Association for Educational Communications and Technology

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About this issue...

Something for everyone to begin Volume 4—a case study, a technique, some theory, some "how-to," a training module, book reviews, letters, and ERIC.

Doden-Parker describes a project that used a needs assessment approach to identify and assess skills and knowledge required for successful job performance in a business setting.

Mitchell discusses the use of algorithms in ID, including what they are, what roles they can play, how they are different from other procedural methods, what areas of application and research are available, and what the implications for developers are.

Kaufman and Carron propose a model for selecting among education alternatives based on the requirement that each learner reach "self-sufficiency" requirement in society: the model allows one to calculate the social utility of various programs in meeting this criterion.

Diamond and Sudweeks present some of the key issues related to course evaluation in the form of a set of "how-to" heuristics and an Evaluation checklist for identifying which questions a developer wants to ask about any course being evaluated.

This issue's ID Training Module teaches several strategies for conducting a workshop needs assessment within the practical constraints of limited time and resources.

The Book Review department features a review of Gaetan Salomon's important new book on the symbol systems of media and their interaction with the mental skills of learners.

Some reaction to Wallington's article "We Live in Two Different Worlds..." (JID, 3, 3) and to JID's theme issues will be found in the Letters column. We'd like to publish more of those—so please let us know your reactions to our articles and format.

—K.H.S.
To the Editor:

I am not sure whether or not you are still accepting feedback on the use of theme issues for JID, but for what it’s worth here it is: I think I prefer JID in the non-theme format, and a discussion I had with a colleague who reads it regularly indicates that he agrees. There are several reasons:

First, I find that I read it more quickly and more completely if there are a variety of articles in an issue. If an issue theme doesn’t happen to catch my fancy, I tend to put the issue aside and return to it belatedly, if at all; on the other hand, as I skim through the variety of articles in a non-theme issue, I invariably end up reading an article or two that I might not have otherwise.

Second, I suspect that occasionally worthwhile and timely articles would be held up from publication because of the theme timetable, and I believe this is unfair to the readership and to the authors (no, it hasn’t and isn’t happening to me). This point, I believe, is especially true for a quarterly journal. Perhaps it might be a reasonable compromise to have, say, one theme issue annually, with announcements of the theme published well in advance (say, 9 to 12 months?).

Third, I think the theme approach will tend to put undue pressure on the editor(s), who will feel obligated to ensure that a journal of reasonable length be put together every issue. This may, in turn, lead to the acceptance of sub-standard articles, or the proliferation of trite articles in requesting that articles on certain topics be written especially to fill gaps, by acquaintances of the editor (again, I’m not suggesting that it is or was happening).

If you have received additional comments from readers who seem to think as my colleague and I do, I hope you will consider going back to the non-theme format. At the same time, let me say that I think JID is looking very good, generally. There doesn’t seem to be as much emphasis on case studies as the early issues tended to make one hope, but I suspect that that is more a consequence of lack of submissions than it is of editorial policy. Keep up the good work.

—Earl R. Misanchuk, Ed. D., Associate Professor of Extension, University of Saskatchewan, Saskatoon, Saskatchewan, Canada

The Editor Replies:

Thank you for your feedback on the theme issues of JID. It is welcome because the ratio of theme to non-theme issues is a question that the Editorial Board has discussed several times.

You might be interested to know the following about theme issues. First, theme issues happen in two different ways, planned and unplanned. The planned issues, as you might guess, are those in which the Editorial Board decides that a particular topic is important enough to the field to warrant extensive treatment in JID and solicits manuscripts from authors known to have differing views on that topic. The Spring “Evaluation” and the upcoming Winter “Training Instructional Developers” issues are examples of the planned approach.

Unplanned theme issues also develop. This occurs when three to five randomly submitted and accepted manuscripts happen to be about the same topic. Rather than just put one or two articles in per issue, we put them all together to create a theme issue. The Winter “ID Consultation” issue is an example of the unplanned approach.

Second, we have had many favorable reactions to the theme issues. Many professors teaching ID find the theme issues extremely useful in teaching their classes. Readers also find it easier to purchase a copy (or multiple copies) of the theme issue, rather than having to duplicate articles from several different issues, to have all the current information on the topic handy.

Third, we will probably go with the compromise approach you suggest, having 1 or 2 theme issues per year. This will, of course, depend on the topics and number and quality of the manuscripts we receive throughout the year.

JID would welcome other reactions to its structure and format, including theme issues, types of articles, and departments.

—K.H.S.

To the Editor:

In response to Dr. Wallington’s request, in the Spring of 1980 edition of JID, (“We Live in Two Different Worlds”) for alternative terms to “the third world of instruction,” I offer the following suggestion.

Formal learning could be segmented in the following three ways:
1. K-12 education
2. Post secondary education
3. Independent training & education

The third item, my alternative, is called independent in the sense that it is any learning situation separate from the usual K-12, K-14, K-16 (etc.) progression and yet is still part of a functional instructional delivery system. The learner’s success is reliant, in part, upon the adequacy of the independent’s assessment of learner deficiencies and performance needs for a particular performance situation. In most cases the independent will require the learner to meet the prerequisite skill and knowledge level prior to entry in the course. The independent will not, however, pro-
Needs Assessment in Depth: Professional Training at Wells Fargo Bank

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Abstract. The Assessment of Technical Credit Skills project at Wells Fargo Bank employed a three-phase needs assessment approach that began at the corporate level and ended with job-relevant assessment of individual employees' skills. This program was developed to identify and assess the lending skills and knowledge that Wells Fargo loan officers require for successful job performance. Tests were designed based on an exhaustive task analysis of lending functions within the bank. A computer-based scoring and reporting system gave test results confidentially to participants, with a complete breakdown of objectives missed and relevant learning resources available. In addition, an unlimited retesting option was made available. The computer system reported overall performance averages and scores by regions and skill categories to bank management. Managers and supervisors at different levels were provided with only those group data relevant to their own decision-making requirements. Follow-up survey results showed acceptance of and general satisfaction with the program.

Problems of Needs Assessment in Training

Monette (1977) points out in his review of the literature on the definition of educational needs and needs assessment approaches:

There appears to be a general consensus in the literature on need that felt needs or wants per se are inadequate for defining educational objectives.... Likewise prescriptive needs ("real needs") per se are inadequate to the task. (p. 125)

In other words, neither simply asking potential learners what they want or need to learn nor solely prescribing enroute objectives to move learners from point A to point B produces effective needs assessment and instructional development. Nevertheless, Kirkpatrick (1977) reports that in his training evaluation workshops, most trainers indicate that their determinations of both general and rather specific training needs are based either on felt needs or wants expressed by management or on their own subjective judgments concerning what employees should know. The risks involved in developing training programs based upon such incomplete assessments of need are many and obvious: Costly training may prove ineffective because the existing problem was not amenable to a training solution; training may fail to improve performance because it does not identify and address critical skill or knowledge deficits; or trainees and their supervisors may resist training imposed from above, may, therefore, fail to participate in training or to transfer training to their actual work situations.

A Three-Phase Model at Wells Fargo Bank

The Assessment of Technical Credit Skills (ATCS) project recently carried out at Wells Fargo Bank's Retail Training Division exemplified a different approach to training needs assessment. It followed a three-part process model developed by McGehee and Thayer in 1961 and expanded by Mooro and Dutton (1978). The model outlines a process that can increase the likelihood of accurate and complete need identification and of acceptable and ef-
ffective assessment of training functions. This three-phase process synthesizes the recommendations of many other researchers and program evaluators in business and school settings, including Kaufman’s problem-solving model which emphasizes client involvement (cited in Trimby, 1979) and Odiome’s cybernetic approach (Odiome, 1979).

The model’s three parts or phases, Organization Analysis, Operations Analysis, and Individual Analysis, are interactive and may be intentionally interwoven for maximum effect. (See Table 1.) Wells Fargo’s ATCS project processes and outcomes illustrate the nature and importance of these three components. They also suggest ways in which the potential impact of a training program may be influenced by the thoroughness of these initial analyses.

I. Organization Analysis: Discrepancy Identification

Organization Analysis involves asking at the corporate level, “Where does it hurt?” and “How much does it hurt?” Organization goals are compared to performance in major sectors of the company (e.g., manufacturing, retail sales, etc.) to spotlight problem areas. Problems may then be weighted or prioritized based upon how much they are costing the company in direct expenses or loss of market, how many employees may be involved as potential candidates for training, and how clearly employees and their supervisors perceive any performance problems.

At Wells Fargo, Organization Analysis focused on lending as a problem area. Bank management saw data on the number, categories, and quality of loans being made at Wells as compared to other banks and lending institutions, data on loan officers’ compliance with federal regulations, and concerns about opportunities for professional skill development voiced by loan officers themselves as indicating a discrepancy between corporate goals and the current state of affairs.

Senior management in lending enlisted the aid of the training division to further define the parameters of the problem. Loan officers at all levels throughout the retail bank were interviewed and surveyed to determine types of lending functions performed and to gather officers’ perceptions concerning the contingencies affecting their performance, information needs, and possible training interests. Existing training resources were also reviewed. Gayle Coates, then Vice President in charge of Retail Bank Training, outlined the results of their investigation as follows:

<table>
<thead>
<tr>
<th>Phase</th>
<th>Function</th>
<th>Examples from ATCS</th>
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<tbody>
<tr>
<td>I. Organization Analysis</td>
<td>Identify and prioritize discrepancies between corporate performance and corporate goals</td>
<td>Numbers and qualities of loans were below goals</td>
</tr>
<tr>
<td></td>
<td>Perform in-depth job/task analysis—to discrete behaviors</td>
<td>INTERVIEWS with subject-matter experts in the bank.</td>
</tr>
<tr>
<td>II. Operations analysis</td>
<td></td>
<td>TASK ANALYSIS item: “The Loan Officer will identify credits and portions of the credit analysis to which Regulation B applies.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QUESTIONNAIRE item: “Employee to identify how often s/he performs task”</td>
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</tbody>
</table>
|                           |                                                                         | 3 = Frequently
|                           |                                                                         | 2 = Occasionally
|                           |                                                                         | 1 = Rarely
|                           |                                                                         | 0 = Never
|                           |                                                                         | 3 2 1 0 “Identify credits and portions of a credit analysis to which Regulation B applies.” |
| III. Individual analysis  | Assess each employee’s performance on identified tasks                   | TEST question: “Which of the following most accurately reflects the scope of Regulation B: a. Regulation B applies to all consumer lending and only to commercial loans to individuals; b. Regulation B is a consumer lending credit law; c. Regulation B applies to all individual borrowers; d. Regulation B applies to all aspects of consumer and business lending.” |

Note: The examples in column three are from Darden-Parker (1979), Darden-Parker and Rankin (1979), and from the Level I test.
1. There were no standards by which loan officers could measure their own performance. They had no definition of what makes a "good" loan officer, and, hence, no idea of what they should do to qualify for promotions. This lack of objective standards also, of course, affected supervisors' ability to evaluate officers' work and provide appropriate guidance, and the training division's ability to provide on-target, effective training.

2. Previously, lending functions had been broken down into three major categories by type of loan: real estate, consumer, or commercial. The few credit training resources available at the bank were organized along these lines and taught only the simplest functions. These categories were perceived as inadequate units by which to organize future credit training because the training staff had discovered that many essential lending activities crossed categories.

3. Similarly, the bank had previously equated loan difficulty with loan size. Discussion with lenders proved that this simply was not true. Instead, loan difficulty depended primarily upon the number and complexity of interrelated factors which influenced the lending decision and which might require periodic re-evaluation.

A new list of things lenders had to deal with or know about was developed and divided into nine general and six specialized lending skills areas (Table 2). All categories were divided into three levels of expertise. These levels were based primarily on observed job responsibilities and secondarily on job titles (see Table 3). Figure 1 shows the relationship between skill areas and skill levels.

<table>
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<th>TABLE 3. Skill levels</th>
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<tr>
<td><strong>Level</strong></td>
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<td>Level I</td>
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<td>Level II</td>
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<td>Level III</td>
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Note: Adapted from Gayle Coates, V.P., Retail Bank Training, interdepartmental memo, "Loan Officer Expertise Levels," April 12, 1978.

So, from an organizational point of view, the problem was defined. Lending personnel at all levels wanted to know where they stood in terms of some agreed-upon performance standards. Once they could identify specific strengths and weaknesses, they would need access to appropriate study references and training resources.

Organization Analysis developed not only a clearer picture of the deficit situation but also built support for further assessment and potential training or other solutions. The investigation sparked interest and desire among lenders to find out what training they needed and to have that training available. Senior loan people also became enthusiastic about developing a program that would define, assess, and teach essential lending skills. Their support was essential in obtaining the budget and subject-matter experts needed to conduct the next phases of the needs analysis.

II. Operations Analysis

The next phase was Operations Analysis: finding out precisely what skills lenders needed on the job. To be useful, this information must go beyond "Make Type X loans" or "Comply with federal and bank policies"—the kind of statement often found in job descriptions of the kind Wells Fargo had thus far collected—to discrete behaviors which could be objectively assessed and specifically taught. Operations Analysis involves detailed delineation of job tasks. Working from the categorized list of lending topics developed in the first phase, training staff members and I interviewed a number of people with recognized expertise in each area to find out what they actually did—that information they used, how they used it,
Figure 1: Progression of Skill Levels

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<th>Skill Areas</th>
<th>Percentage</th>
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distinct differences in the number, pattern, and complexity of tasks performed by respondents at different designated skill levels were evident.

Questionnaire results indicated that the Task Analysis was accurate, both in the behavioral task descriptions and in the assignment of skill levels. Two descriptions were rewritten, and one of them was moved to a different level designation. Skill-level designations were removed from the specialized lending areas, as mastery of skills in these areas was related more to the type of clientele served by a given branch office than to an officer's performance profile in the more generalized skill areas listed in Table 2. A few tasks described in the specialized areas were omitted as a result of questionnaire responses and follow-up consultations which indicated that they were rarely performed.

As often happens in front-end analysis, a potentially important non-training need was identified via the Lending Skills Questionnaire. Questionnaire results showed that loan officers gradually accumulated more and more lending responsibilities as they moved up in skill. While such development may sound reasonable, the actual situation shown by questionnaire responses was that loan officers who had acquired specialized skills in dealing with more complex loans still spent major portions of their time performing the same tasks they did when they were beginning lenders. This practice could very well interfere with the achievement of one of senior management's basic goals: greater and more profitable loan activity in the more complex and specialized areas. The report of questionnaire results included this finding, identified it as an organizational, rather than a training-related situation, and recommended its consideration by bank management.

