CANADIAN JOURNAL OF EDUCATIONAL COMMUNICATION

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Robert M. Bernard

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Editorial

Robert M. Bernard

If you are reading this, you are aware by now that the odd-looking volume that appeared in your mailbox recently is not an unsolicited mail-order catalog or your most recent cookbook-of-the-month-club selection. It is, in fact, the *Canadian Journal of Educational Communication.* AMTEC members should also have received, as an insert to *CJEC,* a copy of *Media News,* a new publication which contains information on current events and other items of immediate interest to the membership. Together, these two publications include the same range of information and articles found previously only in the journal. We hope that, by separating AMTEC news and business from the more general issues of educational technology and communication addressed in the journal, we will attract a wider readership and encourage more library subscriptions.

Changes to *CJEC,* however, are not just skin deep. In addition to the new size and cover design, the interior format has been altered to emphasize the contributions of individual authors and to preserve the continuity of each article. You may also have noticed on the inside front cover of this issue that the number of reviewers has been increased substantially. This is because, as a matter of policy, each manuscript that is received for consideration is anonymously evaluated by three reviewers who have expertise in the topic. Some manuscripts will be published without changes and others will be judged to be unacceptable for publication, but the majority will be accepted pending either major or minor revision. As a case in point, each article that appears in this issue was reviewed and returned to its author for some form of modification. The purpose of this approach is not to make publishing in *CJEC* more difficult, but to improve articles through a process of formative evaluation and revision.

I know that in perusing this first issue it must appear to you that the articles were intentionally organized around a formative evaluation theme. This is essentially true, but the theme evolved out of necessity rather than conscious planning. In June of 1985 we began operation with no submissions. A few well-placed requests resulted in three of the four articles that you see before you. While we hope to offer you a more balanced selection of articles in future issues, our ability to do this depends in large part on the nature of the manuscripts that are received. As a matter of general policy, however, articles will be published in roughly the same order in which they are accepted for publication, although complementary articles will be grouped together whenever possible. This means, of course, that there are no longer deadlines for submitting manuscripts.

A few additional changes are worth noting. You have probably noticed that, with the exception of the abstract, text within articles is not right justified (right justification means aligning the righthand margin by adjusting the spacing within and between words and using arbitrary line breaks). Jim Hartley and others have found through experimentation that a

Robert M. Bernard is Associate Professor of Educational Technology at Concordia University, Montreal, Quebec and the new editor of *CJEC.* His teaching and research interests include the design of media products, print-based instructional systems, psychological aspects of educational technology and quantitative methods and research design as applied to educational technology problems.

"ragged " right margin in conjunction with wide margins (in this case a one-column format) produces the best readability. My own view is that this departure from standard typesetting convention results in an acceptably attractive page. We have also adopted a slightly different publication schedule, beginning with this issue. Number 1, on February 1st. Number 2 will be mailed about May 1st, Number 3 about August 1st and Number 4 will appear in your mailbox sometime shortly after the first of November. Copy intended for *Media News* must be received by the editor, Cheryl Amundsen, one month prior to the publication date (please see Information to Authors on page 72 of this issue for further details).

 CJEC is one of the very few educational communication and technology journals that attempts to serve the entire range of persons working in the field: teachers, managers, instructional designers, media personnel, software designers, reseachers and theoreticians. All too often, however, the needs of these segments differ dramatically. An article one portion of the readership finds useful or enlightening may mean nothing to another group of readers. I suspect that it is the practitioner group who feels most under-represented, since those in business and industry and persons working in the K-12 sector are not rewarded for writing. We have attempted to meet the needs of these groups in a limited way by providing space for a media manager's column and by continuing *From the Media Periodicals, Mediography* and *Microware Review.* However, in order for us to publish articles that address issues of interest to practitioners, someone must write them. We are relying on your submissions and look forward to receiving your manuscripts. I would especially like to encourage those of you who have an interesting topic in mind, but are unsure of how to proceed with its development, to send a detailed outline or description of your ideas to me. Either I or one of our reviewers will attempt to provide you with guidance on how your ideas might be worked into a publishable piece.

 Finally, I would like to thank my collegue and friend, Denis Hlynka, for three outstanding years as editor of *CJEC* . I am, only now, beginning to appreciate the magnitude of the task that he appeared to perform so effortlessly.

Formative Evaluation of Instructional Materials: An Overview of Approaches

Cynthia B. Weston

Abstract: Formative evaluation during materials development has been shown to improve the effectiveness of instructional products. However, suggestions on how to conduct formative evaluation vary widely. This article describes and compares the most common approaches to formative evaluation. Most of these approaches include gathering feedback from students as critical to the success of materials development. A range of recommendations for how data can be effectively acquired is presented and one approach is described in detail.

Brian Mulroney benefitted from formative evaluation. His political slogan, "Together we can do better," was tried out with a group of supporters during his 1984 campaign for Prime Minister of Canada. The test group said,"We don't believe that Mulroney can do better than ... anyone else. We don't buy that ...But what we want to do is we want to believe that we can *be* better..." (Tierney,1984). The original slogan was changed to, "Together we can be better." Brian Mulroney won. Sneak previews are another example of formative evaluation. Representatives of the major television networks stand on 5th Avenue in New York and hand out free passes to sneak previews of new shows. Based on reactions of the test audience, the chararacters, music, title or the overall strategy of a new program may be changed before it ever goes on the air. Formative evaluation is a process used in politics, business, industry as well as in education to collect data about a product during its development so that the product can be improved before final production.

When Michael Scriven (1967) coined the term formative evaluation he was referring specifically to the evaluation of educational programs during their developmental phase; an evaluation for the purpose of improvement. This phrase so aptly expressed a concept that has been practiced intuitively for years (e.g., see Cambre, 1981) that it has been almost universally embraced by the educational community. A recent ERIC search for the period 1966-1985 using formative evaluation as a primary descriptor yielded over one thousand

citations. Included were articles about formative evaluation of curriculae, of programs, of teachers and teaching, and of materials. This paper will focus on formative evaluation as it is applied to the development of instructional materials.

FORMATIVE EVALUATION ADVOCATED FOR MATERIALS DEVELOPMENT

When Andrews and Goodson (1980) reviewed 40 instructional design models they found 38 which recommended that instructional materials be tried out and revised before implementation. This iterative process of try-out and revision is often referred to as formative evaluation; its purpose is the improvement of instructional materials during their formative or developmental stage before their final production or release. It is argued that the product will be more effective in producing learning if materials are evaluated and modified during development and if the data for revision are gathered from students or representatives of the target population.

Stolovitch (1982) compared activities within 12 instructional development systems models and found that 11 of the 12 internationally employed models prescribe or imply the use of students to tryout materials as part of the development process. This commitment to the use of student feedback in materials development tends to be supported by research. In a study by Baker (1970) several instructional programs were prepared and each tried out with three different learner groups. Programs were revised using the formative evaluation data. These revised programs were more effective in producing student learning than original programs. Abedor (1971) tried out materials with small groups of students using general feedback, posttest scores, and information from an attitude survey and debriefing session as data for revision. Student scores improved after the materials were revised. In a study by Kandaswamy, Stolovitch and Thiagarajan (1976) materials were revised using feedback from group and one-to-one try-out sessions. Posttest scores for all revised versions were significantly higher than for the original versions. There was not a significant difference between materials revised using group and individual methods. Similarly, Wager (1983) compared small group and one-to-one methods of gathering data from students for use in revision. One set of revised materials was as effective as the other, but both were superior to the unrevised materials. In general, there does not seem to be an indication that any one method of gathering student feedback is superior to another, only that the materials that had undergone formative evaluation with students were superior to unrevised versions.

While some reseachers are trying to define the kind of students to use and the most effective methods of gathering data from them, others have suggested that it may not be at all necessary to include in formative evaluation the expensive process of collecting data from students. In an early study, Rosen (1968) found that any kind of formative evaluation improved the effectiveness of instructional materials. Two groups of instructional designers were asked to revise materials. One group was given data gathered from student try-outs; the other group, given no data, was told to use intuitive criteria for revision. Both sets of revised materials were more effective in producing student learning than were the unrevised materials. In a more recent study, Golas (1982) had writers revise materials in two ways: one group used student data and the other used only instructional editing guidelines which incorporated the attributes of effective instruction. No significant difference was found in instructional effectiveness of materials revised using the two methods. Montague, Ellis and Wulfeck (1983) also found that materials revised using editing guidelines produced significantly higher test results than did the original materials.

There doesn't seem to be any doubt that formative evaluation of instructional materials improves the effectiveness of the final product. There does seem to be doubt

about the best way to do formative evaluation. There is not a single set of heuristics, or guidelines. There is not a single algorithm. There are several approaches that share certain features in common but which differ along various dimensions. It is the intent of this paper to describe the most common variants of formative evaluation, defining components and examining the relationships among them.

COMMON VARIANTS OF FORMATIVE EVALUATION

Up to this point the term formative evaluation has been employed to refer in general to any try-out and revision of instructional materials. Upon reviewing the literature, one notices that other phrases often are used to refer to what seems to be a version of formative evaluation. Some common, related descriptors have evolved because they more accurately describe a particular approach to formative evaluation: expert review, developmental testing, the three-stage model, and learner verification and revision. All are involved with collecting data about a product that can be used to improve the product.

Formative Evaluation

The general approach to formative evaluation specifies the collection of empirical and non-empirical data during formative stages of product development (e.g., see Cambre, 1981). Students are not considered to be the only source of data for revision. Any review done for the purpose of improving the materials before production is formative evaluation. This would include a self-critique of one's own material, a review done by a colleague or try-outs done with students. The cycle of test-revise-test-revise theoretically ends when the materials consistently produce satisfactory results. Materials are then produced in final form and released for implementation.

Expert Review

The expert review approach to formative evaluation proposes that an expert or a series of experts review prototype materials during development and suggest improvements (e.g., see Montague et al., 1983). Student feedback is not obtained for use in revision. The materials are revised based on the expert review, are produced in final form and are released for use. There is a new interest in this variant because it is more cost effective than approaches which require that data be gathered from a number of learners.

Developmental Testing

Another approach to formative evaluation is developmental testing, which again advocates that draft materials be tried out and revised before a final version is produced (e.g., see Henderson & Nathenson, 1976). In contrast to expert review, developmental testing requires that learners be used as the primary source of feedback for revision. Horn (1964) indicates that in developmental testing the try-out of materials should be done only in one-to-one sessions with individual learners. Geis, Weston & Burt (1985) also include testing sessions with groups of learners as part of the developmental testing approach. In any case, after a series of try-out and revision sessions, the materials are produced in final form and released for use.

Three-Stage Model

Some authors (e.g., Dick & Carey, 1985) suggest that formative evaluation be done in three sequential stages of learner try-out and revision. First, the draft materials are tested with individual students and revised. Second, the revised draft materials are tried out with

small groups of learners, revised and produced in an almost final form. Third, the semifinal materials are tested in the "field" -- in a setting which is a close approximation of the actual situation for which they were designed. Revisions are made again, the materials are produced in final form and are implemented.

Learner Verification and Revision (LVR)

The learner verification and revision approach to formative evaluation (e.g., see Komoski & Woodward, 1985) is similar to developmental testing and the three-stage model in that it requires that learners individually or in groups be used as the primary source of feedback for revision. LVR is unique, however, among all other approaches to formative evaluation in its recommendation that the cycle of try-out and revision be continued for the life of the materials. It is recommended that publishers use LVR on a continuous basis to monitor the effectiveness of commercial material (EPIE Institute, 1975). Results of extended testing may suggest the need for revision and reproduction of the materials or utilization procedures. This may be an expensive proposition in the short-run but one which will extend the life of the materials.

DIFFERENCES AMONG VARIANTS

The differences among the various approaches to formative evaluation seem to be related to the recommended duration of the try-out/revision cycle, the primary source of data for revision and the developmental state of the materials being tested. A chronology of evaluation activities as suggested by Thiagarajan (cited in Kandaswamy, 1980) provides a useful construct for elaboration of the relationships among variants along the above mentioned dimensions. (Minor modifications that have been made in the original technology are noted parenthetically).

The six phases (stages) of evaluation that are proposed - self-evaluation, expert review (professional jurying), one-to-one (individual) testing, group testing, field testing and extended testing - "begin very early in the developmental history of the instructional materials and continue well into the diffusion and implementation stage" (Kandaswamy, 1980, p. 23).

In self-evaluation developers revise their own work. Although this may be a useful first step, the obvious subjectivity of this method makes it difficult to see gaps, inconsistencies and problems in one's own work. For this reason it is recommended that, in addition to self-critique, evaluation be sought from an external source.

At the expert review stage a subject matter expert, a curriculum expert, an instructional designer and/or a technical expert is asked to review the instructional materials (usually in draft form) in order to judge those factors which fall within their area of expertise, such as accuracy, completeness, instructional sequence and technical quality. While they should be uniquely qualified to evaluate these features, which may be invisible to a student, subject matter experts should not be expected to anticipate problems students might have with the materials. It seems desirable that evaluators be given guidelines to help with the review, as was done by Montague et al. (1983), since Rothkopf (1963) found a negative correlation between expert ranking of instructional materials and student achievement. For this reason their reviews should be considered jointly with student data.

In one-to-one testing an individual student works through draft or prototype materials with a developer. It is at this stage that major instructional problems are usually identified resulting in revisions such as a change in the instructional strategy or overall organization of the instruction. To minimize identifying problems that are idiosyncratic to a single

learner it is often suggested that at least three individual testing sessions be held.

In group testing a group of learners works through draft materials with a developer. Recommended size of groups varies, for example: Bell and Abedor (1977) recommend groups of 4-6 learners, Dick and Carey (1985) suggest 8-20 and Friesan (1973) suggests that 30 is appropriate for larger groups. Patterns of errors or problems in the instruction can be identified. As well, a greater amount of data can be gathered during the session.

During field testing, materials which have been revised and are in semi-final form are tried out in a setting which models as closely as possible the actual use situation. Information is gathered primarily from students but also from instructors and anyone else who is directly involved in the instruction. It is often during field testing that utilization procedures are first tested and use problems are discovered. For example, it may become evident that while the procedure for doing a chemical experiment is clear, the location of the equipment has been overlooked as a critical prerequisite to performing the experiment. At this stage it can be determined how well the instructional package functions as a unit.

In extended testing, data are gathered primarily from learners but also from other potential information sources, such as teachers, in order to determine if produced materials that are currently in use continue to be effective. Extended testing can reveal deterioration of desired learning outcomes and can identify appropriate modifications. Kandaswamy (1980) suggests that is is also appropriate at this time to test the material with other than the target population to determine if perhaps it could be adapted for use with other groups of learners.

A comprehensive formative evaluation of instructional materials might include all six phases of evaluation in consecutive order; each successive phase beginning with materials that had been revised based on data gathered during the preceding evaluation phase. In fact, neither formative evaluation nor any of the variants presented here explicitly includes all six phases. As is shown in Figure 1, each approach includes a unique combination of evaluation phases; a combination which for each defines the recommended duration of the try-out/revision cycle, the primary source of data for revision and the developmental state of materials during testing.

FIGURE 1.
Stages of Evaluation Included in Formative Evaluation and Common Variants.

Phases of Evaluation

Formative Evaluation and Common Variants	Self Evaluation	Expert Review	One-to-one Testing	Group Testing	Field Testing	Extended Testing
Formative Evaluation	■	■	■	■	■	
Learner Verification and Revision			■	■	■	■
3-Stage Model			■	■	■	
Developmental Testing			■	■		
Expert Review		■				
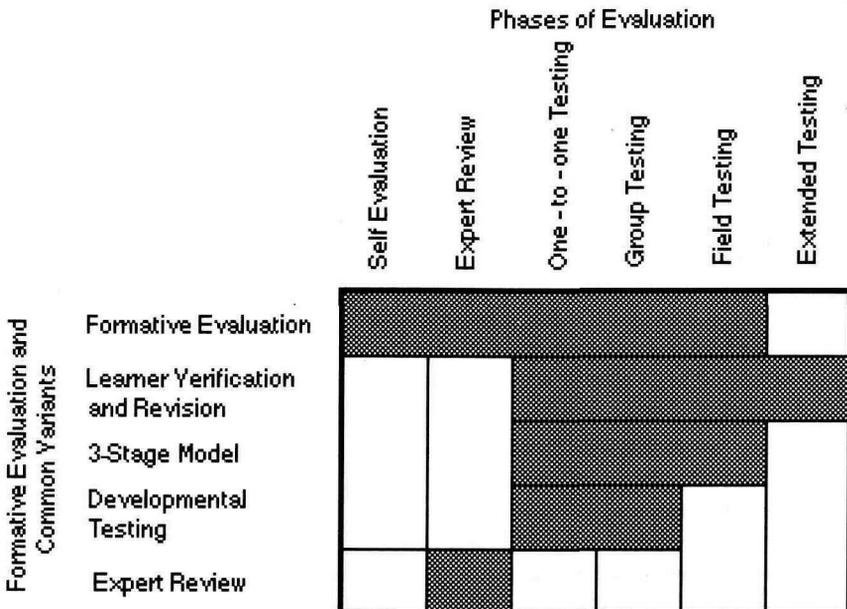
Since formative evaluation implies any kind of review and revision that is done before materials are produced in final form it can span the phases from self-evaluation through field testing. This of course means that the author of the materials, experts and learners are acceptable sources of data for revision. While formative evaluation can include the first five phases, no particular sequence for evaluation is implied. Any single phase, or any combination of phases in any sequence, could be used. It may be for this reason that more clearly defined variant approaches to formative evaluation evolved. Learner verification and revision includes only those phases of evaluation that use learners as the primary source of feedback. It is the only variant that includes extended testing for the life of the materials which also means it is the only approach that tests materials which have been released and are implemented. The three-stage model as well spans those phases that use learners as the primary data source. However, since this approach applies only to materials being developed, it terminates with field testing. Developmental testing, the narrowest learner based approach to formative evaluation, theoretically terminates before field testing. Expert review, which includes only one phase, has the shortest duration of formative evaluation activities and is the only variant which uses experts or editors as the sole source of data for revising materials.

