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ABSTRACT

The availability of audiovisual equipment offers teachers a wide choice of teaching tools and increases the importance of careful instructional planning. This paper addresses the responsibility of teacher educators for teaching not only the use and selection of these resources, but also basic instructional design. A brief synopsis of the instructional design process is presented. Suggestions are made for modifying teacher education curriculum and for further research on the teaching of instructional design techniques. (JD)

INSTRUCTIONAL DESIGN AND RESEARCH ON TEACHER EDUCATION

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- Instructional Design and Research on Teacher Education

- Francis E. Clark and Jay F. Angert

There is an air of change and of anticipation in instructional media research, stemming from an awareness of the new role for instructional technology in designing effective learning environments. One indication of the new direction can be seen in the symbolism of the recent title change made by the Association of Educational Communications and Technology for one of its national journals. The change from Audiovisual Instruction to Instructional Innovator, commencing with the January, 1980 issue, represents a belated recognition and a tacit acknowledgement of an emerging educational technology philosophy. Other indications are reflected in the reduction of gross media comparison studies (Fleming, 1970; Levie & Dickie, 1973; Schramm, 1977), in the calls for research integration stressing interdisciplinary cooperation (Broudy, 1972; Kuhn, 1962; Petrie, 1976; Randhawa, 1978), and in the calls for renewed ties of educational technology research with communication theory (Hill, 1978; Mielke, 1972), resulting in the direct calls for new media research directions (Clark & Angert, 1980).

Apparently, there is no longer a need to prove that technology can indeed teach at least as well as the teacher, if not better. In short, the *audiovisual* orientation is out, and the *instructional design* orientation is in. As a descriptive term for the educational technology field, "media" is out; "resources", as a more generic term,

is in. The difference between these terms is largely one of connotation rather than denotation; thus the current emphasis on "resources" is largely symbolic. The persistent association of the term "media" with "plug-in" devices is an unfortunate characteristic of a philosophy that many educational technology professionals would rather forget. Today, "appropriate technology" are the by-words; if the blackboard is most appropriate in a particular learning situation, today's instructional designers feel comfortable in urging its use.

A full understanding or even acceptance of the significance of these changes is by no means prevalent among professionals in the educational technology field. It seems fair then to ask, "How prevalent is the knowledge of the instructional design orientation among teacher educators, whose interests may be focused in areas quite removed from concerns with media and educational technology?" While this question is obviously beyond the scope of the present paper, we can look briefly at two related questions: (1) With this new emphasis, what advice can we offer prospective teachers regarding resource usage and selection? and (2) What are some of the implications for teacher education research as a result of new educational technology orientations?

Unfortunately, positive suggestions based on generalizable research evidence are virtually nonexistent. The comments regarding media research utility are damning (Cronbach and Snow, 1977; Dwyer, 1978; Fleming, 1970; Hawkridge, 1973; Heidt, 1977). To be sure, media research has had its share of methodological problems (Cronbach & Snow, 1977; Dwyer, 1978), but then most research within the

social sciences has been beset with similar problems. Of perhaps greater significance are the conceptual problems that have plagued media research efforts. As both Conway (1967) and Knowlton (1964) have observed, media researchers have made no consistent distinction between the sensory modalities (audition, vision) involved in communication and the coding system (digital, iconic) incorporated in the message. The importance of this distinction has been amplified by Salomon (1974).

Salomon (1974) argued that media need not be represented only in terms of presentation techniques or technology systems (e.g., television, computer assisted instruction), but also could be represented as consisting of messages (e.g., content) or symbolic systems. This last method of representation has received the least emphasis. In delineating the potential elements in a taxonomy of media attributes, Salomon described a tentative hierarchy of symbol systems (e.g., digital, iconic), coding elements (e.g., dimensionality, iconicity), secondary coding systems (e.g., editing, sequencing), and such additional features as complexity, redundance, and ambiguity. In a review of Salomon's analysis, Schramm (1977) acknowledged the desirability of such a taxonomy, regretted that it was not close at hand, and admitted that media researchers have "only the foggiest of ideas about the area that Salomon is opening up" (p. 87).

It seems fair to ask whether pre-service teachers can succeed in the analysis of instructional communication where so many researchers have apparently failed. If one assumes that most prospective

teachers are not burdened with the disciplinary myopia attributed to many researchers (Broudy, 1972), then an affirmative response to this question is certainly possible.