The techniques used in the Operations Analysis phase—interviewing, task analysis, and administration of a task-analysis-based questionnaire—enabled us to collect and verify a large amount of information about numerous complex job tasks performed by thousands of people relatively easily and quickly. (The Operations Analysis was completed in 2 months by two people, one of whom was assigned to the project on a less than full-time basis.) Our data collection processes also continued building enthusiasm and support for the project among lenders at all levels. Those who had been with the bank longest and were in positions of considerable responsibility were especially pleased at the thoughtful and meticulous attention being paid to the needs and wants they have expressed earlier. This support was to become critical in the third and final phase of the project: Individual Analysis.

III. Individual Analysis

Individual Analysis involves determining as accurately as possible each employee's strengths and weaknesses in the performance of job tasks identified in Operations Analysis. This may be accomplished via interviews, questionnaires, tests, employee or supervisor records of problems and achievements, devised situations such as role play and inbasket exercises, or tests (Moore & Dutton, 1978).

The function of Individual Analysis in training needs assessment is to identify which and how many employees actually have what specific skill or knowledge deficits that can be ameliorated with training. Thus, Individual Analysis is essential for making sure that the right training is delivered to the right employee. Without this step, it would be difficult for a training program to be developed or implemented in a cost-effective way. With the information provided by Individual Analysis, a training department can assign priorities and develop first those programs that are most needed and, therefore, most likely to have a visible effect on individual and corporate performance.

... mistakes, which were made by everyone, were opportunities for growth rather than occasions for intimidation.

Due to pre-established budgetary restrictions, the Wells Fargo needs assessment work had been undertaken with the constraint that, for the present, individual assessment would be limited to paper-and-pencil testing only. Thus, few of the subtle interpersonal interaction and judgment skills important in successful lending could be assessed. Only those judgments about a loan or loan application that could be presented via written material—documents, case studies, or descriptions—could be gauged at this time. While the great majority of the skills identified in the task analysis are amenable to such testing, certainly some of the more critical skills were necessarily omitted from the assessment process.

Available to support the testing program was a computer hardware-software system called "Pulse," purchased by the Training Division from Radix-Capson as part of a long-term development process and installed while the tests were being developed. The Pulse system allowed simple, timely, and complete record-keeping of employees' training status, plus test scoring, item analysis, and, extremely important to the credit skills project: (a) confidential feedback to individual employees concerning their test performance, complete with objectives and reference to training resource citations for missed items; (b) group reports by region, topic (unit), etc., for use by management, and (c) ready access to retesting as necessary to master tested skills, with feedback provided after each test. With tight control over test confidentiality ensured by the computerized system, the threat of testing minimized by the unlimited opportunities for retesting, plus confidence that test questions derived from their task analysis really would be relevant to on-the-job performance, project staff proceeded to develop a set of objectives-based lending skills tests at skill Level I. (Table 1 shows the relationship of sample test questions to the matching task analysis and questionnaire items.)

Tests for each of the nine general lending skill areas were developed by project staff members and subject-matter experts working in a team situation.

Small-scale, one-on-one test tryouts were conducted as with the questionnaire, and necessary revisions were made. The tryout-and-revise cycle was repeated as many times as necessary in order to develop valid and reliable test items.

At the same time, project staff began
a major effort to convince regional loan supervisors to use the testing program. Letters were written, support was obtained from critical senior managers, and meetings were held to introduce the testing program. At the meetings, training department representatives emphasized the confidentiality of test results and the potential usefulness of group data for assessing training needs. Despite prior and ongoing support for

Although some problems were encountered in using the computer system for the first time, the loan officers soon were sent their confidential test reports—scores plus objectives and references for items missed on each of the skill area tests—and project staff had their first group report and item analysis to study.

After the test and computer-system debugging which followed the first re-

• Collect information which would be helpful in planning and developing follow-up training resources (transition from needs assessment to program development).

Project staff were also interested in discovering whether there were any differences among the responses of junior, middle, and more senior loan officers. Equal numbers of surveys were therefore sent to officers in each group.

One hundred and sixty-three, or roughly 50 percent, of the loan officers queried completed and returned the survey: 43 junior, 42 middle, and 78 senior officers. Despite survey-identified differences in job functions among the three groups, the majority of all officers at all levels had the same opinions regarding the credit skills testing program. They accurately perceived the self-assessment and management functions of the program and were well-introduced to the program by their superiors and the training department. Respondents reported that the tests and test feedback reports were clear and easily understood. After receiving their test reports, officers saw the tests as ranging from "fairly accurate" to "somewhat inaccurate" in reflecting their actual knowledge. Split between these two judgments, junior-level officers were the least satisfied with test results.

In the process of taking the tests and using the feedback, loan officers moved from a neutral to a distinctly positive attitude toward the program. They ex-

"... the three-phase needs analysis model holds promise as a powerful means of identifying and demonstrating needs, of developing client support for testing and training efforts, and of justifying investments in training."

tested with the Level I tests. In June, a survey questionnaire (Deden-Parker & Hayes, 1979) was sent to a small but regionally representative statewide sample of 328 of the tested loan officers. The purposes of the survey were to:

• Check once more on the accuracy of the needs assessment by asking testees to identify strengths and weaknesses of the testing program; and

pressed strong support for regular and large-scale program implementation. They became involved in the restudy-test cycle and expressed eagerness for follow-up training to remediate test-identified weaknesses. In terms of preferred training modalities, officers favored, in order, classroom instruction, on-the-job training, and self-study books.

JOURNAL OF INSTRUCTIONAL DEVELOPMENT
Outcomes

The needs assessment process thus functioned successfully for Wells Fargo Bank by maintaining the problem-solving mode emphasized by Kaufman and others as an essential characteristic of such efforts. Working from Organization Analysis through Operations and Individual Analysis, training needs were more and more precisely and usefully defined. Clients were kept informed and involved so that they saw the process as an effective way to develop solutions for real performance problems. The one major deficiency in the process—indefin- itely postponed assessment of some of the subter interpersonal, judgmental, and risk-taking aspects of lending—began in Operations Analysis and was perceived by all. This deficiency could, if left unattended, possibly limit the maximum effectiveness of loan officer training. If addressed after loan officers are able to demonstrate mastery of the more basic skills and knowledge assessed by the present system, this more involved process could be seen as timely and worthwhile. It would require major client involvement, because regional and branch supervisors would have to be involved as observers or assessors. The ability to move into such a potentially sensitive area of assessment would emphasize the value of the earlier client participation and education built into the three-part needs analysis process employed throughout the project.

Meanwhile, the project has begun highlighting specific areas in which training or improved training is needed and has helped motivate officers to self-assess and to pursue such training. During the last half of 1979, Level II tests were developed and implemented. The results of Level I and Level II testing enabled the Retail Bank Training Division to compose a well-documented plan and budget request for loan officer training program development. This program development is now taking place.

Summary

The Assessment of Technical Credit Skills project conducted by the Retail Bank Training Division of Wells Fargo Bank demonstrated the implementation of the needs assessment model outlined by Moore and Dutton (1978). The model's first component, Organization Analysis, resulted in corporate priority status being given to an assessment of loan officer training needs. The second major step, Operation Analysis, yielded a behavioral analysis of 158 major lending skills in 15 job areas and three difficulty levels. At this point, the decision was made to limit analysis to skills which could be assessed via paper-and-pencil testing. This eliminated some loan officer interaction skills from the analysis. In the final step, Individual Analysis, loan officers were tested on the skills previously identified. Loan officers' performance on and response to the tests identified specific training needs and indicated that the assessment process had created a positive attitude toward further testing and training. Responses also suggested that the impact of training may be limited unless interaction skill needs are also analyzed and assessed.

Conclusions

The three-part analysis model was found in this case to be useful in planning, conducting, and analyzing the needs assessment process in a corporate training context. It provided for integration of management's expressions of felt needs with techniques of behavioral task analysis and with the need to maintain positive client involvement. The model served as a way of knowing and anticipating "what comes next" in a complex needs assessment process. Moore and Dutton's work, in particular, also offered a variety of means by which data could be collected during each analysis phase. This was helpful and should enhance the model's generalizability to a broad range of contexts.

Further studies and applications will be needed to answer such questions as: How can human resources development, organizational development, training, and personnel departments interact most effectively in and benefit mutually from in-depth needs assessment? How does this process look, and how well does it function, in larger and smaller scale training operations? Can generalizable guidelines be developed for deciding when it would or would not be cost-effective to use the complete model? How do training programs developed from in-depth needs assessment compare in form and outcome to programs derived from other processes?

At Wells Fargo Bank, the model was used in performance of a complex needs analysis in a somewhat sensitive situation. Skilled professionals, in many cases with major management responsibilities, became sufficiently convinced of the process's merits to participate in a lengthy and challenging testing process. Because the test items had been developed from a careful analysis of the tasks they performed, loan officers could see a clear relationship between test questions and job requirements. The needs assessment process thus resulted in a more positive view of testing and training as well as in a clearly defined direction for upcoming training program development. This experience suggests that the three-phase needs analysis model holds promise as a powerful means of identifying and demonstrating needs, of developing client support for testing and training efforts, and of justifying investments in training.

References


The Practicality of Algorithms in Instructional Development

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Abstract. Two of the most critical issues in instructional development (ID) are cost and time. Algorithmization promises to be a practical technology in optimizing instructional development, reducing costs, and saving development time. The notion of algorithms is briefly examined in this article. The differences between the pure, mathematical algorithms developed and applied in educational endeavors are discussed. Several algorithms employed in ID are spotlighted as examples of the varying roles they can take. The issues which set algorithms apart from other procedural forms are examined in light of available methodology for algorithms development. Some implications for developers of areas of application and research are noted. Finally, conclusions are drawn regarding the practicality of algorithms in instructional development.

More and more is being said and written about the use of algorithms in education. Landa’s Algorithmization in Learning and Instruction (1974) served as a major stimulus to inquiry and discussion of the merits and purposes of algorithms. Merrill (Note 1), Gerlach and Brecke (Note 2), and Brecke, Gerlach, and Shipley (Note 3) have reviewed the literature on the educational applications of algorithms in the United States and Europe. By 1978, articles on the use of algorithms in education were appearing in the professional literature (Bung & Carrasco, 1977; Coscarelli, 1978; Gerlach & Hagan, 1977; Gerlach, Reiser, & Brecke, 1977; Kopstein, 1977).

Recently the use of algorithms as tools in instructional systems development (ISD) has begun to receive direct attention (Mager, 1973; Aagard & Braby, Note 4). However, those reports of attempts to algorithmize certain tasks of functions in instructional development (ID) have dealt only circumspectly with the practicality of algorithms in the applications. It is the purpose of this discussion to examine that practicality.

Algorithms Defined

Merrill (Note 1) reports numerous uses of algorithms in instructional development, particularly in the areas of task analysis and applying instructional strategies. However, although algorithms have a wide variety of uses and serve an important role in instructional systems development, they are not a panacea for all the problems encountered in the design of instruction (United States Army Adjutant General School, Note 3). According to Korthage (1966), if a method is known for the solution, a problem need not be understood at all. However, in such a situation the method of solution must be specified exactly and in a language the user can interpret. Algorithms are exactly specified methods for problem solution which can permit educational practitioners to reliably perform certain ID tasks. Lewis, Horabin, and Gane (Note 6) define an algorithm as an orderly sequence of instructions for solving a problem. Landa (1974) defines an algorithm as “a precise, generally comprehensible prescription for carrying out a defined sequence of elementary operations in order to solve any problem belonging to a certain class (page 17).” Gerlach, Reiser, and Brecke (1977) describe an algorithm as:

... a procedure which possesses two attributes: generality and resultivity. If a procedure is applicable to a class of problems as opposed to a single problem, it is said to possess generality. If application of the procedure always leads to a correct result, the procedure is said to possess resultivity. (p. 14)

Knuth (1968) defines an algorithm in terms of five important features:

1. Finiteness. An algorithm must always terminate after a finite number of steps.
2. Definiteness. Each step of an algorithm must be precisely defined; the actions to be carried out must be rigorously and unambiguously specified for each case.
3. Input. An algorithm has zero or more inputs.
4. Output. An algorithm has one or more outputs, i.e., quantities which have a specified relation to the inputs.
5. Effectiveness. All the operations to be performed in the algorithm must be sufficiently basic that they can in principle be done exactly and in a finite length of time by a person using pencil and paper.

Markov (1962) lists the following three features as characteristic of algorithms:

1. Definiteness. The precision of the prescription, leaving no place to arbitrariness, and its universal comprehensibility.
2. Generality. The possibility of starting out with initial data, which may vary within given limits.
3. Conclusiveness. The orientation of the algorithm toward obtaining some desired result, which is indeed obtained in the end with proper initial data.

Korthage (1966) presents another perspective on the definition of an algorithm. He generally defines a semiauthorized algorithm as a procedure, used (rather) blindly to solve a problem, which succeeds after finitely many steps whenever the problem is solvable. He suggests
that in addition an algorithm solves a related problem: Does the given problem have a solution?

Korfhage addresses some practical considerations for the use of algorithms. Although he writes of devices, meaning computer (electromagnetical) forms, one could substitute instructional developer for device without damaging the message. Making a substitution, the message is: The algorithm must be compatible with the [instructional developer]. That is, it must be in a “language” which the [instructional developer] can comprehend, and must be a procedure which the [instructional developer] is capable of executing.

The preceding definitions clarified the theoretical construct of mathematical algorithm. However, Landa (1974) suggests that in education or the social sciences, the absolution of the mathematical algorithm is probably not attainable. He goes on to temper the rigid concept of an algorithm somewhat by defining what appears to be a more realistic concept—the quasi-algorithm.

Landa defines a quasi-algorithm as a prescription having a number of the essential traits of algorithms but lacking certain others, primarily univocality. Univocality exists when every user assigns the same label to an attribute or defines a concept the same way. Landa suggests that for further educational discussion the label algorithm, or algorithmic process, is acceptable if the term’s limitations are understood—that univocality may not exist. Landa is not alone with his concept of a quasi-algorithm. Korfhage (1966) and Lewis, Horabin, and Gane (Note 6) refer to the concept as a semi-algorithm. Good (1973) and Merrill (Note 1) use the term heuristic. As a matter of fact, Good defines a heuristic as a procedure which may be compared with an algorithm yet may not always yield the desired output, thus defining the terms heuristic and quasi-algorithm (or algorithmic process) as synonymous. In an attempt to clarify the definitional issue, Breckie et al. (Note 3) proposed working definitions which distinguish quasi-algorithms from procedures and true algorithms.

While Landa described the differences between a mathematical algorithm and an algorithmic process in education at length, Good came right to the point and identified the important difference, An algorithmic process (heuristic), while possessing nearly all of the credentials of a mathematical algorithm, contains one significant flaw: that is, the algorithmic process may not yield the desired result every time.