OBTAINING FEEDBACK FROM STUDENTS

With the exception of expert review, approaches to formative evaluation indicate that feedback from learners should be obtained for use in improving instructional materials. There are a number of issues which must be considered when using learners as a source of data for revision. Geis, Burt and Weston (1984) searched the literature for guidelines to follow when testing out materials with learners. The guidelines found were variable and at times inconsistent, but could generally be grouped into a set of organizing categories. Four of these categories will be considered in this discussion: the type of learner to use in testing, the role of the learner during testing, the role of the developer during testing and the kind of data to collect.

Learners used to try out materials should at least be representative of the population for whom the materials are designed so that comments and reactions can be considered typical. Enthusiastic, highly verbal individuals who are not timid about expressing their opinion are often desirable as they are usually willing to proffer criticism. The aptitude of learners selected for the try-out sessions also might be considered. Wager (1983) found that high aptitude subjects were able to identify broader content inaccuracies while low aptitude subjects identified problems such as vocabulary. Scores on materials revised from mixed aptitude feedback were higher than scores on materials revised with feedback from just the high or low aptitude groups. This tends to suggest that a combination of high, medium and low aptitude students should be used for testing.

The role of the learner during testing can range from passive to very active. A passive learner would be asked simply to work through the materials and take tests. The use of the word "passive" should not be misunderstood. The instruction being tested may require student activity, such as doing a chemical experiment; however the student is passive in regards to giving intentional feedback. At the other end of the continuum a student in the critic's role would ask questions actively, make comments and suggest or actually make revision on the materials.

The role of the developer can also range from passive to active. The developer can act simply as an administrator, for example, hand out materials and generally manage the session. In the most active role, the developer as tutor would explain, rephrase or give

examples to clarify the material as well as suggest and make revisions.

Various kinds of data can be collected to be used as the basis for revising materials. Written or audio records should be kept of learner/developer interactions (verbal as well as non-verbal) so that the details of the try-out session will be available for reference during revision. Pretest and posttest scores can be collected as a measure of student learning. An attitude questionnaire can be used to gather information about the learner's affective response to the learning experience. Debriefing sessions can be used as a follow-up technique to probe learners about specific difficulties, gather additional commentaries, and summarize results of the sessions.

Table 1 (see next page) presents a summary of the range of recommendations for the type of learner, roles of the learner and the developer, and the kinds of data to collect when trying out instructional materials with learners.

One Approach to Student Based Formative Evaluation

What particular combination of roles and data collection should be used to obtain feedback from learners? Currently there are no rules to aid in this decision. Instructional materials developers present various combinations which apparently have been developed over time, based on experience. Our research team is investigating those procedures that are most commonly used by practitioners in an attempt to determine which combinations are most effective for obtaining from learners the data that are necessary for revision, but the research is not yet completed.

Figure 2 presents a combination of roles and data for student-based formative evaluation which the author has found to be effective.

FIGURE 2.
One Approach to Student-Based Formative Evaluation.

	Role of Learner				Role of Developer				Data Collection			
	Passive	Semi-passive	Active	Critic	Administrator	Passive	Active Intervener	Tutor	Test Scores	Attitude Survey	Debriefing	Records of learner/developer interaction
Individual Testing	o	+	+++	++	+	++	+++	+++	o	+	+	+++
Group Testing	o	++	+++	++	+	++	+++	++	+	++	++	+++
Field Testing	+++	++	+	+	+++	++	+	o	+++	+++	+++	+

KEY: +++ Usually, ++ Occasionally, + Seldom, o Never

TABLE 1
Range of Recommendations for Obtaining Student Feedback

Type of Learner	Role of Learner	Role of Developer	Data Collection

- Representative	Passive
	- works through materials
	- takes test
		Administrator
		- administers session
			Written or audio records of:
			- learner
			   questions
			   comments
			   suggestions

- Enthusiastic, verbal		Passive -observer - recorder	

-Not timid	Semi-passive
	- responds to tester's
	  questions
	- asks questions when
	  necessary
	- comments occasionally
		Active intervener
		- responds to verbal and
		  non-verbal cues
		- probes for difficulty
		- suggests revisions
			- developer
			   explanations
			   suggested
			    revisions
			   teaching
			    required

- High, medium and low aptitude			
	Active - questions - comments - explains problem	Tutor - revises - remediates -teaches	Pretest
			Posttest
	Critic - suggests revisions - makes notes and revisions on materials		Attitude Survey
			Debriefing

One-to-one testing is used to identify major problems in the instruction. The most active learner roles seem to be most effective for obtaining maximum feedback. Usually the learner is asked to question, comment or criticize any aspect or detail of the materials. The tests are reviewed for clarity, vocabulary and so forth, in the same way as are the learning materials. The active learner role requires that the developer also be active as an intervener and/or tutor. At this early stage, the documentation of the learner-developer interaction is critical. Comments, suggestions and revision are collected. Sometimes a written attitude survey and debriefing are used to search for additional data, however results may duplicate findings from the testing session.

Group testing is used in two ways: instead of one-to-one testing and in addition to one-to-one testing. When group sessions are used as an alternative to individual try-outs, the purpose is the identification of major instructional problems. Therefore, the more active learner and developer roles are again encouraged. Due to the group setting, however, in depth tutoring and criticism can become difficult. An advantage of group testing is that a great deal of information can be collected at one time. A disadvantage is that group discussions can tend to persevere with particular details of the materials to the exclusion of other equally important problems. Data collection becomes more complicated as the number of learners increases. In order to preserve the maximum information about the learner-developer interaction a tape recorder is invaluable. In addition, notes and revisions are made directly on the materials. A debriefing session is often used to summarize group comments and revision suggestions. An attitude survey is also useful for summarizing group reactions.

When group testing is used as a follow-up to one-to-one testing, the structure of the session changes. The group works with materials that have been revised based on individual testing and therefore the focus is often on seeing if the materials function more smoothly. For this reason, a semi-passive learner role is used at the outset of the session. The learners are told that their comments and reactions are important in order to improve the materials but are not necesssarily encouraged to criticize. The developer then starts the session in a passive role, observing learner response. If problems arise, as they often do, then the developer actively intervenes or tutors as the learner becomes a more active commentator. The group interaction is again recorded. Debriefing and attitude surveys are used to gather additional data. If the session goes well, (i.e., few problems arise) the learners are asked to complete the tests to determine if the desired learning has occurred.

Field testing is used to determine how the materials function in actual use. In order to obtain an accurate picture, the learners are usually asked to take the actual learner role, working through the materials and tests as designed. The developer may administer the session or unobtrusively observe and record. Occasionally, when problems arise, the developer actively questions or probes students thus moving them into a more active role. Since the learner-developer interaction tends to be minimal in field testing, there is less emphasis on documenting this aspect. Debriefing students after the session is critical. An attitude survey is almost always used to collect information about reactions. Pretest and posttest scores are collected as a measure of the effectiveness of the materials.

SELECTING AN APPROACH

The question should not be whether to include formative evaluation as a part of materials development (it clearly does make a difference!) but rather how to include it. Selection is often based upon practical constraints. Available resources (e.g., time, money, personnel, facilities) can affect the decision. One-to-one testing, for example, takes a great

deal of time, usually a minimum of one hour per session of tester and student time. Individual testing costs more than expert review; for example, the former requires multiple copies of materials, the latter only one copy. For a series of three individual sessions, three students (minimum), one developer (minimum), and one observer (optional) will be necessary; only one expert (minimum) is necessary for expert review. Preference of the developers also affects the selection. Some developers are comfortable in a highly interactive individual session where the student acts as critic. Others prefer a more subdued, controlled situation with the student in a semi-passive role and the tester primarily in a passive role as an observer and recorder.

The selection should be based first upon the type of data that is being sought. One-to-one testing yields in-depth information about students' interactions with materials being developed. Expert review guidelines can incorporate the attributes of effective instruction in materials but will never reveal a student's response to the materials. Field testing shows the effectiveness of materials when placed in the actual use situation. Consider the type of information being sought and select the combination of formative evaluation strategies that will best deliver those data.

REVISING

After data have been collected the developer is faced with the dilemma of revision. Prescriptions are few. Usually one is simply told to revise appropriately. This apparently is better than nothing since even materials that are revised intuitively are more effective than unrevised materials (Rosen, 1968). Sometimes revisions seem obvious, such as the addition of an example to help clarify a concept. Sometimes the appropriate revision is not so obvious. The following list provided by Debert (1979, p. 20) is one of the most comprehensive summaries of types of revisions that are made in instructional materials after formative evaluation:

Addition:
- Add instruction on prerequisite skills and knowledge.
- Add training on the use of the material or the method.
- Add training for teachers or trainers who will use the materials.
- Add a preview (advanced organizer).
- Add illustrations.
- Add performance aids.
- Add examples.
- Add activities.
- Add feedback.
- Add transfer exercises.
- Add test items.
- Add motivation.
- Add variety.

Simplification:
- Reduce the level of complexity.
- Simplify the language.
- Use smaller units.
- Combine materials into larger units.
- Rearrange the sequence.

- Remove irrelevant information.
- Remove irrelevant activities.

Others:
- Make examples more relevant.
- Change the instructional medium.
- Change the instructional design format.
- Change the target population.
- Abort the project.
- Make no changes.

This can be a valuable checklist to keep at hand when selecting revisionary tactics.

APPLYING FORMATIVE EVALUATION TO ANY MEDIUM

Formative evaluation specifies that materials must be tried out while in a draft or prototype form. Most probably this is because the developer's willingness to revise seems to decrease as the time and energy that has been invested in a product increases. As well, learners seem to be more willing to criticize rough materials that clearly require work. Due to this draft form requirement, it is often thought that only print based materials lend themselves to formative evaluation. Certainly it is easy to conceive of presenting learners with, for example, a handwritten version of text with rough sketches or even a clean typewritten copy prepared on a word processor. In fact, the formative evaluation process should be applied to materials being developed in any format (e.g., CAI, slide-tape or videotape) although it may be more difficult to conceive of a first draft form of these materials. The following anecdotal accounts may serve to exemplify the possibilities.

A branching CAI program was developmentally tested in draft form. The developer placed each frame of the program (text and/or sketches of graphics) on a separate note card. The learner was then presented with the frames, one by one. Based on the learners oral response to critical embedded questions, the developer supplied a set of cards which provided the appropriate branch of the program. Changes that were to occur within frames, such as additions to graphics, were provided by the developer in both oral and written form. Major problems were identified and corrected before the developer became attached to a package that had already been programmed.

Slide-tape and videotape programs have been successfully tried-out while in storyboard form. Instead of viewing the programs, at this early stage the learners "read" through the images and narration. Each planned visual was sketched or described in words. The accompanying audio was written next to each sketch, and when necessary an audiotape presented examples of music and sound effects. In one case, a rough draft videotape was produced based on the results of the storyboard try-out. The developer used only portapak equipment.

Developers often feel that it will be impossible for learners to make any sense out of the instruction when it is presented in a form that is so different and distant from the final product. In fact, properly prepared learners never cease to amaze us with their astute ability to overcome the form and concentrate on the content. Regardless of how first draft materials are presented, it is important that they be in a form not only that one feels willing to revise, but in a form that is so rough that revision is mandatory.

SUMMARY

Formative evaluation of instructional materials can be done using various approaches. Though the purpose is always the improvement of materials before they are produced in final form, the guidelines for try-out and revision are sometimes vague and sometimes inconsistent. However, this is not an excuse for excluding formative evaluation from the materials development process. Even the busiest instructional developers can find the time to review and revise their own work, or have someone else review and revise it. If more time is available, students should be asked to try out the materials to provide data for revision. The evidence is consistent; any kind of formative evaluation, any kind of preliminary review improves the instructional materials and improves student learning.

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Interactive Television Brings University Classes to the Home and Workplace

Joyce Carver
Ruth C. MacKay

Abstract: Live, interactive television over the Anik C III satellite delivered a university credit course in nursing research to 36 registered nurses in the Maritime provinces. Student grade achievement was similar to on-campus courses. Student evaluation of the delivery method on a post-course questionnaire *(n* = 34) indicated that the televised approach achieved the objective of making credit courses more accessible to working nurses. Flexibility of study time and place were the most frequently stated advantages. All reported they would recommend to others that they take a TV course. Eighty-three percent *(n* = 30) of the sample registered for the next course given this way out of a total course registration of 81.

Design of courses with a clinical application component and adequacy of library resources will be studied in the delivery of future courses. More detailed cost analysis will also be sought.

Seven thousand registered nurses across Nova Scotia lack the baccalaureate nursing degree. Dalhousie University School of Nursing is addressing the problem of making undergraduate credit nursing courses accessible to these nurses. Nurses in the immediate university area, as well, have difficulty attending classes on campus because of the varied time demands of shift work and family responsibilities. Written requests to the school from nurses in Nova Scotia for outreach classes have increased since 1981 when the professional association resolved to ask the universities "...to seek ways of making baccalaureate nursing courses available to nurses living outside the university areas" (RNANS, 1981). A mail survey conducted in 1983 through the professional and union associations further confirmed the need for outreach programming.

This paper reports on the first of two full credit courses offered by Dalhousie University School of Nursing via live interactive television during 1984-85. The paper describes the delivery method, course design, and student achievement and attitudes towards the delivery method. The courses were presented in cooperation with the Distance University Education by Television (DUET) system developed by Mount Saint Vincent University

(Carl, 1983), Issues are highlighted which must be addressed if this teaching method is to have a significant, long-term impact on the problem of educating professionals at a distance.

DELIVERY METHOD

Our decision to test the DUET system was based on its reported success with our courses (Carl, 1984), and on the work of Collins (1982) with televised nursing education in British Columbia. Collins concluded that the use of satellite based instruction is a viable alternative to traditional classroom instruction for nursing education. Collins' findings were based on a field test with a continuing education course in Nursing Assessment followed by a credit course, "The Teaching/Learning Process in Health Care". Although the DUET system has some differences, the recommendations of Collins (1983, pp. 172-179) provided valuable guidelines for our work.

Cost

Cost and accessibility of the delivery method played a role in our decision to offer courses via television. Resources available through the Atlantic Satellite Network (ASN) and DUET have a major impact on cost. Free educational broadcast time provided by ASN enables DUET to access the Anik C 111 satellite. The signal is carried by most cable TV companies in the Atlantic Region, thus allowing students to view classes at home or work, provided they subscribe to cable TV Our broadcast costs are limited to rental of the DUET classroom with its experienced technical team. Sharing arrangements to keep costs of educational technology systems manageable are suggested by Ruggles, Anderson, Blackmore, LaFleur, Rothe & Taerum (1982, p. 80).

Teaching by television often evokes images of high cost and lack of spontaneity mainly because individuals assume that a commercial broadcast approach will be employed. Carl (1984) argues that a production-expertise dominated system is inappropriate for higher education, resulting in unnecessary costs, and restricting the dynamism of university teaching. The prime consideration of DUET is to make it as user-friendly as possible so that faculty can teach the way they normally do in any classroom; faculty are the key and DUET is their teaching tool (Carl, 1984).

With the DUET system, three video cameras in a regular university classroom replace the structured, highly technical TV studio environment normal for expensive production standards of broadcast television. There is a small control room at the back of the classroom One stationary camera gives wide angle views and a technician operates a second camera on a wheeled tripod from the classroom floor.

The professor controls the third camera and uses it in much the same way as an overhead projector. The camera is suspended from the ceiling directly above the lectern (Figure 1). A professor places materials for projection in a specified area on the desk and focuses or frames the picture with push button controls attached on the right side of the desk (Figure 2). This adds flexibility to the presentation because picture and object, as well as word diagram overheads, are easily projected.

Accessibility

Teaching over open broadcast satellite offers tremendous accessibility and flexibility in study place and time. Common use of home videorecorders makes the system even more accessible. Our previous use of audio-teleconferencing was suitable for graduate nursing seminars (Carver and MacKay, in press). However, the current lack of a widespread audioteleconferencing network in Nova Scotia severely limits the number of small, widely

FIGURE 1.
Overhead camera suspended direcly above lectern.
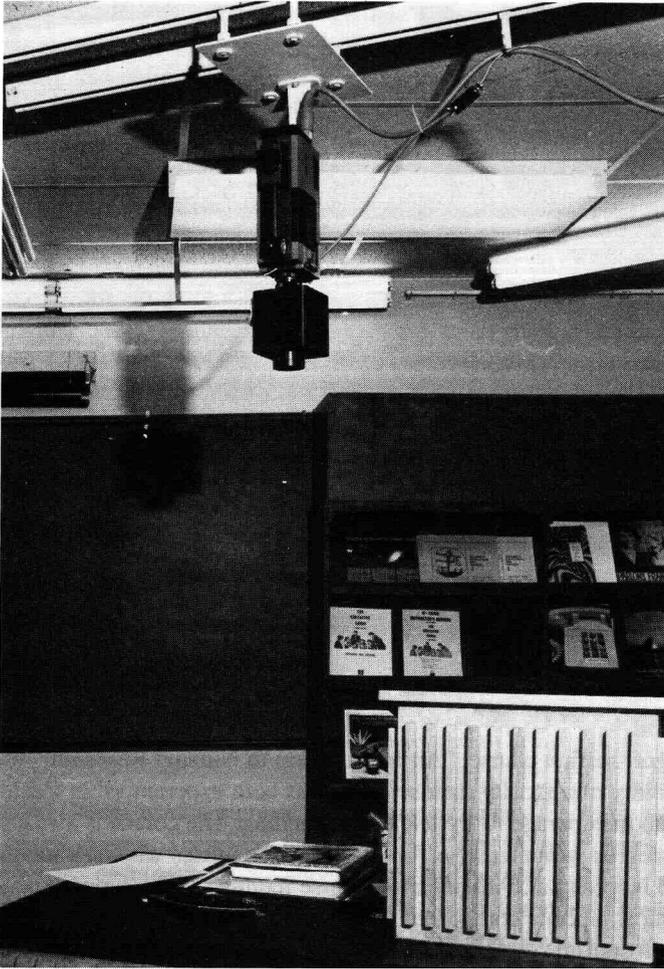
dispersed groups we can reach. While some smaller communities do not receive cable TV, service is otherwise widespread across the province.