It is undeniable that a considerable amount of classroom instruction, devoid of experimental controls or constraints, frequently produces learning of practical significance. Intuitively, many teachers manage to derive an optimal blend of personal style, learner and resource characteristics, and an understanding of task requirements through a consideration of psychological, sociological, and physiological factors. Instructional researchers could benefit from an adaptation or application of the eclectic approaches of "successful" teachers to the design of educational research. Thus far, this has not been done. Mielke (1972) concisely stated that: "Stepping into a classroom does not invoke a new set of principles about human behavior. As education and educational technology develop beyond traditional structures and missions, the relevance of general areas such as mass communication becomes inescapable" (p. 393).

Obviously, teachers do design instruction, and the "effective" teacher often makes design decisions which are theoretically sound. The reasons, perhaps, may be inappropriate (e.g., reliance on the blackboard out of convenience, or fear of equipment failure), but the bottom line may still be the same -- effective instruction often results. Travers (1964), for example, has pointed out that an instructional decision to utilize the blackboard is potentially consistent with the theoretical principles of relevant cues, stimulus

reduction, and limited channel capacity. The emphasis on highly realistic materials, he asserted, was the "worship of a false God" (p. 380). This emphasis on realism, he also noted, has enjoyed the status of a cornerstone in the audiovisual field for over forty years.

The message, therefore, to teacher educators is that judgments regarding teacher effectiveness or creativity should be based not on an observed willingness or unwillingness to use technological devices, but rather on the decision structure utilized to select the appropriate resources. Moreover, any conclusions concerning teacher candidates made in this regard should be carefully tempered with the further understanding that those who do show films and slides or use overhead projectors are not necessarily innovative, nor do they automatically ensure instructional effectiveness through their propensity for "devices."

As instructional designers, teachers will engage in some basic instructional design activities, primarily task analysis. It is incumbent upon teacher educators to emphasize the skills involved in this activity. If sound instructional decisions are to be made, teachers must be taught the skill of carefully analyzing instructional objectives. This will involve the classification of tasks as to type of learning involved, the specification of the specific internal and external conditions a task may require (Gagné, 1977), and a matching of these characteristics to resource, learner, and teacher attributes.

Therefore, instruction should concentrate on the process of collecting information necessary to reach decisions about *what* to teach, *how* to teach, and *how much* to teach, in relation to restraints such as costs, time, space, equipment, teacher competencies, and the group "makeup." In essence, the analysis should lead directly to an instructional design that specifies preplanned interactions within, between, and among the teacher, the learner, the task, and the resources (materials, equipment, and methodologies), resulting in an instructional environment where responses are predictable. A brief synopsis of the instructional design process, as we perceive it, may help clarify the above position.

Pertinent learner characteristics may be derived from the identification of those individual or group attributes (e.g., modalities of inference, cultural determinants, and symbolic orientations) that can be combined to form a schema for the selection of individualized or group instructional strategies (packaging, tutoring, pacing, mediating, sequencing, programming, grouping) based upon learner strengths. Since the teacher is also an integral element in the system, a similar self-appraisal becomes appropriate.

When considering resource attributes, such as the *coding system*, *intent*, *strategy*, and *restraints*, answers to the following questions serve as guides in designing and selecting resources. Is the content of the message primarily digital, iconic, or a combination? Is the intent to reinforce, reinstate, provide repetition, or verify? Is

the strategy of the stimulus sensory (active), or vicarious (passive) in nature? Are there cost, time, equipment, or space restraints?

In establishing the conditions for instruction, the preservice teachers should first identify the *task* in the form of an objective; classify the objective; and identify both the prerequisite *internal conditions* and the *external conditions* to be controlled during instruction.

At this point in the design, decisions about the *instructional conditions* are made. Identified characteristics of the teacher, learner, task, and resources are now considered. The teachers objective is to correlate the resources (whatever they may be), to the external conditions of the task and the internal and external attributes of the learner. This decision structure disciplines thinking and allows the preservice teacher to make systematic comparisons that they may otherwise fail to perceive. The overriding purpose of our instructional system is to differentiate and coordinate personnel, time, and available resources to maximize the learning opportunities for all students. Needless to say, the obstacles to be overcome before this level of sophistication is reached by teachers appear to be enormous.

First, many pre-service teachers show difficulty in both constructing and appreciating the utility of behavioral objectives. If the disdain for the specification of learning outcomes in precise terms remains prevalent, what chance does an even more finite analysis have to escape the label of "excessive nit-picking?"

