Socialization of high school science

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Thesis
SOCIALIZATION OF HIGH SCHOOL SCIENCE

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OUTLINE
SOCIALIZATION OF HIGH SCHOOL SCIENCE.

A. Something new in science.

B. 1. Meaning of subject—definition of terms.
   2. Origin and growth of ideas.
   3. Present application.

C. 1. The benefits of socialization.
   a. for pupil
      1) educationally
      2) practically
   b. for community
      1) Links the school subject with community life.

2. Objections to socialization.

D. 1. Practical program for extending socialization.
   2. Advantages of such program.

Conclusion:

E. Forecast of possibilities.
   a. Economic
   b. Commercial
   c. Social
   d. Educational
MAIN BODY OF DISCUSSION
SOCIALIZATION OF HIGH SCHOOL SCIENCE.

We are witness in our day to mighty convulsions in every department of human life. Old traditions which our parents reverenced are being thrown rapidly into the discard, convictions which once were cherished with all the sacredness of dogmatic truths no more are binding. The world is restless, a new spirit is abroad. It is breaking over the face of the earth, truly the old order changeth.

In the midst of this restlessness, political, economic, social and religious, it would have been strange if the sphere of education had not been affected. As a matter of fact, in things educational this reaching out for new ideas, new methods, new fields is particularly noticeable; and happily it can be said that few departments give evidence of a more healthy radicalism.

Among the many ideas which have come to the fore is one which embraces a plan proposed by Herbert Spencer and advocated by illustrious thinkers which is known as socialization. Our
purpose in this paper is to give results of experience on this subject, its meaning, advantages, and practicability as applied to High School Science.

The High School is a prominent and responsible charge in every community. Through its portals pass legions of pupils. It is, moreover, "the academies" in which our youth, for the most part, begin to realize, that they are social beings. Here they first conceive the notion of using their learning to improve their status in life and feel the impulse to turn their knowledge to their own betterment and the betterment of others.

In the High School, therefore, where the pupils are awakening to the consciousness of their place in the life of the community we feel that the idea of socialization may very well be carried out and that its application will work to the benefit both of the pupils and of the community.

Socialization in its present application is of rather recent origin. The term itself has been given various shades of meaning though all are more or less connected with ideas conveyed by the word "Social." Mr. Lester F. Ward in his work "Pure Sociology" defines socialization as "conscious, intentional, wished for and welcomed"
action not of the individual as such but of those individuals into whose hands, society, by whatever means entrusts the conduct of its affairs." As far as the subject affects High School Science it is a controlled and directed method by which science subjects are made to approach more nearly the life of the pupil and the community.

The American mind has become increasingly practical during the past two generations. This fact is evidenced in a variety of ways. It is reflected very clearly in the curriculum of our schools and colleges. The so-called cultural subjects of a century ago are steadily given way to studies of a technical and practical kind. Science subjects have been added and more hours of study have been allotted than heretofore to these departments of school work.

Not so long ago vocational training was unknown. The thought that elementary and high schools should prepare their pupils for some definite and determined kind of work, according to the pupils bent or interests, had not been conceived.

Mind training of a general character was the
order of the day. It was felt that by training
the memory, by developing powers of observation and
by increasing the ability to think that the pupils
would be able to solve whatever problems confronted
them in later years. Thus those subjects were
selected for teaching which were supposed to be
best cultivated to strengthen and develop these
powers of mind.

But the rush of modern life demanded quick
results. Why give a preparatory college course
to a boy who will never go to college and whose
future work soon to be undertaken is in some trade?
If a boy is going to be a carpenter, why not let
this fact govern the subject which he shall study
and allow him to go out from the school prepared
to work at the chosen avocation of his? And so
were introduced sloyd, mechanical drawing. And
so too came our Technical High Schools, our
Vocational Schools.

Socialization is an outgrowth of this same
trend of thought. It would bring the community
nearer to the school and make the school reflect
more accurately the life and needs of the community.
It has in mind not merely the development of the pupil but the development of the pupil as a member of a community. It will try as it becomes more nearly a science to lay down principles and suggest the methods whereby the aim may be realized.

But Socialization is not merely a natural outgrowth of the tendencies of American life, it embodies as well a very sound pedagogical principle. The mind is keenest and most alert in the presence of subjects which interest it. The adult, by dint of concentration and by reason of training, may be able to apply himself to any and all subjects, regardless of the appeal which the subject may make to him. But even the adult mind will require more readily information and knowledge concerning subjects that prove interesting.

With the young this fact is even more true. Interest a pupil in some particular subject and how eagerly he tries to learn what he can concerning it. His mind seems to awaken to new life; at least for the moment the spirit seems to triumph over the usually sluggish boy. The old familiar statement which all of us heard no
doubt in our earlier years, "Well, you are not interested now, but it will do you a lot of good later on" may have set us to work in a spirit of trustful confidence in the wisdom of our elders, but it hardly awakened in us any zest for the subject itself.