Why does the algorithmic process fail occasionally? Landa (1974) suggests two probable causes: the lack of univocality, and the difficulty of recognizing the attributes. While recognizing the second reason, he casts most of his support to the univocality issue, the attribute of the algorithmic process which others

Groppper (Note 9) employs an algorithmic approach to instructional systems development. Gropper’s 11-volume ISD procedure appears to be the most complex and extensive algorithmic process in instructional development. Other examples of algorithms employed in instructional development are included in the U.S. Air Force’s Handbook for Designers of Instructional Systems (Note 10), a 5-vol. set, and Sweczy and Pearlmstein’s Developing Criterion-Referenced Tests (Note 11). A handy al-

"An algorithmic process (heuristic), while possessing nearly all of the credentials of a mathematical algorithm, contains one significant flaw; that is, the algorithmic process may not yield the desired result every time."

(Knuth, 1968; Markov, 1962) call definiteness or universal comprehensibility. Landa suggests that pedagogs (or educators) have some difficulty in defining the concepts they employ so that examples are always correctly classified.

As Landa (1974) pointed out, it is likely that many if not most algorithms or algorithmic processes applied in education or the social sciences would also be classified as quasi-algorithms. With that qualification in mind, then, what is the nature and future of algorithmic processes, or quasi-algorithms, as a practical technology in instructional design and development?

Examples and Current Applications

Use of algorithms in instructional design and development is expanding rapidly. Numerous examples of applications can be found in the literature. The Far West Laboratory for Educational Research and Development (Note 7) has devised an algorithm called ALERT (Alternatives for Learning through Educational Research and Technology) for selecting instructional materials to fill certain needs. Branson, Rayner, Cox, and Hannum (Note 8) developed an algorithm for reviewing and selecting existing instructional materials during instructional systems development. Merrill (Note 1) lists several examples of instructional design algorithms ranging from task analysis to prescribing instructional strategies.

gorithm for determining objective/test item match has been prepared by Maggie (1973). Indeed, it is difficult to find recent complex ISD models that do not appear to employ an algorithm (quasi-algorithm) somewhere in their procedures.

Instructional management has provided fertile ground for the application of complex algorithms for resource management as well as record keeping and the management of instructional strategies. Two of the most impressive applications are the U.S. Air Force’s Advanced Instructional System and the U.S. Navy’s Systems Capabilities/Requirements and Resources Model (SCRR) (TAEG, Note 12). A portion of an SCRR algorithm is included here as Figure 1.

Hansen, Brown, Merrill, Tennyson, Thomas, and Kribs (Note 13) employed several algorithms in their adaptive instructional models (AIM). AIM was the theoretical framework for the U.S. Air Force’s Advanced Instructional System (AIS). Twelve learning algorithms (instructional strategies) for 12 types of training objectives have been prepared by Aagar and Braby (Note 4). A portion of one such algorithm is illustrated in Figure 2.

A closer inspection of Aagar and Braby’s learning algorithm for identifying symbols reveals these vital statistics:

- The algorithm is based on 11 guidelines derived from the literature on psychological learning principles.
- It contains 34 elements (attributes and operations).
Additional individualization of the instruction is provided by 11 loops. It should be appreciated that the algorithm is complex; Figure 2 illustrates only a small part.

Earlier in this article it was pointed out that the algorithms applied in education were subject to occasional failure because pedagogists had difficulty in defining the concepts and principles they employ. The Aagard and Braby algorithm highlighted here (as well as the other 11 in the set) is based on such concepts and principles and therefore suspect.

In a test situation (Braby, Parish, Guitard, & Aagard, Note 14), the algorithm was applied in the development of signal recognition training for the U.S. Navy. In this case it worked; validated instruction was developed. It is possible that the relative ease with which validation was achieved is attributable to the use of the algorithm, although there is currently no way to isolate that contribution. The validation issues will be discussed later.

Just how was the algorithm employed in the development? The learning algorithm for identifying symbols was employed as the instructional strategy. To use it the developers compiled a data base of symbols, referents, mnemonics, criterion test items, and suitable reinforcement statements. The algorithm specified the data base requirement and then, when the data base was in order, managed the instruction by controlling student movement through the data base. The utility of the algorithm is that a proven strategy for instruction need not be "reinvented" for each development, and the algorithm defines the data base, thus clarifying the elements of the instruction which must be developed. The application of the algorithm during the development of instruction on identifying symbols reduces the time and effort involved in arriving at an instructional design. After all, the algorithm constitutes the design—and it is already developed.

Learning to identify symbols represents a very complex skill to be learned. This is the instructional arena in which the use of ID algorithms can make a significant contribution. Ob-
Previously, once the algorithm is validated, it can be used over and over, requiring only the definition of the data base (examples, test items, rules, etc.) for the objective at issue. This is extremely important for a production-minded agency whose bottom-line concern is the production of cost-effective instruction.

**Issues of Development and Application**

Although it appears that algorithms are being designed and applied in all phases of instructional design and development, few if any of those who have developed algorithms for instructional design and development have made any true effort to validate their contributions. As a matter of fact, from among all of the sources reviewed here, only one mention was made of validating instructional design algorithms—by Aagard & Braby (Note 4) regarding their 12 learning algorithms. They cautioned readers and users of their document that the 12 algorithms were not validated.

Several of the documents cited here for their use of algorithms were evaluated through formative trial (Branson et al., Note 8; USAF AFP 50-58, Note 10; Swezey & Pearlstein, Note 11). However, in each of these cases the evaluation involved the documents' ability to convey the processes and not the predictive validity of the algorithms themselves.

It can be concluded, then, that the practitioners of instructional design and development recognize the ability of algorithms, even quasi-algorithms, to produce fairly reliable results and to be both efficient and effective. Whether the apparent lack of concern about validation stems from a recognition of the difficulties surrounding validating algorithms or whether it stems from the belief of some practitioners that their algorithms are valid by definition, is not clear. What is clear is that either researchers in instructional design and development are not attempting to validate their algorithms, or they are not reporting their attempts.

Essentially, two types of algorithms are dealt with in instructional develop-
ment. There are algorithms which operate as managers of instruction, such as instructional strategies and resources; the two algorithms in Figures 1 and 2 are of this type. There are also those which select or develop the instructional materials. The test item/objective match algorithm advocated by Mager (1973) is of this developmental type. The validity of the instructional algorithms can be verified directly through the performance of the learners. However, the validity of the developmental algorithms can only be inferred through the performance of the learners.

One of the most difficult issues in validating instructional development algorithms stems from the fact that the product of an algorithmic process (i.e., a test item) must be combined with other elements of the instructional system. Many developmental processes, algorithmic and nonalgorithmic, interact to develop the instructional system. This entire instructional system is then subject to validation.

Apart from the validation issue, the use of algorithms appears to be gaining popularity in instructional design and development as a practical technology. As attempts are made to translate the products of research in instructional design and development into field-useful concepts and rules, algorithms apparently provide a logical technology (Carvahlo, Roiser, & Breckle, 1977).

The use of algorithms as the structure for many of the processes of instructional design and development ... the effort to evaluate quasi-algorithms helps us to identify those steps which are ambiguous, which leads to the need to refine our concepts. It leads us to refine the definitions and identify a large enough set of examples and non-examples such that it is possible for others to classify examples and non-examples with greater precision.

Many instructional design principles and concepts, as well as other educational concepts, suffer from ambiguity which inhibits their effective use. Some of the principles heretofore granted unrestricted application in instructional design may have only limited usefulness. It is doubtful that the ambiguity can be entirely removed from some educational postulates such as the events of instruction (Gagné & Briggs, 1974). Such postulates form the cornerstone of modern instruction and as such may be the reason education is classified as an art rather than a science. Algorithmization of the designing of instruction can isolate these principles for systematic investigation and improvement.

The quasi-algorithm is certainly a viable alternative to the algorithm if two assumptions are recognized: that the general shortcoming of the quasi-algorithm (i.e., it does not always yield a correct result) is acknowledged; and that the application of the process can be validated so that it can be viewed as acceptably reliable. The first condition is simply a matter of acknowledgement. However, the second condition is not universally achievable.

Any further study of instructional development algorithms should include attention to the methodology employed in validating the application of the algorithms. The subjective elements should be reduced in favor of the objective elements. Horabin (Note 16) advocates an algorithmic process for validating algorithms. However, the process includes only the opinion of a panel of experts. Two major questions concerning the validation process should be asked: 1) How was the criterion correctness determined? and 2) Are the experts representative of the user population? If criterion correctness is based on opinion rather than definition, the best one could report would be that the application of the algorithm would have face validity. For instance, if the algorithm was intended for use in selecting instructional materials in a criterion-referenced instructional system, then to select materials simply on the opinion that they would be valid in the instructional system would set up a face validity situation. It would be much more meaningful if the application of an algorithm to some instructional development task had some predictive validity.

According to Nunally (1967), "Predictive validity is at issue when the purpose is to use an instrument to estimate some important form of behavior, the latter being referred to as the criterion" (p. 76). With regard for the second concern stated above, then, if the subjects used in validating the algorithm are not representative of the user population, one could certainly question the algorithm's validity since it was not evaluated within its operational context. One could argue that training of users is really at issue here. However, we return to the criterion performance again: Was the criterion that a select expert could use the algorithm or that some other defined subject (or class of users) could use the algorithm? If one accepts Landy's (1974) condition of univocality, the training issue must precede the validation of the algorithm and only users can be employed in the validation study. There may be many acceptable procedures for establishing that the application of an instructional development algorithm is valid. Whatever the procedure employed, it should adhere to the principle that in order for the application of an algorithm to have predictive validity, the product of the algorithm must perform as intended.

Although it appears that algorithms are being designed and applied in all phases of instructional design and development, few if any of those who have developed algorithms have made any true effort to validate their contributions. However, the second condition is not universally achievable.

Only when the methodological issues of validation have been resolved will instructional development algorithms be viewed by potential users with regard to their true usefulness. At present, users accept the algorithms they use because they believe they work better for them than any other technique they have reviewed. The decision to use any instructional development algorithm remains an intuitive rather than an objective one.
Implications for Developers

For those concerned with instructional development, the implications of algorithmization fall into essentially two categories: using algorithms and quasi-algorithms in instructional development and conducting research in instructional development with the aid of or in regard to algorithms.

Using algorithms and quasi-algorithms in instructional development allows the use of less highly skilled persons in ID. Algorithmization of certain tasks would permit many of the ID activities now performed by graduate level professionals to be performed by technicians with less sophisticated training. The realized personnel savings would certainly enhance the cost-benefit of the ID. In addition, algorithmization standardizes both processes and the products of ID where standardization is desirable, and provides a way to insure high standards in developmental activities. Standardization is probably more important in large ID operations where technicians are being employed in certain tasks. When standardization is employed, day-to-day operational communications are simplified. As anyone who has worked in large-scale ISD knows, clear, simple communications are critical to efficient operation.

Research areas in the application of algorithms and quasi-algorithms include the general study of ISD and its functions, subfunctions, and elements. There appear to be four degrees of specificity in the systems approach to instructional development:

1. The ISD model or paradigm.
2. Procedures based on a chosen model.
3. Quasi-algorithms imbedded in, or instead of procedures.
4. Algorithms imbedded in, or instead of procedures.

Attempts at algorithmization in degrees 2 and 3 can assist in the improvement of instructional development by revealing issues of ambiguity and invalidity in currently accepted theory and dogma. Another area for research centers on development of algorithms for simulation, prediction, and management of ID resource allocation. This has particular import for large-scale ID operations and has already received some attention (O'Neal, Note 17). Finally, a fertile ground for researchers is the validity of Aagard and Braby's (Note 4) algorithmic algorithms.

Summary

Numerous attempts have been made to apply algorithmization to instructional systems development, thus saving time and reducing costs. However, the practitioner as well as the researcher should be cautious against blind acceptance of published "algorithms,” which are probably quasi-algorithms, meaning that they do not always yield the correct result. The issue of validation of instructional development algorithm is by no means resolved; however, if the ISD practitioner uses the algorithms with due caution distinct savings in time and expense may be realized. Additionally, the use of algorithms will provide an ideal framework for carrying out developmental research in instructional development.

"Any further study... should include attention to the methodology employed in validating the application of the algorithms. The subjective elements should be reduced in favor of the objective elements.”

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Utility and Self-Sufficiency in the Selection of Educational Alternatives

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Abstract. Methods of deciding among educational programs usually have taken too narrow a focus or have been unsystematic. A set of guidelines for selecting among alternative programs would be helpful to the decision-maker who must design new programs, continue existing ones, or modify and synthesize the old and the new. This paper provides a possible set of decision rules for identifying and choosing among educational programs based on the underlying requirement that each learner reach at least self-sufficiency. It proposes a two-level decision model that is intended to accommodate people in society who are self-sufficient or who are "on target" for reaching that state and those in society who are neither self-sufficient nor moving toward that state. Both a rational and mathematical model are presented; both require empirical validation and continued thought.

Introduction

Dissatisfaction with the results of our public educational system has triggered a search for better ways to instruct learners. Moreover, there is a growing awareness that merely tinkering with classroom methods will not suffice. Attention is being expanded from "how to teach" to include formal consideration of "what to teach" and, finally, justifying "why teach what we teach" (Kaufman & English, 1979). The "why" is a critical issue, only now receiving the attention it has long deserved. Contemporary concern is becoming more focused on determining goals and objectives for education that are both measurable and justifiable.

Schools have begun to identify goals and objectives using a variety of approaches. School boards may set goals using "arm-chair" philosophy (which unfortunately often turns out to be some form of "develop each child to his or her own capacity") or they may use a more sophisticated "needs assessment procedure" (cf. Witkin, 1977). Almost all existing statements of need (and of derived goals and objectives) refer to "how-to-do-its;" it is more productive, however, to look at "needs" as gaps between current outcomes and desired outcomes (Kaufman, 1972; Kaufman & English, 1970). By so doing the agency is more likely to design interventions that will successfully meet these needs not just develop "wish lists" of desired resources or processes. The purpose of this paper is to suggest criteria for the "required outcomes" portion of a rigorous need assessment (i.e., goals, objectives) so that needs will be properly identified and interventions appropriately selected.

We suggest that objectives best relate to useful and acceptable social goals, namely preparing learners to survive, be self-sufficient, and contribute in today's and tomorrow's world. Although successful completion of a particular educational course may be a precursor to the student's ability to succeed in society, it is the success in the societal context itself which is desired. Therefore, it is suggested that both planning and evaluation criteria for education and associated curriculum and programs be based on the performance of the learner in society, rather than within the more restricted ambit of the educational system. Some educators (cf. Popham, 1975) reject the usefulness of the concept of the societal referent for planning and evaluation, claiming that employing it is too complex. We submit that it is just this complexity that must be addressed, understood, and serve as the basis for further research, development, and evaluation (Kaufman & Thomas, 1980).

