



## **Need for Research Guided by Theoretical Analysis**

LEARNING is not inevitable. In order to produce efficient learning, good materials must be used in the right way. For example, Jaspen's (1950) study, which we have already described, showed that the poorest version of a given film, which was comparable with many films used today, taught only 46 percent of the students to perform a task while the best version taught 98 percent. Why are some films much more effective than others? Discovering the scientific answer to this question will help us to improve teaching.

We have already seen that the application of graphic techniques to education is a part of the general problem of the curriculum. Similarly, the problem of discovering fundamental principles of graphic communication is a part of the general problem of the psychology of perception, motivation, and learning. Discovering more about fundamental principles will help us to improve all media and should tell us under what conditions one medium will be superior to another.

We believe that the greatest advances in graphic communication are likely to come from basic research of a theoretical-analytical type at the pure science level. Completely empirical comparisons of different media in a given situation can yield results which are largely an artifact of unspecified characteristics of the particular representatives of the media which the experimenter happens to use. Such results tell us little about the inherent properties of different means of representation. A better theoretical

analysis of how people learn from pictures and words will help us to design more discriminative experiments.

There is a great need for more discriminative experiments. After a thorough survey of over 30 years of work, Hoban and van Ormer (1950) conclude: “. . . we are impressed with how little discrimination has actually been developed with reference to the various factors or processes that influence audience behavior by means of films.”

In performing research on communication, it is often advantageous to use an exactly reproducible medium like the motion picture. The problem is to find an experimental situation in which one can always get a measurable and controllable effect. Then one can study how different variables change this effect. Unless we use the situation to analyze the influence of basic variables, we are subject to the criticism that research on motion pictures simply shows what has been known for a long time, namely that people can learn from them. We must go beyond this and design analytical studies showing how specific factors influence the effectiveness of learning. (Lumsdaine, 1947; Carpenter, 1948).

Since the motion picture is flexible and reproducible, it has been convenient to concentrate most research on this medium. It should be possible, however, to generalize many of the principles derived from research on the motion picture to other forms of graphic communication. Each generalization must be tested by experiments on the new media, but it is much easier to make the critical tests after the principle has been discovered and clarified by work on whatever medium is best adapted to research on the variable being investigated.

At present, most research on graphic communication media is supported by the Armed Forces. To have the military responsible for such a large majority of the research on a fundamental aspect of education is not healthy. Military purposes are necessarily too specialized to bear the brunt of responsibility for such a basic educational problem. Also much of the present military emphasis is on research that is likely to have a fairly immediate application. Each organization sponsoring research must justify itself annually

by what it has done that year. The basic research which usually produces the greatest long-run results tends to be neglected because its importance is not so well understood. There is too much emphasis on specific applications and too little on general principles.

This problem is part of a broader one. Both industry and the Armed Forces have learned that basic research in the physical sciences will pay off in the long run, but they have not yet had time to become convinced that basic research in the newer social sciences will pay off. Therefore, they support long-range, basic research in the physical sciences but only short-range applied research in the social sciences. But it is just as true in the social as in the physical sciences that many of the most important and practical applications stem from basic advances in knowledge produced by pure science research.

### *Plan of the Following Discussion<sup>1</sup>*

Since the basic principles of effective teaching-learning with graphic communication seem to be the same as with other media, we shall group the variables involved according to certain fundamental factors of teaching-learning which are:

*Drive* (motivation)—the student must want something.

*Cue* (stimulus)—he must notice something.

*Response* (participation)—he must do something.

*Reward* (reinforcement)—he must get something he wants.<sup>2</sup>

Finally, we shall discuss a number of research problems and practical principles which do not fit neatly under any one of the foregoing factors.

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<sup>1</sup> Miller takes responsibility for the theoretical organization of this section and for any shortcomings which it may have.

<sup>2</sup> These factors are illustrated in a film by Miller, N.E., and Hart, G., *Motivation and Reward in Learning*, 15 min., sound, black and white, Psychological Cinema Register, Pennsylvania State University, University Park, Penna. For further discussion of these factors and of significant details of the learning process, see Dollard and Miller (1950) and Miller (1958).