Interactivity or Instruction? A Reaction to Merrill

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The models for designing instruction that we have traditionally used are based on or otherwise reflect Gagne's work. These models, called "first generation instructional design" (ID_1) by Merrill and his colleagues Zhongmin Li and Mark Jones (1990a) show, however, a number of shortcomings. Among the shortcomings observed by Merrill and his colleagues is that they are out of date.

That is to say, new technologies make possible certain forms of interactive education procedures. For these kinds of educational procedures the traditional ID_1 models are not sufficient. ID_2 models should integrate instruction with these "interactive, technology-based delivery systems" (p. 8).

As part of Merrill and his colleagues' proposal, which cannot be welcomed too much, we would expect, however, at least two theoretical expositions: A new definition of "instruction," and the other, a concise description of "interaction."

Instruction

According to Gagne, instruction can be defined as the bundle of "instructional events" that create the necessary "external conditions" for learning. Instruction, then, is everything the teacher does within the direct environment of the learner to facilitate learning. Such a definition should be maintained. But it should now be supplemented with all those learning-related events that are included in the interaction of the student with the "interactive delivery systems." When the student does fully interact with a teacher or a teaching system, many things happen that are not included in the traditional definition of teaching. Instruction will be instruction no more.

The traditional view of educational technology puts the teacher at the center of attention: What can be done to help him do his job? The Association for Educational Communications and Technology (1977) tried to establish a then-new orientation in educational technology by embracing communications theory and systems theory so as to stress that the learner be accepted as an integral part of any learning system.

Still, this AECT position saw as the aim of educational technology the development of "situations in which learning is purposive and *controlled*" (p. 77). (Italics added.) The rights of the learner were recognized, although he is still always at the end of a chain.

At about the same time, UNESCO reflected changes in society by acknowledging that, at least in Western democracy, the learner has to learn to be free; education therefore should be personalized (Faure *et al.*, 1972). Since then, and continually more so, because of the growing availability of microcomputer and computer-assisted learning and other "interactive delivery systems" such as simulation programs, hypertext, database resources, interactive video, etc., the learner is becoming more and more emancipated from the control of the school, the teacher, or the instructional designer. This effect is also observed by newer communication theory, that states that thanks to new, interactive, technology, there is an increase of user control in mass communication (Severin and Tankard, 1988). In fact, the expression of "interactive delivery" is a *contradictio in terminis* from the viewpoint of optimum interaction and emancipation. "Delivery" implies a unidirectional relationship. In full interaction there can be no one-sided relation; the student is not just at the end of a chain but also at its beginning.

Thus, what we definitely need is a new definition of instruction. Or even more so, a concept that replaces the instruction concept. It is evident that this substitution will make reference to the concept of interactivity.

Interactivity

Merrill and his colleagues (1990b) begin a definition of interactive instruction by introducing "transactions." A transaction is a "particular instructional interaction with a student. A transaction is characterized as a mutual, dynamic, real-time give-and-take between the instructional system and the student in which there is an exchange of information. Transactions include the entire range of instructional interactions including: one-way transmission of information (e.g., video, lecture, or document, which are not very good transactions because they lack interaction), discussions [. . . etc.]" (p. 9). There is an inconsistency here that cannot be overlooked. We sense the AECT- and the Gagne-type of thinking behind

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this interaction-talk: It is still the teacher who is in focus.

Interactivity as an expression is much in vogue. Many designs, as we have known them for years, are now called interactive, and the expression is being used for a variety of instructional formats. Some educational radio broadcasting is called "interactive," as it invites the pupils to answer collectively to a question, or to execute certain movements (Friend, 1989). Other radio programming is advertised as interactive because the audience is allowed to make phone calls to the broadcasting team.

From the learning perspective we know that learning never is passive. It always takes the learner to perform mental activities. Yes, instructional formats in which the pupil is "passive" (he sits down, in silence, and waits for the teacher to present the lecture to him) are opposed to formats in which the pupil is "active" (he takes part in discussions, he chooses his topics or modules, he asks for a quiz, he looks up what he thinks is helpful information in the library, he handles a video camera, and so on). But even in "passive" modes, the learner is attending, remembering, comparing, operating on past and new knowledge, etc. Is this "interaction" like calling the radio broadcast "interaction"?

From interactive video we know that several formats are discerned: linear play, manual frame access, automatic stop, random frame access, program control, and microcomputer control. All are called "interactive."

In spite of the popularity of this interactivity feature, we do not find in the literature much effort to define it. Barker (1990) says that interaction involves the two systems mutually influencing each other's "state space," and speaks of an oscillatory nature of the dialogue process. But then, Barker includes computer-based resources as well as radio. Nevertheless, according to Barker, several media utilization paradigms are required for the creation of interactive learning systems, among which is learner control over what is learned, over the pace of learning, over the direction of learning, and over styles and strategies to be adopted.

It is from human conversation that Lippman, at the Massachusetts Institute of Technology, extracts a definition of interactivity—a mutual and simultaneous activity of partners—and gives five characteristics for interactivity: interruptibility, graceful degradation, limited look-ahead, no default, and impression of infinite database (Brand, 1987).

From phenomenological observation of dialogue we know that in an interactive process both partners take part. They initiate; they set goals; they interrupt; they determine the subject, its interpretation and evaluation; they ask for feedback; they ask and they give information; they help each other to clarify problems and to keep the dialogue going; and they terminate the interaction. There is equality in all or in a certain number of aspects. Just as in instruction, we see in dialogue two classes of interactive operations, one is exchange of information, the other is management of the process.