The time will never come when the class room and the school house will appeal to the pupil more than the out of doors.

The time should never come when every element of drudgery has been eliminated from the work of the class room. But the time should come when the school will be for the pupil a work shop, indeed, but a work shop in which the pupil works with interest because he feels that he is dealing with things worth while for him, problems dictated by his own nature or required by his environment.

Socialization of High School Science is a step toward the realization of this ideal. It does not throw out any of the subjects formerly taught in the High School, it does not introduce any new subjects. It tries to utilize the objects lying
round about, to supplement the work of the classroom and to give practical setting for the principles or theories which are to be taught.

Let me give an elementary example of the "socialized" work. About ten miles out from a certain town, a water-ram was installed at a spring in order to furnish water for Mr. Weston's house and barn. Mr. Sanborn, the physics' teacher, took his class over the hills to see this simple application.

The principle of the ram was discussed while we listened to the clicking of this particular ram which had been set up at the spring.

The pupils measured the amount of water flowing through the ram per minute, fourteen pints, and the amount delivered to a trough at the barn, per minute, namely, one pint. Mr. Weston gave them the distance from the ram to the house, 1000 feet, and the elevation, eighty-five feet. He explained how water was delivered to various places by the operation of valves. They computed the amount of water delivered per day and the amount of work done. Another spring bubbles up near by. The class estimated the amount of water.
flowing from the two and the fall that could be obtained. They decided that sufficient energy was present to furnish electricity for the home.

The boys and girls gained a better appreciation of this one demonstration of a practical kind than Mr. Sanborn could possibly have given them with his pretty little glass model in the laboratory. They were face to face with a local problem. They were interested. For here was their dreaded difficulty, science and physics, acting as a labor saver, not as a labor maker.

Their genial host then took them to his fine orchard and told them of an interesting example of air drainage and frost. The east side of the orchard sloped rapidly down into a woodland which continued on to a ravine far below. One year all the apples in the lowest row of the trees were destroyed by frost. On the next row only those at the very top were left. Farther up the slope only the lower half were destroyed, then only those on the lowest branches had been claimed by the frost. Above this, all the trees hung heavy with Winesaps and Jonathans. Mr. Sanborn asked him to allow the class to work out the explanation.
They did so with much more interest than he could have received with the best book problems.

The pupils visited also the local ice plant, the Electrical Company, the Telephone Central Station; and different heating plants. All of these studies were most beneficial. No notes were required, little data collected and the pupils did not have to "write them up". Frequent reference in the later class discussions to the observations made, showed nearly all the boys and girls had their eyes and ears wide open.

True, it would be easy to consume too much time with this kind of work. The visits, moreover, must be well directed else they will degenerate into mere picnics. But, that being said, it does seem helpful to connect up in this way with applications outside the laboratory the thinking of the pupils. The backbone of the physics course must ever be the lecture room and the laboratory. The course ought to call for the very best efforts of the pupils. It should give considerable training in the scientific method of thinking and doing. But "to socialize" the work does not detract from these essentials. On the contrary, it helps the course materially. It
vitalizes the work: it gives the boys and girls a higher regard for science; and in later years, when school days are over, it will show its fruit still in this that the pupils will continue to see physics in the things around them.

No matter how well one laboratory may be equipped, no matter how well our course may be organized, if our teaching is cold and dead, if it lacks interest and inspiration, the students may never discover the possibilities which the future holds, as one writer beautifully expresses it, "What a privilege to teach with such skill and inspiration as to develop every member of the class to the limit of his capacity and perchance cause some boy or girl to consecrate a talented life to the service of science."

Against the program of socialization of science teaching, many arguments have been advanced. It is new, it is radical, it coddles the pupil. The old traditional methods have proved themselves by centuries of use, they should be left in power. These are but a few of the criticisms which are passed on socialization. These objections are voiced
by honest men who are sincerely interested in the work which education is intended to accomplish. Criticisms which come from such a source cannot be ignored nor passed over lightly. They must be accorded respect or given attention. They may very well serve as a helpful and healthy check on the development of the new idea of science teaching.

But though we grant that socialization is new, radical even, if you will, we do not feel that that fact should condemn it. It is born of a demand created by conditions in this land of ours, behind it is the idea, which modern pedagogy has been quick to grasp and utilize, that the imagination is not merely a faculty of the brain which itself should be developed, but a faculty as well which can be used to bring the intellect and the will to work with more interest and better results.

