

Audio-Visual Aids in Chemistry at the Secondary Level

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I. Introduction

Of necessity, I shall limit the subject, "Audio-Visual Aids in Chemistry at the Secondary Level," to certain aspects of the problem specifically concerned with the selection and use of such aids. Any statement, however general, may well illuminate some of the pupil-teacher problems in relation to such materials of instruction. Beyond these considerations, some emphasis will be placed on the selection and use of two groups of aids: (1) radio programs, including electrical transcriptions, and (2) slides, film-slides, and films, both silent and sound.

II. Pupil-Teacher Problems

Mr. Douglas E. Lawson, of this University, in speaking on the "Changing Concepts of the Mind,"¹ has summarized in an admirable way the basic pupil-teacher relationships for all learning when he says for the teachers: "We attempt to change stimuli, to direct processes, to establish conditions."

He then summarizes his thinking on the subject by saying:

"We guide, direct, motivate."

Guiding, directing, and motivating students is the indispensable role of the teacher, regardless of whether the subject is chemistry or Latin; of whether the medium is the latest sound film or the most traditional of texts. In relating guidance, direction, and motivation to audio-visual aids the effective teacher will utilize the fundamental principle of pupil participation. Group activity, as an aspect of such participation, will be used also for maximum values. [It may have been such a conception which led Donald A. Laird, the psychologist to say:

"Belonging to and working with a group changes each active individual, strengthens his ordinary emotions, and propels him further toward the goal of the group than he could ever push himself without the miracle wrought by the mere fact of *belonging*."]'

Concerning the teacher in relation to the effective use of audio-visual aids, we may be led to say in moments of idealistic reaction that real teachers do not need such materials. We are apt to point with pride to the increased teacher training requirements, without pausing to examine the net results. Under such circumstances, we may be genuinely disturbed by Alstetter's report² for the Cooperative Study of Secondary School Standards—operating under the American Council of Education. His survey places science teachers, whose major teaching field is science, fifth in the teacher groups of secondary schools from the standpoint of semester hours earned in training for the respective teaching field. That is to say: foreign language teachers rank first with an average offering of 33.6 hours in foreign languages; social studies teachers have 31.2 hours; English teachers, 23.4 hours; mathematics teachers, 21 hours; and science teachers, 19.8 hours. Even if we were to assume that in Illinois, the average chemistry teacher had training equal to that of the foreign language teacher; that is, 33.6 hours, we would still be forced to recognize the fact that much of the average chemistry teacher's training has suffered for lack of recency and

that much of the original training was not specifically directed toward the needs of the chemistry courses of the secondary school as they now are and as they are coming to be. The point I am getting at is this: Much is being said and rightly so, it seems to me, about in-service training in the use of audio-visual aids. Little has been said about audio-visual aids, such as the sound films I am to present for the first time in this section of the State (if not in greater area) as in-service training material for teachers. In-service training material for the under-trained, under-paid, and over-worked classroom teachers represents one of the practical approaches to the problem of better teaching. . . . The unseen lecturer of the film, based on inherently silent material, may be eliminated in favor of the teacher's voice as soon as he feels competent to make the presentation. In the same way, capable students may supplant the teacher in repeated showings.

Regardless of the contributions which have been made for audio-visual aids through the science of chemistry, the need of special training courses for chemistry teachers at the secondary level, with reference to such aids, is probably about as pressing as for any other group of teachers at that level. This point is worth making in view of the fact that there were but three training schools in Illinois which offered summer session courses in audio-visual aids last summer. This record was only exceeded by Pennsylvania where this course is required of all prospective teachers and is offered in all teacher-training institutions of that State. Thus, forty-four of the eighty-six schools offering summer session courses were to be found in one state. Obviously, the eighty-six courses considered together are inadequate for the 850,000 teachers of the United States. The sooner teachers of chemistry, and of other subjects, have had sufficient training to select and use audio-visual aids effectively, the sooner we may expect desirable improvements in the content of such media. That is to say, master teachers themselves should constitute one of the important tribunals concerned with the audio-visual needs of the classroom. The State Academies of Science, the American Chemical Society, and similar bodies through national and state committees, may well render positive approvals for specific films and other teaching aids. Likewise, these organizations through concerted action may render a distinct service to education by indicating the materials of greatest need.

III. The Radio Program

The teacher using the radio program in the classroom finds himself beset with many problems. While class periods based on the whole clock hour appear to be increasingly more common, many secondary schools are still operating on periods of forty-five minutes with double periods for laboratory courses. This is further complicated by daylight saving time in given areas; by school days beginning at different hours; by assembly periods of variable lengths substituted for given class periods; by "home room" and "activity" periods of lengths varying with the individual schools and sandwiched in the school day at no common point; and, also, by situations wherein the regular class periods—due to the shortage of rooms and other factors—run through the noon hour. And further, is the fact that given academic subjects are offered, at different hours in different schools; perhaps at all hours of the school day in the larger schools. The resulting picture becomes a pattern of variability equally disconcerting to the classroom teacher trying to use the programs and to the administrators who are in sympathy with such usage but are unable to do much about it. I have presented this analysis in order that the problem of obtaining radio service for a given class might be seen in relation to a scheduled series of radio programs. Of course, such series of programs to be effective must be presented at a fixed time in the day as well as in the calendar and on the dial.