IMPLEMENTATION

We used a project team approach, formed along the lines of that described by Collins (1983, p. 65), consisting of three members: content specialist, co-ordinator, and administrator. The content specialist has primary responsibility for designing and teaching the course and student evaluation. The course coordinator is a resource to the content specialist for specific needs relevant to the course design and evaluates the delivery method. This person also makes arrangements for technical requirements, faculty orientation, office services, student registration, and liason with outside agencies. The administrative member looks after budget and publicity.

FIGURE 2.

Push Button Controls Operated by the Professor when Using the Overhead Camera.

Course Selection

Selection of the first course, "An Introduction to Nursing Research," was based on need and the availability of a faculty member who was both experienced in teaching the course on campus and had the courage to try television teaching. The course is a requisite for the baccalaureate degree in nursing and for baccalaureate nurses who lack the prerequisites of entry to our M.N. program. Although the course requires a laboratory experience, it does not have a clinical practice component. There is a statistics prerequisite. Students lacking a formal course in statistics were permitted to register if they passed a test based on a home study statistics program designed and administered by the faculty member teaching the course.

Publicity began in May for the September course and was conducted only through professional association publications and booth information at conferences. Registration was handled at the School of Nursing rather than the central university office.

Three main factors negatively influenced enrollment: short lead time for publicity, general disbelief that the endeavor would materialize, and the statistics course prerequisite. Thirty-seven students registered; only one student withdrew. Eighty-three percent $(n = 30)$ registered for the second course which had more than twice as many students $(n = 81)$ and a similar attrition rate $(n = 2)$.

Faculty Preparation

A number of adjustments are necessary for faculty teaching by live interactive television. These relate primarily to timing during the class, use of visuals readable on TV, how to compensate for lack of student feedback (i.e., both non-verbal and verbal) which is available in regular classroom teaching, and how to facilitate and humanize

interaction with students at a distance. A high degree of organization is essential. We found that planning time is one and one half times greater than for on-campus courses the first time taught by television. On second offering, now underway, the planning time was similar to any other course the professor has taught before.

A six-hour experiential orientation to live interactive television teaching was made available to faculty and required for those teaching the course. All faculty involved voiced positive attitudes to this teaching method afterwards. The main concern they express is that teaching workload may increase because of higher student enrollment.

COURSE DESIGN

The first full credit course was equivalent in content and hours to that offered on campus in a traditional face-to-face classroom setting. It was taught in two weekly live televised classes of one and a half hours each over a single semester of 13 weeks. Telephone interactions between students and faculty both on and off air replaced traditional face-to-face office visits. The instructor prepared printed materials for students: a detailed course outline, notes regarding particular difficulties in assigned readings, weekly guides for the laboratory periods, and detailed instructions for completing assignments.

There was a required laboratory session of two hours weekly. Laboratories used a small group format for informal self-directed discussion of course material, with the focus an assigned laboratory problem. The small groups met at local sites convenient to students. Laboratory sessions had two objectives: (a) the opportunity to apply principles taught in class to problems familiar to professional practitioners, and (b) time to discuss class materials, for clarification of difficult points, or to enhance learning of principles through active involvement with the material.

Teaching Strategies

The televised classes used a number of teaching strategies. Lectures were a major component of many classes. Therefore, the usual visual aids of the overhead (camera) and blackboard were used frequently. Some slides were used as well.

Guest lecturers are particularly valuable as they give a specialized view of a topic. Several times guests were interviewed to offer variety in approach, but also to evoke discussion of controversial material or to demonstrate particular skills. For example, one dialogue with a guest used role playing to show how an investigator might discuss with a nurse manager the means of gaining access to research subjects.

Interaction

Students were encouraged to telephone the classroom (collect if long distance) during live classes to ask questions or give comments. An average of two or three calls were made per class. Many preferred more private consultation during telephone office hours. Students were asked to submit written questions for discussion in class and a number were received. Mailed audiotapes for questions and responses were also used with a few geographically isolated students.

EVALUATION OF STUDENT LEARNING

Laboratory group assignments were mailed to the professor each week for review and comment. Four pre-selected laboratory assignments were evaluated to give a group mark

which constituted 40% of the individual student's grade.

Individual work provided the basis for 60% of the student's achievement in the course. This grade was based on a paper and a test. The paper represented selected components of a proposal for an imaginary small-scale investigation of a problem in nursing practice. The test at the end of the course consisted of multiple-choice questions designed to serve as a critique of a published study report. The test was administered in four geographic locations.

Student Characteristics

All 36 students were actively registered nurses and a self-selected group by virtue of course registration. All but one was female. Forty-two percent *(n =15)* were previously admitted to the post RN-BN program; and an equal number applied for and obtained admission upon registration for this course. One student had a baccalaureate in nursing and needed the course to qualify for the graduate program. Three students used the course as a transfer credit for a nursing degree at another university in the region. Two were registered on a non-degree basis.

Eighty-nine percent *(n - 32)* of the students completing the course were from Nova Scotia, and 46% of these *(n =18)* were from the Halifax-Dartmouth Metro area. Fifty-eight percent *(n =21)* worked full-time and 31% *(n =11)* worked part-time.

Student Achievement

Grade achievement in the televised course was comparable to what has been experienced generally in the teaching of the course on campus. One student withdrew for personal reasons. Thirty-six students completed the course with a range of grades from A- to C, along what we would consider a normal distribution.

It is a basic assumption that student learning in the televised course is not essentially different from the campus course. However, it should be noted that a different professor taught the course on campus. As well, the campus course had important differences in student characteristics. Therefore, we were unable to make exact comparisons.

Student Attitudes

The results of a post-course questionnaire returned by mail from 34 students (94%) at course completion are contained in Table 1 (see next page). Eight-five percent (n = 29) of the students said it was very helpful to see the professor and 71% (n = 24) thought it would be much more difficult to learn from a correspondence course with phone calls and no TV component. Ten students (29%) felt they were not at all disadvantaged by lack of face-to-face professor contact. Only one student found learning through this delivery method uncomfortable. Comments from open-ended questions indicated students need encouragement to use the phone-in question opportunities for interaction. However, the fact that many students viewed classes in rebroadcast or recorded sessions removed the possibility for them to use a live question period regularly. All but one respondent recommended that this course be offered on TV again, and all stated that they would recommend a TV course to others.

On an open comment item about the delivery method, students were overwhelmingly positive and requested more courses be given by live television. The tremendous flexibility of student time and place was repeatedly mentioned by students regardless of their location.

SERENDIPITOUS FINDINGS

Presently unmeasurable is the public relations aspect of teaching on open broadcast television. Phone inquiries and comments made to faculty indicate there are many viewers

TABLE 1
Responses to Post - Course Questionnaire (n = 34)

Question	Response		
1 . Learning through this delivery method was:	Very Comfortable	16	48.5
	Comfortable	16	48.5
	Unconfortable	1	3.0
	Very Uncomfortable	0	0.0
2. You were at a disadvantage not having face-to-face contact.	Yes	5	15.0
	No	10	29.0
	Sometimes	19	56.0
3. It was helpful to see the the professor.	Very	29	85.0
	Somew	4	12.0
	Not very important	0	0.0
	Not at all important	1	3.0
4. Do you think a correspondence course with phone calls and no T.V. component would be:	Easier to learn from?	0	0.0
	Just as easy to learn from?	1	3.0
	Not as easy to learn from?	9	26.0
	Much more difficult to learn from?	24	71.0
5. Would you recommend this course be offered on the T.V. again?	Yes	33	97.0
	No	0	0.0
	With changes	1	3.0
6. Would you recommend taking a T.V. course to others?	Yes	34	100.0
	No	0	0.0

Note: Percentages for each question = 100.

who are not enrolled in the course, some of whom are not nurses. We have received comments from nurses that the TV courses will have a positive impact on the public image of nursing. Our serendipitous findings are confirmed by the following student comment on the post-course questionnaire:

...you reach nurses who are not involved in the course and interest them in working on their nursing education. The TV reaches a much wider nonpaying audience and offers them a glimpse of what the courses are like. Good P.R.!

An added benefit is the two minute station break times which we use for announcements about upcoming courses and events.

LIBRARY RESOURCES

Students were asked about their knowledge and use of libarary resources as a result of the course. Since most distance learners practice where they live, learning to use local

library resources maximally and to tap university libraries are important outcomes. Ninety-seven percent *(n* = 33) reported they knew more about available library resources than before the course. About one third *(n* = 8) said they read the Canadian Nurses Association journal more, and over two-thirds *(n* = 23) said they read more journal articles available to them.

COSTING THE PROJECT

A detailed cost analysis was beyond the scope of this feasibility study. Tuition fees for distance students were the same as for students on campus. A developmental grant from the university paid for a teaching assistant, classroom rental, technician, mail, phone, printing and typing costs. The tuition fees of twenty-five students would have covered these costs. It is estimated that an additional twelve tuition fees will cover most faculty costs. However, tuition fees are made payable to the university. Fund redistribution is being considered and it is hoped that this kind of tuition disbursement will enable the School of Nursing budget to accommodate increased enrollment. The developmental grant is extended for three more years and a more detailed cost analysis will be a major focus for study in the next courses offered.

DISCUSSION

Experience in the teaching of this course in research methods to registered nurses through live interactive television shows it to be a welcome and effective teaching medium. The advantages to students who can live and learn in their own home towns are many.

Advantages
Flexibility of study time and place is by far the major advantage. Students use home video recording more than had been anticipated. Even when they can view live classes, home recording allows students to review class segments again, especially for content difficult for them, or to clarify their notes and instructions. Students point out the ease of "catching up" if classes are missed due to illness or work, because they can record TV classes. When they miss on-campus classes the most they can do is borrow notes that may be difficult to interpret.
Home recording raises copyright concerns. Students are granted permission to record classes for their personal study use only, and are asked to comply with copyright laws in tape erasure. The faculty member holds copyright for all programs as stipulated by the union contract.
Because students can attend class at home or sometimes at work, travel time and costs are reduced. Child care and parking problems evaporate. Students find they are able to manage two courses rather than only one as they planned. They often attend classes on the job in TV viewing rooms arranged by staff educators. In this way they can be reached if a patient emergency arises.

Disadvantages
It was difficult to encourage the poor student who did not seek out help. Experience with distance education may enable the professor to spot such students early in the course and to offer structured assistance.
Off-campus and part-time students may need access to writing/study skills workshops available to students on campus. Half of the students purchased the book, *Studying*

Effectively and Efficiently ,   (MacFarlane and Hodson, 1983) through the school. We recommend students seek non-credit courses in writing and time management that may be available in their local area. We hope that germinating plans to offer such courses on DUET will grow.

A major impediment to distance learning is the lack of convenient access to university library resources. Many students live in rural areas or small towns at some distance from a university, particularly one with a baccalaureate program in nursing and its attendant library resources.

There are hospitals and diploma schools of nursing in some locations which have been generous in sharing their library holdings. Further, the Kellogg Library at Dalhousie offers an inter-library loan service to registered nurses in Nova Scotia, and to other off-campus students. However, when materials are on loan to distant sites they are unavailable to university students on-campus. Although a number of course design strategies alleviate the need for library access for a particular course, this is a pressing long-term problem if we plan to deliver an entire program at a distance (Ellis, 1982). This serious issue is under review.

Future Considerations

Our next challenge is to test out additional courses with this delivery method. Future planning must assure that the quality of distance courses remains equal to that on campus. The role of student interaction and campus workshops as course components needs study, especially for courses with a clinical component.

Achieving an effective balance between independent and interactive activities is crucial. Interactive activities are deemed significant to learning but are costly and decrease flexibility for the student (Daniel and Marquis, 1983). As well, the importance of the faculty role as a human interface between educational technology and the learner needs attention (Forsythe, 1983).

Satellite communication automatically crosses provincial and traditional territorial boundaries. Our courses are broadcast to all areas receiving the ASN signal. Joint planning amongst universities in the region could result in rotating course offerings and the kinds of collaborative arrangements reported by Carey and Peruniak (1982) in Alberta.

CONCLUSION

Based on the students' achievement and reported attitudes from a pilot course offering, live interactive television teaching is a feasible way of making nursing degree credit courses accessible to nurses where they work and live. Additional courses using this delivery method are being offered and evaluated in relation to long term plans within a total program context. Creative course design using a combination of interactive and independent activities is a necessary and particularly critical point to be explored with clinical courses.

The issues of cost and library resources are priority concerns for us. Expansion in times of restraint requires defensible decision-making and a leadership willing to take risks while searching for excellence.

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Formative Evaluation of Educational Television

Jon Baggaley

Abstract: Media and communication researchers have attempted to isolate the effects of television since its inception. They have dwelt at length on the negative contributions of television to society, and have raised numerous concerns about the potential of television to corrupt and manipulate. However, media research has contributed little to our understanding of how to use television as a reliable educational tool. As a result, there are few guidelines that we can give to the television producer who inquires about the techniques needed for "a good TV programme".

The following paper suggests some of the benefits of a "formative evaluation" approach to educational TV development. Examples are given of recent Canadian studies in this field, and of their theoretical and practical implications. The variables underlying audience responses to media materials are set in the context of attribution theory.

DESIGNING "GOOD TELEVISION"

When asked about the types of insight they would like to gain from media research, television producers invariably have specific demands. They need to know about the impact of their programmes on a wide variety of audiences - adults and children, urban and rural. They need feedback on whether a programme fulfilled specific intentions, and whether or not particular production techniques were as useful as had been hoped. If a programme fails, its producer needs to know the reason it failed. He or she needs precise details about the types of performer to be used (or avoided) in future programming, and asks whether a programme will continue to be useful with repetition. Moreover, whenever they pose such questions, producers usually need the answers with speed!

The reasons for failure in a TV programme are often quite impossible to predict. On the one hand, the design team may have completely misjudged the capabilities and interests of its audience; on the other hand, a programme designed with the best theoretical intentions may be jeopardized by a momentary lapse in production skill. Camera angle, styles of editing - the ways that you say it as well as the things you say - are responsible for profound effects upon audience reactions.

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The most substantial body of research regarding TV production effects is found in the literature of educational technology (Baggaley & Duck, 1976; Coldevin, 1976). Coldevin reviews over 40 empirical studies dating since the early 1960's, concerning:

(a) Presentation/technical variables (e.g., camera factors, setting, colour versus monochrome, still versus motion pictures, visual/audio reinforcement, and speed of presentation);

(b) Content/subject matter organization (e.g., televised lecture, interview and discussion formats, audience reaction inserts, review strategies, direct explanation versus inserted questions); and

(c) Performer characteristics (e.g., sex, age and appearance, dress, camera-eye contact).

Many of these studies indicate subtle effects of technique upon attitudes and learning that even an experienced TV practitioner would be unlikely to predict. However, as Coldevin notes, little consistency is to be found in the outcome of the various studies, since few of them paid adequate attention to the control of the experimental variables, and/or were followed up by further research.

Considering the immense array of production techniques offered by television, it is not surprising that research has been slow to shed light on their audience effects. In fact, we may wonder whether conventional research methods will ever be precise enough to predict the massive number of effects that TV techniques combine to produce. The traditional empirical approach to media production research has involved, as in the psychological laboratory situation, the testing of specific hypotheses. On this basis, deductions are made concerning the variables responsible for programme impact. If the factors underlying a programme's success or failure can be clearly defined, a *hypothetico-deductive* approach to its study can yield useful results. However, the normal TV production is too complex to support a single set of hypotheses, and a different research approach is clearly required.

In the last ten years a type of study has emerged which is aimed less at the isolation of production effects on hypothetical bases than upon their inspection in actual programme contexts (Baggaley, 1979-1980, 1984). This approach may be characterized as *inductive,* by which specific production guidelines are inferred from general observation. The approach derives in large measure from the fruitful relationship between producers and researchers at the Children's Television Workshop in New York during the 1970s (Dennis, 1979; Mielke & Chen, 1981). The design of CTW programmes such as "Sesame Street" and "3-2-1 Contact" was then, as now, the focus for intensive research and evaluation. Methods were devised for supplying producers with evidence regarding a programme's impact in time for modifications to be made as appropriate.

The emphasis here was upon effective formative evaluation (Scriven, 1967) which aims to monitor and to recommend modifications to the impact of a production during its formative process. The approach contrasts with more traditional "summative" styles of evaluation, which are conducted when production is completed and modifications are no longer possible. The objectives of formative evaluation are usually more pragmatic than those of summative studies, although they are also more limited than the objectives associated with full-blown research studies. In Scriven's words, research studies usually aim to prove something, while formative evaluation is content to improve something. Evaluation studies commonly use the same techniques as research studies, and they are a valid form of research activity; but their aims and accomplishments are usually more specific.

In addition to providing rapid feedback to the designer of a product, an effective formative evaluation must also give precision of feedback. Traditional evaluation methods, involving pretest and posttest procedures (Borich, 1981; Dick & Carey, 1978) are often

incapable of the precision required by TV producers. In order to measure the precise effects of TV production technique, methods for monitoring a programme's moment-by-moment impact upon its audience are needed. Attempts to develop technologies for time-based audience reaction measurement date back to the 1930s (Cambre, 1981); and with the advent of the microcomputer in the 1980s, such facilities have gained immensely in speed, precision, portability and general practicality.