Undoubtedly the socialization of science in the High School can be overdone. Like all things else it must observe the "via media". Properly controlled, however, and directed rightly it contains many benefits both for the pupil and the
community. In the presence of the great industries and activities, of his district where the principles of science are being employed in a practical way, the pupil learns a new respect for his science course. It is no longer a dead thing, a thing of memory and of textbook. It is vital and real. He goes back to the textbook with new interest and with this new interest comes greater application. It is easier to concentrate now. His imagination has been stirred. It is the experience of teachers who have adopted the methods suggested by socialization that the students are much readier to apply themselves to the formulas of the textbooks than they were before such incentives towards interest were employed. Not all pupils can see beyond the textbook to the world around them. Very few can visualize circumstances and conditions where the principles of science, which they are attempting to learn, could be applied. But in the presence of a practical situation where they are actually being used this difficulty disappears. With it disappears too the initial fear with which most pupils approach the science
courses. They had heard that the science class was "terrible," filled with hard problems, dry as dust and purposeless. Older pupils, perhaps, had told them this or former students. Through the medium of socialization, by which the work of the class is tied up with practical situations, though the problems still remain difficult, they lose their "dryness" and appear in a very purposeful aspect.

But these are not the only advantages which occur to the pupil from an educational standpoint by the linking of the science course with practical situations. More important still are the mental processes which are thus begun. We are apt to think in terms of our experience. "One is compelled to recognize," says Mr. W. L. Eikenberry in his book "The Teaching of General Science," that the potential value of knowledge is realized only if in the circumstances of its learning or otherwise it is in some manner rather closely associated with situations in practical life. Thus the small amount of knowledge acquired by a 'practical' man in the pursuit of his occupation may be of greater functional value to him than is the more extensive knowledge of another if gained in the pursuit of
'theoretical' studies."

"Knowledge which is to be used in practical situations should result from study having its origin in practical situations rather than in theoretical ones."

Nor can we overlook the value for the pupil of this "socialized" work in the matter of habit formation. Beyond a doubt, in the course of his work the pupil will form habits. It is inevitable. Obviously, therefore, every reasonable effort should be made to inhibit the formation of wrong habits and to facilitate the formation of habits that will be of value. The habits that are usually mentioned as objectives in science teaching are such as the habits of observation, neatness, carefulness, accuracy, and the like. It must be remembered, however, that the habits actually formed are such specific habits as neatness at the laboratory desk, accuracy in weighing or in compounding chemicals, care regarding spelling and punctuation of notes or methodical procedure in recording data. These habits have
very great social, vocational and individualistic importance if they are actually employed outside of school or in later school life. But it does not follow that they will so function. The one who has formed these specific habits may not be equally neat about his study desk nor accurate in the kitchen or careful with personal correspondence. He is more likely to be, however,---or to express it in another way---this "transfer of training" will at least be facilitated, if the scientific materials are so closely related to the actualities of occupations that the associations are readily made; if the apparatus used, for example, approximates commercial types; if the data are similar to those secured in industries and affairs, and if the class activities generally are similar to extra school activities.

When we speak of the influence for good which socialization may exercise for the community its value appears no less great. All the courses of study in the High School curriculum are to develop the pupil in one way or another. They
cannot divorce themselves from the fact that the student is a future citizen, a member of the community. They are intended to develop tastes, ideals, the elements of character, habits of thought etc., and through these they make their splendid contribution to the community. But the science course is bound up with the community and the activities of life in a more definite way. The facts and principles of Science have to do with the material utilitarian world in which we make our livings, in which we associate with one another as members of a social organism. One of the first aims of science teaching is to instruct the pupil in that scientific knowledge which is valuable as a preparation for the activities of life.

Socialization of Science makes this relationship more intimate still. It goes into the life of the community for subject matter. It brings the community, its activities and forms of endeavor, to the very door of the school. The problems which the pupils are to work out are taken as often as possible from the world of affairs. The
visits which are made for the purposes of study and observation to electrical plants, telephone exchanges and the like not merely give a practical setting for certain subjects which the pupils are to learn but at the same time they awaken in them a new interest in the life of the community and a greater respect for its manifold activities. More than this, most teachers who have adopted socialized methods will agree that parents, older brother and sisters, business men who are approached for one reason or another, are not infrequently aroused to unwanted interest in the students and their work and problems. The result is a stimulus to the pupils, an encouragement to the school and a benefit to the "outsiders"—all of which must inevitably react to the advantage of the whole community. Thus far we have spoken of Socialization of High School Science from the point of view of the subject matter selected. But it is not in the selection of the subject matter that the real meaning of the movement lies. The movement is aimed toward a reform in method,
point of view and the selection of subject matter is largely dominated by the method.

Materials chosen from the environment and experience of the pupils are calculated to arouse their interest and lead to helpful thought processes. But this subject matter must be presented to the pupils in ways which will further stimulate enquiry if socialization is to reap its full fruit.

Students of psychology tell us that the origin of thinking is found in a perplexity which we recognize as such.

Reflective thought operates only toward the solution of a problem. In accordance with this fundamental law of mind, the value of challenging the intellect to attempt the solution of a perplexing problem can readily be seen. This suggests the importance of introducing each new laboratory exercise of each new subject in the textbook or class discussion by means of these elements that stimulate wonder or awaken curiosity.

It is this principle which is acted upon where science teaching is socialized. Obviously the work of the teacher is important here to give the
principle its proper application. It will be the teacher's task to select situations that contain real problems, to develop the situations in such a way that the pupils will apprehend them and be anxious to solve them and to guide the subsequent processes of observation, experiment and reflection.