Second, pre-service teachers receive a limited amount of training in the diagnosis and remediation of learner deficiencies, but a woefully inadequate amount of time is spent in identifying learner capabilities. If instruction is the transmission of information from one person to another, and we communicate with learners through the senses of hearing, seeing, touching, smelling, and tasting, then these learner capabilities and preferences become important considerations in the design of the message. Whether the learners think in terms of relationships or differences, or are more receptive to digital than iconic referents, are but two examples of capabilities with potential significance for instructional design decisions.

Third, our considerations of teachers as designers must be tempered with an appreciation for their understandable temptation to abandon decisions of instructional design or resource effectiveness and leave it to the so-called experts (producers of commercial materials). One vitally needed area of increased emphasis in teacher education includes resource evaluation based, to a large extent, on task analysis. It would also be worth devoting a lecture or two to the marketing techniques of materials producers, and the problems created by the inappropriateness of commercially produced materials for specific instructional tasks.

Fourth, we must recognize that teacher propensity to use "devices" is partly a result of undergraduate training in "how to" media skills. We must further recognize that, although there has been a shift in emphasis from media user to instructional designer, the teaching of

"how-to" skills is still a basic necessity, especially for desensitizing "equipment-shy" individuals. However, unless these skills are balanced with an understanding of some theoretical principles, the "thrill" or "smugness" associated with technical competence may lead to false expectations of resource effectiveness, and ultimately to an increased reliance on a few favorite resources which come to be considered universally appropriate.

Fifth, we must recognize that teachers who do show a predilection for selecting electronic resources, based on their intuition that these media possess intrinsic motivational qualities, often face a paradox which is not easily resolved. Research has shown that learning effectiveness does not necessarily parallel preferences (Dwyer, 1971; Travers & Alvarado, 1970), and yet, the affective responses these media arouse may be more important for sustaining and thereby for enhancing future learning possibilities. In the long run, it may be more important to capitalize on spontaneous interest and to sacrifice, temporarily at least, superior learning. Until research supported guidelines are formulated, we must trust teacher judgment in this regard.

A simple solution, of course, to this whole problem of resource selection and usage would be to direct prospective teachers to the available taxonomies and systems for media selection (Levie, 1977). These, however, reflect a preoccupation with technical considerations (e.g., convenience, portability) and are relatively short on instructional design considerations. This is not to say that these technical

restraints aren't important, but if instructional effectiveness rather than temporal or fiscal economy is the first priority, then technical considerations should be secondary.

While research to date has taught us woefully little about what to do in terms of resource selection, it at least has taught us what we should not falsely expect physical technology to accomplish. Physical technology can neither replace sound intellectual technology (instructional principles) nor reduce the necessity for incorporating them into materials and methodologies. We know this both from the gross media comparison studies (e.g., film vs. television) showing no significant differences more often than not, as well as from research studies indicating learning effectiveness when reinforcement, feedback, motivation, and other behavioral principles are included (Gagné, 1977).

What is needed now is research evidence that the teaching of instructional design techniques will result in their application and, further, that their application will make a difference in the results of instruction. Should the future research in this area provide more positive guidelines than past research efforts, we may be afforded an opportunity to refine our teacher effectiveness evaluation techniques. Prospective teachers may be evaluated not merely on the basis of observed student outcomes but, additionally, on the clarity, originality, and soundness of their instructional design decisions. It is quite possible that these considerations may be a better predictor of future teaching success than the measures we currently employ. At the very

least, it will give some indication of those teachers who analyze, with some depth, their instructional activities. This may be the most positive benefit of all.

The suggestions we have made for modifying either teacher education research or instruction ought to be followed by certain precautions. Many of us find it difficult to break from the "teach as we have been taught" syndrome. As a result, some teacher educators teach people how to write objectives without written objectives to guide the instruction; some teach people how to individualize instruction via the lecture; while still others teach people how to produce instructional resources, such as non-print media, without employing non-print media.

As teacher educators, we make the decisions which spell growth or stagnation, performance or pretence. It is true that all teacher competencies cannot be identified through critical-incident methdology. Nonetheless, much of the content that we are teaching would probably be eliminated if it were based upon observations of ourselves.

Since most human beings learn best through practice and example (modeling), the only logical way out of this situation is to practice what we preach. Otherwise, how can we justify a teacher education curriculum whose content includes competencies and procedures that we ourselves do not hold or apply? Likewise, how can we justify our criticism of preservice teachers who conclude that teacher education is at worst hypocritical, or at best, an irrelevant bore?

Lastly, we must understand that the first priority of teachers, particularly pre-service teachers, is survival, that the temptation of teachers to redesign instructional objectives to match available materials is great and, that until teaching as a profession is less labor intensive and more technology intensive (both intellectual and physical), sound resource design and selection decisions may not be made.

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