One such system - the Program Evaluation Analysis Computer (PEAC) - records fluctuations in programme impact as fast as every quarter-second. It employs a set of push-button hand-units to record the responses of individual audience members on measures such as interest value and credibility (Nickerson, 1979, 1981). Developed as a collaborative venture of the Children's TV Workshop and research staff at the Ontario Educational Communications Authority, the PEAC system is currently finding a particular niche within the media advertising industry (The Program Evaluation Analysis Computer (PEAC) is a product of PEAC Media Inc., Toronto.). To the producer of a TV commercial, second-by-second evidence of appeal and persuasiveness can obviously be invaluable. It can be equally useful, for that matter, to the designer of a political campaign, in determining the detailed impact of campaign strategies or candidates. The scope for abuses of the new methodology is thus only too clear; and it is to be hoped that educational broadcasters will come to use it with the same enthusiasm as their advertising and propagandist colleagues.

At Concordia University in Montreal, and at the Human Sciences Research Council, Pretoria, programmes of formative research and evaluation using the PEAC system are currently underway. The present paper, based on the Montreal experience, indicates various educational applications of the new formative evaluation methods. Separate applications are discussed in areas of (a) needs assessment, (b) product development, (c) product utilization, and (d) process development. Studies conducted in each of these areas may have immediate application within specific media projects, and more long-term implications for media research. Ultimately, the potential of the new methods extends beyond the media field altogether, to the study of human communication processes previously incapable of measurement. With these broader implications of formative evaluation methodology in mind, a theoretical perspective is now suggested for the analysis of communication effects.

TELEVISION AND ATTRIBUTIONS

Television is neither good nor bad. The same techniques may be employed to teach via television as to manipulate and persuade. As with any medium, the morality of television depends upon the intent of its users (Jamieson, 1985). The value of television's effects, moreover, can differ widely from one individual to the next; and with the same individual they can vary across time. We are reminded of these factors by attribution theory, which examines the desire to attribute causes to the events and phenomena encountered, and the bases on which a person's attributions may be predicted (Heider, 1958; Kelley, 1967).

To understand the effects of television, attribution theory warns, we must examine:

(a) Individual differences, due to psychological and social factors, between the responses of audience members;
(b) Differences over time in the responses of individual viewers;
(c) Technical effects: that is, differences in audience response due to the manner in which televised material is mediated; and
(d) Parallel influences upon audience responses by the wide range of alternative factors thought capable of such effects (Baggaley, 1980, pp. 110-11, 162-5).

To mount a comprehensive study of television's impact, we must ideally be capable of controlling or at least recording each of these complex sources of variance simultaneously.

While comparison between individuals - (a) above - is a relatively simple matter, the measurement of all parallel, alternative influences , (d), may be totally impossible. Using traditional methods of programme evaluation, the influence of outside factors upon audience reactions can at least be kept to a minimum. A baseline reading of audience attitudes or ability may be obtained; a TV "treatment" is presented; and post-test measures are then administered in order to guage aspects of the programme's immediate impact.

The major problem occurs in attempting to measure long-term effects of the programme (b) and (d), for the extraneous influences that may operate in the long term are too numerous to conceive. The necessary controls for long-term effects are often cumbersome and expensive (Glass, Willson & Gottman, 1972; Ostrom, 1978), and they may preclude the pragmatic approach to media research required in most broadcasting contexts. Within the context of a single programme or programme series, however, insights into audience effects can now be obtained with a new sophistication. The modern response analysis systems allow for precise measurement of audience responses during the time-span of the programme itself - (b) above. The second-by-second precision of this measurement also allows the analyst to identify effects due to particular variations in production technique (c).

The new opportunities provided by time-based response analysis are indicated by the following case study.


CASE STUDY #1: THE U.S. PRESIDENTIAL DEBATES

In November 1980, American President Jimmy Carter and Presidential challenger Ronald Reagan engaged in a 90-minute debate televised live throughout North America. In St. John's, Newfoundland, a panel of two dozen adult viewers gave their reactions to the debate, second by second, via the hand-units of the Program Evaluation Analysis Computer system owned by Memorial University of Newfoundland (Baggaley, 1985a). The viewers each watched the debate in their own homes, to which the response units were delivered in advance. The study was commissioned by the Canadian Broadcasting Corporation as material for a radio report on the debate the following morning.

The units were programmed to sample responses to the following question: "Who, from one moment to the next, is winning the most votes?"   Three responses were available to the question, on buttons labelled CARTER, REAGAN, and DON'T KNOW. Audience reactions to the debate were sampled, on this basis, at 4-second intervals. In Figure 1 (See next page), moment-by-moment fluctuations in the perceived success of the two candidates are plotted for the first 30 minutes of the debate.

As Figure 1 indicates, the candidate perceived as winning the most votes at the beginning of the debate was Jimmy Carter. As the incumbent President, he was perceived as winning even before he first spoke. In the 19th minute, however, audience responses began to favour Ronald Reagan. On synchronizing the animated computer display of these results with a videotape of the debate, this shift in viewer response was found to coincide with verbal points made by Reagan concerning the Carter administration's economic record. A comparison of individual responses to the debate indicated that the shift to Reagan was due primarily to male viewers in the sample. Thirty seconds later, the same shift was observed in the responses of the female viewers; this effect coincided with a repetition by Reagan of the same verbal argument. The internal validity of these conclusions is demonstrated by statistical procedures beyond the scope of the present paper.

The Carter - Reagan debate (November, 1980): First half-hour

Segments: Introduction (Studio, platform, chair)

Q1R · A1R · Q2R · A2R · Q1C · A1C · Q2C · A2C · X1R · X1C · Q3C · A3C

Response Frequency

12 10 8 6 4 2

(Don't know)

Carter · Carter · Carter · Reagan · Carter · Carter · Reagan

TIME (mins.)   3   6   9   12   15

Q4C · A4C · Q3R · A3R · Q4R · A4R · X2C · X2R · Q5R · A5R · Q6R · A6R · (Commercial Break) ....(1 1/2 hours - Reagan dominating)

12 10 8 6 4 2

Carter · Reagan · Reagan · Carter · Reagan · Carter · Reagan · Reagan

(TIME cont'd)   18   21   24   27   30 (mins.)

Segment Code:
Q1R - 1st question to Reagan
A2C - 2nd question to Reagan
X1R - 1st rejoinder by Reagan

(Audience question: "Who, from one moment to the next, is winning the most votes?")

The external validity of such results is, of course, debatable. A panel of viewers randomly selected from the population of Newfoundland, Canada, can hardly be regarded as representative of the voting population of the United States. The panel's reaction could in no way be assumed to predict the outcome of the Presidential election one week later. On the other hand, specific conclusions of the Newfoundland study were identical to those later put forward by Wingerson (1982). A tendency was noted for the Newfoundland panel to give a response against Carter at moments when the camera presented him from a particular side-shot. It was concluded that Carter appeared more tense from this camera angle than he did from others; and the conclusion was reported on CBC-Radio the morning after the debate. Eighteen months later, Wingerson's discussion of the debate was published, crediting the visual evidence of Carter's tension with being a major reason for his defeat.

The Newfoundland study indicates the greater speed as well as precision of a moment-by-moment analysis in comparison with conventional measurement techniques. If it had been replicated simultaneously with a contrasting range of American voters, there is no reason to doubt the predictive value of its conclusions. Four years later, the 1984 TV debates between Presidential contenders Reagan and Mondale have been subjected by American polling organizations to exit-surveys and other analytical procedures far more suspect than the methodology reported here. A further set of electronic analyses of the 1984 debates has been conducted by Concordia University researchers in Los Angeles and New York State, lending support to this view.

The information derived from such studies has obvious value for TV production staff. Since it was analyzed and reported after the Presidential debate's completion, the current study is essentially summative; but it has distinctly formative implications for the designers of future debates. For the television producer, the study indicates camera techniques that may bias audience reactions, and which should therefore be avoided. For the politicians and their advisors, such information can suggest strategic manoeuvres both verbal and visual. The findings can thus be used in the planning of new TV productions, as well as the post-mortem stage of the existing production.

The same methodology may equally be applied in educational broadcasting to investigate the influence of presentation techniques before, during, and after the production process. Examples of these applications are given in the next study.

CAST STUDY #2: THE IMPACT OF SMOKING PREVENTION FILMS

In 1981, the Canadian Cancer Society (CCS) commissioned a summative evaluation of four films commonly used to inform the public about the dangers of smoking. The Society was particularly concerned to determine the films' impact upon under-educated (or functionally illiterate) viewers, representing a quarter xtf the Canadian population and particularly susceptible to lung and other cancers. Accordingly, the films were shown to a contrasting sample of viewers in urban and rural communities of Newfoundland and Labrador. The viewers' reactions were obtained by a range of conventional pre-test and post-test procedures, and via the time-based procedures of the Programme Evaluation Analysis Computer (a 4-point scale of approval across time was used, ranging from GOOD to POOR). The effects of prior attitudes to smoking and cancer upon perceptions of the films were assessed, also the moment-by-moment impact of the films upon prior attitudes. Finally, production techniques were recommended for future productions aimed at audiences varying in age, education, and sex.

Reported to the CCS by Baggaley (1982a), particular conclusions of the study were as follows:

(a) Male and rural members of the sample have significantly less active concern for cancer prevention than female and urban groups.
(b) Adult illiterate persons (reading grade 8 and lower) gain little or no benefit from the films, nor from the print materials accompanying them.
(c) Adult illiterate persons have the highest incidences of smoking, cancer in the family and general pessimism about cancer issues.
(d) Schoolboys (15-17 years old) exhibit unusually high incidences of smoking/pessimism also.
(e) Television is the medium with the strongest potential for reaching these audiences, although radio may also be useful for communicating with housewives.
(f) Smoking prevention films in current use serve to reinforce non-smokers in their distaste for smoking, though are generally received by smokers with defensiveness and hostility; the films under test were thus considered more useful for education about the prevention rather than the cessation of smoking, although in both connections their presentation should be accompanied by careful group discussion
(g) Smokers are willing to consider practical guidelines for smoking cessation, being inclined to respond most positively to the films during segments when practical "quiting tips" are given; however, they respond negatively to any suggestion by the films (usually visual) that quitting will make them appear socially eccentric, and they require evidence that the effort to quit will be worthwhile.
(h) A successful formula for films encouraging smoking cessation would be to increase viewers' pessimism regarding the dangers of smoking, while reducing pessimism regarding cancer prevention and cure.

As in the earlier case study, these conclusions have formative as well as summative uses. Their summative implications concern the distribution and utilization of the films. The conclusions regarding audience knowledge and opinion, and about the effects of specific production techniques, can be of value at the needs assessment and production planning stages of future health campaigns.

The benefits of a formative evaluation approach are thus seen from the earliest to the final stages of programme development. These possibilities have been described by previous writers in terms similar to those used here. For example, Sanders & Cunningham (1973) have identified four types of formative evaluation, as follows:

(a) Predevelopmental Activities - audience needs assessment and other evaluation procedures occurring prior to actual product development;
(b) Evaluation of Objectives - assessment of the formal goals and objectives defined by the product developer;
(c) Formative Interim Evaluation Activities - assessment of the product at its early stages of development; and
(d) Formative Product Evaluation Activities - assessment of the product at its final draft stage.

Defined in this way, the very distinction between formative and summative evaluation conceived by Scriven (1967) begins to blur. It becomes apparent that evaluation activities can, or at very least should, aim to generate some formative recommendations before and after production as well as during it. This contention would certainly be supported by media producers, for whom purely summative evaluations have little or no applied value. Since summative evaluation customarily serves to expose the weaknesses of a product when it is

too late for improvements to be made, producers can also regard it as threatening. The advent of today's microcomputer-based techniques, with a speed and precision quite unforeseen by writers on this topic ten years ago, makes it even more possible for all evaluation activities to have a formative outcome.

In one sense, it would be desirable if the distinction between formative and summative types of evaluation were now disbanded. The distinction has served a useful function in pointing out the need for formative conclusions at a time - the late 60s and 70s - when evaluation studies were almost exclusively summative. However, evaluators of educational TV products are now capable of fulfilling a formative role whether the product is technically completed or not. They should aim to fulfil this role automatically, in order to be maximally useful to production personnel and to avoid having a threatening effect upon them. Without a relationship of mutual support and trust, the validity of an evaluation study is jeopardized in any case, for effective collaboration between a media producer and researcher becomes all but impossible.

The final case study describes a collaboration between film production personnel and an independent team of formative evaluators in the planning and development of a film on skin cancer.

CASE STUDY #3: FORMATIVE DEVELOPMENT OF A SKIN CANCER FILM

In 1983, the Canadian Cancer Society (CCS) commissioned a formative evaluation study leading to the production of a new film on skin cancer prevention (Baggaley, 1985b). The study was prompted by the findings of Case Study #2 (above) - that male and rural people show little concern for conventional cancer education films compared with female and urban groups. This observation provides cause for some concern, for rural males are known to have an exceptionally high incidence of skin cancer, largely in view of their greater exposure to the sun.

The only existing film in use by the CCS was already fifteen years old, and the facts it contained were now out-of-date. A new film was required whose primary audience would be the rural male; a secondary target audience would be those individuals - urban as well as rural - who risk over-exposure to the sun in the course of leisure activities (e.g., sunbathing, gardening, skiing). The need to design a film for such diverse target groups presented a considerable challenge, and a formative research and evaluation plan was devised running parallel to but independent of the film's production schedule.

The research was in four stages, broadly equivalent to the four types of formative evaluation recommended above (Sanders & Cunningham, 1973).

Needs assessment

Prior to the planning and scripting of the film, a summative evaluation was conducted of the existing film ("Sense in the Sun", produced by the American Cancer Society in 1968). Two-hundred and fifty people from the provinces of Newfoundland and Quebec gave their reactions to the film on the PEAC system's electronic hand-units and on pretests and posttests, as in the second case-study. The sample was divided according to geographical location (urban versus rural), age, sex, and education. Urban audiences found the film old-fashioned and insufficiently informative, while rural people enjoyed its location in a coastal fishing environment similar to their own. Rural males, however, tended to react suspiciously to the film's message about the dangers of exposure to the sun, and to disagree that people who work out-of-doors should protect themselves from the sun. The second-by-second reactions (on a 4-point scale of approval from GOOD to POOR) indicated the need to

present material to the urban and rural groups at different rates. Once again the particular defensiveness of male and rural viewers to the cancer topic was observed.

Based on these and other findings, an outline - or storyboard - was prepared for the new film. In order to be acceptable to lesser educated viewers as well as those with high-school education or above, the CCS decided not to include detailed information in the film, but to aim for a product which would motivate people to seek further information from other sources. Findings of the research concerning production technique, however, were applied in detail. It was decided, for example, that the new film should cater to the urban and rural audiences in a series of alternating segments. The types of information required by the urban audience would be conveyed by segments using speedier cutting rates and an urbane story treatment. The segments for rural viewers would be motivational rather than fact-packed, filmed in a rural context and presented at a gentler rate. The effort to maintain the interest of each type of audience during segments intended for the other, would be a challenge requiring careful monitoring.

The needs assessment stage of the study, featuring the evaluation of an existing film, provides a good example of a summative evaluation with formative implications. For want of a shorter term, such an evaluation may be described as quasi-formative.

Evaluation of the Film Concept

The objectives and storyboard of the new film were now evaluated in discussions with a further 107 people from the same urban and rural areas. Subjects favored a storyline approach using a logical rather than emotional approach. They stressed the need to feature real people in the film rather than actors, and they suggested a wide range of characters with whom they could identify. They requested explicit details of the symptoms and effects of skin cancer, and of the types of person most susceptible to it. They remained unconvinced that a Canadian audience would be particularly anxious about the dangers of sun exposure, and a need was indicated to stress facts concerning the sun's effects through cloud. The design of pamphlets and posters to accompany the film was also discussed.

The storyboard evaluation ascertained that the findings of the earlier needs assessment-had been correctly interpreted by the production and scripting team, and generated new ideas for specific script additions and changes.

Formative Evaluation of the Film Roughcut

In June 1984, a 13-minute roughcut of the new film was tested upon a further 128 urban and rural viewers from Newfoundland and Quebec. Responses to the film were collected via pre- and post-tests, and on a second-by-second basis as in the needs assessment. It was found that the film was creating an appropriate set of general attitudes about skin cancer, though was not as yet convincing viewers of the need to take preventive measures. Specific moments in the film were strongly disapproved by urban and rural viewers alike. The second-by-second responses of male and female viewres to the film(18-25 years old, rural, high-school educated) are presented in Figure 2 (See next page).

The results of the formative evaluation were reported to the film's producer and sponsor in July 1984. The producer responded by shortening various segments, by changing the voiceover to strengthen character identification, adding montage and graphic sequences to emphasize some of the educational points, repeating certain sequences in order to create relief, and adding music to heighten mood and structure. He also prepared draft versions of a printed leaflet reinforcing the film's main points.