How this work shall best be accomplished is a matter for discussion. The capacity of the students, the environment, the individual views and aptitudes of the teacher will all enter into the decision. Two methods which are receiving much attention today are the problem method and the project method. Both methods have much in common; indeed, by some writers the problem method is considered a species of the project method. Both start with a practical difficulty; in both the inductive method of reasoning is used. They differ in the variety of the subject matters introduced—the project method allows a wider range according to the purpose to be obtained.

Formerly in science teaching the method employed was largely deductive. A principle
or a definition was to be proven. Our textbooks of science in fact usually begin each chapter with statement of certain general principles and the definition of certain terms and ideas.

There follows then a discussion of these concepts and principles and the chapter closes with the introduction of some practical applications. Not infrequently these examples or applications are of a kind which do not occasion any particular interest on the part of the pupil. They are remote from his actual experiences and observations. The first condition for reflective thinking—a problem is lacking.

In contrast to this, socialized science begins with a practical situation which involves a problem, endeavors through a discussion of the problem to discover the general concepts under which the particular phenomenon falls and having ascertained these concludes with the statement of principles and definitions. The process in this method is from the particular to the general; in the other method the process is from the general to the particular. Consider as an example, the displace-
ment of water by a submerged body. In the traditional process—the deductive method—the principle would be laid down that a submerged body displaces an amount of water in exact proportion to the weight of the body submerged. A glass tank filled with water and various blocks of wood and the like would then be called into service. Observations would be made and in this way the principle would be verified.

In the new method the process begins with the experimentation. A block of wood is submerged into the glass tank; the displacement of water follows. Other blocks of wood are submerged; water is displaced in varying degrees. A problem is thus suggested. Next follows the observations and calculations until finally the pupils arrive at the principle.

This problem method with its process of inductive reasoning solves a difficulty which was very likely to be found in the old system. Where the general principle is stated first to be verified later, the average pupil is quick to realize that this statement is an expression of ascertained fact
which is to be accepted without question. Hence his efforts to prove it are apt to end when he has established some sort of concurrence between his observations and the stated proposition. His memory is apt to be taxed much more than his powers of observations, analysis and reflection. Under the problem method the experiments assume a greater importance in his eyes, his observations are made with the definite purpose of ascertaining the facts which apply to the particular situation and his later recollection of the principle is likely to be more vivid and to endure longer because it rests not so much on memory as on his own observations and experience.

Obviously, the subject matter of the problems is of great momentum. In order that the problems may interest the pupils and the solution of them may lead to worth while results, the subject matter must come from the life that the pupils are leading or from the life that they recognize as lying in the immediate future. The problems may originate in school experience, in the home, or in play; they often arise as a result of previous problems in the
course or the teacher may deliberately introduce
them. It is the part of the teacher to control
the selection of problems and to see that the
problems are appropriated by the class as their
own, before the solution is attempted.

But more even than the problem method the
so-called "project method" is receiving attention
in educational circles and deserves a place in any
study of socialization of science teaching.

The idea which is contained in this method
is not altogether new. It has indeed been em-
ployed under one form or another by wide awake
teachers for some time. The term "project" how-
ever is itself a recent addition to the terminology
of pedagogy. Its meaning has been variously
expressed. The following are some of the defini-
tions which have been offered.

Drushel: "A project is a concrete problem
outlined sufficiently, fully and clearly to enable
the student for whom it is designed to carry it
out."

Stevenson: "A project is a problematic act
carried to completion in its natural setting."

Nolan: "A project is a reflective act carried
on in its natural setting."
Kilpatrick: "A project is a wholehearted, purposeful activity proceeding in a social environment."

It appears from these definitions that the concept represented by the term "project" is not confined to school work or the field of education. As it enters into science teaching in High Schools we prefer Randsell's definition: "A school project is a problem the solution of which results in the projection of some object of knowledge of such value to the workers as to make the labor involved seem to him worth while."

The words of W. I. Eikenberry on the subject may serve to explain the definition. He writes, "The contrast between common 'assigning lessons' and the project method is the contrast between a task imposed by superior authority and an activity entered upon from choice. It is conceived that a pupil who was assigned the task of constructing from tinfoil and paper an electric condenser would be likely to execute the task in a perfunctory manner designed to get by the teacher's inspection
while the boy who planned to use the facilities of the school for constructing a condenser because he wished to use it in his wireless set would do an entirely different grade of work."

As in other forms of "socialized" work in science teaching the effort is first of all to interest the pupil to cause him to do as much personal work as possible and to make him feel that he is dealing with things that are near at hand, socially fundamental and for him worth while. For the heart of the method lies in securing the whole hearted, purposeful interest of the pupils. Sometimes this interest will be spontaneous, growing out of the out-of-school activities of the pupils or the intriguing character of the subject. More often, however, it must be developed by adroit handling on the part of the teacher. This preparation is called the "approach" of the project when the pupil recognizes his project he is ready to begin.