We are fortunate, indeed, in having one of the thirty-odd educational radio stations in our state. With the increased power by which all schools in the state may be reached, it occurs to me that there is a further significant problem for such educational stations as WILL, and that is the opportunity to use the evening hours for educational service. Again, such

a valuable service in the cause of education can only come about through the united action of educational forces actually demonstrating selection and use of educational radio programs. For five consecutive years, Station WILL had made possible the broadcasting of the weekly programs of the Illinois Junior Academy of Science. These programs were designed for science club members and as much constituted an aspect of extra-class activities. Students freed from the barriers of the official school day have been free to listen and to participate in these programs. If more time could be made available after school hours, much more could be done through such stations to enrich and to support the curricular offerings. As I have said on a previous occasion,

"I believe that we may yet produce an educational system wherein the needs, interests, and abilities of the child, rather than the minutes of the hour, will serve more fully as a criterion for what the child is to be doing throughout the school day."

It was with such a point of view in mind that Joy Elmer Morgan, Editor of the Journal of the National Education Association once said of the radio:

"If it can add as much as five percent to the effectiveness of our schools—and that is a most conservative estimate—it is worth \$100,000,000 a year to the educational enterprises of our various states and communities."

Assuredly, it is no mythical idea that we may have the recreated voices of Madam Curie, of Charles Martin, of Albert P. Mathews, and of our own B. S. Hopkins, speaking as we need them to inspire our students in behalf of chemistry as it could be done in no other way. Through the medium of the electrical transcription we may continue to dwell in the presence of these enthusiastic masters of chemistry. Only the concerted demand of chemistry teachers is required to make possible a library of such vital records for students of the future. Such a library in a greater or lesser degree can likewise become the property of the average school, as can visual complements in the form of film-slides, biblio-films, lantern slides and other materials.

IV. Recent Developments Implying Correlation

These suggestions are not theoretical ones. To illustrate: "Radio-vision" is the term used to designate the weekly educational radio programs called, "The World is Yours."⁶ Specially prepared filmslides will be developed and distributed by Mr. Gustave Marx in cooperation with the Smithsonian Institute, the National Office of Education, and the National Broadcasting Company. This project is intended to benefit schools and other interested agencies.

The biblio-film or micro-film idea has been developed under the direction of Watson Davis of Science Service, in cooperation with the Chemical Foundation and other scientific organizations. These biblio-films are made on 35 mm. motion picture stock and represent 1,600 pages of text or manuscript. Special projectors are used to magnify the material to at least the size of the original page.⁷

Again, the rotoprint process,⁸ of producing diagrams, sketches, pictographs, and graphs on transparent transolene at a cost of 12 cents per lantern slide, in quantity production, represents a development which should lead to a wider use of the standard stereoptican.

From many angles, it is apparent that no one type of audio-visual aid is adequate for all types of desirable and practical learning situations. Further, there is an increasing recognition of the idea that the various types of aids must be correlated with each other as well as with the subject matter. One of the types of audio-visual aids in which sound and pictorial values are closely if not perfectly correlated is the sound film. Obviously, there is no quality inherent in the sound film which will insure that the material will always be perfectly selected and perfectly presented. Indeed, I have seen sound films that might as well have been produced

in silent form at approximately half the cost. Likewise, I have seen silent films that might as well have been produced in the form of lantern slides, but for the fact that some schools now possess a motion picture projector and no longer have a stereopticon in working order or otherwise. Again, I have seen as all of you have, motion pictures that failed or succeeded because color was wanting or was present. Too few of the educational sound films present facts in such a way as to build up a problematical situation from which solutions requiring deductive and reflective thinking are required. In the matter of selection and use of these aids, we should keep in mind the extent to which motion, sound, and color are inherent and indispensable qualities of the subject. These considerations tend to be under-emphasized in the literature and in the evaluation schemes such as those of Brunstetter,⁹ and Lemler,¹⁰ nevertheless, they may be vital when measured in terms of desirable student responses.

If the classroom work is to be improved materially through audio-visual aids, the attention of every teacher using them must be focused constantly on the important problems of selection and usage.

¹ Lawson, Douglas E. "Changing Concepts of the Mind," *Phi Delta Kappan*, 20:42-49, Oct., 1937.

² Alstetter, M. L. "Scales for the Evaluation of the Training of Teachers," *The School Review*, 45:529-539, Sept., 1937.

³ Astell, Louis A. "Significant Aspects of Visual Aids in Chemical Education," *J. of Chem. Educa.*

⁴ Astell, Louis A. "The Radio Program as an Aid in Education," *School Science and Mathematics*, 38:293-299, March, 1938.

⁵ Quoted from the "Introduction" (p. ix) of Darrow, Ben H. *Radio, the Assistant Teacher*, Columbus, Ohio: R. G. Adams & Co., 1932, 271 pp.

⁶ Hoffman, Josephine "News and Notes—Visual Aids with Radio Lectures," *Educational Screen*, 17:96, 1938.

⁷ Davis, Watson "A Library in Your Desk Drawer," *The Educational Focus*, 8:22-24, Sept., 1937.

⁸ Gregory, Wm. M. "A New Method of Quantity Production of Graphs and Diagrams on Lantern Slides," *Educational Screen*, 17:121, Apr. '38.

⁹ Brunstetter, M. R. "A Program for the Utilization of Audio-Visual Teaching Aids—A Plan for the Evansville Public Schools."

¹⁰ Lemler, F. L. "A Critical Evaluation of Teaching Films," *Education*, 58: 479-483, April, 1938.