Summative Evaluation of the Modified Film

The final evaluation of the film was conducted in Newfoundland and Quebec during

FIGURE 2.
Audience Reactions to New Film (pilot version).
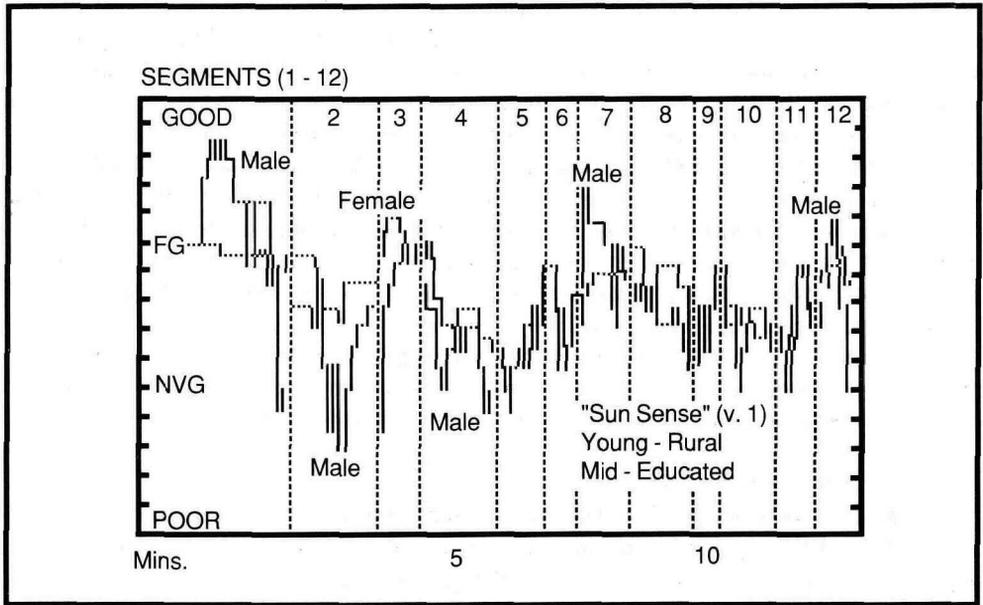
FIGURES.
Audience Reactions to Modified Version.
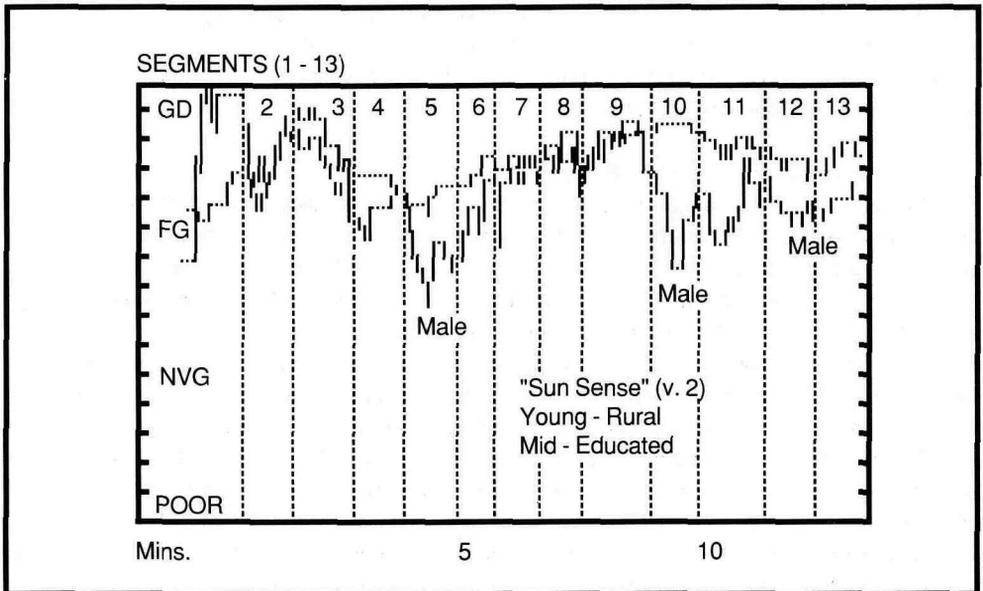
Note: Both Figures feature the responses of a representative subgroup
       of viewers: rural, 18 - 25 years old, with highschool education;
         n (pilot version) = 18; n (modified version) = 19.

October 1984 and January 1985, upon a further 194 viewers. During the same sessions the supporting leaflet was evaluated, and was found appropriate for audiences with a reading level of Grade 5 and above. The need was indicated for modifications to the leaflet's layout.

Overall reactions to the film were now positive. It was regarded as an effective means of persuading people to take preventive measures against the sun. Even the rural male viewers approved of the film, which seemed to have overcome their earlier reluctance to regard exposure to the sun as potentially dangerous. Second-by-second responses to the film by male and female viewers (18-25 years old, rural, high-school educated) are presented in Figure 3 (See previous page).

A comparison between Figures 2 and 3 reveals the effects of the modification made to the film between its roughcut and final stages. Reactions to the four segments eliciting low approval at the roughcut state (Figure 2) are now significantly imporved (Figure 3). The relatively negative response to the first of these segments - set in a doctor's surgery - is eliminated altogether.

At each stage of a formative evaluation - including the final one - it is always possible that further modifications may be made in the attempt to attain perfection. The three segments in the skin cancer film which continue, at this summative stage, to elicit relatively negative responses, might certainly be changed on this basis or cut out altogether. It is easy to detect a pattern in the audience responses to these segments, for all three feature the same character (a young lady artist) and setting (an artist's studio). The lower rates of approval for the segments seem due to the lack of specific information within them, and to an attempt by the script to develop human interest.

If further evaluations are not contemplated, however, it is important that further modifications at this stage are made with caution. It is quite possible, for example, that the removal of these segments could upset the balance and pacing of the film, so carefully calculated on the basis of the earlier research. Post-test reactions to the artist character are very positive; and in view of the approving audience reactions to this version of the film in general, the relative weakness of the three studio segments may be regarded as of little consequence.

During this final evaluation of the skin cancer film, however, one audience subgroup remained more negative than the others. Highly educated urban viewers continued to disapprove of certain segments in the film, and of its general pacing and lack of detail. The evaluators recommended that in the future use of this film with urban groups, accompanying print materials or discussion should be designed for different target groups, providing an inexpensive way of maximizing the film's utility.

It should be noted, of course, that the urban, educated population was not the film's primary target audience, and that the crucial evidence for the educational value of the film was provided by the rural viewers. Many of the production features criticized by urban viewers - including repetition of segments and design of characters - were based quite deliberately on the earlier feedback from the rural viewers. It is possible that urban viewers, however highly educated, are less expert in the matter of what makes a good TV programme for a rural audience than are the rural people themselves. Yet most instructional films are made in an urban, middle-class environment, based on urban, middle-class values. It is clearly important to provide viewers from other environments with the opportunity for input into the programmes which concern them. The role of formative evaluation is to create this opportunity.

FORMATIVE EVALUATION: THEORY AND PRACTICE

As an increasing range of media productions is evaluated by these methods, our knowledge of the communication processes underlying educational TV production will increase dramatically. From the study of the smoking prevention films in the second case study, it was possible to generate guidelines for the production of the skin cancer film in the third case study. From the evaluations conducted in that context, information has been derived which can be applied in film-making on other aspects of health education. On this basis, we should ultimately be in a position to define the techniques required for effective television on any topic, and for all types of audience. For we will have established - inductively - the impact of all production methods common to the conventions of the day. We will always, of course, be limited in our ability to predict unconventional production techniques. The creative freedom of the media producer will therefore remain intact; indeed, his or her artistry may even be stimulated by the insights gained into audience psychology.

The ability of research to penetrate the effects of media communication is seen to have been increased substantially by the development of new techniques for electronic response measurement. It is now possible to record, and to make speedy comparisons of the effects of a TV programme upon different individuals; simultaneously one may inspect second-by second variations in these effects due to presentation technique. Three independent dimensions of measurement may therefore be controlled, relating to:

(a) the intensity of the effect under scrutiny (e.g., cognitive, affective, or behavioural);
(b) fluctuations in the effect across time; and
(c) individual differences in the effect (due to demographic, geographic, or psychographic factors).

When data are available on all three of these dimensions at once, we have the means to predict and explain the effects of communication according to attribution theory (see earlier section). The interaction of the three measurement dimensions accounting for media effects is summarized in Figure 4.

FIGURE 4.

Interaction of Dimensions Accounting for Audience Attributions to Television.

E: Intensity of Effect

T: Fluctuations Across Time

I : Individual Differences
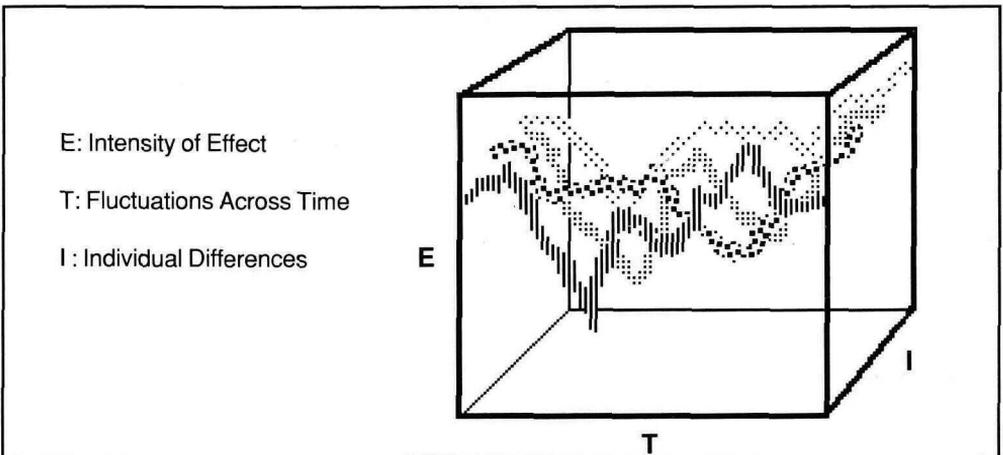
The precision of the new forms of data, and the speed with which they can be analyzed, have already been found to have immediate benefits for the media audience itself (Baggaley, 1982b). By providing a group with fast feedback concerning its reactions to media presentations, it can be sensitized a) to ways in which the media can manipulate public opinions, and b) to media techniques that the group may use for its own purposes. Baggaley & Smith (1982), for instance, have reported the use of formative research methods in a rural development context - a project which has since led to a fuller understanding by fishermen of social and economic problems facing them, and to the correction of some of these problems via the mass media. Implications of formative evaluation methods for "process" as well as "product" research are thus indicated, and for the use of media in a wide range of social situations.

With careful advance planning, a formative evaluation approach to the development and use of media materials can proceed as in Figure 5. A single project may use formative

FIGURES.

Stages in the Development and Formative Evaluation of Media Materials.
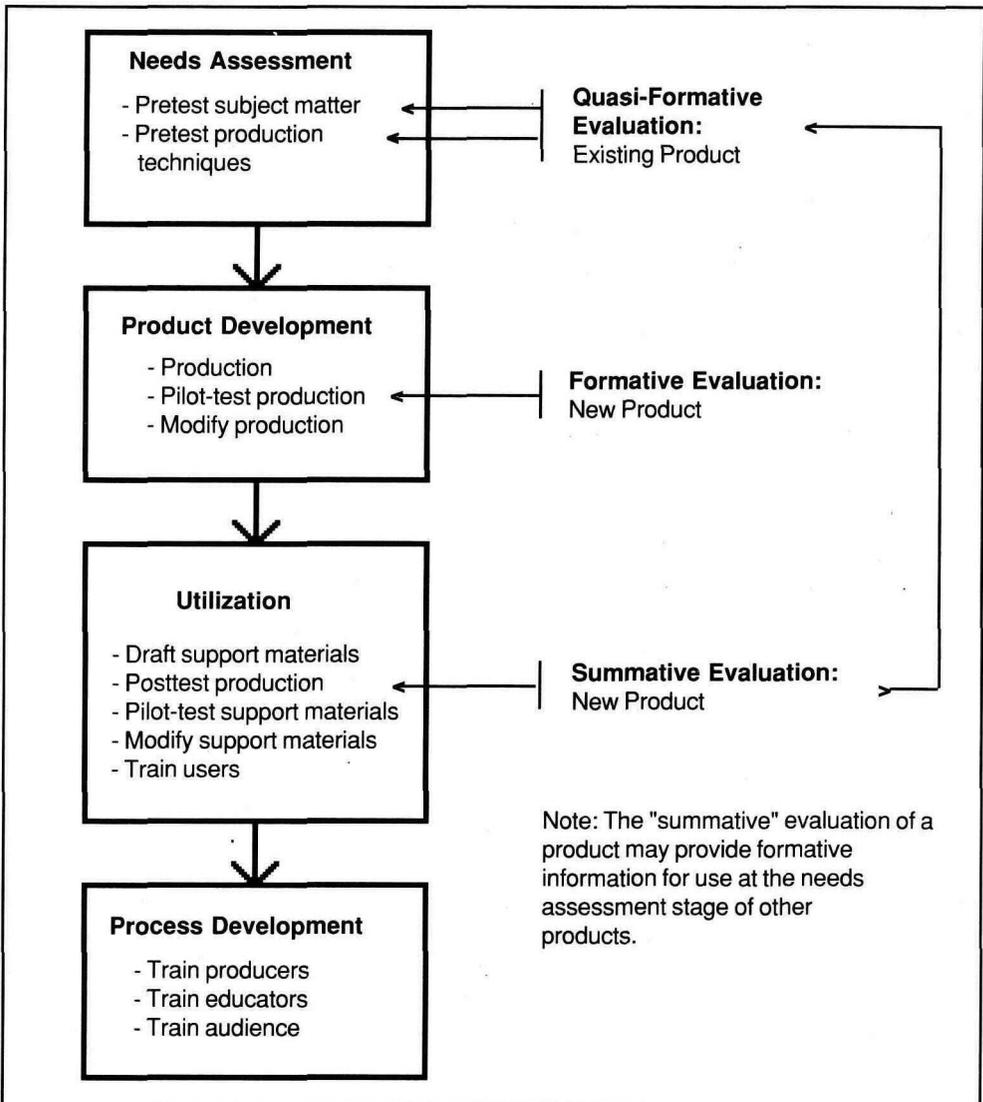
methods for one or more of four general reasons: needs assesment, product development and utilization, and process development. Of course, the true test of a methodology is that it should be able to identify phenomena that would not have been so readily apparent otherwise. There is little doubt that formative evaluation methods will be rapidly seized upon by the political and commercial users of media; the benefits of formative evaluation in these contexts may be inferred from the case study of the Presidential Debates. It is hoped that the new methods will also be used in educational television, leading to an increased awareness of the public's needs, and to an understanding of the differences and similarities between cultural groups. On this basis we may learn to use the medium in society with a greater accountability and effect.

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Formative Evaluation:
The TVOntario Perspective

Patricia Parsons
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Abstract: Formative evaluation is undertaken at several educational media producing institutions in North America. The article describes the formative evaluation process at TVOntario, the provincial educational television network of Ontario, and provides examples to illustrate the points outlined. Its main objective is to describe the many ways of interacting with audiences.

First presented are the objectives of formative evaluation and the kinds of information that can be sought, such as the level of appreciation and the intellectual impact of a program. Next, a brief overview of methodology for formative evaluation is given, followed by an outline of the various production stages when an evaluation can be undertaken. Descriptions of recent evaluations, with findings, are briefly noted. Finally, the article discusses how results are analyzed and reported to the production team and management.

Formative evaluation can be loosely defined as "verifying a product with the target audience in its developing stages in order to provide feedback to revise and improve the product." The term "formative evaluation" originated in 1967 (Scriven, 1967) when two kinds of evaluation were distinguished: one that can take place during a product's developmental stages and another that measures the effectiveness of a product after its completion. There is, however, documentation of this activity for instructional media as early as 1921 (Lashley and Watson, 1921). At this time American World War I training films were becoming available for general viewing, and government wanted to obtain early audience reaction. The practice has now been incorporated structurally into the research and evaluation undertaken at several organizations.

This article presents an overview of the formative evaluation process at TVOntario. TVOntario is a provincial educational network that develops television programs and educational materials for the schools and general public. There are three research departments at TVOntario: Development Research, Market Research, and Project Research. Development Research is involved with long term planning, while Market Research concentrates on audience research and large scale mail surveys. Project Research is the department most closely linked to the production process and it is here that formative evaluation has been undertaken at TVOntario since 1974.

This article focuses specifically on the different stages of production when formative evaluation can be undertaken. It does not discuss in depth the use of different methodologies

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and their credibility. Its main objective is to describe some of the many possible ways of interaction with members of the target audience.

THE OBJECTIVES OF FORMATIVE EVALUATION

At TVOntario, formative evaluation is not mandatory and is usually undertaken at the request of the production team. Uncertain about various aspects of the production, the production team wants to obtain feedback from the audience they are trying to reach. Those not involved in the technical production, but who have concerns - such as managers and administrators - may also request formative evaluation. Given the cost of television production, it has become more and more important to justify decisions made during the creation of a program. By discovering errors before the product is ready for broadcast, one can, in part, assure the presentation of a quality product and, in part, avoid spending large sums of money that could be better used elsewhere. At TVOntario, an educational concern is added to this financial one. As well as measuring audience reaction to the program, it is also necessary to verify to what point the educational objectives have been met. A formative evaluation should measure the level of appreciation for a product (a program, script, etc.) and its intellectual impact on the audience.

Level of Appreciation

A major concern of producers is that their program be interesting to watch. It is not, however, enough that a program be interesting. It must be interesting enough that the viewers will be motivated to watch the whole program and want to watch future programs. Different elements can influence the level of interest a program arouses.

(a) Subject: The fact that one is interested in a subject considerably influences one's level of appreciation. For formative evaluation, it is therefore necessary to identify participants' interest in a subject before and after the screening of a program. The treatment of a subject is also an important element that can change participants' interest in a subject.

(b) Style, Formats: As the same format can be effective for cultural information but ineffective to explain social phenomena, it is necessary to reexamine the effect of format for every new production. This part of the evaluation of format also includes aspects such as rhythm, setting, etc.

Intellectual Impact

The intellectual impact of a program can be measured by the amount of information retained and by the level of comprehension of the content. For a program created for classroom use, it is easier to evaluate retention of information. First, students are more familiar with being evaluated and, second, program content is more directly linked to a curriculum, making it easier to categorize. Students' learning is therefore easier to measure.

However, it is often "delicate" to evaluate the comprehension and retention of an adult audience. Adults feel insecure more easily in an evaluation situation. Indirect methods, such as relating concepts from a program to their personal experience and asking general questions about program content, can be used at these times.