The development of the project is open to considerable variation and individuality. In general, however, the work consists of reading, experimentation and discussion. The work may proceed with the pupils working in groups or as individuals.
teacher is necessary to guide the reading and activity. There are times when demonstration is needed: when the pupils must be "shown how". The teacher accordingly gives the demonstration, but only as an example. The pupils later, the same thing. This, they may do either in school or after school as the instance may require. It proves helpful to allow the pupils at times to assume the role of teacher or demonstrator. The incentive to the pupil by the knowledge that they are going to "show something" to the class is an excellent form of motivation of the work. The pupils who thus demonstrate come to know the project and what it involves very thoroughly and at the same time, these seeing the demonstration, realize that what is being done they also may do. The result is that many go home and try it. The fact that one group is not working entirely for itself but for the whole class is an excellent way of socializing the work.

This demonstration by the pupils to the class is one way in which to bring the project to its "culmination". The pupils are in control both of the demonstration and the discussions. This
method of procedure brings out the active interest of the pupils. They insist on an explanation that explains to them. Since the discussion and argument are in their hands, the point of view of the work is theirs. So often students exclaim, "Oh! there's no use to argue with the teacher!" But when they are talking and working by themselves, this is different. There is an equality in the exchange of ideas that is bound to be stimulating. The teacher, of course, must be present to guide and instruct and to keep the work efficient. Once the thing attempted has been accomplished, the project closes.

Now what is the practical value which results from this type of work? First of all, a new attitude is produced. The pupil has done things of a scientific nature; he has done them, he feels, by his own industry and application. He feels a personal satisfaction in what he has done or made or learned. He has gained too, a certain familiarity with scientific terms, books and apparatus which enables him to feel at home in work. The fact, moreover, that he has done something successfully gives him encouragement to try something else. This, he does not merely
in school but at home. It is a fact to which teachers who have used the project method in science teaching will attest that pupils who have been thus awakened to the interesting possibilities of science will continue their work of reading and experimentation outside of school and call in their friends to be witness to their demonstrations.

A word now about our own observations and experiments with socialized methods in science teaching will not, we hope, be amiss. In the course of our five years in this department of High School work, we have employed both the problem method and the project method, and, at times, a combination of both. Our experience in applying these methods has been very happy. As a result we have learned a wholesome respect for the socialized methods of science teaching and a whole hearted advocacy of them. By this, we would not minimize the value and the necessity of the traditional methods of teaching. Not every item in the science class can be made a problem. The project method cannot, at least as yet, be used exclusively. The lecture method must always have a place. The text book—a revised text book—we hope, but none the less, a text book, can never be
eliminated. Demonstration by the teacher will always be essential. But the new methods in our judgment and from our experience constitutes a distinct advance in the science of teaching. They tend toward making the class more interesting. The pupils become more wide awake, more receptive. The home and the community grow nearer to the class room and the class room responds with a finer appreciation of the world which lies at its doors. The contribution, moreover, which this type of teaching makes to mental development of the pupil and to the formation of helpful habits of thought are very great. Of this matter, however, we shall have a word to say later.

In applying the socialization idea, we have found the General Science Club very satisfactory. Membership in the club is restricted to those who have an average of eighty per cent or better in the science course. In organizing the club, we carried out a more or less formal and parliamentary form of procedure. At the first meeting temporary officers were elected and questions were presented for answer
at the next meeting. The second meeting was given over largely to the drawing up of a constitution. The set of laws or by-laws which were to govern the organization were discussed, altered and finally adopted by a majority vote. This was later typewritten and pasted into the secretary's book. All this, it may be remarked, tends to create "Atmosphere". It is perhaps the experience first of its kind that the boy has ever experienced. It appeals to him and likewise makes for the solidarity of the group. The officers selected consisted of a President, a Vice-President, a Secretary, a Treasurer, a Sergeant-at-arms, who as custodian of apparatus, arranges seats, collects and distributes materials and in general maintains order, a Librarian who is in charge of books, pamphlets, magazines, articles, and pictures owned by or contributed to the club, and Scouts whose work is to discover and investigate interesting places to which the club may make trips. The club voted to impose five cents a month as the regular dues and left provision for an extraordinary tax, not to exceed ten cents, which might be levied in order to
purchase a special bit of apparatus or the club insignia (buttons) or to pay for the awards and prizes.

Perhaps we should state here that we use the name "General Science Club" not merely because the club is an auxiliary of the General Science course but also to distinguish it from the specialized science club. Most of the efforts of teachers have been confined to these specialized clubs. We have had the Photography Club, the Wireless Club, the Chemists Club, the Radio Club, the Aireo Club etc. But these specialized clubs have labored under two defects and as a result have often lived a comparatively short life. First of all, this type of club is almost always dominated by a few prime movers. These advance so rapidly that the rest are soon hopelessly outclassed and tend to drop out. In the second place, the progress of the few leaders in the club soon exhausts the knowledge, ability and equipment of the average teacher of general science. Where the latter is not the case the group continues; but it becomes
very limited and select and establishes an aristocracy of scientists, this, of course, is of immense value to the "aristocrats", but it does not at all utilize the possibilities along science lines which the mass of individuals possess.