We must conclude that the point is not: interaction yes or no. The point is: more or less. All the named characteristics of interactivity are gradients. Also, interactive systems, as presented in the literature, differ in their degree of interaction. Acknowledging the difference between overt and covert interaction, it seems better to discriminate several levels of interactivity between learner and environment. The telephone is very interactive. The book is less interactive overtly, but still there is the possibility of overtly addressing the author and of making notes. A lecture from one professor is hardly interactive, while with another professor there is a vivid interaction among the people present. An "audio-active" language laboratory allows the learner to be active: listening and speaking. The "audio-active-comparative" type of language lab allows the student also to look for feedback: it is more interactive. In both types teacher and students can talk with each other.

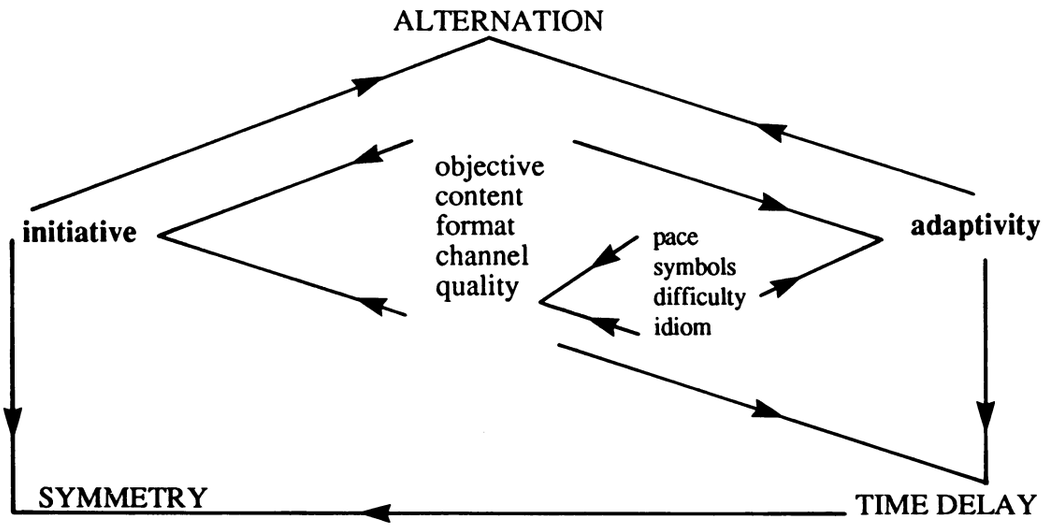
Thinking of media in relation to the user, we therefore propose the following levels of interaction capacity relating to media:

- **Linear media**: An ongoing stream of information reaches the student; his/her activity is covert.
- **Feedback media**: In addition to expository information, questions and assignments also reach the student; the medium responds to the student's reactions with feedback (examples: tutorial computer-aided learning, book with test pages and answer pages).
- **Adaptive media**: Dependent on the reactions and performance of the student, the medium determines the objective, the route, and the difficulty level (example: videodisc with a choice of two languages).
- **Communicative instruments**: In addition to the possibility of his reacting, the student is allowed to feed questions, decisions, problems, and information into the medium's system, to which the medium responds with answering, opening a database, suggesting a solution, showing consequences, or storing the input and implementing it in its database (example: computer simulation, adventure game, supported by expert systems).

In fact, we would prefer to reserve the attribute of

Figure 1

First Draft of a Theory of Interaction



interactivity for systems in which each partner has the occasion to influence the common stream of events, including the operations of the other partner.

Toward a Theory of Interaction

Let us see what we have. First, the communicational or educational relation between two partners or systems has some primary *qualities*, such as pace, difficulty level, symbolic format, idiom, and jargon. Next to these qualities the relation is characterized on a secondary level by *objective, content, sensory channel*, and *educational format* indicating the communicational style as being exploratory, expository, tutorial, directive, and the like.

Accordingly, the instructional events may vary from one-way drill to full equal-partners dialogue. Concerning such secondary characteristics, the interacting systems have a certain degree of *initiative*, they are allowed to take turns. System A, the teacher, for example, takes the initiative to introduce a quiz and determines its content. B, the learner, is only entitled to respond in written format and to choose his wording. The opposite of the initiative of A is the *adaptivity* of B. The initiative, that is to say, an action with the intent to influence the course of events, has effects to the degree that the partner-system is adaptable in the aspect that was meant to be influenced by A's initiative.

A set of fourth-level characteristics describes the total interaction of the partner-systems. *Time delay* deals with the time passing between the respective initiatives of the partners. When I react, how long will it take to change the communication pattern of my partner in one or more aspects?

Symmetry states the degree to which partners are equal in influencing aspects of the relation. Finally, an interactive relation can be described by the degree of *alternation* of turns and initiatives: How often do they occur, and in what way (by power, by role, by emotion)?

Trying to visualize this first draft of a theory of interaction, we get Figure 1.

It is not clear *a priori* at what point a relation will be called interactive.

Without a well-specified idea of what we are looking for when we want to design interactive transactions, we will not be able to develop a Second Generation Instructional Design Model. Thus, a good definition or a consistent theory is needed. We have tried to instigate a beginning. □

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