In evaluating the intellectual impact of a program we generally investigate the following areas:

(a) The amount of information: Audiences often remark that the program was interesting but they were unable to remember all the information. Unlike print, television has a fixed pace and viewers are normally unable to stop and review or reflect on points as

they are presented. The amount of information in a program should sustain viewers' attention while assuring comprehension of the concepts presented. At TVOntario we have found, as those at other institutions have noted (Bates, 1984,1985), that one of the most common problems in all types of educational programming is "too much information, too fast."

(b) The level of information: One purpose of an evaluation is to verify that the content of the program is presented in language easily understood by viewers. Concepts introduced must also be suitable for the target audience and readily comprehensible.

(c) Depth of information: In our experience, this aspect is often sacrificed to amount of information. As one example, in an evaluation of a recent pilot TV program for a series on new scientific discoveries, viewers were very interested in the three items presented in the half hour program, but would have preferred one topic covered in more depth.

Beside the level of appreciation and intellectual impact, formative evaluation also endeavours to respond to any other questions of the production team. For example, participants could be asked what they think of a mini-series that production has in mind or what ideas they have for future programs in an existing series.

For all of the above objectives and to find out very specific concerns the research team begins the evaluation process by first meeting with members of the production team. All the necessary information, such as their questions and areas of concern, the objectives of the series and the program, and timelines, is obtained. Getting a clear definition of the program's objectives allows the researchers to select an appropriate methodology. While working on a program, the production team can often lose sight of its original objectives. This exercise is thus beneficial for both the production and the research teams. Timelines are also a factor in determining the extent of the evaluation. Unfortunately, at TVOntario the evaluation process often begins very late in the production schedule. Very little time is available to the evaluation team who must often undertake a study and report results in a period as short as three weeks.

In consultation with the production team, the evaluators must also determine who the sample audience is for testing purposes. A learning system or educational media product often has two or more target audiences: a primary audience, a secondary audience, and those of the general public interested in a topic. A learning system about the use of computers, for example, might have several target audiences: those who have a computer at home, those who are enrolled in a course, or students in secondary schools. The mix of people recruited for an evaluation session, the sample audience, can vary. Sometimes an evaluation is conducted only with a primary target audience, while for other products several types of audiences can be included.

After the sample audience for the study and the objectives of the evaluation have been defined, the evaluation team prepares a proposal for the study and presents it to the production team and to others involved (for example, the manager of adult programming, if the program being evaluated is for adults). The proposal briefly describes the context of the evaluation as well as the methodology suggested. It is reviewed by those requesting the evaluation and revised if necessary.

METHODOLOGY

At TVOntario qualitative methods are often used for formative evaluation. The holistic approach adopted allows the researchers to see interrelationships among the different elements that make up a program. By not manipulating any variables, the qualitative

method also provides an overall sense of a viewing situation in a natural setting. The reader is referred to the work of Bogdan & Taylor (1975) and Huberman (1981) to obtain arguments favoring the utilization of qualitative methods. The most frequent criticisms formulated (Sadler, 1981; Miles, 1979) cite the impossibility of generalizing to the population, the use of a tool that is only more or less structured and the contamination that can occur in group discussions or interviews. Recent research on this subject (Research Communications Ltd., 1985) seems, however, to indicate that participants do not allow themselves to be influenced by the remarks of others and that, in fact, remarks generated in discussion are congruent with results of questionnaires. Examination of our own data also leads us to believe that this halo effect only rarely occurs and usually with the type of participant who would not give his or her opinion anyway. Research from Research Communications Ltd. seems also to show that the results obtained from a small sample with characteristics representative of the target population are similar to results obtained from a larger representative sample. Regarding the criticism concerning the lack of structure in methodological design, the research team at TVOntario is currently developing an evaluation grid adaptable to evaluations for various educational materials while still maintaining some rigor in the analysis of results. This grid would allow a systematic and rapid comparison of verbal comments and written questionnaire results within and between groups. Qualitative and quantitative data are not, in our view, incompatible. While remaining aware of the possible limitations of qualitative methods, we feel it should be recognized that they permit the collection of information that allows formulation of recommendations and concrete suggestions.

The specific methodology used in each evaluation differs according to the nature of the product, its target audience, and its development stage. To simplify in the extreme, a basic model can be formulated to serve the purposes of many formative evaluations. In general, an evaluation session would be divided into four parts: a prescreening questionnaire; the screening of the program; a post-viewing questionnaire; and a group dicsussion. However, for each product evaluated, different modifications can be made to obtain the information requested.

Production State for Evaluations

The following is an outline of the different pre-production, production-in-process, and post-production stages during which research and evaluation can enter into play. The list is not exhaustive but provides an idea of what we at TVOntario have undertaken. The only elements that limit evaluations are budget restrictions, time, and imagination. Some methodological aspects are briefly described.

Concept testing. This can be done when producers or project teams know they are going to do a program or a series on a certain topic, but are uncertain how much emphasis to place on what, or want to know more about how special segments of the population think before proceeding to the scripting stage. For instance, TVOntario has recently produced a series on the future of work (Karam & Duggan, 1983). The developers of the series requested the help of formative evaluators to explore the potential audience's reactions to material that might be included in the first program and in the series.

Small discussion groups were organized with participants from varied ages, educational levels and occupations. A written questionnaire was used to stimulate discussion and to record quantitative data. The first section of the questionnaire presented the basic ideas of the series in the form of 11 questions. The second section included questions based on the ideas for program 1. After completing their questionnaire, the participants took part in a discussion where they were encouraged to exchange their opinions on the suggested topics. The participants gave their reactions to a brief description of the program's major possible

themes. By compiling and comparing the quantitative data and the verbatim comments, the research team found major difficulties with the outline proposed and made a series of recommendations.

The storyboard or graphic stage. Before camera work, it can be useful to test drawing or pictures with members of the target audience. For example, a children's series producer was developing a sequence for a preschoolers' television program using a set of graphics that would be shown on air with a nursery rhyme as a voiceover (Duggan, Parsons & Karam, 1981). When reviewing what his graphic artist had done for the sequence, he became concerned that the younger members in his audience, the 4-year-olds, might be frightened by drawings of a mouse that had elongated teeth, sharp ears, bright black eyes, and a long twisted tail. The evaluators showed the drawings to a group of 4-year-olds, in individual interviews, using a brief story as introduction. The children were then asked probing questions about their feelings about the mouse. A sizable proportion of the children tested did express some dislike for the mouse, saying he was ugly, and looked "scary". The producer instructed the graphic artist to "soften" the look of the mouse and the producer could then feel more confident that irate partents would not be complaining to the network about a program frightening their child.

The outline stage. Before completing a full script, a writer often likes some feedback before fleshing out the details of the story. He or she may be dealing with a particularly sensitive subject and wondering what approach to take, or may be unfamiliar with the target audience's thinking about the topic.

Again, in the same preschool series, the developers requested help from evaluation for a program they wanted to produce on the topic of death. The writer had completed an outline for a story about the death of a butterfly, and before writing the complete script, he wanted to know if his treatment would disturb young children. In this instance, instead of testing ideas with members of the target audience (which would be extremely delicate, and perhaps unethical, because we could frighten children), we engaged a child psychologist to consult for the program. She read the outline, and with the writer, producer, and researchers, discussed the fears of young children and the feelings that could be explored at the end of the program. As a result of this, the writer altered the script considerably, deleting certain scenes and adding an ending that included a celebration of life.

The script stage. After a complete script or several scripts have been written, the developers often feel ready to have it reviewed by an objective team. Although this stage has the advantage of a complete story to present to an audience or reviewers, the disadvantage is that, if problems turn up, the writer is faced with a considerable amount of work in revamping the story or theme. This misfortune did in fact occur during the development of a series prepared at TVOntario for a teenage audience (Bailey, 1983). A manager, in reading several completed scripts, had certain reservations and requested an evaluation before further scripts were written or production began. We realized that a teenage audience may not be interested in reviewing scripts and answering a questionnaire. Instead, we chose to rewrite the scripts in play format, so they could be more easily read aloud in highschool classes, with several students taking part. In this way, an entire class heard the script and was able to become involved with the characterizations. The students then gave their views about the characters and how realistic they felt the situations to be. Since teenagers are often the most difficult audience to target for, the data collected were extremely informative. In this instance, the teenagers were critical of aspects of the plot as well as the characterizations.

After actual production takes place, there are several points at which formative evaluation can be undertaken.

The rough-cut stage. When shooting has been completed and the production team is ready to assemble the programs, the producer may be uncertain about elements in the

programs and want to obtain reaction before assembling a final pilot program. One program is put together, in a format that will be used for the entire series. The audiotrack may not be completely done and some sequences may not be finished as the producers envision them for the final product. At this stage, formative evaluation serves to give feedback on various features of one test program, so that all the programs in the series can be planned better. We conducted a "rought cut" evaluation for an adult learning series on the Middle East (Karam & Winsor, 1984). A "typical" program was assembled and shown to audiences. Because of certain segments, the audience showed some confusion as to whether the series was exploring the current situation or recounting the history of the area. Some visuals, such as maps, were also felt to be unclear.

The pilot program stage. This is the stage at which producers and management at TVOntario traditionally request formative evaluation. A pilot program can be a trial or sample program made specifically to test audience and management opinions and this is true for most of the pilot programs produced for the large North American private networks. In educational broadcasting, where funds are more limited, a pilot program is usually the first program in a series, and may be kept for broadcast if acceptable to the target audience, or may be changed in part, after formative evaluation. At TVOntario the most difficult barrier to successful formative evaluation at this point is the production deadline for the rest of the series. Evaluators often only have a brief period to test the program and report results back to the production team before the scripting and production planning are too advanced to incorporate changes recommended from the testing.

Pilot testing can often alert production people to inconsistencies, errors, or faulty assumptions that develop during the rush of putting a program or package together. At TVOntario we have often found many elements forgotten, neglected, or unchecked. For instance, in a preschool pilot we noted that print appeared on the screen without the characters saying the words aloud. The writers had forgotten that preschoolers — the target audience — can't read (Duggan, Parsons & Karam, 1981). For the same series, we discovered that quizzes, with direct questioning of the audience, elicited greater participation and attention than elaborately produced studio sequences.

The test instruments used for a pilot evaluation vary according to the audience and the participants recruited. For example, with a teenage audience, instead of having group interviews led by one person, we formed task groups during which participants responded to a series of questions. The ultimate objective of this task group was to revise the program from the elements already used and make a new version. In each group one member had the responsibility to see what participants said for each question. In the analysis of results one must be conscious of the fact that the participants are not experts in television and that their suggestions do not take into account factors which are not known to them such as budget, timelines, and technical concerns.

After three or four programs. After the rough cut or pilot stage, when the developing team has gone on to produce several programs, a producer may request formative evaluation to find out if an audience reacts more favorably to certain elements in the program after changes were made according to a pilot evaluation. For a family-oriented science program, the production team wanted to verify if they were on the right track in a later program in the series, after a pilot evaluation had indicated that the information in the program was presented in a confusing manner (Windsor, 1983).

After one season. If a series continues for more than one season, management or the production team may be contemplating some changes and wish to obtain reaction to them before committing themselves to production with these new variables. A new host may be contemplated, or less location shooting and more studio sequences proposed. We recently investigated audience reaction to a movie show that had been on air for many seasons. The

production and management team requested formative evaluation to help them decide between the continuation of location shooting for interviews and straight studio "living room" interviews. An interesting finding was that although the viewers appreciated the visual variety of location shooting, they found that the surroundings disrupted the flow of information presented in the interviews. They learned less from location interviews than from studio interviews.

ANALYSIS OF RESULTS AND REPORT PRESENTATION

When evaluation sessions are completed, the questionnaire results are compiled statistically. The calculations done at this first stage are generally frequencies and crosstabulations with characteristics such as lifestyle and general appreciation, level of education and comprehension. Given the small number of participants, more elaborate statistical calculations often would not give any additional pertinent information at this stage.

Tape recordings of group interviews are also transcribed. A systematic analysis of their content provides complementary information to the quantitative data. Supplementary information about the elements of the program that were not included in the questionnaire is also obtained.

Preliminary report. Following this first analysis, a preliminary report is presented to the production team from one to two weeks after the evaluation sessions. At this meeting statistical data and a content analysis of the discussion are briefly presented. Some recommendations and interpretations are then formulated. The meeting essentially serves to present information for the questions that particularly interest the members of the production team. If other results seem interesting, they are also outlined. The emphasis is placed on the oral presentation and the written report usually constitutes several pages. Diagrams, graphs, and other visual material are used to make the presentation of results easier. Often, transcripts of discussion group tapes or actual discussion tapes that seem particularly representative are left with the producer. Typed lists of responses to open-ended questions can also provide the rich detail that producers enjoy. If the request for evaluation has come from management, results are usually first presented to the producer or production team and, then, at another meeting - with the producer present - presented to management.

Draft report. After the preliminary reporting, a draft report is written that includes as detailed an analysis of the results as the researcher feels necessary. Demographic information may be looked at more closely or specific questions addressed. At this point, more interpretation is included and verbatim comments of test participants are added if these can help provide insight and more interesting reading.

Final report. The draft report is revised after feedback or criticism from readers. Often, after disucssion with producers or developers, more recommendations for the project are included. A problem that frequently arises at this point is report distribution. Most developers and producers do not relish having even the slightest weakness in their project discussed in a report that is circulated to upper management. At TVOntario, an abstract of the report is circulated to upper management, and often does not include the details of sessions. The full report is usually available to upper management upon request.

CONCLUSION

What happens after the results of formative evaluation have been analysed and presented

depends on the producer, the evaluators, the budget, the program, the series, and the time available. If, for example, after a pilot evaluation, results show that one character has received a very negative reaction, and parts of the program are found to be confusing, a decision to reshoot that character's segments and reedit certain sequences may be made. On the other hand, the pilot might be left as is and the evaluation recommendations taken into consideration in the planning of the rest of the series. Not only can the production gain from an evaluation but the methodology used can also be refined. Through the years the process of formative evaluation at TVOntario has undergone changes and developments. After more than 11 years of experience in this area, we at TVOntario are convinced of the effectiveness and usefulness of formative evaluation. We know that formative evaluation does not guarantee the improvement of educational media products, but feel it is a tool that is available for those willing and able to use it; a tool to help make a product that answers more precisely the needs of the audience.

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Media Managers

Al LeBlanc, Editor

Resource Review Project

Donald P. Bates

The Grey County Board of Education Media Services was established in the late 1960s. The film library in use today essentially was developed between 1968 and 1972 with the help of Ministry of Education incentive. To be eligible for these, at least 50% of the titles had to be selected from the Ministry of Education Catalogue (1970). Though some prints were purchased, many actually came from the Ministry's film library as part of it being phased out; many of these showed signs of wear on arrival.

Like many film library managers, I sensed that the quality of the library was deteriorating. Mattison (1978), in his article "Maintaining the Centralized Film Library" argues that there is a relationship between reviewing/culling and budget; he suggests the lifespan of a title should be less than ten years. Budget restraint prevented any positive hope of addressing the problem. Feedback from teachers reinforced the feeling that much of the material was growing too old to be useful.

I used the comment of a teacher, "This old turkey should be put out of its misery," as the basis for a proposed review project. Funds covered stipends for two teachers and I to work four weeks in July. Terms of reference included reviewing Primary/Junior level films five years old or older. The first task was to establish evaluative criteria: (a) validity or accuracy of content, (b) communicativeness (i.e., would today's pupils relate to its approach?), and (c) relevancy to courses presently in place. Other considerations included: (a) physical condition, (b) frequency of use, and (c) availability of other resources (i.e., content/audience).

The magnitude of the task in the time frame available meant the approach had to be relatively clear-cut. The dated titles and statistics were made available by the staff. An unsophisticated system was established where material would be reviewed and rated on a three-level scale based upon the following criteria:

(a) reject, because of failing to meet any one of the first four criteria above in spite of frequency of use,

(b) hold in the library because of relevancy to courses, but phase out and/or replace in the near future, or

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(c)   accept and leave in the library until some future review.

In total 861 titles reviewed; 245 of these were withdrawn from the collection, 60 will be replaced at the first opportunity, and 556 remain in circulation. Figure 1 shows how few recent productions are in the film library (i.e., there are only 34 titles at the Primary/Junior level produced from 1981 to 1985). The committee took time to exchange ideas about the place of film and other resources in Grey County classrooms. They drafted a short summary report for each Primary/Junior teacher and provided a comprehensive project report and two sample utilization models for school reference.

It is being recommended that the Media Center 1986 budget include funds to carry out the second phase of the library review; looking at older material of the Intermediate/Senior Divisions as well as adding film and/or videotape titles to both replace the outdated materials withdrawn and continue the development of the centralized resource collections.

If any *CJEC* reader would like a copy of the summary report, contact the author: c/o Media Centre, Box 100, Markdale, Ontario NOC 1HO.