This paper proposes a simple model for evaluating educational interventions based on such wider "social" indicators.

Education as "Public Good"

Education is a "public good" in the microeconomic sense (cf. Nicholson, 1972; Henderson & Quandt, 1971): some of the benefits of education flow to one's neighbors and associates, and the market system provides no means of individually charging the recipients of these desirable "externalities." Left to the private (nongovernmental) market, individuals would be inclined to underinvest in education, because the benefits they perceive would be less than the true gain to society as a whole. Education does have a consumption component. Many individuals may pursue education partly for current enjoyment, rather than as a means of enhancing future economic and social prospects. This tendency works counter to the propensity to seek suboptimal education, although it still may be argued that the schooling

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pursued for consumption purposes has few positive public benefits, i.e., externalities.) This characteristic argues for public education: only when aggregated to the level of society as a whole will benefits be correctly measured and allocation decisions optimally made.

The educational agency is established as the means of efficiently producing the socially optimal quantity and quality of education. But the agency is nothing more than that: an instrumentality—its goals should be consistent with and contributive to society's goals. So on the one hand we must charge the agencies with the proper allocation of the public good aspect of education. And conversely there is a presupposition that public enterprises should not be used to generate purely private returns. Virtually anything one might learn could have spillover (private) benefits, and public education certainly has this characteristic. In order to focus on the public good aspects, however, we shall suggest that the identification and ranking of objectives for the educational system would begin with those having the greatest social (as opposed to private) effects. We propose two hypotheses:

- The goals of an education agency should be external to the agency itself, rooted in the current and future values of society; and
- Those goals should emphasize the public good aspects of education relative to those aspects conferring more purely personal benefits.

The following two sections of the paper will amplify these points, and a model for achieving them will be developed subsequently.

Organizational Goals and External Criteria

From a societal perspective an organization is a means to achieve social ends. Organizations may function smoothly yet fail to meet the goals which society has set for them. Typically, programs and resource allocations are based on efforts within the organization and results—inputs, processes, products, and outputs—and thus measure the success of the organization in meeting internally set goals rather than formally considering the usefulness of that which the organization delivers to society. We hold that organizations should plan and be evaluated in terms of outcomes—the value of its outputs external to the organization (Kaufman & English, 1979). In considering this important relationship between means and ends the following definitions are useful:

An input is any resource (ingredient, raw material: factor to production; goal or objective to be achieved; need) which is available for possible use or mandated to achieve valued results (e.g., product, outputs, outcomes).

A process is any method, procedure, tool, or technique which is used to convert inputs into “products” (see below).

A product is any en-route (to an output) result obtained, usually at the course or course element level.

An output is a set of organizational accomplishments for which inputs have been obtained, processes run, products achieve, and all three aggregated to yield a total organizational result. Examples of outputs would be numbers of college students graduated, high school diplomas awarded, or vocational certificates granted.

An outcome is the impact and utility of any one or set of outputs in society, as indicated by an individual's ability to survive and contribute in society. (In earlier work this term "survive" was used. We will, in the balance of this paper, substitute "self-sufficiency" for "survival." Included in "self-sufficiency" is the ability to be self-reliant and not dependent upon others for handouts or charity.)

Figure 1 presents these relationships between internal and external factors. Many existing educational programs exclusively use goals and objectives which are internal to their agency or system. Thus, goals for a school might be to produce graduates, or provide those finishing the program with job-entry-level skills. These goals—actually educational system outputs—are likely to be more useful if first related to external outcomes, such as enabling each learner to be self-sufficient and to contribute in society upon legal exit from the educational agency. Seen in this manner, organizational outputs are useful to the extent they are related to useful outcomes (Kaufman, 1979).

In society today, some reach or exceed self-sufficiency (earned income enough to survive without public assistance) and some do not with current curriculums and programs, even though learners may be meeting the internal goals of the educational system. Thus we see high school graduates who cannot find and hold jobs. Moreover, even the organizational goals themselves are not all being met (e.g., learners who fail to graduate from high school).

Educational agencies must not only change some of their objectives to align them with current and future social utility, but they must also become more effective at achieving the objectives that are set. As a first step, socially desired

Continued on page 23.

FIGURE 1. The relationship between organizational efforts and results and societal results. "Internal" refers to the organizational efforts and results because these pertain to what goes on within and results from any organization. The elements of organizational efforts and results are: inputs, processes, products, and outputs. The effects and impact of the sum of these "internal" elements in society (external) are termed "outcomes." (Based upon Kaufman, 1979, and Kaufman & English, 1979)
INTRODUCTION

For many instructional developers the following situation is probably not an unusual one:

You have just received a telephone call from a department chairperson you do not know very well. She tells you she is responsible for organizing a professional development workshop for her faculty. The “preparation of instructional objectives” was chosen as the topic for the workshop. The chairperson states that you were recommended to conduct the workshop. You decide to accept the invitation because you see an opportunity to work with a new group of faculty members. Your task now is to plan the workshop.

Instructional developers are frequently asked to conduct workshops for a variety of different audiences. Workshop requests may be accepted before developers have a clear understanding of the audience and exactly what the audience needs to know about the topic. Attempting to conduct workshops without initially obtaining such information can be disastrous for both the instructional developer and the workshop audience. This training module will apply some of the concepts from needs assessment to the planning of effective workshops. Several strategies will be suggested for conducting a workshop needs assessment within the practical constraints of limited time and resources.

At the completion of this training module, the reader should be able to:
- Explain the consequences of not conducting a workshop needs assessment
- Identify initial information to be collected before accepting a workshop request
- Explain the different strategies for conducting a workshop needs assessment
- Formulate needs assessment questions that obtain information useful for workshop planning
- State the criteria for selecting a workshop needs assessment strategy

Why Assess Workshop Needs?

There are a number of options available to instructional developers for determining the learning needs of a workshop audience. The easiest option is to ignore assessment of learning needs altogether and plan the workshop based upon personal beliefs and assumptions about the audience. While this may be the easiest option, it is probably not a wise one because it may create a variety of problems. Specifically, the consequences of not assessing the learning needs of a workshop audience include:
- Giving the audience information they already have
- Giving the audience information they cannot use
- Not meeting the audience’s expectations for the workshop
- Misjudging the importance of the workshop topic to the audience

In other words, there is a high likelihood that failing to conduct any form of a workshop needs assessment will result in errors that may be costly to the instructional developer and the audience. Conversely, few developers have time to design and implement the formal needs assessment procedures typically referenced in journals and textbooks. Somewhere between the extremes of doing nothing and conducting a formal and exhaustive needs assessment is a point that represents a reasonable effort on the part of the developer to determine the content and strategies of the workshop.

In the sections that follow, a variety of different workshop needs assessment strategies will be suggested. Decisions regarding what strategies to use and what questions to ask will depend upon the nature of the workshop, the audience, and the developer’s familiarity with each. Some strategies will clearly require more effort than others; however, any one strategy is better than doing nothing at all.

Initial Needs Assessment Checklist

From the initial telephone call requesting the workshop, instructional developers can begin collecting information
for workshop planning. By having a brief checklist easily accessible, the developer can begin asking fundamental questions to help determine whether the workshop request is reasonable and to help make subsequent workshop planning less tedious. The checklist shown in Figure 1 is but one example. Such checklists will be most helpful when the questions are tailor-made by the developer.

By using the Initial Checklist, the developer can make an informed decision about whether or not to accept the workshop request. Also, by completing the checklist, the developer has already collected information that will be helpful in planning the workshop.

Instructions: Obtain answers to the following questions during the Initial workshop request and before agreeing to conduct the workshop.
1. Who is making the workshop request? (Relationship to audience?)
2. What is the purpose of the workshop? (Use the respondent's words.)
3. Who is the potential audience?
   a. Is their attendance voluntary?
   b. How many will attend?
   c. What are the duties and backgrounds of the audience?
4. What are the audience's expectations for the workshop?
   a. To be informed?
   b. To be motivated?
   c. To be skilled?
5. How much time is available for the workshop?
6. Where will the workshop be held?
7. What are the telephone number of individuals who will be attending the workshop?

Figure 1. Initial Checklist.

Workshop Needs Assessment Strategies

Assuming the workshop request has been accepted, the next step for planning effective workshops is to simplify and confirm the information obtained from the Initial Checklist. Given the constraints of time and resources, what are the different strategies instructional developers can use to collect this vital information? Eight different workshop needs assessment strategies are presented below. Each strategy may be used singly or in combination with other strategies. Also, remember that each strategy can be used not only with the workshop audience, but also with the audience's superiors and subordinates to confirm information. The workshop needs assessment strategies are:

1. Personal Interview—Prepare a series of questions about the workshop and interview a sample of the potential audience. Ask the audience what they see as their needs, what they know about the topic, what they would like to do, etc.
2. Telephone Interview—Similar to the personal interview; prepare a series of questions and telephone a sample of the audience.

3. Written Questionnaire—Have the workshop audience complete a brief written questionnaire with in-depth responses to needs assessment questions.
4. Preworkshop Letter—Send the workshop audience a letter which describes the tentative goals, agenda, and strategies of the workshop. Request their feedback on the importance and relevance of the workshop plan.
5. Observation—For some workshop topics, it is possible to observe members of the audience performing a job-related skill. Also, it may be possible to observe products developed by the audience to determine their mastery of the topic.
6. Interview Past Presenters—Valuable information about the audience may be obtained by interviewing someone who has previously conducted a workshop for this audience.
7. Talk to Early Arrivers—By talking with those members of the audience who arrive early, it may be possible to conduct a "mini-interview" to determine their problems, needs, and motivations for attending the workshop.
8. Problem Posting—if it is impossible to contact the audience prior to the workshop, begin the workshop by asking the audience to identify their problems related to the topic, and the questions they would like to have answered during the workshop.

If after collecting the workshop needs assessment information, there is still some confusion over what exactly the workshop should address, proceed carefully. Recognize that the person requesting the workshop may represent one view of what is needed. Others, such as the workshop participants, may have entirely different perspectives. Also, those contacted may have been expressing their wants instead of their needs. In such cases, it may be necessary to collect additional information from other sources, or use additional needs assessment strategies. This process can be continued until the instructional developer feels sufficient information has been collected to conduct an effective workshop.

PRACTICE EXERCISE 1: SELECTING STRATEGIES

Situation:
Assume you have agreed to conduct the workshop on "instructional objectives" described earlier in this module. From your Initial Checklist, you know the workshop will be given 2 weeks from today. There are 50 faculty members in the department, all are currently teaching undergraduate or graduate classes. Some of the faculty have developed objectives for their courses and some have not. The workshop is scheduled to last 3 hours. You have a limited amount of time between today and the workshop to assess the learning needs of the audience.

Task:
1. Selecting different needs assessment strategies:
   1. Using the list of different needs assessment strategies, identify which strategy or strategies you would use to prepare for this workshop.
   2. List each strategy you would use and who you would interview.

After you finish, compare your responses with the solution presented at the end of this module.
Formulating Needs Assessment Questions

Many of the workshop needs assessment strategies presented in the previous section depend upon posing questions to individuals. The way these questions are formulated may greatly influence the type of information obtained. For example, consider the following two questions:

1. “Do you understand what ‘enabling objectives’ are?”
2. “What does ‘enabling objectives’ mean to you?”

There are several critical differences between these two questions. The first question is called a closed-ended question because it requires only a single-word answer. While this format allows an easy response (from the person being interviewed), it will not always provide the instructional developer with information crucial for workshop planning. First, many people would hesitate to answer “no” to the first question because they might appear to be ignorant (resulting in a deceptively high number of “yes” answers). Second, whatever a person answers, there is no certainty that the answer is valid because the judgment is made by the person responding and not the developer. That is, individuals may honestly believe they know what “enabling objectives” are; however, they may be totally incorrect.

The second question is considered an open-ended question because the respondent is free to answer in any way believed appropriate. It is more difficult to summarize the results of open-ended questions; however, such questions have several advantages over closed questions. Because the open-ended question requires the respondents to answer in their own words, a great deal can be learned from how a person answers the question. For example, if an individual responds with a “textbook” answer, he or she probably has a high level of knowledge about the subject matter or has encountered the topic. Conversely, someone who answers with a popular though incorrect response probably has been exposed to the topic but is misinformed. Another advantage of open-ended questions is that an attitude can often be inferred from the answer. That is, if a member of the workshop audience answered, “I don’t really care what enabling objectives are,” the developer could easily predict that person’s attitude toward the workshop topic.

The following are general guidelines for developing better questions when collecting needs assessment information:

1. Be specific and clear about the information to be obtained from the question. Is understanding of the topic being assessed? Prerequisite knowledge? Attitudes? Expectations?
2. Ask only questions that will actually be used to help plan the workshop. It may appear necessary to ask certain questions, but if the responses will not influence the content or strategies selected for the workshop, such questions are a waste of time for the developer and the respondent.
3. After the questions have been drafted, try them out on a person whose background is similar to the workshop audience’s. Sometimes a question may not be asking what is intended.
4. Eliminate all unnecessary professional jargon.
5. Limit each question to one main point.

Selecting Needs Assessment Strategies

With so many different needs assessment strategies available, how does the instructional developer decide which strategies to use, and where to stop? The selection of appropriate workshop needs assessment strategies can be determined by answering the following questions:

1. How confident must I be of knowing the learning needs of the audience? If the workshop topic or audience is unfamiliar, it may be necessary to use several strategies and collect information from different sources to confidently assess the audience’s learning needs. Conversely, if audiences familiar to the developer, the need for in-depth information may not be as great. As the need for confidence increases, so should the number of needs assessment strategies and the different sources of information.
2. How much time do I have? The amount of time between the workshop request and the actual workshop may determine the available needs assessment strategies. Some strategies, such as the written questionnaire, observation, and the personal interview, require a great deal of time to complete and analyze. Other strategies may not yield as much in-depth information, but they can be quickly and easily completed by the developer.
3. How can I get the most information with the least amount of effort? Certain needs assessment strategies, such as the written questionnaire, can be administered and tabulated by others. Depending upon the availability of resources and support personnel, it may be possible to select needs assessment strategies to obtain the necessary information without a great deal of personal effort.

Assessing the learning needs of a workshop audience is not an end in itself. Rather, it is a means to an end. By asking these three questions, it should be possible to select the appropriate needs assessment strategies and sources of information to design effective workshops.
PRACTICE EXERCISE 3
APPLYING THE CONCEPTS

Situation:
Several months ago, you submitted a proposal to your professional association to conduct a training workshop on "designing instructional simulations" at the association's annual meeting. The professional association accepted your proposal. The association's program committee tells you you have 3 hours to conduct the workshop and that 17 people from across the country are enrolled. You have been allocated $50.00 to cover the costs of preparing materials and conducting the workshop, which will be conducted 6 weeks from today.