In the General Science Club, the primary aim is to get every pupil in the class at work on a problem of his own choosing and one in which he is sufficiently interested so that he will work on it.

The particular problem, topic or question which he selects is, of course, a compromise between his own interests and desires, the teacher's ideas as to its worthwhileness and the pupil's ability to cope with it. The problems assigned, work commences. It is the understanding that on certain days (and a program of names and dates is made out and posted) each pupil will have an opportunity to report to the class on his (or her) problem. Sufficient work must be done on the subject so that the pupil whose turn it is to demonstrate will be able to answer nearly all questions that the class may ask. In fact, the class regards each pupil as the expert in his or her field; just as they are each expected to be experts in theirs.
The meeting day arrives, the usual method of procedure is carried out, the minutes of the preceding meeting are read, reports are heard from committees and whatever organization business is before "the house" is transacted. Then comes the demonstration and discussion. Let us say that it is the day on which George is to present what he has learned about how an automobile works. The class looks upon him as their auto expert. For three weeks he has been reading books and magazine articles on automobiles. He has been experimenting in simple ways with gasoline, carburetors, spark plugs and engines. He has watched automobiles work and has examined many of them. He has, moreover, had two conferences with the teacher. In the first of these, an outline was made which covered what the class would like to know about the automobile and where information was to be found. During the second conference, George reported to the teacher what he had read and learned, difficulties were cleared up for him and he presented a set of questions which he was going to ask the class to answer after they had listened to his report. This set of questions, revised by the teacher, George had posted
on the bulletin board a few days before and now
every boy and girl in the class before him has it
copied into his or her notebook.

George takes his place before the class. He
is the teacher. He performs the experiments he has
prepared, explains his charts and diagrams, operates
the lantern, asks questions of the class, grants the
privilege of speaking to the other members and in
short, is "master of ceremonies". Although George
is by no means a brilliant boy, he is singularly
free from nervousness. He is so full of information
on his subject that he is anxious to impart his
knowledge to others. The feeling that he knows
his subject gives him confidence. The teacher,
who is in the background, is, however, ready at any
moment to enter into discussion; guiding, directing,
helping, supplying some information, cautioning this
pupil and encouraging that one. The meeting ends
with a summary by the teacher.

Of course, a class must be trained to such a
procedure; but they do not, as a rule, take long
to adapt themselves to this form of "socialized
recitation". During the first few weeks, when no
one is as yet ready to report, the teacher presents
reports on topics in which she herself has been
interested. These teacher reports should serve as models for the pupils to follow. The teacher should put forth great effort in these initial meetings. Questions should be posted in the usual way, discussion should be carried on and the demonstrations and the summary presented just as pupils will be expected to do later on. The sequence of reports, moreover, should fit into the teacher's organization, which might be some standardized course of study to this end; every few weeks the teacher should appear before the class in order to unify the reports of the month and to review what has been gone over. In this way, what might otherwise be a disjointed presentation of many topics becomes a unified whole. It is well, too, to commence the term's reports with the most capable pupil so that success in the beginning may be assured. At the end of the year, every boy or girl had an opportunity of reporting at least twice and has answered fifty sets of questions (if there are twenty-five in the class).
Compare this with the result where the teacher has done all the lecturing and demonstrating, all the gathering of materials, all the organizing, all the experimenting, and, in fact, all the thinking. The advantages resulting from the socialized method become apparent at once. In the years in which we have used this method there has been an almost negligible number of pupils who have failed to be ready when their turn came. They enjoy it too much. Rather, it is difficult to satisfy them with but two opportunities in which to report.

But the possibilities of the club are not exhausted by the club meetings as such. The club may enter in a helpful way into the social activities of the school. Indeed, there is no surer way for a teacher and his subjects to become popular and respected than by entering into the social life of the school. The club may arrange periodically for events to which the whole school may be invited. This may take many forms. The school assembly period may be devoted to an exhibition of "science magic" or a demonstration of some boy invention or
even the presentation of a playlet which has a "science plot".

We recall an experience which illustrated the point. A play was to be presented at a Saturday afternoon gathering of boys, girls, teachers, and parents. The plot, written by one of the boys, was briefly as follows: The science club sergeant-at-arms detects a small boy in act of tampering with the wireless serials belonging to the club. He brings the culprit before a meeting of the club where the boy is put on trial. It develops that the offender has been urged by mere curiosity and a desire to understand what "the thing" was. After some rather wild suggestions by the members as to punishments, one boy makes a plea for the culprit's life and proposes that he be permitted to join the club where he may learn all about it. The eloquence of the advocate wins over the club and the members then proceed to initiate the candidate "scientifically". This done, the President ties the club insignia around his arm. Hardly had the "drama" commenced on the day of its presentation, when some of the leading actors became stage struck
to the extent of forgetting their lines. Fortunately, the movement of the plot being of their own origin, was very clear in their minds. First one and then another, they all abandoned their memorized lines and rose to the occasion spontaneously. In parts the effort was crude; but months of rehearsing could not have produced the spirit and genuineness of the acting. The affair was a great success.