FIGURE 1.
Number of Films by Impression. Date.
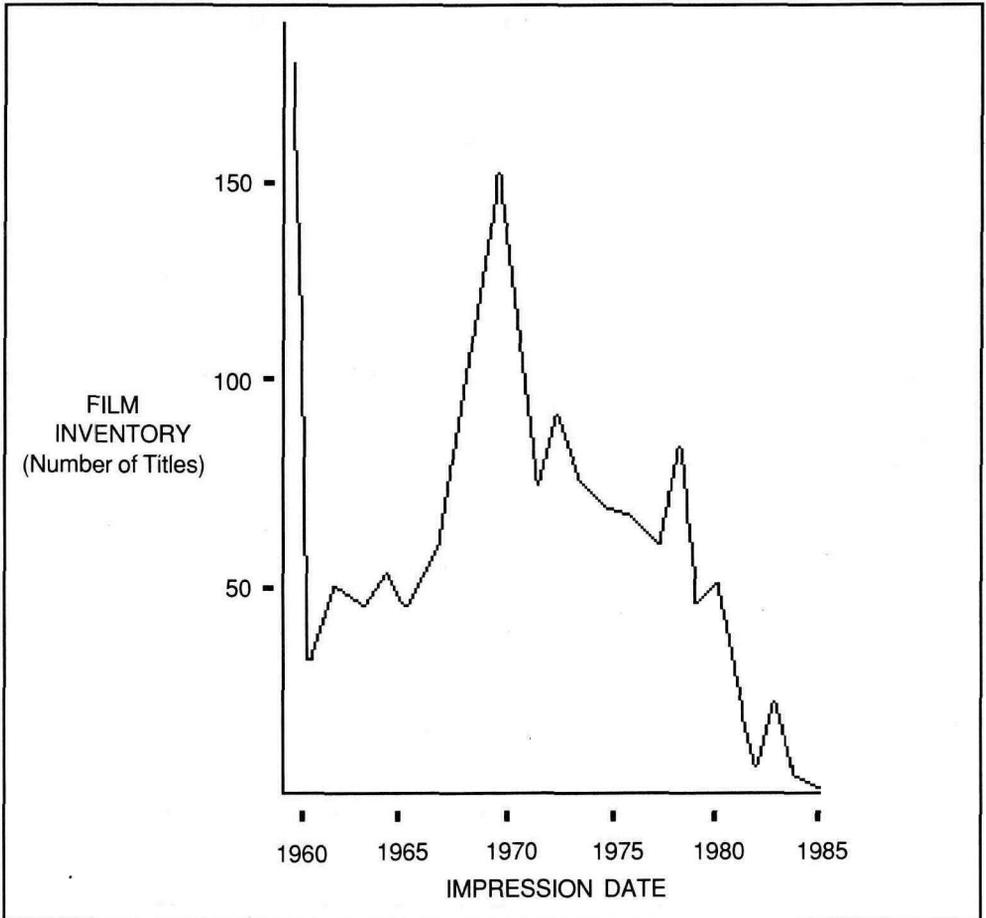
Microware Review

Len Proctor

The SwyftCard

Abstract: If you had to type "LOAD CODE.TOAST" into your toaster to make it work, how often would you take the time to make toast for breakfast? Jef Raskin, C.E.O. for Information Appliance, Inc. suggests that the average toaster user would not accept this type of operating system. The next logical question is, why do computer users in general and microcomputer users in particular accept a complex procedure to get their systems up and running. I suspect that the answer is, as Captain Grace Hopper would say, "its because we've always done it that way."

The SwyftCard is a productivity tool that facilitates word processing, information retrieval, mathematical calculation, communication with other computers and programming in Applesoft BASIC. It is distributed in a slightly unusual form in that the program is stored on a small card which is inserted into the rarely used slot 3 of an Apple He, rather than being loaded into memory from a standard floppy disk.

Functionally, I hope that this product is the harbinger of future product design strategies because it attacts many of the problems that have plagued users since the very beginning of computer development. Complex command structures, disk storage systems that allow the loss of work through human error and tardy operational speeds have virtually been eliminated.

For example, to get the card up and running, simply turn on the computer and start typing. To store what has been created, place the disk (formatted or unformatted) into the drive and press CONTROL-G. Saving a 40K file takes about 8 seconds. Locating any point in a 40K file takes about .5 seconds and entering any text character from the keyboard takes about 300 milliseconds. On an "Apple" you say ...? Get out the stopwatch and see for yourself.

COMMANDS

Only six commands are needed to use these five applications. They are as follows. CONTROL-G (Send) transmits the highlighted text via the super serial card to the modem. CONTROL-G (Calculate) evaluates or executes the highlighted text. CONTROL-N (Print) delivers tha highlighted text to the printer interface. CONTROL-L (Disk) directs the disk to

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do the appropriate disk operation. CONTROL-Z sends the next keypress as a control character via a super serial card. Key labels are provided to label these keys according to their function.

ATTRIBUTES

No formatting commands are required. SwyftCard is a what-you-see-is-what-you-get text editor. To enter text, simply start typing. To delete text, press the delete key. The cursor simultaneously shows where the character that will be deleted is positioned and where the character that is entered will be positioned. To save or load text from an existing file, press CONTROL-L. SwyftCard determines the appropriate action. Each disk, then, becomes a 40K file.

Cursor control is achieved by using the open and closed apple keys. Ergonomically, this is more efficient because these two keys can be operated with the thumbs, just like the spacebar. Consequently, users never have to take their eyes off the screen to look for the arrow keys.

Pressing the open apple key moves the cursor one character left - closed apple, one character right. This operation is known as "creeping." Holding the closed apple key down, and pressing any key or sequence of keys initiates a "leap" to that character or string of characters anywhere in the text to the right of the cursor. Visa versa for the open apple key. If the text string desired is not found to the right of the cursor, the card automatically initiates a search to the left of the cursor. Therefore, only two conditions can exist, either a text string match is found, or it is not found. No false error messages can occur because the search was not initiated from the beginning of the file.

Block moves of text are achieved by highlighting the section of text to be relocated, deleting it, repositioning the cursor and then initiating the rewriting of the text with CONTROL-A, one of the six commands. Page breaks are automatically inserted, but can be forced by pressing the escape key. The TAB key functions as a tab key or when used in conjunction with the "leap" key initiates a "leap again" or "find the occurance of this text string again" function. Functions like line spacing and margin settings are handled on a global basis.

Calculations can be done anywhere in the text. For example, if it was desirable to stop right here and multiply two numbers, such as 64 times 254, it would be entered as 764*254. The answer would then appear, and the numbers would be highlighted. Pressing the delete key deletes the 64*254, leaving the answer behind to be pnnted as part of the text. Similarly, programs can be written and executed from within the text editor. And, by the experienced user, this capability can greatly reduce the time required to complete repetative tasks.

THE PACKAGE

When the SwyftCard is delivered, the package contains the card, a set of decals to label the keys, a reference manual and a disk. On one side of the disk, there is a very good tutorial on using the card. The other side contains a conversion utility which is very similar to the Apple ProDos conversion program. It converts SwyftCard to ProDos and vice versa. This utility program provides access to the best of both worlds. SwyftCard can be used to prepare the text and print it out in a simple but efficient manner. The conversion utility can then be used to make a standard ProDos file which can be read by any of the standard word

processors. Then, any special formatting requirements or printing requirements such as font changes can be used.

USERS BEWARE

There is some danger in doing this. When the user is forced to go back and use a conventional editor, the power and simplicity of the SwyftCard becomes very evident. What was formally thought to be "the best," has now become a cumbersome version of the horseless carriage. The user is constantly reminded of this every time a complex control sequence is required to move the cursor, find a word, when the program has to be terminated in order to do a mathematical calculation, or, when it takes a minimum of three menu options to print or store a document. SwyftCard, where have you been all this time ... ?

FRINGE BENEFITS

Finally, SwyftCard offers some additional fringe benefits. Being that the program is contained within a set of chips on a board, there is apparently no known way to copy it. Thus, teachers, teachers/librarians and learning resource specialists who are concerned about copyright violations, can rest a bit easier. Second, because the program is hardware resident, it is always immediately available on request. Third, unless the card is physically damaged during installation, it cannot be destroyed by static electricity, bending or putting fingers in the wrong place. Fourth, users find they can purchase it on either hardware or software budgets because it is, in fact, both a piece of hardware and software. Finally, the cost is very competitive. It retails for under $100.00 U.S. and there are educational discounts available if ten or more cards are purchased.

THE CHALLENGE

In closing, it is interesting to note that Jef Raskin, the person primarily responsible for the design and development of SwyftCard, once worked on the development of the Macintosh. Apparently, in its early stages of developemnt, a component like the SwyftCard would have gone to the Mac. Fortunately for the Apple II family and unfortunately for the Mac, we now have the SwyftCard because some people are still willing to act on the suggestion that "you can't do it that way." Are there any more Jef Raskins out there?

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> Ms. Suzanne Daningburg
> Department of Education
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From the Media Periodicals

Richard Ellis, Editor

This column is a listing of articles that have appeared recently in the literature of educational media and technology.

CLASSROOM COMPUTER LEARNING, 6 (1), September, 1985.

Olivas, J. "Restoring your micro to health."
Alterman, A. E. "Pulling in the reins on freewheeling Logo."
Eiser, L. "What's a picture worth?"

COMPUTERS IN EDUCATION, September, 1985.   '

Lam, T. "Survey of MBL (microcomputer based laboratory) packages."
Cathcart, G. M., & Cathcart, W. G. "Logo bar graphs."
Brown, J. L. "The computer centre director and you."
Storey, M. "Teaching keyboarding."
De Jong, M. L. "Using a computer for precision timing."

COMPUTERS IN EDUCATION, October, 1985.

Hanke, M. "Writing your own utility programs for the ICON."
Wright, I. A. "Computers in the geography classroom."
Eiser, L. "Surveys by spreadsheet."
Cathcart, G. M., & Cathcart, W. G. "Logo bar graphs for Halloween."
DeJong, M. L. "Using a computer for precision timing: part II."

EDUCATIONAL TECHNOLOGY, 25 (9), September, 1985.

Whiting, J. "New directions in educational computing: Coming changes in
    software and teaching strategies to optimize learning."
Barrett, S. S. "When you wish upon a CPU: Truly integrating the personal
    computer into the classroom."
England, E. "Interactional analysis: The missing factor in computer-aided
    learning design and evaluation."
Nowlin, W. A.,& Friedstein, H. G. "A guide to information utilities for
    educators."
Braden, R. A. "Interactive video: A formative evaluation."
Jensen, R. P.,& Osguthorpe, R. J. "Better microcomputer manuals: A
    ,   research-based approach."

Richard Ellis is with the D. S. Woods Educational Library at The University of Manitoba, Winnipeg, Manitoba.

EDUCATIONAL TECHNOLOGY, 25 (10), October, 1985.

Carrier, C. A., Glenn, A. D., & Sales, G. C. "A two level program for training teachers to use computers in the classroom."

Nelson, P., & Waack, W. "The status of computer literacy/computer-assisted instruction awareness as a factor in classroom instruction and teacher selection."

Muller, E. W. "Application of experimental and quasi-experimental research designs to educational software evaluation."

Braden, R. A. "Interactive video: A formative evaluation: Part two."

Norton, P. "Problem-solving activities in a computer environment: A different angle of vision."

Fink, J. A. "Implementation of an online bibliographic database into a community college library: An evaluation."

Widmer, C. C., & Parker, J. "A study of characteristics of student programmers."

INTERNATIONAL JOURNAL OF INSTRUCTIONAL MEDIA, 12 (3), 1985.

Hefzallah, I. M. "Visual primacy, reality, and the implying image in motion pictures and TV."

Canelos, J.; Taylor, W., & Dwyer, F. "The effects of recall cue and cognitive trace compatability when learning from visualized instruction: An application of encoding specificity."

Moore, D. M. "Cognitive style, presentation mode in a visual location task."

De Graff, J. T. "Notes on computer literacy: Another catch-all phrase?"

Hysaw, J. "I've got class (computerized learning assistant)."

Gray, R. A. "Educational technology use in bilingual education."

Blair, B., Jr. "Television & films: Promoters of youth mental health."

JOURNAL OF COMPUTER-BASED INSTRUCTION, 12 (2), Spring, 1985

Locatis, C., & Carr, V. "Selecting authoring systems."

Tatsuoka, K. K., & Eddins, J. M. "Computer analysis of students' procedural 'bugs' in an arithmetic domain."

Perez, E. C., & White, M. A. "Student evaluation of motivational and learning attributes of microcomputer software."

Munro, A., Fehling, M. R., &Towne, D. M. "Instruction intrusiveness in dynamic simulation training."

JOURNAL OF COMPUTER-BASED INSTRUCTION, 12 (3), Summer, 1985.

Bangert-Drowns, R. L, Kulik, J. A., & Kulik, C.-L.C. "Effectiveness of computer-based education in secondary schools."

Leibowitz, A. Z. "User-friendly methods of judging."

Harrison, A., Jr., & Musial, D. "Computer based instruction for school board members - a potential solution to the problem of implementing national training programs."

MEDIA & METHODS, 22 (2), November/December, l985.

Rehman, S. N. "Film-making on video: Getting the best of both worlds at a lower price."

Portnoy, K. "Video in script writing projects."

MEDIA IN EDUCATION AND DEVELOPMENT, 18 (3), September, 1985.

   Warnock, Baroness. "The social responsibility of the broadcasting media.'
   Shears, A. E. "Training agricultural managers."
   Atkins, S. "The Domesday Project."
   Gillick, D. "Communications for development."
   Hart, A. "Making connections: Higher education and cable television in
      Britain."
   Hancock, R. "Interactive videodisc for learners of French."
   Brookes, B. "Radio training in developing countries."
   Kerrison, D. "E S C A P farm broadcasting."
   Tiene, D. "Japanese educational television: An intriguing case study."

SCHOOL LIBRARY MEDIA QUARTERLY, 13 (1), Winter, 1985.

   Herr, T., & Truett, C. "An integrated computer library system down under:
      what can we learn from Tasmania, Australia,"

SCHOOL LIBRARY MEDIA QUARTERLY, 13 (2), Spring, 1985.

   Bauer, C. J., Campbell, N. J., & Troxel, V. "Altering attitudes toward the
      mentally handicapped through print and nonprint media."
   Clyde, L. A., & Joyce, D. J. "Selecting computer software for school
      libraries."

Mediography

Nancy L. Lane, Editor

This column contains titles and a brief annotation of media products that are currently available on the market. In each issue of *CJEC, a* different theme is researched.

MEDIA ON TECHNOLOGY AND SOCIETY

There are many new programs focusing on this topic. Listed below are some of them - all available from Canadian Distributor.

BRAVE NEW WORLD

RESOD THOM HOWE 198?, 6 programs, 65 minutes each. This unique series parallels the expectations of technology with the situation in the Sourthern Hemisphere. The titles are: *Chance and Necessity, The Anthill of the 21st Century, Robots and Bacteria at Work, Open Spaces of FreeTime, A Cocktail of Energies, The Planetary Society.*

THE CHALLENGE OF HIGH TECHNOLOGY

DALLAS COUNTY COMMUNITY COLLEGE, MAG. LANT. 1985, 30 minutes, sd., col. *From The Business File Series.* This program discusses high technology and the impact on the worker, on management and the work environment.

CHILDREN OF THE FUTURE

EB/VEC 1985,55 minutes, sd., col. A documentation of the advances in genetics and the question of the effects of research is the topic here.

COMPUTER APPLICATIONS

EB/VEC I985,6 programs, 30 minutes each. A look at how computers right now are permeating society. Titles are: *Manufacturing and Design, Science and Medicine, Education, Business, Games and Recreation, Lifestyle.*

COMPUTER CHIPS SHAPE AN INFORMATION SOCIETY

SC. SC./MAG. LANT. I985,14 minutes, sd., col. This Science Screen Report covers a range of effects of the computer chip on human lives.

Nancy L. Lane is is head of the Distribution Group for Communication Systems, The University of Manitoba, Winnipeg, Manitoba.

COMPUTER SECURITY

MAG. LANT. 1985,24 minutes, sd., col. Computer theft is the subject here. The program describes the crimes and profiles the perpetrators.

COMPUTER: TOOL FOR THE FUTURE

NG 1984, 23 minutes, sd., col. The focus of this program is the importance of the computer in modern society.

DR. VIDEO

NOM/OMEGA1983,26 minutes, sd., col. From the series: *Break Throughs.* This video demonstrates how technology has transformed video games into aids for the handicapped.

EPCOT ADVANCED INFORMATION SYSTEMS

DIS. MAG. LANT. 1984,20 minutes, sd., col. A problem and a solution. This program traces the development of the World Key Information System used at Epcot to answer visitors questions.

ETHICS AND MORALS

NIMR/OMEGA1984, 30 minutes sd., col. From the series *Medical Aspects,* this presentation examines questions resulting from the advances of technology such as quality of life, consent to treatment, etc.

ETHICS IN THE COMPUTER AGE

MAG. LANT. 1984,20 minutes sd., col. This production deals with the potential for unethical and illegal use in the application of computer technology.

FROM QUILL TO COMPUTER

CBC1983, 25 minutes, sd., col. An in-depth look at development in scientific areas is the focus of this CBC program.

GET WITH IT I.T. (INFORMATION TECHNOLOGY)

NEW DIM/CAN LEARN 1984,20 minutes sd., col. This production deals with the historical development and the future implications of computers as they affect human activity.

HIGH TECH: DREAM OR NIGHTMARE?

CAR/MARLIN 1984,47 minutes, sd., col. The CBS news report studies the impact of technology on the American work force.

MAKING THE FUTURE WORK

MAG. LANT. 1985,9 minutes, sd., col. John Diebold discusses creative leadership, the challenge of advanced technology, and the changing workplace.

MIRACULOUS   MACHINES

NG I985,59 minutes, sd., col. This program covers observations of technical revolutions in medicine, art, space, sciences and industry.

ROBOTICS - THE FUTURE IS NOW

AIMS/CAN LEARN I984, 20 minutes, sd., col. The Role of Robots in Industry is the subject here.

ROBOTS: THE COMPUTER AT WORK

MAG. LANT. I984, 22 minutes, sd., col. Here we see an examination of the uses and impacts of Robots on society.

TECHNOLOGY AT WORK

NOVA/CORONET I986, 55 minutes, sd., col. The focus of this program is a look at the workplace of the future and the role of advanced automation.

Book Reviews

Suzanne Daningburg, Editor

The three book reviewed in this issue are: *Screen Design Strategies for Computer - Assisted Instruction* by JesseM. Heines, *Producing Instructional Strategies* by A. J. Romiszowski and *Styles of Learning and Teaching* by Noel Entwistle.

Screen Design Strategies for Computer-Assisted Instruction, by Jesse M. Heines. Bedford, MA: Digital Equipment Corporation, 1984. 154 pages.

