

# Theoretical Bases for Research in Media

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A persistent problem facing teachers and researchers alike is finding answers to the questions: what point of view should I assume and what evidence should I use to determine the effects of media upon learners and the ways that learners utilize media to perceive and process information? After many years of research in media these same questions are still being asked and are still largely unanswered, at least to the degree that 'there are absolutes to guide educators in making decisions. Yet, looking at this situation from an historical perspective, developments over the past ten to fifteen years give promise of more definitive directions.

It is probably fair to say that most studies of media applications to instruction in the first five or six decades of this century were built upon narrower theoretical positions than today. That is, the effects of media upon learners were analyzed primarily as stimulus presentations which were to have a direct influence upon subsequent behavior. Learners were assumed to be reactive and under stimulus control. For example, in 1963, Finn, in defining "instructional technology", suggested that it was "...a branch of educational theory and practice concerned with the design and use of messages which control the learning process." But there were others who had a different view. Several years earlier than Finn, Carpenter (1957) contended that "...teaching materials are effective...depending on the degrees of their personal relevance to learners... The organism or individual interposes its entire relevant life history between the stimulus material and his or her response." In a similar vein, Hartman (1963) in a review of learning theory, emphasized "...that facilitation or interference with learning arises from the cognitive organization the respondent imposes upon the message."

While there were others thinking as Carpenter and Hartman, most media studies were characterized in the familiar gross *comparisons* format. Such research seemed a natural reaction to the expanding availability of media through federal funding and the need to prove the utility of media for the improvement of education rather than a need to analyze the peculiar characteristics of media themselves. Much research studied learning with media rather than studying *about* media effects. All of us are familiar with the oft-repeated phrase

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"no significant differences." Subsequent analyses have criticized the assumption that global forms of media, such as television and films, were unambiguous entities that somehow could be described and controlled to determine a cause and effect relationship with any precision. Additional criticism focussed on the theoretical assumption that learner responses were directly influenced by the stimulus input, with little regard for either the contributions of learner idiosyncracies or the peculiar characteristics of media themselves.

More recent analyses of viable ways to conduct research and to define the nature of fundamental research questions have focussed on the confounding effects of uncontrolled variables. Clark (1983), for example, has suggested that much of media research -- that is, that which has been reported as media research -- has actually been a study of variable methodologies and settings in the uses of media. I would tend to agree, but with a recognition that there have been exceptions. One that comes to mind were the film studies done under Carpenter's direction in the Instructional Film Program at Penn State back in the 40s and 50s. In some of those studies there were careful analyses of variables within films as these affected the performance of subjects. On the other hand, subjects were not questioned to determine which variables were preferred; neither were learner repertoires explored to determine what affected their interpretation of stimulus elements.

Added to the problem of determining defensible theoretical paradigms for research in media are assumptions about the conditions necessary in a research setting to derive generalizations from methods and statistical analyses. I refer to the controversy between the reductionist view of research and those who advocate naturalistic inquiry as a more realistic approach to what life is outside the laboratory setting (Magoon, 1977; Guba, 1981). I do not intend to discuss the intricacies of each point of view, but rather to suggest that our initial orientations to what needs to be investigated and under what conditions quite logically affects our theoretical bases for research. For example, our attempts to control all conditions, either by statistical manipulations or tight controls of the situation and subjects, are based on assumptions that such controls are possible in the first place and that validity and generalizability are possible outcomes. An assumption is also made that reactions of learners as groups are indicative of the true picture about individuals in that group. The opposite view espoused by those who advocate naturalistic inquiry is that the assumptions of the reductionists are untenable, given the interaction of social, contextual, and personal factors which affect learner responses. Each approach to inquiry assumes its own conceptualizations about the nature of learners and becomes the starting point for judging what should be observed. On the other hand, both methods do provide a framework for the study of effects of variable media characteristics. But the extent to which each method takes into account relevant factors becomes an argument that inevitably leads to judging the results of each type of research paradigm.

Most of us are familiar with conditions that have brought changes in views about media/learning relationships since the days when media were considered primarily as stimulus control mechanisms. Government sponsored research through the National Defense Education Act in the U. S., for example, supported traditional gross comparative studies, but also fostered studies of programming of instructional materials, which in turn had an important influence on greater interest among researchers in determining how learners perceived and processed information. While some studies compared the relative advantages of linear versus branching programming, there was also, through the so-called 90-90 criterion for the validation of materials, attention paid to the reaction of individuals to specifics in information displays.