In other ways, too, the club may participate in school activities. It may raise funds for the Red Cross by selling and repairing scientific toys. It should get write-ups in the school newspapers, have a place in the library etc. About every other week it is well to spend part or all of the program in actual working with tools and apparatus. The members take turns at this, not more than ten or twelve come at a time. The purpose of the period is to give them an opportunity to try out their ideas and to experiment with their toys. The work period gives outlet for these stimuli. It also presents a golden opportunity to direct a boy's thought into proper channels. "Wild Cat"
schemes can be quickly discouraged; information can be supplied; proper books and magazines put in the way; and in many other ways the boy can be helped to develop in scientific concepts and methods.

An idea which the writer has tried to develop in socializing her teaching of science is the use of groups as "authors". As the method in its application is, we believe, a new one we may be permitted to expose it in much the same way as we introduced it into the class.

"To-day we are going to be authors. I would like to have you separate into groups of six and stand in different parts of the room."

In a few minutes this is done.

"Now select a chairman and a secretary for your group. I will give you ten minutes to talk over any subject in science which interests you or which you would like to know something about. The group which first hands into me, on a slip paper, the subject it will treat will have the first choice."

In fifteen minutes the subjects chosen had all been presented. The list included oil, submarines, wood, wool, light, starch, foods, gases, salt and heat.
"Now each group must have a name under which it will write. Mary, what will yours be?"

"Our subject is oil and our name will be: 'The Six Gushers'."

"And yours, John?"

"Our subject is submarines and our name will be: 'The Deep Sea Divers'."

"Can you guess who will be the authors?"

"Yes, the groups."

Straightway there is an ill suppressed hum of excitement. A flow of questions followed:

"May we each write a chapter?"

"May we have a picture on the cover?"

"Can we take pictures from magazines and periodicals?"

"May we write to people?"

These, and many other questions were put, and answered by telling the pupils that they might do as they wished. And so the work of the groups as joint authors began.

The next day "the books" are the topic of conversation among the pupils. At the beginning
of class someone asks: "May we discuss our books today?"

To which answer is made: "Yes, you may have ten minutes for discussion."

A "squabble" arises in one of the groups. Appeal is made to the teacher.

"Mary Mason wants this picture included and Mildred Aberle doesn't, what shall we do?"

"You must settle your own squabbles," is the answer.

Accordingly a vote is taken by the group and immediately Mildred gives in to Mary, forgets about the difference and the two become chummy again. Thus the many disagreements which arise in the course of the work are always settled intelligently.

The next few days are devoted to the regular work of the class. No mention of the groups is permitted during the period. In the meantime, however, the members of the different groups have been writing letters, collecting or writing for samples and gathering all possible information and data for their particular books. Answers to letters
and appeals for samples are addressed to the pupils at the school. They take great pride in receiving these and in opening them in class. The following week, reports are called for. As the reports are given, each group listens attentively to the individual report to see if it can do something still better.

Occasionally I am told: "This is a secret: may we show it only to you?"

The date is then set for the completion of the books.

"Four weeks from to-day all books must be finished and handed in. Mr. Rockwood, our principal, will act as judge and select the prize book. Remember each book must contain six reports."

Then follow meetings of the members of the groups, both in school and out of school, conferences with the teacher, efforts to gather material and information and finally the arrangement and compilation of the matter in book form. As the work advances the interest of parents and others in the progress of the book becomes very evident. Such remarks are made as the following:

"My father wants to know if he may touch up our cover."

"My brother wants to fix my samples."

"My mother thinks that we ought to visit the
Finally the time allotted for the completion of the books comes to an end and the groups submit the result of their labors. In the appendix to this paper several of the books are offered as evidence of what was done.

This idea of group work is, I believe, original, but I believe strongly that it is one of the biggest things I do in socializing my science course. Through it, I am able to include the pupil, the parent and the community. It makes my teaching more stimulating, more attractive, more useful and more practical without, in any way, detracting from the seriousness and value of the science study. The buzz of voices may, perhaps, be an object of disapproval to some teachers, but my experience has been that the pupils like the work so much that they are willing to try and moderate their voices in order that they may continue the work.

After the books had been submitted I asked the pupils to write their ideas of this group work, I include three of the compositions which were submitted.
The system of writing books in groups is very interesting, instructive, and educational. It broadens one's mind on that particular subject chosen to write about.

The meetings help the writer to co-operate, to express his idea on the subject, to tell its uses, value and so forth.

After they have collected a number of interesting facts they can put it into story form. It teaches them to use better English and to put it into correct places, also to express themselves in a clear manner.

