

## A New Approach to High School Science Teaching

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Those whose acquaintance with high school science teaching goes back to the comparatively recent period when the high school was primarily for the selected few, will realize that only gradually was it impressed upon teachers and administrators that science teaching would have to undergo considerable modification to meet the changed conditions brought about by the influx of students who were to a large extent not academically minded, and who were not intending to continue their schooling beyond the secondary level. From that time to this we have seen various attempts made to provide a course suitable to such groups, particularly in the science courses of the junior and senior years. Many times we have seen the solution attempted by offering two separate courses, a physics and chemistry "general course" and a somewhat stiffer college preparatory course.

This was surely a step in the right direction, but too often, many will admit, the general course was simply a milk-and-water copy of the regular college preparatory course, a pale imitation which had the justification neither of real value nor of interest. Too often when this was not done, the single courses offered for both groups in junior and senior year science took on much of the nature of the weaker course, with loss to those who needed college preparation, and to the weariness of all.

Many have felt, and rightly I believe, that it would be well to uphold the original high standard for college preparation and to face determinedly the problem of noncollege-preparatory science by attempting to develop a course entirely different, if need be, and really suited to the group for which it is intended. Such an attempt I would call to your attention today, using physics as an illustration. Its practicability has been proved both in actual teaching and in its successful use in teacher-training programs. It will be recognized that if changes are to be made, the problem of both method and content will have to be faced. Turning first to content, the approach may be described briefly.

The idea as worked out for a group of low IQ students in physics, was frankly to abandon the text book, except as desired for reference, and to omit class recitations except for an occasional group gathering when the situation warranted. The key to the situation was in the developing of a set of apparatus which was practically self-teaching, so that by means of brief mimeographed guide-sheets the individuals or groups could proceed in independent order through the larger part of the various standard divisions of the subject, though by no means taking all the traditional subdivisions. To make this material self-teaching, the absolutely essential requirement was to make sure that every piece of apparatus was divested of all its mechanical mystery. This was done by making it either dissectible or glass-enclosed. Sturdiness, full working size if possible, "fool-proofness", and maximum simplicity are the essentials. Whenever possible, though that was not very often, the standard materials supplied for the usual course were used, many times needing modifications however to suit the changed requirements.

Throughout, the emphasis is on stressing the interests of the common man rather than of the research specialist. The result was a course offered in mensuration which by means of a ninety-cent imitation of a surveyor's transit and one or two still simpler devices, rather thoroughly covered the elements of plain surveying; which by means of reclaimed pieces from the nearest automobile wreckers, covered the essentials of the automobile; which by means of a set of "open-faced" panels beginning with the carbon coherer

and proceeding through the crystal and one-tube receiver up to a fairly complete transmitter offered a thorough enough course in radio so that only the addition of the code was needed to qualify the student for a government license. Finally by means of a small wind-tunnel and a simple lift-and-drag meter, both built by the school shop, a thorough course in aerodynamics may be developed, including both streamlining and the flying of models.

The total cost of the complete apparatus needed for such a course need not be greater than that of the standard equipment, even if purchased from an apparatus supply house. A considerable number of the pieces may be made by any teacher possessed of a workroom and a little ingenuity.

Only brief mention can be made of a course in chemistry planned along similar lines, emphasizing the practical and industrial features and including many working models of common chemical processes. The possibilities are being developed also in the biological sciences so that there is now no need, where such a program has been worked out, of putting the terminal group in with the college preparatory classes at any stage in their high school science career. Incidentally, it may be added that much if not all of this type of apparatus has been used with great enthusiasm instead of the usual material by college preparatory students working with the standard manuals.

Time will not permit a discussion of the other item mentioned, that of method. Suffice it to suggest that the new approach has seemed best adapted to a rather unique procedure which may be described as a compromise between the teacher-demonstration and the individual laboratory method. This, which might be called the pupil-demonstration method, has been rather completely described elsewhere.