Task:
Using the information presented in this training module and your own experiences, complete the following tasks:
1. Identify the needs assessment strategies you would select to prepare for this workshop.
2. Categorize the strategies into areas you could conduct before the workshop and during the workshop.
3. Identify the different sources of needs assessment information.

After you finish, compare your responses with the solution presented at the end of the module.

Summary

- Although a workshop needs assessment does take time, the alternative of doing nothing creates a high risk of serious and costly errors.
- It is possible to begin a workshop needs assessment from the first contact by using the Initial Checklist.
- The workshop needs assessment may use a variety of different strategies, depending upon the purpose of the workshop and the constraints upon the developer. Further, using more than one needs assessment strategy will help determine the accuracy of the information.
- The way needs assessment questions are asked will greatly influence the quality and accuracy of information.
- Some workshop needs assessment strategies are more complex and demanding than others. However, by asking questions about the amount of time available, the level of confidence and the cost-benefits of various strategies, instructional developers can tailor-make a needs assessment plan to assist in the planning of effective workshops.

Additional Readings

SOLUTIONS TO PRACTICE EXERCISES

Exercise 1: Selecting Strategies
While there are many ways to assess the audience's learning needs for this workshop, here is one possible plan:
1. Confirm the departmental chairperson's perspective of the need for the workshop by telephoning a sample (four to five members) of the departmental faculty.
2. Observe course objectives developed by the departmental faculty.
3. Mail a preworkshop letter to the departmental faculty describing the reason for the workshop, the workshop objectives and agenda, and materials the audience should bring to the workshop.
4. Talk to the early arrivals.
5. At the beginning of the workshop, ask faculty members to identify questions they have about instructional objectives and post them on a flipchart for later use.

Three strategies were not selected for this problem: The personal interview and written questionnaires were not selected because of the time required; there was no previous workshop presenter to contact for this audience.

Exercise 2: Formulating Questions
The following are possible questions to ask faculty members in conducting the needs assessment for the instructional objectives workshop. They represent suggested questions formats, but not all possible questions.

Faculty Knowledge
- What does the term "learning conditions" mean to you?
- How do you use instructional objectives in your courses?

Faculty Attitude
- Do you believe objectives are necessary for effective teaching?
- Why or why not?
- What disadvantages can you see in using objectives? Advantages?

Faculty Expectations
- What problems have you experienced in using instructional objectives?
- What questions about instructional objectives would you like to have answered during the workshop?

Exercise 3: Applying the Concepts
Here is one possible way to conduct the audience needs assessment for the workshop:

Before the Workshop:
1. Contact the professional association (by phone or letter) to get the names, addresses, and telephone numbers of those registered to attend the workshop.
2. Conduct a telephone survey of a sample (four to five members) of the audience. Interview each to determine knowledge of the workshop topic, attitude toward the topic, and personal expectations for the workshop. Or prepare a written questionnaire asking the same questions and mail it to all people currently registered for the workshop.
3. Talk with someone at the association or past presenters to learn the procedures, timelines, norms, and resources for conducting workshops.
4. Interview colleagues to get their reactions and input to the tentative workshop objectives, agenda, and strategies.
5. As people arrive for the workshop, briefly interview the early arrivals to find out what they already know, what they would like to know, etc.

During the Workshop:
1. Ask the audience to complete a brief pretest. This provides an early indication of the audience's mastery of the workshop topic.
2. When asking the audience to introduce themselves to the entire group, also ask them to share their reasons for attending the workshop and what they would like to learn.
outcomes should be identified for the agency; this important step is often ignored or accomplished only informally. The next task is to identify measurable outputs of the agency which are linked to the identified desirable social outcomes. Researchers in education have only recently begun studying the links between outputs and outcomes, and effort requiring new skills for those who have heretofore been concerned solely with the links between processes (e.g., teaching methods) and products (e.g., courses completed) and/or outputs (e.g., diplomas granted).

Only after these crucial preliminary steps have been completed and the outcomes identified and justified does the "traditional" role of the educational agency begin: achieving the organizational objectives in an efficient manner. Here, too, there have been failings but the problem at least is well known. With outputs more appropriately chosen, producing them may become more successful if for no other reason than that learners might be more motivated by the promise of tangible, valued, and useful rewards.

This paper concentrates on the first step: the definition and justification of outcomes. We leave to a later work an analysis of the output-outcome linkages and to the researchers already at work the problems of meeting organizational objectives. We turn now to what we consider the most important and possibly least appreciated problem.

### Setting Social Goals

In a world of scarcity, not all desired goals can be achieved. That which we consume today cannot be consumed next year and that which one group consumes precludes its use by others. Society develops rules for balancing the worth of one outcome against the worth of another.

Social goals should be explicit, although in current practice often they are not. Different people may have different goals and the goals may change over time. Goals are selected implicitly as new consensuses are reached among the various groups which have power in society. It is typically (and perhaps sometimes inappropriately) left to the politicians to allocate resources and to select the criteria for accomplishment (Pechman, 1980). The many programs for the poor, disadvantaged, and unlucky in society, however, indicate a strongly held belief that society should redirect some resources from the "haves" to the "have-nots."

Consistent with the hypothesis that the public aspects of education should have precedence over the private aspects, we would propose as the principal (but not only) requirement for an educational program that each learner be able to maintain a level of earned income sufficient to support life in the biological sense and to support the individual in the social sense, given the economic environment. Society must concern itself with aggregate performance, but also with the performance of those on the bottom of our social and economic strata.

### The Dependency- Contribution Model

One previously suggested model calls for an overall minimum objective for any educational agency:

- By the time the learner legally exits the educational agency, she or he will be at the independent survival point or beyond. (Kaufman, 1972)

According to this referent, there is a point along a continuum where independent survival may be achieved, and this is indicated by an individual's consumption being exactly equal to production. There are two additional zones of concern: "dependent survival" where an individual's consumption is greater than production, and "contribution" where production exceeds consumption.

While this model communicates easily, it represents an imperfect model for educational design, implementation, evaluation, or planning, because it does not supply any metric for defining a position within the consumption or production zones. It also implies that any intervention (say, a reading program in an urban-center school) where the program fails to enable all learners to perform at least at the independent survival point or where its positive effects cannot be demonstrated will be counted as a failure. Because of this "all or none" criterion, the model does not provide a "degree of failure" index which could be useful for evaluation and revision; the design of successful interventions demands more comprehensive, precise, and rigorous means of measurement.

We next define more precisely what is meant by "independent survival," or self-sufficiency, and then develop a more responsive model.

We usually do not observe directly the "what is" of societal outcomes, we see indicators—levels of income, crime rates, unemployment statistics, and the like. For a model to be useful there must be indicators for the complex array of social goals (self-sufficiency, happiness, freedom of choice, luxury, altruism, leisure, etc.). Some researchers limit studies only to consideration of later-earned salaries and taxes paid, not including other issues such as ability to retain and invest earned monies, and related personal and social results (cf. Alexander, Melcher, & Nickens, 1980).

Such considerations as taxes paid and income earned, while being important, are not sufficient for a clear understanding of the utility of educational efforts and programs. (Equations (1) through (6) shown in Figure 2 consider this limited perspective—benefit-cost in terms of salary differentials and taxes paid. Additional personal and social dimensions are added in Equations (7) and (8).)

We have suggested that each learner should be able to maintain at least some minimum level of production and consumption after completion of the educational program. Careful attention must be paid to the selection of external success (outcome) toward which any program will be identified, selected, designed, directed, and evaluated. The goal must represent the consensus of those responsible for and receiving the program and should be based on the best technical evidence available.

The minimum consumption level used for program selection may take into account the relevant demographic characteristics (e.g., age, family size, values, location, health). This quantity might include food, clothing, shelter, and a prorated share of a variety of necessary social goods such as police and fire protection, defense and general government administrative expense. One possible measure would be the poverty level income as defined by the U.S. Department of Labor. If this indicator were chosen, it would be necessary for an agency to decide whether to use the national level or some regional index and make a decision whether to use the indicators for family or individual income and consumption. One might want to use a forecast of
this consumption level some years into the future, to represent more accurately the environment which will exist upon exit from the educational program. To this poverty level income, which is essentially a physical intake and use determination, one might add an amount to cover the individual's share of the costs of social goods. Such an amount would be limited to public goods (those such as defense from which it is impossible to exclude any citizen from enjoyment of the benefits) and even further restricted to those required for a minimal level of survival (fire protection but not parks, street lighting but not agricultural price supports). It would not be appropriate to include in income amounts paid by governments in income redistribution programs—welfare, unemployment compensation, social security. These are funds transferred from individuals with surpluses (taxpayers) to other individuals but are funds which do not involve production or consumption. Likewise, taxes which go toward transfers should not be considered a "necessary" component of minimum consumption.

In general, then, we might evaluate the success of particular programs according to how well they succeed in pushing a learner's level of production up to and beyond some minimum level of consumption: self-sufficiency. We measure production and consumption in dollars conceding that some workers are overpaid and others underpaid, that some consumer goods are overpriced and others underpriced, and that some types of production and consumption have no price tags on them at all.

Relating dollars and educational productivity has been neither simple nor entirely successful (cf. Sobel, 1978). The definition of educational "product" and the appropriate unit of analysis have been elusive. In many cases education has been viewed as a total system result instead of as a subsystem of a larger system. For the limited purposes of this model, we want to make a case for using money income of graduates or "learners" as an indicator of the performance of an educational program.

Money is merely a convenient token of exchange; we cannot eat it, use it to shelter us, or wear it. Money is a means by which we may trade our time or possessions for the time or possessions of others. In some cultures we use dol-

\[ U_i = f(Y, M_1, M_2, \ldots, M_k) \]  

where \( Y \) = income,

\[ M_j \quad \text{all goods, services, and states of the world (j = 1, 2, \ldots, k) not available for purchase to which the individual attaches utility, and} \]

\[ f \quad \text{a function relating the quantities of Y and the M's to } U_i, \text{a utility number for individual i.} \]

\[ U_c = f(Y, M_1, M_2, \ldots, M_k) \]

for the contributing group, \( Y \geq C^* \);

\[ U_d = f(Y) \]

for the dependent group, \( Y \leq C^* \);

where \( C^* \) = the defined minimum level of required consumption.

\[ R = R_c + R_d \]

where \( R_c \) and \( R_d \) denote the current allocation of resources to programs serving the contributing group and the dependent group, respectively.

\[ U_c' = f(Y', M_1', M_2', \ldots, M_k') \]

with cost \( R_c' \) where \( U_c < U_c \) and \( R_c' < R_c \)

\[ U_d' = f(Y') \]

with cost \( R_d' = R_c \cdot R_c \), where \( U_d' > U_d \).

\[ U = \begin{cases} 1 & \text{if } Y \geq C^* \\ 0 & \text{if } Y < C^* \end{cases} \]

where \( U \) = social utility.

\[ U = \sum_{i=1}^{N} (Y_i - C^*) \]

\[ U = \sum_{i=1}^{N} \min \{0, (Y_i - C^*)\} \]

where \( \min \) means the lesser of the quantities in the brackets, zero or \( (Y_i - C^*) \).

\[ U = \sum_{t=1}^{T} \sum_{i=1}^{N} (1 + r)^{t-i} \min \{0, (Y_i - C^*)\} \]

where \( r \) = the discount (interest) rate.

FIGURE 2. Equations.
lars, in others pesos, rice, or shells—in each case we allow some token of exchange to be traded in lieu of the non-monetary items.

In addition, money has the virtue of reducing all goods and services to a one-dimensional scale of value: price. Those things which are scarce and valued will command a higher price than those items which are abundant and not as prized. Given an efficient market system, the laws of supply and demand will assure a direct correspondence between worth (or utility) of an item and its price. Not everyone has the same value system, of course, and so not everyone buys the same things. But the market system continuously allocates and reallocates resources from low-valued to high-valued items.

There are some things to which we may attach high levels of utility but which are not available through the market system: such qualities as happiness, love, inner peace, and the like. While we do not quarrel with the worth of these states of being nor with the difficulty of incorporating them into the present model, we exclude them from the concept of self-sufficiency for the limited purposes of this model. This point will be treated explicitly later.

A program will be successful, then, if the production level of the learner after exit exceeds some minimum level of consumption, both levels measured in dollar terms. It is not required that income exceed minimum consumption in every year, only that it does so in terms of lifetime income (including any interest paid on loans).

It is useful to explore the implications of a “failure” lifetime minimum consumption exceeding lifetime production (income). The individual may have persuaded private lenders to advance that amount, or private givers (family, charity) to donate support. Of greater concern to public institutions are the income maintenance payments (welfare, food stamps, social security, unemployment compensation) to which the individual might be legally entitled. Or the individual may be earning enough to pay for personal consumption requirements but may be paying no taxes to support his or her share of necessary social costs. In all cases these funds must come from surpluses generated by productive (“contributing”) members of society.

We have suggested that the output goals of an educational agency may be ranked according to their contribution to social outcomes. That is, they can be ordered by “public” usefulness (magnitude of spillover effects) and desirability. We have gone on to indicate that self-sufficiency in our economic system might well rank at the top of the list. For expositional simplicity, we now propose to divide the learner population into two groups and apply different rules for program selection to each group. (Programs are seen here as possible processes and products delivering outputs. See Figure 1.) For that group which is contributing, according to our definition (or seems to be on course to reaching that state), with current programs, we attempt to maintain current social outcomes. Some programs with purely private returns may be curtailed, and improvements in technical efficiency will be made—producing the same general social outcomes with a reduced expenditure of resources. Another rule is used for that group which, according to predictors (to be developed), is not approaching self-sufficiency. Programs for this latter group are reoriented with self-sufficiency the only objective. Once self-sufficiency is reached, members of the dependent group move into the contributing group where increments above the minimum survival level of production are added to the list of objectives.

In an application of this model, additional goals not directly related to income and production might be added for either group. A straightforward benefit-cost analysis may then be performed, using the suggested array of objectives for each group, to design and evaluate educational programs.

The rules for allocating resources to these two groups are suggested in the following section.

A Description of the Model

Individuals, we assume, have preferences among commodities, services, and states of the world. Furthermore, individuals are presumed able to rank those items in terms of increasing preference, although some individuals in some situations may be indifferent among the alternatives. These preferences may be arrayed over a limited set of possibilities internal to a particular system. It is our contention that preference orderings for organisations serving individuals, and for individuals within these organisations, ought to be related to external ("social") rather than internal ("organizational") referents.