The arrangement of the book helps the writer to be neat, so when they have larger and more difficult tasks to perform it will not be so hard for them to do it.

The reward comes only to those who do their best in trying to make it a success. This makes the "Slackers" wake up and stimulates them to do their best also. Therefore it creates workers who are all striving for the one point--Success."
"The Six Gushers." (2)

"I think the idea of writing these books was good because it was something new and naturally it attracted the attention of everyone, that is, all who would be capable of being interested, and best of all, it held their attention.

Working in groups helps to bring together all the ideas and talent that that particular group might contain. The originality of the drawings show the talents of the group and the ideas are shown in the chapters, one assigned to each person.

The information we gathered was valuable and of course added to our knowledge of the subject. It was necessary to find all we could about it and I think most of us did work to make our book a success.

We had plenty of time to prepare the book and we ought to have had something worth while to show at the end of the time given. I do not think it hindered our other subjects in the least as it was all home work.
As good as I thought our book to be I did not in the least expect it to be chosen as the best. Our chairman was a good worker and she had good helpers; so most likely she was responsible for our book being chosen."

Food (3)

"I think that the making of the books was a very good idea because everybody seemed very interested in it, and spent much time, sending far and near for information. While writing these books we found very much material which was unknown before. The idea of the books was good because everybody used his or her original ideas about arrangement and, in fact, the whole book.

In this book was shown most every study which we take in the Commercial Course. First; the penmanship of the writer; second; the drawing done by the pupil who drew the illustrations; third; the English of every scholar who took a part writing the book; fourth; the science of all the pupils,
because these had to contain scientific reasons for most everything written in it, for these books were written for science.

The work of our group went along very smoothly, everybody was willing to do her share of the work. As for my part, I think that the "Team Work" of most every group was very good.

The idea of the teaching in this manner seems to be very good because the children seem to take more interest in the work of this sort. I think that it is a very successful way by which to teach lesson."

Almost without exception the students expressed their appreciation of this type of work and they were quick to see its value to themselves. They spoke of the "team work" which the group idea called for; the interests which it gave them in the science course; the new information which they obtained; the existence of which they had scarcely dreamed; the way which the work touched upon the other branch of school work; the interest and co-operation which were shown at home and the happiness which came to them in accomplishing something themselves.
In other ways than these, however, the work was helping the pupils. It was developing in them mental alertness and curiosity, thoroughness and sticktuitiveness. The work was carried out in a spirit of wholesome rivalry and competition. They were taxing their inventive powers to make their particular books as attractive or as complete as possible. They had to use their judgment in the selection of samples, of matter to be included or left out. And not least of all they were getting considerable training for future citizenship. For the group could continue only while the members of the group were loyal to one another. Anything like jealousy in the group was quickly frowned on, courtesy and cooperation with one another was a requisite for success. To play fair, to be generous and sportsmanlike, to be honest, not only with the members of the group, but also with all the groups—these ideas, too, were being brought home to them.

It would be false to say that one hundred percent of the pupils profited one hundred percent
from the working out of this idea. It would be untrue, too, to assert that all the pupils, without exception, threw themselves wholeheartedly into the work. But the results accomplished were very much worth while and the "books" were uniformly good. The habits of thoughts and work which the pupils were acquiring and their awakened interest in the class of science together with the new information which they gleaned gives me great confidence in this feature of group work as a helpful method of socializing science teaching.
Summary

The field of socialization is vast in extent and has as yet been scarcely explored. It may be that the traditional methods of teaching will clash eventually with this new idea. More probably the two methods will fit in one with the other to make a useful and harmonious whole. But, however, that may be, it seems unlikely that the idea of socializing science teaching can be cast aside or ignored. It has grown quite naturally from the soil of American life and thought and can hardly be uprooted. It is based on sound principle of psychology, the value of which educators have recognized before and used before; its application in the present form is already gaining quite general adherence. It seems quite certain that it will be taken in more and more into the science of education. The arguments offered against it are based rather on its abuse and over-enthusiastic employment than its sane, directed and controlled application.

Socializing science teaching, no doubt, will
make few demands upon the science teacher, but it will give ample return in the results achieved in opening the minds of the children to the possibilities of scientific achievement in material betterment of life and in the gradual substitution of labor saving and economic devices for the primitive methods and machines of an older generation. The response of the students, their increased interest, their augmented receptivity will all react to the benefit of the classroom. Through socialized teaching the classroom and its work are brought nearer to the life of the community; in it the matter of what the pupil should study is dictated as far as possible by the pupil's nature and the requirements of his environment. By its means, the pupil may develop habits of thought and conduct which mere "theoretical" study could never give him. It has elements in it which are calculated to make the pupil better fitted for citizenship. Surely, then, an idea or a method which tends to enhance the work of the classroom, which influences the fledgling mind of the pupil for good, which has a healthy reaction on the community at large, and which makes for a more useful and higher type of citizenship, must be given a hearing.
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