A more recent movement, Trait-Treatment-Interaction (TTI) is based on the premise that knowledge of the interactive effects of learner aptitudes with instructional treatments would make it possible to predict the proper types of materials and methods to insure desired learner responses. But TTI has also to contend with basing measurement on a *moment-in-time* in the life of a learner as a defensible basis for predicting future performance. The continuing problem, not only for TTI but for all types of research methodologies and theoretical orientations, is that learners are dynamic individuals changing constantly as more information from many diverse sources is processed each passing day. What causes idiosyncratic responses among learners is still quite elusive.

Clearly, the major focus today is upon the processes by which a learner perceives the environment, processes and stores information, and retrieves it for use. This emphasis has come about because of the recognition that indeed each learner is unique, a product of many experiences, and that messages appear to be meaningful only as each person gives them meaning.

There are current opinions that media, in fact, do not make any difference in learning, at least as measured by typical research paradigms that tend to manipulate situational variables rather than intrinsic attributes of media themselves. But there has been a shift from the more incidental role of media in instruction to a greater emphasis upon the interacting relationships among content and symbol systems with specific learner characteristics. A case in point is the hypothesis of Salomon that the greater the similarity between the coding systems in the message and the coding system in the repertoire of the learner, the more likely learning will occur. Such a shift is also seen in Olson's (1972) theory of instructional means which says that technologies and techniques used with learners are accompanied by the development in learners of relevant cognitive skills.

What, then, are some prominent theories which have evolved in the last decade? For current opinions I am indebted to Clark and Salomon's (1984) final draft of a manuscript they prepared for the *Third Handbook of Research on Teaching*. Those of you who have studied the 1974 volume by the National Society for the Study of Education, *Media and Symbols*, will find some of these theories familiar.

The first has to do with the nature of symbol systems. This model offers a theoretical foundation for differentiating among symbol systems and may provide a systematic way for defining those aspects of symbols that may not only be pertinent to certain types of information, but also which may serve as devices by which learners process information. I am referring to Goodman's Symbol System Theory, discussed by Gardner (1974) and others. Goodman divides symbols into two categories as being either notational or non-notational. By notational, he means that a symbol must meet the criteria of being unambiguous, such as the concept "one is always one"; it must be semantically disjointed -- that is, no two characters can have a common referent -- and it must have a finite differentiation. For example, the signs for the bass and treble clef in musical notation are finite differentiations and remain so, assuming no other meaning. Non-notationality, on the other hand, suggests symbols that are dense, replete with information, and subject to a variety of interpretations. A picture may be classified as non-notational because it may be interpreted in a variety of ways. There can, however, be symbols within the picture which can be finite in their meaning and designation, and hence notational. While this discussion is not the place for a detailed explanation of Goodman's model, there is an additional model worth mentioning which complements Goodman's work. It is Gross's identification of various information modes that contain symbol systems peculiar to given sets or types of information. The

modes, which he calls primary, are linguistic, socio-gestural, iconic, logico-mathematical, and musical. Each of these categories provides a system for differentiating among symbols used by learners to acquire and process certain kinds of information. They may also be useful for determining whether learners utilize these symbols as tools in their own cognitive processing.

Gross has also formulated two other general symbol classifications which utilize primary modes in idiosyncratic ways. One is the derived mode, such as poetry, dance, and film. The other is the technical mode, suggesting the peculiar language of the sciences, engineering, technologies, and architecture.

A second prominent theoretical formulation of is that of Olson (1972, 1974), referred to earlier. Calling his theory one of instructional means, Olson pinpoints two aspects of media which affect learning. One is that content may assist in the acquisition of rules and principles. The other aspect relates to the acquisition of skills which are required to utilize the information presented in the medium. Thus, the coding system and means for presenting information may become tools for utilizing similar coding systems and means.

Olson also points out that there is a significant difference between *an utterance* and *text* which have direct implications for our understanding of the functions of media. Olson defined an utterance as oral language that is flexible, unspecified, with a low degree of conventionalization, and that it is negotiable in a social setting. Written language, on the other hand, generally demands precision and explicitness of meaning. It serves to maintain philosophical, scientific, or analytic knowledge. Thus, as learners are schooled in written language, they develop the skill and habituation to textual material. For purposes of analyzing the effect of various forms of media, it may be important to note that long training and practice in text materials may inhibit learning from other than text. This may be a partial explanation for the discovery of Guba when he observed the visual attention of subjects who watched science demonstrations on television. At times their eyes went out of focus and they tended to watch the mouth of the demonstrator more often than the details of the demonstration. Do we perpetuate dependence upon text by utilizing it continuously in our testing procedures and thus condition learners not to observe other forms of information? Perhaps we need to spend more time in conditioning learners to interpret and glean information from non-textual materials.