Utility is here defined as a “number” or weight assigned by an individual to a commodity, service, or state of the world (or some bundle of same) according to his or her preference ordering of all such items. Then to say that the utility “number” attached item “A” by an individual is greater than the utility “number” for another item “B” is equivalent to saying that the individual prefers A to B. If the individual is indifferent between having A or B, then the utility “numbers” assigned to A and B are identical.

It is not required that degrees of preference be measured ("A is twice as good as B"); the utility “numbers” are merely assignments in a preference ordering.

Beginning with individual preferences, we may assign utility numbers to these preferences. For each individual a utility function scale can be constructed. Utility is a function of the quantities of the various goods and services consumed by the individual; the derivation of the utility function can (and perhaps should) include the “state of the world” (i.e., war or peace, feast or famine) as well as income, food, housing, and the like. In general, the utility function for an individual may be written as in Equation (1), Figure 2.

The difficulty arises in comparing utilities across individuals. It is possible for a single individual to have a consistent set of preferences. But there is no unambiguous way to relate the strength of one individual’s preferences to those of another. In practice, coalitions of individuals impose their consensus preferences on all of society; we may agree or disagree with the resource allocations which are then made.

In this model, we have sidestepped most difficulties of this nature by making strong assumptions. A few clear choices remain, and our model is explicitly biased more in the direction of equality of outcomes (for the educational agency) than is current policy. It stops well short of pure egalitarianism, however.

Define a level of consumption necessary for survival, possibly according to the measurement criteria suggested above. We then advance the following proposition: the social value of an individual’s own utility inures as enjoyment of nonpurchasable items in-
creases only if income is above the self-sufficiency level. (Self-sufficiency is the goal; income is the indicator.) We thus consider two groups of individuals and the problems of allocation between them, rather than the considerably more difficult problem (both technically and philosophically) of allocations among all individuals affected by the intervention agency. (See Equations (2) and (3).) Further, assume that total resources are fixed, and that it is possible to determine the costs of generating each indicated outcome. (See Equation (4).) We then apply the rules developed above.

For the contributing group, we identify the current outcomes and indicators thereof and make the existing programs more efficient and find new programs to produce the same outcomes at lower cost. Then a (political) decision is made that some programs with a social utility-cost ratio below some specified level will no longer be funded, even if some members of the contributing group will have lower (private) utility. There may be alternatives outside the public educational system for restoring those individuals' prior utility level. (See Equation (2).) In this manner, the cost of programs for the contributing group have been reduced, generating surplus resources to be reallocated to the dependent group. So the problem is to find the most efficient way of maximizing the utility of the dependent given the original resources plus these reallocated from the contributing group, with the proviso that the marginal cost of a program does not exceed the additional income which that program might be expected to produce. (See Equations (3') and (4').)

We now have a means of evaluating educational programs. A program will be considered desirable ("has a positive utility") if it generates learners who are (or who are an end to being) self-sufficient. We can determine the utility of a given program by assigning an arbitrary utility number to a success and another, smaller, number to a failure; the rule is then "maximize utility." (See Equation (5).) Note that we have initially defined the desired outcome (self-sufficiency) and then related it to a measurable output (money income). But this measure lacks sensitivity to the interpersonal and intertemporal distributional issues discussed above and, unfortunately, makes no distinction between a "near miss" and missing the target completely. We might simply add up all of the surpluses and deficits of all individuals, as in Equation (6). This is a frequent stopping point for most cost-benefit studies; we suggest it is premature to stop here.

This rule, however, would not distinguish between two results of the following types: (a) all graduates perform moderately above the survival level, and (b) most graduates perform below the survival level and a few become millionaires. It is possible to develop a utility function that more heavily weights the failures. Decisions based on such a rule would then allocate more resources toward getting every learner up to at least the self-sufficiency level. A possible rule would be: Social utility is the sum of negative surpluses (i.e., the deficits); a value of zero is assigned for a positive surplus. (See Equation (7).) This concept is actually quite basic: No additional utility is realized by exceeding the survival point. (Since utility functions are arbitrary, there is no reason the scale cannot fall entirely in the negative range.) If, as suggested, we are also concerned with performance over time, we can apply the standard present value criterion from investment theory to this utility function, as in Equation (8). This refinement merely adjusts future income to allow comparisons across time, income today being more valuable (all other things being equal) than the same income received instead next year.

Further corrections would be necessary to adjust for changes in the entry population characteristics, inflation, and returns that society finds desirable (i.e., income above survival, nonmarket items). Ideally it probably would be most appropriate to use these rules to evaluate programs in comparison with a control group not exposed to the problem.

No mention has been made so far of the costs of various programs. As minimum criterion for any education program (including vocational ones) we propose that its costs not exceed the increased earning power (current and future) of the participating learners. If the cost exceeds the returns to society, it would be cheaper to pay off the learners in cash.

We now have a possible way of evaluating proposed programs: Predict the utility of each program based on the anticipated job market for the graduates of such a program; predict the cost of each program based on known salaries and material costs; rank all programs according to the ratio of utility to cost; implement programs beginning with the largest ratio and continue down the list until available funds are spent or until the cost of a program exceeds the incremental returns.

References


TABLE 1. Hypothetical programs

<table>
<thead>
<tr>
<th></th>
<th>Dental Lab Technician</th>
<th>Marketing/ Merchandising</th>
<th>Administrative Secretary</th>
<th>Auto Mechanic</th>
<th>Hvy. Equip. Operator</th>
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<tbody>
<tr>
<td>1. Cost per student</td>
<td>$3,350</td>
<td>$2,360</td>
<td>$2,730</td>
<td>$2,310</td>
<td>$10,340</td>
</tr>
<tr>
<td>2. Performance for 100 students: number earning less than C*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. no training</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>b. with training</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>3. Average earnings for students earning less than C*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$3,500</td>
<td>$3,000</td>
<td>$2,000</td>
<td>$3,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>4. C*</td>
<td>$7,000</td>
<td>$7,000</td>
<td>$7,000</td>
<td>$7,000</td>
<td>$7,000</td>
</tr>
<tr>
<td>5. U (Social Utility)*</td>
<td>266,000</td>
<td>304,000</td>
<td>570,000</td>
<td>456,000</td>
<td>76,000</td>
</tr>
<tr>
<td>6. Score (U adjusted)**</td>
<td>3.75</td>
<td>3.29</td>
<td>1.75</td>
<td>2.19</td>
<td>13.16</td>
</tr>
<tr>
<td>7. Score/Cost (Line 6/Line 1)</td>
<td>1.11</td>
<td>1.39</td>
<td>0.04</td>
<td>0.95</td>
<td>1.27</td>
</tr>
</tbody>
</table>

\[
T = \frac{\sum_{t=1}^{N} \left(1+r\right)^{-t} \min\left[0, (Y_i \cdot C^*)\right]}{
\sum_{i=1}^{N} \min\left[0, (Y_i \cdot C^*)\right]}
\]

*To avoid dealing with large negative numbers, but without changing the substance of the results, Social Utility (Line 5) has been inverted and multiplied by -1000 to derive a “Score.” A larger score is directly related to a larger (smaller negative) Social Utility.

Illustrative Example

Following is an example of the way the criteria developed in the preceding section might be used by decision-makers to evaluate a variety of possible programs. Data regarding the costs and benefits of five hypothetical programs (“processes”) are presented in Table 1. These might represent projected performance for programs in development. Although the data are chosen to bear some resemblance to reality, they have been extensively simplified for the purposes of this illustration and are not intended to represent actual programs in place. At the conclusion of this section, we shall suggest refinements and additions necessary for the implementation of the model.

For ease of example, we make the simplistic assumption that, without additional training, exactly one-fifth (Line 2a) of the students in each program would subsequently earn less than the minimum required income (C*, Line 4—set arbitrarily at $7000 in this example). In reality, one would expect different types of people to enroll in the different programs, and that therefore Line 2a would show different numbers for each program. In that case, it would be necessary to adjust the results for variations in entry-level characteristics. We do assume that the training programs have differential effects (“outputs”) on the students who subsequently earn less than C*; some do better than others in the Dependent Zone. As noted previously, this model does not consider different levels of performance within the Contribution Zone.

The remaining lines in Table 1 calculate the social utility (“outcome”) according to Equation (8) and compare the score to the cost. A separate calculation, not shown here, would be necessary to determine if the added earnings from all students who take the course is sufficient to cover the costs of teaching it. Another consideration, not mentioned so far, is that a program cannot be expanded indefinitely without encountering diminishing returns. The “Score/Cost” ratio for the Marketing/Merchandising course, though the highest for the five programs, does not indicate that all resources should be redirected to that program. An appropriate strategy, if this self-sufficiency model were one’s only criterion of success (rather than a minimum), would be to consider the increase or decrease in the “Score/Cost” ratio from small changes in course enrollment. Programs could then be expanded or cut back until these marginal changes in “Score/Cost” were equal for all programs under consideration. This would be an efficient approach in that any deviation from the levels suggested involves a lower “Score/Cost” in one program that is not offset by a higher “Score/Cost” in another.
A Comprehensive Approach to Course Evaluation

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EDITOR’S NOTE

In order to meet the diverse needs of JID’s readership, we have decided to occasionally publish more practically-oriented “tools and techniques” articles. They will deal with specific aspects of the ID process, and will present validated “how-to” techniques useful to experienced developers. As with all other manuscripts, they will meet the criteria of making a contribution to the field, being literature-based, and containing generalizable and useful ideas. The following article, which presents an evaluation checklist, is a good example of this new type of article.

Abstract. Evaluation is an important phase of course development and improvement efforts. This article discusses a number of problems with current approaches to course evaluation. A broader, more comprehensive approach is recommended, and a checklist illustrating the kinds of issues and questions that need to be considered is presented.

The Problem

Under the pressure of state and local agencies, diminishing resources, and decline in enrollment, academic institutions are becoming increasingly concerned with improving the quality of their courses and instructional delivery systems. Faculties are usually untrained in formal evaluation procedures and, unfortunately, adequate professional assistance is often unavailable. In addition, time and fiscal resources to support an evaluation effort are limited.

In this paper we will focus on two basic questions:

1. What purposes and/or roles can be served by formal, systematic course evaluations?

2. What are the issues that must be explored and the questions that must be asked in attempting to determine the value of a course?

This will be followed by a practical checklist that has been developed to assist in the design of a comprehensive course evaluation.

The Roles of Evaluation

Without the information base that formal, systematic evaluation provides, decisions about content, structure, and revision must be based on hunches, personal preferences, or tradition. And yet, of all the essential elements involved in instructional improvement, evaluation is the one that faculty and administrators feel least comfortable about. As a result, the time and resources necessary for implementing a formal evaluation are rarely provided and their potential benefits are rarely realized. In the end, the student, the faculty members, and the institution suffer.

Evaluation has two distinct roles in the design and implementation of courses and academic programs. First, it provides information essential to those involved in designing the goals, content, and structure of the program (information about the student, the discipline, the profession—in job-focused programs—the institutional priorities, etc.). Second, once the program is under way, evaluation provides information about what is happening, what is working, and what isn’t. (See Stage I.)

STAGE I

DESIGN → IMPLEMENTATION

Evaluation Data  Evaluation Data

The data produced by the evaluation of the ongoing program then serve two additional purposes: (1) to provide a basis for making decisions about revisions in the program, and (2) to provide the basis for external reports on the project. (See Stage II.)

STAGE II

DESIGN → IMPLEMENTATION

Evaluation Data  Evaluation Data  External Use

These reports may range from brief descriptions of the program and its impact provided to the department chairman, dean, or faculty curriculum committee to more comprehensive documents required by external sources of financial support and by accreditation agencies. By providing the basic information on which program decisions are made, evaluation will have a major impact on both the quality of the program and its potential for survival.

Some Observations

Before presenting an array of evaluation questions that should be considered by those actively involved in course and program improvement, some observations based on the present state of the art might be appropriate.

JOURNAL OF INSTRUCTIONAL DEVELOPMENT
Too Often Evaluation is
Only an Afterthought

Often, when projects are planned, too little attention is paid to evaluation. Innovations may be implemented without plans or procedures for formally evaluating the program; when the initial implementation has been completed, those involved find themselves facing a major problem in reporting information and supporting conclusions. Even when an evaluation component is included it may be under-budgeted in terms of time, personnel, and funds. In some instances, where external funding is involved, the guidelines that must be followed exacerbate the problem by limiting both the money and time to be spent in the evaluation function. Failure to plan in advance for evaluation creates problems when one tries to make comparisons without the necessary baseline data—information that can no longer be collected (e.g., entering levels of student achievement, entering student attitudes, success of previous programs, etc.). The checklist presented in this article is designed to help develop a more solid framework for the evaluation process.

Participants in Course or Curriculum Development Projects May Not Be Aware of Evaluation's Scope or Potential Impact

Many faculty members do not understand the impact of formal evaluation; as a result, they are unaware of action on their part that may be required. This not only affects the preliminary design and budget of the project but can also create major traumas later in the process as unaddressed but important issues are identified or major revisions become a necessity. For example, faculty members may find, totally unexpectedly, that new content must be added, that the instructional sequence needs to be substantially modified, or that procedures being used to evaluate students must be altered.

Evaluation Instruments May Be Determining the Scope and Focus of the Evaluation Process

When evaluative studies are included, there is a tendency to select prematurely a particular inquiry technique and then allow that technique to determine the issues and questions investigated. Questions that cannot appropriately be addressed with the tool or method chosen

Consider each of the following questions and check those appropriate for the course being evaluated.

I. Course Rationale

☐ A. What population of students is the course intended to serve?
☐ B. What student needs is the course intended to serve?
☐ C. What institutional, community, or societal needs is the course intended to serve?
☐ D. What other defensible reasons exist for offering this course?
☐ E. What other courses serve these same needs?
☐ F. To what extent does this course overlap with or duplicate these other courses?
☐ G. On what grounds is the continued existence of this course justified and warranted?

II. Development and Current Status of the Course

☐ A. When and under what circumstances was the course developed?
☐ B. How frequently and how regularly has the course been offered?
☐ C. To what extent has the enrollment increased, decreased, or stabilized from year to year?
☐ D. What problems have been associated with the course and how have they been resolved?
☐ E. To what extent is the course intended to be replicable from instructor to instructor or from term to term?
☐ F. To what degree do the plans or design for the course exist in a written or documented form? In what documents (course approval forms, course outlines or syllabi, memos, etc.) do these plans exist?
☐ G. How does the current version of the course differ from earlier versions? Why?