Reviewed by Gina Siliauskas

If you are new to CAI courseware design, *Screen Design Strategies for Computer-Assisted Instruction* will be a welcome find. It is probably the only book currently available to provide a concise and well-organized introduction to screen design for CAI applications. There is a growing body of research which indicates that screen display variables can have a critical impact on the viewer's attention, retention, and accuracy of responses. This book is primarily intended to create an awareness of these variables in the instructional designer; it is not, as the author is careful to assert, a "how-to" book.

Author Jesse Heines begins the book by addressing several aspects of the "computer/video medium" which he considers to be of significance to the screen designer. After briefly describing how this medium differs from the traditional print medium, Heines sets out to discuss how picture representation occurs. A good understanding of picture resolution with its limitations is critical to the development of screen lay-out. Picture resolution is explained here in easy-to-understand terms, as are the differences between the basic video display systems available, (i.e., raster scan and stroke vector systems). By presenting this material in such a straight-forward fashion, the author succeeds in directing our attention to technical limitations which have a direct bearing on design decision. As a conclusion to this chapter, several role models for screen design are suggested.

Chapter 2 focuses on the use of "functional areas" of the screen to help structure the material to be displayed. This entails dividing the screen into different areas for presenting different types of information. The selection of locations and shapes for these areas is discussed in relation to standard screen components, which Heines defines as: orientation information, directions, student responses, error messages, and student options. Split-screen design or windowing techniques are not disucssed in this chapter or anywhere else in the text, probably because of the relative recency of their development. (A major problem in publishing a text such as this one, which is so dependent on hardware considerations, is the rapid obsolescence of the information presented.) Otherwise, this chapter serves as a useful introduction to display organization, particularly as it includes a description of scrolling and other display clearing techniques.

Despite the author's warning that the book is not on computer graphics, the third chapter, which deals with visual symbols, proves to be somewhat of a disappointment. As

the development of symbols depends on the graphics capabilities of the system used, and there is a notable lack of standardization of these capabilities across systems, I can appreciate the author's dilemma in presenting this chapter. Sketchy assistance, however, is provided in terms of generally applicable design considerations (although the author takes the time to belabor the point that cuteness should be avoided). This section could easily have been improved by the addition of examples of perceptual principles relevant to the design of visual symbols, e.g., closure (closed figures being more readily perceived), unity (a good symbol being characterized by having all parts contained within a single boundary), simplicity (the avoidance of too much detail), etc.

Chapter 4, on the other hand, provides an excellent introduction to the effective use of menus. The major advantage of designing a menu-driven system is the ability to explicitly present to the user a structure for the learning and use of the knowledge required to proceed through the system. The decisions involved in the design of menus, such as choosing the number of options, screen lay-out, user method of indicating choice, and visual representation of the chosen option, are clearly described and illustrated in this chapter, thus providing the novice screen designer with a useful design tool.

Chapter 5, which concentrates on text display, is the most well-developed chapter in the book attesting to the recent surge of research in this area. Pointers are provided on how to use typographical variables such as type style, line length, justification, and break points to improve message readability. Similarly, the use of character attributes which can change the appearance of display units is detailed. These attributes, which include font, boldface, reverse video, underlining, varied text sizes, text rotation, and color, can also greatly enhance the message to be communicated. They must be used wisely, however, and in this connection the author cautions against the use (and over-use) of screen design techniques to compensate for poor writing.

In Chapter 6, Heines turns his attention from specific strategies to the use of screen-oriented text and graphics editors as tools that simplify the design process. The discussion of general screen design issues, such as the need to separate oneself from the actual programming of the CAI program and the necessity for separating display logic from lesson logic, offers some valuable insights into the designer's perspective. The need to design courseware with transportability in mind, a requirement which cannot be over-stressed, is also an important piece of advice for the beginning designer and the author should be commended for emphasizing these points. The value, however, of including a description of text and graphics editors in this chapter is questionable as such details are no doubt better documented in the manuals accompanying the system the user will be accessing.

The final chapter of the book takes a look at CAI style and attempts to provide some guidelines for improving the instructional communication beyond the screen design variables discussed in the previous chapters. The author urges the CAI courseware designer to maximize learner interaction; to use other media in connection with CAI; to take the student population into consideration, including individual differences; and to make use of formative evaluation. These guidelines are certainly valid and worthwhile. My only criticism is that I would have liked to see them fleshed out in terms of concrete examples. Heines may well have sacrificed substance in the interest of brevity, not only here but elsewhere in the text.

One of the difficulties any author of an introductory text faces is the selection of cut-off points for content. When the quality of the writing is as good as Heines', one can only wish for greater elaboration and a more in-depth treatment of the subject. In spite of this objection, my view is that this book does indeed successfully accomplish its goal of sensitizing the reader to the major variables in the field of screen design. *Screen Design Strategies for Computer-Assisted Instruction* is a concise and readable text for the novice courseware designer which has made a timely entry into the market.

Producing Instructional Systems, by Alexander J. Romiszowski. London: Kogan Page/New York: Nichols Publishing, 1984. 286 pages.

Reviewed by Suzanne Daningburg

Producing Instructional Systems deals with systematic lesson planning and should be required reading for any professional directly or indirectly involved in some aspect of the educational planning and producing process. It is an exhaustive "how to" book which includes references to historical background as well as examples of practical applications. Romiszowski paves the way for the serious-minded to make clear and pragmatic decisions at the level of day-to-day instructional implementation. The prose, appearing deceptively simple at a glance, is comprehensive. The author does not provide fluff for the uninitiated weekend reader, but rather specifies that the intended readership consists of "teachers, instructors, training analysts and others who plan the detailed tactics of instruction."

Producing Instructional Systems is the first volume of a planned two-volume set and deals with lesson planning for individualized instruction in the conventional classroom environment as well as for small group learning situations. It also explores the producing of educational simulations and games. The forthcoming volume 2, *Developing Auto-Instructional Materials* will deal, as its name suggests, with the development of many different types of materials, including programmed instruction, structural communication, audio and audio visual instruction and computer-based materials. Both books may be considered as companions to an earlier work, *Designing Instructional Systems* (Romiszowski, 1981), which dealt with the decision-making process involved in overall course planning and curriculum design. This conceptualization of instructional design in its beginning phases is what Romiszowski calls the "initial macro-design stages of lesson and instructional materials development". Basically, macro-design deals with the overall objectives (what should be achieved), the principal inputs (content, learners and resources) and the environmental climate and constraints (context).

Producing Instructional Systems continues, where *Designing Instructional Systems* left off, to deal with the "micro-design system", providing extensive coverage of practical techniques for the development of instruction. Micro-level tactics are meant for the lesson plan itself and the individual exercise. The book concentrates on the analysis and design of the lesson plans.

In writing for a professional audience, the author assumes a reasonable level of prior knowledge of instructional design and development on the part of the reader. He has structured the book to be easily accessible to the professional looking for a specific treatment. Numerous structured "maps" and charts indicate at a glance how relevant material is organized. A caveat for the busy professional is that individual sections of the book may be read independently without any loss of meaning.

The philosophical approach is a systemic one. Individualized instruction is seen as a cybernetic system which, while sensitive to the needs of individual students, must also have the capacity to correct and adapt itself on an instructional level.

The book is divided into three major sections: theory, strategy and tactics. Each section is in turn structured into three parts: 1) an analysis of the basic concepts and principles; 2) a synthesis of schemata, strategies and techniques used; and 3) an evaluation of these planning tools.

Part 1 begins with an examination of the theoretical base for the individualization of instruction. A brief and selective historical review of previous attempts at individualization

is presented. Romiszowski describes a classification system based on four key factors: 1) what is to be individualized; 2) when or with what frequency will the course adapt to the individual; 3) who decides; and 4) how the system adapts to the individual.

Control of individualized instructional systems is categorized into three basic approaches. The prescriptive approach, characterized by both Ausubel and Gagne, supports individualization on the basis of a comparison between the individual student's profile and some ideal model. The democratic approach, favored by the discovery learning school, supports individualization for the student's own sake. The cybernetic approach, exemplified by Pask, suggests that machine-based systems can be constructed which can learn from the learner, adapt to the learner's strategy for learning and can redesign presentations in ways superior to those achieved by human tutors.

A variety of well-known North American and European innovatory systems of individualized instruction, including print, multi-media and computer-based categories are evaluated. Examples discussed include the Personalized System of Instruction (PSI) associated with Keller, information mapping techniques and the Kent Mathematics project.

Part 2 deals with strategy and presents a condensed version of the concepts and techniques of systems thinking and the systems approach considered necessary to the production of instructional systems. The chapters are, however, detailed in *Designing Instructional Systems* and readers familiar with the latter may well find the material redundant. The methodology of knowledge and skills analysis is summarized. Guidelines for evaluating macro-level design are outlined and two instructional plans are provided as examples.

Moving beyond the theoretical bases and overall strategies, Romiszowski addresses the issues of micro-level analyses in Part 3. The main part of this section is devoted to the development and practical application of a lesson planning model. Emphasis is focused on the selection and implementation of specific instructional tactics based on the content and objectives of the proposed lesson together with the characteristics of the target population. A general model for lesson planning is developed which considers both the instructional system and the sequences of the lesson itself. Production and testing are highlighted, with further aspects of detailed design decisions presented as tactics. The production decisions involved at this stage are classified into two levels: the planning details of lessons; and the actual preparation of instructional materials.

Perhaps the most interesting sections of *Producing Instructional Systems* are the chapters covering simulations and gaming and the dynamics of group learning. While the author's comments on much of this material may be familiar, his way of dealing with it in relation to specific instructional situations is new (for the reader) and thought provoking.

As Romiszowski exposes practical guidelines for concise and clearly thought-out methods, he leads the reader to understand the answers to everyday questions of instructional implementation. In doing so he exposes a wealth of wisdom from major figures in instructional theory and design, including Bloom, Krathwohl, Gagne and Gilbert. As the author outlines the contribution and stance of each one, the reader is left with a rich synthesis of the background of his or her craft and profession.

Those readers accustomed to straight liner text presentation may consider the appearance of this book sloppy and unstructured. In fact, this reader found the initial effort in understanding the complex mapping figures to be well worth the time and energy expended, The prose, while comprehensive and unbroken, save for the numerous figures and tables, is easy to understand on a practical level.

The book's strengths are major ones; its weaknesses minor. Among the strengths are the following:

- A precise definition and use of key terms such as macro and micro levels of analysis

and planning, strategies and tactics. This is essential in such an interdisciplinary area as educational technology and communications.

- A synthesis of the instructional design area which combines the strengths of many major theories.

- Numerous examples of the strategies and tactics are described. The guidelines presented are viable. They work.

As for the weaknesses, I found two issues irksome.

- A not insignificant amount of the content is reiterated from *Designing Instructional Systems.* While this may be in part unavoidable, it is disappointing for those who have read and used the earlier book.

- Romiszowski's use of pronouns would have one believe that the female gender is not included in the general profession of educational technology and communications. The author also clings to stereotypical gender classifications in providing examples, as in referring to a salesclerk as "she" and insurance salesperson as "he". Aside from reference to specific examples, all references are to a masculine entity. The content of the text is of the future — the language, however, is outdated.

In summary, go out and buy this book. Recommend it to your students. As a synthesis and evaluation of the methodology of instructional production it will be referred to again and again.

REFERENCE

Romiszowski, A. J. (1981). *Designing instructional systems* . London: Kogan Page.

Styles of Learning and Teaching, by Noel Entwistle. New York: John Wiley and Sons, 1981. 293 pages.

Reviewed by Rob Dainow

Noel Entwistle has done an effective job of building a model of student learning that is grounded in both educational and psychological research. He weaves a convergence of evidence from differing areas to substantiate the main elements of his model while recognizing the limitations of our knowledge in these complex cognitive and social areas. The goal is not to prove the truth or validity of the model; rather, it is to "build up a coherent framework within which to understand the learning process" (p. ix) with the objective to help readers "consider critically their own ways of learning and thinking" (p. xi). In this he succeeds admirably - in fact, a more appropriate title might be "Styles of Learning and Thinking: An Integrating Framework".

Part I sets the stage; Part II builds up the model based on a small group of related studies of (college) student learning; Part III draws support for the model from the (educational) psychology literature; and Part IV provides an overview of suggested applications of the model in various teaching situations.

In setting the stage, chapter 1 serves as an advance organizer by outlining the main themes of the book (intellectual and cognitive development, the importance of individual differences in personality and styles of learning, and the importance of activity in learning) and the use of different forms of evidence from different areas to uncover a convergence of ideas. The discussion of scientific versus, humanistic evidence is well presented and is

further developed in chapter 2 with a review of different types of research evidence. All support the following frequent statement: "the interplay of objective evidence and sensitive interpretation from personal experience is a continuing theme" (p. 30). However, one important theme of the book that is not stated in advance is the creative tension between opposing forces - a theme that is developed in the later chapters and is chosen as the message of the closing paragraph of the book. A perhaps more important criticism of this introduction as an advance organizer is that the model developed after chapter 5, which is the core of the book, is neither presented nor described at the beginning. I, for one, would have found an overview of the model helpful at this point.

The concluding sections of Part I are among the strongest parts of the book. The presentation of the writings of early theorists on thinking (Watts on learning styles, James on learning by association, and Dewey on thinking as analysis) are not only stimulating in their own right, but also serve as a reference point for more recent evidence presented in later chapters. It is a skillful and interesting way to link present and past to illustrate the continuity in the development of ideas. It also shows the value of introspection in the continuum of types of research evidence. The "learning experiment" presented in the "bridge" section that concludes Part I serves to introduce another view of thinking (Wertheimer's imaginative reconstruction) at the same time that it actively involves the reader through a study styles inventory questionnaire which follows the Wertheimer excerpt. The interpretation of results provided in the Appendices provides the reader with a personal perspective for considering the ideas presented in Part II. Although the suggested time requirement of 2 hours may intimidate some readers and is probably more than necessary, the benefits in both personal insight and heightened involvement in the ensuing reading are well worth the effort. Other creative activities like this would enhance reader involvement and increase the usefulness of this book as a course text.

Part II is really the core of the book, for it is here that Entwistle builds the main elements of his learning model. Drawing primarily from research about styles of studying and learning by Heath, Perry, Marton, Pask, and his own work, he sees a convergence of findings and selects Marten's classification of deep and surface learning as two main styles, adding achievement motivation as the third one. Thus, Marton's deep approach is seen as similar to Pask's holist and Perry's "contextual relativistic reasoner". Further discussion of these studies highlight the influence of personality factors and task content and context on learning style. It is in this latter area that his model suggests that the teacher has a major influence.

Thus, in its simplest terms, the model suggests that student characteristics interact with task content and context to influence the learning process and determine the extent and quality of the learning that occurs. The focus is on the individual and the task, in recognition of the variability in both of these dimensions. By describing the basic studies in some detail, and the ensuing descriptions of related educational psychology studies in Part III, Entwistle enriches what might otherwise appear as a rather simplistic model.

In effect, chapters 4 and 5 flow together. In fact, I found the division awkward and would have been more comfortable to see the discussion of styles of learning included in chapter 4, with chapter 5 focusing on the elements of the model that influence learning style. This, in turn, would have allowed more opportunity to develop the section on personality factors into a broader introduction to the range of student characteristics shown in the model, as well as an introduction of teacher characteristics and their influence on students' task perception and choice of learning style. In this way the model would have been more consistent with the material presented. As it stands, the model appears as almost an adjunct to the discussion rather than the culmination of it, an impression further reinforced by its presentation in a separate "bridge" section rather than as an integral part of

the chapter. I also would have dispensed with the presentation of his "Academic Achievement Game" which struck me as a digression that served to disrupt rather than enhance the flow of ideas. A more appropriate bridge might have been to show a specific application of the model that would involve the reader in identifying the psychological issues to be dealt with in Part III.

Part III reviews the educational psychology topics that Entwistle sees as important to enriched understannding of, and support for, his model (memory processes, intellectual abilities and their development, concept formation, cognitive style, and personality and motivation). The discussions present the differing perspectives and the frequent lack of consensus in these fields (e.g., cognitive style). Some of the material is clearly related to learning styles and what influences them while in other cases the connections are more obscure. In the memory processes (chapter 6), he makes interesting connections between association and overlearning as similar to rote, or surface, learning; while the process of transfer into semantic long term memory is seen as similar to more meaningful, or deep, learning. On the other hand, the discussion of intellectual abilities (chapter 7) discusses IQ testing at length to provide support for a hierarchy of cognitive abilities and their division into associative, analytical, and creative thinking. Over 10 pages of discussion seems unduly long to conclude that the distinction between associative and analytic thinking is useful, especially when it is admitted that this view is not widely accepted in that field.

The above examples serve to illustrate my overall impression of Part III: the selection of topics is relevant to the styles of learning model, but their treatment is often too wide to provide a clear focus on their relevance. Although there is certainly important value to presenting the differing views in each area, there is a need to relate these to the central topic, viz, learning styles and how they are influenced. Part III covers 106 pages while Part II, the core of the book, is only 54 pages and Part IV, on applications, is 48 pages. A shorter and more focused treatment would have improved my integration of psychology's contribution to the understanding of styles of learning.

Part IV is, unfortunately, the weakest section. It is here that the use of the model for teaching and learning was expected. Instead, the presentation is more general in its review of different approaches to teaching (behavior modification, mastery learning, discovery learning; formal and informal approaches) and chapter 11 concludes by stressing the need for versatility in accommodating teaching to task and student characteristics. Although chapter 12 brings together much of the previously cited research in discussing issues at the primary, secondary, and tertiary levels, there was some feeling of disappointment at the end that the integrating framework proposed at the outset had not been fully demonstrated in a sufficiently explicit fashion.

Despite some of the criticisms and concerns noted in this review, the book is an ambitious synthesis that provides a great deal of information and stimulation for both students and teachers. My criticisms may well result from my own learning style that seeks structure and practical application. Although this book could use more activities or exercises like the bridge following chapter 3 in order to be used easily as a teaching text, it is unquestionably a rich source for introspection on learning and teaching styles and provides a framework for relating this introspection to a wide range of empirical investigations.

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