The third theoretical model is Salomon's Media Attribute Theory (1979, 1981). The theory says, in effect, that both media and the human mind employ symbol systems for acquiring, storing, and manipulating information. Also, some of the tools of cognition are the consequence of employing symbols that were inherent in the media. In essence, he has suggested a supplantation theory which says that it is possible for technological devices, such as a zoom lens, to provide an observable analogy to the mental process of proceeding from a generalization to a particular and back to a generalization again. The use of a zoom lens to assist field-dependent students to observe details in a picture is offered by Salomon as tentative evidence of this phenomenon. Clark (1983), on the other hand, argued that zooming is not a media attribute, but a method of enlarging and focussing.

In addition to these three theories, there is a controversy that cuts across all of them. It is the controversy whether humans process information through images or propositions. Those who support the imaging hypothesis contend that a mental image is analogous to the perception of the actual object. In the opposite camp, those who deny the possibility of imaging see no direct connection between what one observes and the final knowledge acquired, because all stimulus situations are affected by beliefs, goals, previous knowledge,

experience, and emotional states. Final knowledge is governed by rationality, that is, all stimuli are acted upon by the learner's repertoire of the moment.

There is some evidence supporting the notion that factors other than media have more influence on learner responses to media than the elements or coding systems within media themselves. Clark and Salomon (1984) suggest that one relates to the effects of learner anticipation of media in terms of efforts that must be invested in their use. It appears that where media are perceived as critical to future performance, learners will expend more effort. Where media are perceived as entertainment, less effort is expended. Twenty years ago Greenhill (1967) wondered why television instruction did not often prove superior when compared with traditional university instruction. He hypothesized that good television instruction required less expenditure of effort by students; therefore, they put more time into traditional courses which were less well presented, thereby diminishing television effects.

Clark (1983), in reviewing studies of student effort found that high-ability students chose structured methods and media because they perceived that they would have to expend less effort. Lower-ability students, on the other hand, chose less-structured media and more discovery-oriented methods because they wished to avoid the failure that may have come from being unable to fulfill the requirements of the structured and directed situation. In a letter to me, Clark (1/15/83) said, "I have arrived at a very reluctant conclusion that media do not contribute much to learning...and only minimally to decoding. I do think that the symbol system approach has promise for instructional design but not much theoretical importance...". He thinks media contribute only "...indirectly through variations in persistence which are contributed by our subjective impressions of how much effort is required to learn from various media."

Where, then, are we in our search for theoretical foundations that have viability? Theoretical bases for research have proceeded from one of regarding the learner as reactive and under stimulus control, to one in which the learner is much more a participant in determining what effects media have upon the transmission of information, upon perceptions, and upon cognitive processes themselves. It is not only a matter of how learners perceive the messages conveyed via media, but also one of discovering whether and how learners utilize the coding systems of media as tools for manipulating information. It seems that the attempt to prove media utility is a dead issue, as is the attempt to depend upon gross comparative studies for definitive answers about media characteristics and their influences upon learner behavior. Yet some fruitful questions still need to be asked for research purposes:

- Do the coding systems of media actually serve as tools for cognition?
- Do skills required for utilizing media content and methodologies become skills in cognition?
- What methods might we use with learners to discover the uniqueness of media?
- Can qualities of media and technological devices supplant or support given mental activities?
- Are notationality and non-notationality viable for analyzing coding systems effects?
- What methodologies best complement the uses of media?
- Do unique qualities of media support particular learning needs, or is it methodologies which contribute the differences in learner responses to media?

- Are learner attitudes and motivations the only dependable evidence to account for media effects?

Finally, let's turn to a questionnaire survey four graduate students and I conducted to determine which of fifty propositions about media characteristics and use would be judged valid or invalid and important for research by a random selection of the membership of the Research and Theory Division, AECT. Nine of the hundred questionnaires were sent to persons outside the Division. Forty two returns were used in data analysis. The fourteen statements regarded valid and important for research follow:

- The greater the match between learner experience and media attributes the greater the likelihood of learner acceptance of media content.
- Overt/covert responses of learners to media experiences are more likely to result in greater memory storage than covert/passive responses.
- The more a symbol system matches the criterial features of an idea or event, the more appropriate it is.
- Fitness of a message form depends upon the characteristics of the information.
- Negative teacher attitude toward a media presentation creates negative student attitudes.
- ~ Presenting various forms of media provides the greatest compatibility with the nature of idiosyncratic brains.
- It is critical for effective media usage to know the range of coding elements available in each learner's repertoire.
- Sequential build-up of illustrations leads to better understanding.
- Excessive detail interferes with transmission of intended information.
- The advantage of visual over auditory materials increases for more difficult material.
- The more similar the coding schemes in the teacher's and student's repertoires the greater the possibility for learning to take place.
- Message, message forms, and conveyance systems interact to convey the intended message.
- Cultural differences affect learner interpretations of media.
- Learners have difficulty discriminating between subjectivity and objectivity in their interpretation of messages.

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