Credit and Curricular Implications

☐ A. What credit is awarded for successful completion of the course? On what basis is this credit allocation justifiable?
☐ B. In what ways can credit for this course be applied towards fulfillment of graduation and degree requirements?
☐ C. At what level (lower division, upper division, graduate) is the course classified? Why? On what basis is this classification justified?
☐ D. How does the course fit into the overall curriculum of the sponsoring department and college?
☐ E. In which departments is the course cross-listed? Why? How does it fit into the curriculum of these departments or colleges?
☐ F. What prerequisite skills or experiences are needed in order to succeed in this course?
☐ G. What problems are experienced by students who do not have these prerequisites?

IV. Course Objectives

☐ A. What are the formal, stated objectives of the course?
☐ B. How feasible and realistic are these objectives in terms of the abilities of the target population and the available time and resources?
☐ C. How are the stated objectives related to the adult life-role competencies students will need in everyday life outside school?

FIGURE 1. The course evaluation checklist.
are overlooked. When this occurs, important concerns are likely to be ignored. Consequently, the evaluation effort is likely to be less productive than it could have been. The key is to first identify the necessary information and then select an inquiry technique to provide it. For example, relying solely on student feedback to measure the effectiveness of a program totally overlooks such factors as what actually was learned and how the program prepares students for courses that follow. In addition, instruments of this type are usually administered near the end of a course when the most negative students may no longer be in attendance.

Evaluation Raises Questions That May Otherwise Be Avoided

Thorough evaluation causes us to question what, how, and why we do what we do. It questions the status quo and may force faculty and administrators to face up to key issues that have studiously been avoided. Quite often we find that assumptions are being made that are of major concern to some of the participants, but because of political relationships they cannot be brought out into the open by a member of the content team. These issues can, however, be raised without much difficulty in evaluation reports or by other members of a support team as instructional developers.

Cost and Usefulness Do Not Necessarily Correlate

The most expensive approaches are not always the most useful. In fact, many of the inexpensive, “quick-and-dirty” techniques are not only easy to use but extremely effective ways of collecting essential information. While available dollars may limit some of your options in dealing with a particular question, neither the scope nor long-range quality of the evaluation effort need be substantially restricted. For example, short student questionnaires can provide invaluable data about the time, level, clarity, usefulness, and effectiveness of instructional units. In addition, most campuses have available at very low cost several computerized data processing systems that, if the forms being used are appropriate, can provide a comprehensive analysis of the information collected.

IV. Course Objectives (Continued)

☐ D. How are the objectives related to the competencies students will need in their subsequent academic careers?

☐ E. If the course is designed to prepare students for a specific professional or vocational field, how are the objectives related to the competencies they are likely to need in their future careers?

☐ F. What values are affirmed by the choice of these objectives as goals for this course?

☐ G. What other purposes, intents, or goals do the faculty, administrators, and other interested audiences have for the course?

☐ H. What goals and expectations do students have for the course?

☐ I. To what extent are these additional goals and expectations compatible with the stated course objectives?

V. The Content of the Course

☐ A. What (1) information, (2) processes, and (3) attitudes and values constitute the subject matter or content of the course?

☐ B. How are the various content elements related to the course objectives?

☐ 1. Which objectives receive the most coverage or emphasis? Why?

☐ 2. Which objectives receive only minor coverage? Why?

☐ C. How is the content sequenced or arranged? Why is this sequence appropriate/inappropriate?

☐ D. What means are used to integrate and unify the various content elements into a coherent pattern or structure? To what extent does fragmentation or lack of coherence appear to be a problem?

☐ E. What values and assumptions are implicit in the decisions which have been made regarding content selection and emphasis?

VI. Instructional Strategies

☐ A. What kinds of learning activities are utilized?

☐ 1. What activities are the students expected to engage in during class sessions?

☐ 2. What assignments or projects are students expected to complete outside of class?

☐ 3. In what ways are these activities appropriate or inappropriate in light of the course objectives?

☐ 4. How could these activities be made more effective?

☐ B. What instructional materials are utilized?

☐ 1. How and for what purpose are the materials used?

☐ 2. How accurate and up-to-date are the materials?

☐ 3. In what ways do the materials need to be improved?

☐ 4. How could the materials be utilized more effectively?

☐ C. What instructional roles or functions are performed by the teacher(s)?

☐ 1. How could these roles be performed more effectively?

☐ 2. What important instructional roles are not provided or are performed inadequately? Why?

☐ D. What premises and assumptions about learning and the nature of the learner underlie the selection of instructional strategies? How and to what extent are these assumptions warranted?

FIGURE 1. The course evaluation checklist. (Continued)
VII. Procedures and Criteria for Evaluating Students' Achievement

☐ A. What instruments and procedures are employed as a means of collecting evidence of students' progress and achievement?
☐ B. What criteria are used to assess the adequacy of students' work and/or achievement? On what basis were these criteria selected?
☐ C. How well do the assessment procedures correspond with the course content and objectives? Which objectives or content areas are not assessed? Why?
☐ D. To what extent do the assessment procedures appear to be fair and objective?
☐ E. What evidence is there that the assessment instruments and procedures yield valid and reliable results?
☐ F. How are the assessment results used? Are the results shared with the students within a reasonable amount of time?
☐ G. How consistently are the assessment criteria applied from instructor to instructor and from term to term?
☐ H. What indications are there that the amount of assessment is excessive, about right or insufficient?

VIII. Organization of the Course

☐ A. How is the course organized in terms of lectures, labs, studios, discussion sections, field trips and other types of scheduled class sessions?
☐ B. How frequently and for how long are the various types of class meetings scheduled? Is the total allocation of time sufficient/insufficient? Why?
☐ C. If there is more than one instructor, what are the duties and responsibilities of each? What problems result from this division of responsibilities?
☐ D. What outside-of-class instruction, tutoring, or counseling is provided? By whom? On what basis?
☐ E. How well is the student workload distributed throughout the course?
☐ F. To what extent are the necessary facilities, equipment, and materials readily available and in good working condition when needed?

IX. Course Outcomes

☐ A. What proportion of the enrollees completed the course with credit during the regular term? How does the completion rate vary from instructor to instructor or from term to term?
☐ B. What proportion of the enrollees withdrew from or discontinued attending the course? Why?
  1. To what degree does their discontinuance appear to be related to factors associated with the course?
  2. How does the attrition rate vary from instructor to instructor or from term to term?
☐ C. At the end of the course, what evidence is there that students have achieved the stated objectives?
  1. For which objectives was the course most/least successful?
  2. For what kinds of students was the course most/least successful?
☐ D. What effects does the course appear to have had upon students' interest in the subject matter and their desire to continue studying and learning about this subject?

FIGURE 1. The course evaluation checklist. (Continued)
the quality of higher education must take this task seriously. This will require building in a reward system for faculty members who participate in the process. Unfortunately, at present there is little incentive for faculty to take part in activities of this type. Every department should periodically review and examine each of its courses. In conducting this review it must be kept in mind that the design of a course on paper may not be synonymous with the course offered. The implementation of the planned course should not be taken for granted. It is not enough just to review a course syllabus. What happens in the course when it is actually offered may differ substantially from what was intended: consequently, the course, as it is offered, must be evaluated.

Perhaps the best approach is to establish a rotating schedule of reviewing a few courses each year on a cyclical basis. Courses with limited enrollments or infrequently offered courses may have to be given lower priority and examined less frequently than others. Nevertheless, some sort of rational schedule for reviewing each course should be established.

We suggest that a committee of faculty members from both inside and outside the department be charged with the responsibility of conducting the inquiry for a particular course or sequence of courses. Hard questions should be investigated and not glossed over. It is important, therefore, to involve individuals external to the department who will question issues insiders might no longer question or prefer to avoid.

Appropriate Options Must Be Selected From a Wide Range

We have choices in dealing with the scope of our evaluation and the procedures we wish to follow: No single project can do everything: Time, budgets, and resources make this impossible. We can, however, select the combination of options that makes sense for us. No two combinations will be the same. The factors influencing which questions to consider in the checklist include:

1. Purpose of the evaluation. Are you in the first stages of designing a new course or are you evaluating an ongoing program?
2. Who will receive the information. Is it for the faculty and staff involved in the project, an administrator, or for an

IX. Course Outcomes (Continued)

☐ E. What other effects did the course have upon the students?
☐ 1. How were their values, attitudes, priorities, interests, or aspirations changed?
☐ 2. How were their study habits or other behavioral patterns modified?
☐ 3. How pervasive and/or significant do these effects appear to be?
☐ F. What evidence is there that students who have completed this course were adequately/inadequately prepared for subsequent courses for which this course is intended to prepare them?
☐ G. To what extent do students rate their experience in the course as producing a meaningful and worthwhile contribution to their self-development?
☐ 1. In what ways were the students satisfied or dissatisfied with the course?
☐ 2. What suggestions do they have for improving the course?
☐ H. What evidence is there, if any, that the experience of teaching the course has a positive or negative effect upon faculty members?

X. Institutional Costs and Benefits

☐ A. What are the time, space, equipment and facilities requirements of the course?
☐ B. What are the requirements of the course in terms of faculty and staff?
☐ C. What other support services are required by the course?
☐ D. What direct instructional costs are associated with this course?
☐ E. What benefits derive to the department, the college and the institution for having offered the course?

*This checklist may be reproduced if appropriate credit is given.

FIGURE 1. The course evaluation checklist. (Continued)

1. Course Objectives

A. What are the formal, stated objectives for each course? In what ways are the objectives similar? How are they different?
B. How appropriately do the stated objectives of each course match the needs of the target population?
C. What other unstated purposes, intents or goals do faculty members, administrators, and other interested persons have for each course?

2. Student Population Serviced

A. How comparable are the groups in terms of demographic variables such as age, sex, high school rank, SAT scores, academic major, and full-time student status?
B. Why do students choose to enroll in one course instead of the other? Were students turned away from CMS 100X because of a ceiling on enrollment? How many?

FIGURE 2. Questions to be investigated in evaluating two interdisciplinary communications skills courses.
external source sponsoring the activity?
3. What resources are available? Are professional evaluators available? What levels of computer processing exist? How much money is available for staff time and computer processing?
4. How much time is available. When does the program begin? When are the data needed?
5. How the findings are to be used. Is the information to be used to help improve the program or to decide if it should be continued? What are the specific questions to be answered?
6. The nature of the project. Are you involved with a single course, an entire curriculum, or a specific activity?

In every project there will be trade-offs. Decisions must be made as to which data are most important and which questions deserve the most attention. A limited evaluation is not necessarily a poor evaluation. It is far better to do a few things well than to design an evaluation plan that is so broad that the information generated is either inaccurate or unavailable until after it is needed.

**Evaluation Checklist**

Evaluations, as noted previously, must be planned. The design of a particular course evaluation should be determined by the study’s purpose and the information needs of the decision makers. No two evaluation designs are likely to be the same. However, there are questions which tend to show up recurrently in course evaluations. We have compiled a list of such questions presented in the form of a checklist (See Figure 1.) This list is designed for use by faculty members and administrators with responsibility for evaluating courses. The list is intended to serve as a functional guide to the kinds of issues to be addressed in evaluating a course. It is presented as a checklist in hopes of increasing the probability that all relevant questions will be considered in the planning stage of a course evaluation.

Keep in mind, however, that because of limitations of time, staff, and money, **not all of the suggested questions are likely to be feasible or appropriate in evaluating any one particular course**. However, in many instances you will find that it is relatively easy to collect important data. Those involved in planning an evaluation must select the specific questions to be addressed and tailor the design to the particular situa-

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3. Types of Learning Encounters & Opportunities Provided
   A. How do the two courses differ in terms of content and organization?
   B. What are the primary modes of instruction used in each course? Approximately what proportion of the students’ time (in class plus time spent on assignments) is devoted to various activities, such as reading, writing, taking tests, or small-group discussion?
   C. What are the criteria for determining passing grades in each course?

4. Attendance and Course Completion Rates
   A. To what extent do the courses differ in terms of average daily attendance?
   B. What proportion of the students withdraw from or discontinue each course? To what extent was their discontinuance associated with factors related to the course?
   C. How do the courses compare in terms of the proportion of students who complete the course with passing grades (full credit)?

5. Observable Student Outcomes
   A. What gains in students’ writing skills appear to have occurred in each course?
   B. What gains in performance on a test of English grammar and usage appear to have occurred in each course?
   C. What gains in students’ oral presentation skills appear to have occurred in the trial course?
   D. What effects did participation in the courses have on students’ writing apprehension and speech apprehension?
   E. What effects did participation in the courses have upon students’ attitudes towards the practical value and importance of clear and persuasive expression in both oral and written forms?

6. Student Satisfaction
   A. To what extent were students’ expectations of the courses met? In what ways were their expectations not met?
   B. To what extent did students perceive the content and learning activities to be relevant to their needs and interests?
   C. How did students rate the quality of the instruction provided?
   D. What suggestions and recommendations did students have for improving the course?

7. Impact on Course Instructors
   A. What activities do the instructors of the trial course perform as a team? What activities do they perform individually?
   B. What effects do participation as an instructor in the trial course appear to have upon faculty members? How does it affect their philosophy of teaching? To what extent do they borrow ideas and methods from the trial course for use in other courses they teach?
   C. What proportion of the instructors want to continue teaching the course? What proportion prefer to discontinue their involvement? Why?

8. Support Requirements
   A. What are the space, time, physical facilities, and equipment requirements of each course?
   B. What instructional materials and support services are required by each course? What are the relative costs involved?
   C. What are the requirements of each course in terms of full-time equivalent faculty and staff? What dollar outlays per student are required?
   D. What policy and/or logistical changes would be necessary to support the continued use of each course?

9. Feasibility of Expansion
   A. What is the feasibility of creating additional sections of the course and offering it to a greater number of students each term? What problems would likely be encountered?

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FIGURE 2. Questions to be investigated in evaluating two interdisciplinary communications skills courses. (Continued)
tion. It is our hope that the checklist will lead to more comprehensive course evaluations. Questions not raised in evaluating a specific course should be omitted intentionally rather than accidently. The approach selected should be determined by the questions being investigated rather than vice versa. The place to begin in designing a course evaluation is selecting the issues and questions to be studied.

An example of the use of the checklist, a list of questions that were used in evaluating and comparing two communication skills courses being taught simultaneously on a university campus, is shown in Figure 2.

Conclusion

Evaluation is an inquiry process which involves seeking answers to questions as a basis for making informed judgments about the value of some object or event. The scope of an evaluative study is determined largely by the range of questions investigated. Course evaluations that focus on trivial questions may produce precise and unequivocal answers, but the findings are likely to be irrelevant or superficial. Course evaluations that focus solely on questions about students' reactions to the course may be interesting, but they are not sufficiently informative to serve as a basis for judging the worth of the course or its component parts. A more comprehensive approach to determining the merits and shortcomings of a course would address a broader range of questions. The accompanying checklist is submitted as a means of encouraging educators to broaden their vision of the kinds of issues and concerns that need to be addressed in attempting to determine the value of a course. The suggested questions are intended to be illustrative rather than prescriptive. Thoughtful consideration of the kinds of questions and issues suggested in the checklist should help educators design more comprehensive and more revealing evaluations. Better evaluations should lead to more informed judgments as to where and how courses need to be improved and which courses should be continued or discontinued. Courses of better quality should result.

