age becomes a reality only when those concerned are obsessed with the notion that *all* youth of high school age are the business and concern of the high school. We must accept this notion or face the alternative. The alternative is that we shall let some other agency assume a part of the responsibility—another NYA perhaps.

Another study in the series sponsored by the ISSCP was concerned with the question, "Are pupils in our high schools participating in extracurricular activities according to their needs, interests, and abilities?" Do certain factors operate which make participation selective in one or more respects?

In the study which we conducted, we related extent of participation with sex, age, grade in school, location of school, mode of transport, acceleration-retardation, and socio-economic status. The data were then analyzed on the basis of each of the factors noted. The only factor identified which was associated with the number of participations was socio-

economic status, the accident of birth in an economic sense.

In all types of participation, there was less participation by children from low income families, somewhat more by children from middle income families, and by far the most by children from upper income families.

A fourth study was concerned with the problem, "Are the available guidance services both adequate and effective?" In all, or nearly all, schools some pattern of organized personnel services has been developed for students. These services may be concerned with the educational, occupational, social, and personal adjustments of young people.

Our investigation was carried on in 96 schools. We used three instruments, namely, the *North Central Association Check List of Elements in a Minimum and an Extended Program of Guidance and Counseling*, the *Illinois Revision of the Kefauver-Hand Guidance Test*, and the Ross L. Mooney *Problem Check List*. Our findings indicated that the major concerns of girls were in the area of Personal-Psychological Relations: "Losing my temper," "Nervousness," "Worrying," "Can't make up my mind about things," "Can't see the value of daily things I do," etc. The boys were most concerned with problems of Adjustment to School Work: "Taking wrong subjects," "Not getting studies done on time," "Worrying about grades," "Slow in reading," "Trouble in using the library," "Can't see that school is doing me any good," etc. Both boys and girls were bothered about problems concerned with Curriculum and Teaching Procedures: "Dull classes," "Made to take subjects I don't like," "Poor place to study at home," "Textbooks hard to understand," "Teachers too theoretical," "Wanting subjects I'm not allowed to take," etc., as well as problems concerned with The Future—Vocational and Educational: "Needing to decide on an occupation," "Not knowing what I really want," "Concerned over military service," "Deciding whether or not to go to college," etc. Typically, twelfth grade pupils exhibited about 75 percent knowledge of vocational trends and of the nature of the work involved in a sampling of representative occupations and a 67 percent knowledge regarding unfounded beliefs which lead to unfortunate vocational and educational choices.

So much for the 1947-48 studies which were variously conducted in 135 high schools. Copy for the inventories, tests, and schedules for conducting each of these studies has been set up in manual form. The manuals will be available on or about June 1.[7]

A fifth study in the series of studies basic to curriculum improvement, the Follow-Up Study, was initiated on February 15, 1949.

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[7] Allen, Charles M., *How to Conduct the Holding Power Study*. Circular Series A, No. 51, Illinois Secondary School Curriculum Program Bulletin No. 3, Office of the State Superintendent of Public Instruction, Springfield, Illinois. May, 1949.

Hand, Harold C., *How to Conduct the Hidden Tuition Costs Study*. Circular Series A, No. 51, Illinois Secondary School Curriculum Program Bulletin No. 4, Office of the State Superintendent of Public Instruction, Springfield, Illinois. May, 1949.

Hand, Harold C., *How to Conduct the Participation in Extra-Class Activities Study*. Circular Series A, No. 51, Illinois Secondary School Curriculum Program Bulletin No. 5, Office of the State Superintendent of Public Instruction, Springfield, Illinois. May, 1949.

Lovelass, Harry D., *How to Conduct the Study of the Guidance Services of the School*. Circular Series A, No. 51, Illinois Secondary School Curriculum Program Bulletin No. 6, Office of the State Superintendent of Public Instruction, Springfield, Illinois. May, 1949.

This study is concerned with two problems, "How may we build a strengthened teacher-pupil-school-patron consensus regarding the 'need-meeting' function of the secondary school?" and "How may we appraise the extent to which the local school is, or is not, now meeting the real-life needs of its secondary-school youth?" The five instruments, each of the check-type, which were designed for use in this Follow-Up Study, and which are now being used in 100 schools, focus attention upon 55 real-life problems of youth variously subsumed under the categories of "Earning a Living;" "Developing an Effective Personality;" "Living Healthfully and Safely;" "Managing Personal Finances Wisely;" "Spending Leisure Time Wholesomely and Enjoyably;" "Taking an Effective Part in Civic Affairs;" "Preparing for Marriage, Home Making, and Parenthood;" and "Making Effective Use of Educational Opportunties."

Teachers, pupils, parents and laymen who are not parents are asked anonymously to indicate whether or not the high school should help pupils with each problem cited. If the response is in the affirmative, they are asked to state how important it is for the school to provide such help. Teachers are also asked to evaluate the extent to which they believe graduates typically received help on each problem. Graduates are requested to indicate which of the problems they are experiencing, how much of the help they needed for each problem they obtained in high school, and how effectively they believe they are meeting each problem.

In closing, I should like to state that the Illinois Secondary School Curriculum Program is truly grateful to the Academy for the attention it is giving in this program, and through other activities, to the improvement of the high school science program. Many of the findings that I have reported this morning are discouraging, but of this I am sure—if we all work together and cooperate with the teachers of other instructional areas—the situation will improve rapidly.