References


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The purpose of Course Design—A Guide to Curriculum Development for Teachers is to "bridge theory and practice in curriculum development." It is intended for use by undergraduates in curriculum design courses, classroom teachers at the secondary and post-secondary level in inservice workshops, individual teachers desiring to increase professional competencies, and by graduate students in beginning courses in curriculum and instructional design.

Divided into eight chapters, the book opens in the first chapter with the presentation of a model of curriculum development. Each subsequent chapter focuses on one phase of the model and its associated processes. In each chapter there is also a list of objectives for the reader, a brief discussion of design theory, examples, questions for discussion, and frequent exercises. The exercises are intended to aid readers in the design of their own course.

Located in the back is a glossary of terms, references, a briefly annotated bibliography and appendices containing two examples of curriculum design completed by the authors' students. The absence of an index makes it difficult to use this book for recovering strategies or ideas. A close examination of the references and bibliography revealed familiar authors such as Tyler, Gagné, Dewey, Phenix, Mager (of course!), Bloom, and Bruner. Nevertheless, I was disappointed. I had hoped to find new references from the curriculum design literature dealing with such topics as task analysis, learner analysis, design of instructional strategies, evaluation, etc. No new or interesting references were to be found. With the reference to Principles of Instructional Design by Gagné and Briggs a rather curious description appeared: "A detailed account of one school of design theory." We are never told what the other "schools" might be.

"Getting Oriented" is the title of Chapter 1. A framework for curriculum design is presented and important distinctions made between process and product, and curriculum and instruction. The processes and products of curriculum design, from the authors' perspective, are depicted in a curriculum instruction model. This model provides the topics for the next seven chapters. For some reason the book is not ordered in the same sequence as the model with its obligatory boxes, arrows, and feedback loop. As a result, I found it somewhat difficult to orient myself to the remaining chapters.

The major concentration of Chapter 2 ("Developing a Focus") is on identifying the intended learning outcomes (ILOs). As a prerequisite, we are asked to consider: our motives for planning, the composition of the audience, and current approaches to the subject. Then, from a listing of initial ideas and related "central questions," the ILOs are written. Each ILO is categorized as a skill (things students are expected to be able to do) or nonskill (things the student will know/understand or feel) and further examined for prerequisites. The authors suggest that it may also be necessary to identify the concepts encompassed by the ILO and, when such relationships are obscure, map out relationships between them. This is called "conceptual mapping." The derivation of the ILO from the initial ideas was a strategy that could prove useful, though no explicit rationale for guiding the process was evident. The ILOs seem to just "appear." I also found the purpose of the central questions to be rather obscure. According to the authors they are "questions that once discovered by a student serve as the focus for study." As such, they are used to expand the list of ILOs. I can hardly imagine a more un-systematic way of deriving learning outcomes. The ideas surrounding conceptual mapping were equally difficult to accept. I have used both hierarchies and matrices as tools for identifying relationships. Each of these methods has rules, or at least a rationale, to guide its application. With conceptual mapping we are never told what rule or rationale might guide the derivation of relationships between concepts. It appears that anything is possible. Conceptual mapping apparently is used for the benefit of the curriculum developer with little impact on the design of the course. No further references to it are found in subsequent chapters.

Now that the ILOs have been identified, the next step is to develop a course rationale. This is the topic of Chapter 3. A rationale is a general statement of educational goals that are derived from an examination of three value areas: the learner, society, and the subject matter. The authors consider the development of such a rationale essential to an effective curriculum design. Such a process occurs between the initial thinking about the ILOs (which the rationale serves to justify) and the refinement of the ILOs (for which the rationale is a background).

Chapter 4 is entitled "Refining Intended Learning outcomes." To the authors, objectives have three functions: instructional planning, communication to the learner, and as the basis for developing indicators of successful learning. These are important points and the authors do an effective job of discussing their importance. The refinement of the ILOs involves their further categorization. Skills are divided into two subclasses of
learning: psychomotor, perceptual and cognitive skills. Non-skills are classified as cognitions and affects. The presentation of numerous examples and practice items is helpful as they are the guidelines for selecting and establishing priorities among objectives.

Once the ILOs have been clarified, it is necessary that they be organized into units and the units are further organized to form a cohesive course. These are the topics of Chapters 3 and 6 respectively. Five bases for clustering and organizing units are presented: the way the world is, the way concepts are organized, the way knowledge is generated, the way students learn, and the way learning is utilized in life. These bases, though very general, should be useful in clustering objectives and units.

"Developing General Teaching Strategies," Chapter 7, provides the curriculum designer with a list for each of the four learning classes of specific strategies and associated justifying principles. This list is intended to aid in relating ILOs. It would have been helpful if the authors had made these relationships more explicit by using examples from the last few chapters. The examples of teaching strategies were, I assume, outcomes of using this chapter and as such were vague. A portion of one such example reads as follows: "Reading Basic Ecology and discussing this reading provides for introduction of relevant concepts and terminology with examples. Structuring terraria will provide practice and experience with these concepts and skills" (p. 143). This is the level of precision I would expect to see for individuals organizing their own course. However, this is not an appropriate level for designers who must work and communicate with others.

The title of Chapter 8 is "Planning a Course Evaluation." A discussion of various perspectives in evaluation (Cronbach and Scriven) is presented along with the use of information for course improvement. A brief discussion of various indicators for assessing the ILOs is also provided. The number of examples of these indicators was not adequate. Methods for measuring these indicators also were never discussed. This chapter tells us nothing new about evaluation. For example, in assessing side effects of learning, we are told to examine student attitudes toward the subject, the teaching methods used with the subject, and the school. How this is to be accomplished is anyone's guess. At the very least, the reader might have been provided with references for further reading. The authors also suggest, "...if the course is immediately bad, this fact should become evident during the formative evaluation. The courses can almost always be improved" (p. 149). I would hope so! This indicates that either the authors are completely naive about the politics of design or they have never worked in an educational organization. In any other book on instructional design, the chapter on evaluation is usually among the most important. In this book, it is the shortest and probably the worst.

A number of things bothered me about this book. It seems to provide a lot of "shoulds" but very little in the way of substantive strategies that might help the novice curriculum (or instructional) developer. When strategies were discussed, they were vague and without a clear rationale. The design and format of the book is poor: More diagrams might have been employed, different type styles and headings might have been used to help the eye distinguish between sections, and an index most certainly should have been included. The book looks as if it had been taken almost directly from the authors' class handouts. The perspective is too narrow. It is meant for a curriculum designer who also happens to be the subject-matter expert. Although some individuals may function in both roles, it is more likely that the designer will work with subject-matter expert.

In conclusion, I believe this book is narrow in focus, ambiguous in its approach to curriculum design, and about 20 years too late in terms of what it has to offer.—Reviewed by David P. Rutt, instructional designer, Elgin, IL 60120.


In the early days of the development of instructional technology, major interests often centered on the issue of "color versus black-and-white" instruction. We have come a long way since then. In the 1920s, Edgar Dale offered his theory of the "cone of experience," which emphasized the need for differentiating between concrete and abstract types of information and for providing appropriate learning experiences to the learner. Gabrielle Salomon's new book, *Interaction of Media, Cognition, and Learning*, attempts to take instructional technology still further toward integrating mental processes, learning theory, and instructional development.

What interests Salomon are symbol systems and their interaction with mental skills of the learner. According to Salomon, a symbol system is "a set of elements that refer in specifiable ways to domains of reference and are interrelated according to some syntactic rules or conventions" (Salomon, 1979, p. 20).

His view points to a new era of research in such areas as cognitive styles and media's mode of presentation, developmental psychology and media, left-and right-brain hemispheric research, symbol systems, and visual literacy and its relationship to thought processes.

Salomon aims his book at research-oriented instructional developers, educational psychologists, media managers, and curriculum specialists. He wants to show how people can develop in learners specific mental skills, such as seeing out details or visualizing three-dimensional objects, and enhance these through design and use of instructional materials.

In Chapter 1, the author provides a background of educational research and then presents a new conception for media research through the symbol systems approach. Salomon states his theory relating symbol systems to common thought processes. In Chapter 2, he describes the characteristics of symbol systems and discusses various psychological considerations. Nelson Goodman's ideas on symbol systems have strongly influenced Salomon and a discussion of these ideas takes up much of this chapter. Salomon accepts Goodman's theory that we can rank symbol systems according to the extent that they are more or less notational. (A musical score is notational because each note stands for a single sound pitch. A painting is nonnotational because each line or shading does not necessarily correspond to a discrete item.)

Chapter 3 is one of the most informative chapters; here Salomon considers the relationship of symbol systems to cognition. He asks, "Does one mode of appearance convey an idea better than another because it is more similar to the referent?" (Salomon, 1979, p. 86). Dale's "cone of experience" might sug-
suggest that this is true, but Salomon goes a step further, saying:

I proposed that symbol systems vary as to the cognitive systems they address, and that, given a particular content, person, and task, the information they carry requires different amounts of mental recoding and elaboration. Thus, the better the correspondence between the way information is presented and the way it can be mentally represented, the less recoding is needed and the easier is the communication. I proposed that better communication means easier processing (Salomon, 1979, p. 86).

To the instructional developer, easy processing by the learner is an important consideration. Salomon points out that because all messages are coded, even the most familiar ones require some skill in processing. In Chapter 4, Salomon says:

For effective instructional communication, a match needs to be established between the cognitive demands of a learning task, the skills that are required by the codes, and the learner’s level of mastery of these skills. Thus, attitude-treatment interactions between codes and learners can be expected (Salomon, 1979, p. 112).

Chapter 5 deals with the cultivation of mental skills through symbolic forms. Here Salomon concludes that his experimental results do not suggest that using symbol systems is necessarily the best method to cultivate a given mental skill. However, his research does show that the film medium can affect cognition and can thus give a new approach to teaching such skills.

Chapters 6, 7, and 8 describe Salomon’s experiments, which deal mainly with television and film. Salomon concludes from these experiments that a learner uses certain coding elements and certain mental skills according to the kind of information he wants to understand, or can learn. Chapter 9 provides the reader with an overview of Salomon’s experiments that took place over a period of 10 years and summarizes his conclusions. Here Salomon also relates his theories and conclusions to Bandura’s scheme of reciprocal determinism.

Salomon’s theories are not always clearly stated. There are some style and typographical errors. The book also has many terms that are new to most readers. Salomon appears to know this and takes care to define the terms, but there are so many and they are so densely packed into the first three chapters that the reader can become exhausted. In addition, a few sections are in italics for subheadings, definitions, and emphasis. A separate glossary, preferably with concrete examples for the more abstract terms, would have helped.

Salomon does help the reader by providing a summary at the end of each chapter, and the final chapter is a summary of the entire book. The book is well documented.

In Chapters 4, 6, 7, and 8, Salomon describes his experiments. I agree with some of his conclusions and question others. That Israeli children are more literate television viewers than United States American children is surprising—until we consider the different conditions under which the two groups watch television. (Israeli television has only one channel and most households have only one set. American children have a greater choice of channels and often more than

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**CALL FOR CONVENTION PAPERS**

This Research and Theory Division (AECT) announcement is the official call for papers for presentation at the 1981 AECT Convention to be held in Philadelphia.

Types of Papers

A. Research Papers: Historical, Descriptive, or Experimental. Please summarize in 1,000 words: (1) purpose and rationale, (2) method, and (3) results and discussion. Research papers will be grouped by topic and four or five related papers presented in a session. Fifteen minutes will be scheduled for each paper presentation.

B. Conceptual Papers: Theoretical, Position, Critical Review, or Evaluation. Please summarize the major elements of the paper in 1,000 words.

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Proposals must be submitted with the cover sheet attached. They will be rated anonymously. Criteria for selection will be: (1) relevance to the objectives of the Research and Theory Division, (2) contribution of ideas, concepts, models, empirical data, conclusions, etc. to educational technology research and/or theory, (3) quality of research, and (4) clarity of expression.

With the cover sheet, send three copies of a 1,000-word (maximum) summary of the study and two self-addressed envelopes (to acknowledge receipt of the proposal and to notify contributors of the decision of the program committee). Symposium proposals should be submitted as a package listing participants on the cover sheet.

All proposals should be received by October 1, 1980.

Mail to: Carol Carrier
Curriculum and Instructional Systems
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178 Pillsbury Drive S.E.
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To be eligible for presentation, the author of each paper selected will be required to provide a manuscript with two complete copies of the paper by March 1, 1981. (Presenters not doing so will be dropped from the program.) Discussants will be identified at the same time notice is given of acceptance of the paper. The primary role of the discussants is to raise questions and to stimulate dialogue and discussion after the presentation.

Presentations will be 15 minutes in length, with 3 to 5 minutes for questions.

Note: See inside back cover for copy of Cover Sheet.
one set in the house. Also, commercials are much more frequent on American television.) Other of Salomon’s conclusions seem unwarranted, for instance, when he says that modeling an operation depresses the scores of more skillful learners because “it interferes with the smooth mental applications of the modeled skill” (Salomon, 1979, p. 155).

It is difficult to disagree with Salomon’s general conclusions, which are:

1. When a person learns, he deals with the media’s symbol systems;
2. A learner gets different content and different meaning from different symbol systems;
3. A learner must make different mental transformations and use different mental skills with different symbol systems;
4. A learner uses certain coding elements and certain mental processes according to the kinds of information he wants to, should, or can learn;
5. We can cultivate in learners specific mental skills by using coding elements of a symbol system to activate or supplant these skills;
6. A learner will learn something from exposure to media in an undirected learning situation, but he will learn more in a directed situation.

If it is difficult to disagree with anything here, is Salomon’s theory really new? Some instructional developers will argue that mental processing and cognitive skill development through symbol systems are already components in their design models. Perhaps what Salomon is offering is not so much a new theory as a new focus for instructional technology research. Certainly we need clarification of terms and more research and debate on conclusions before we can say that Salomon’s ideas will have the same influence that Dale’s “cone of experience” had.—Reviewed by John A. Horlin, a former instructor at Rosary College Graduate School of Library Science, now a doctoral student in instructional technology at Northern Illinois University, DeKalb, Illinois 60115.

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**ERIC Reports on ID**

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**Instructional development (ID) encounters are dependent on success on such variables as power, politics, promotion, and organizational placement. ID consultants must be aware of power bases or orientation of other personnel and clients, e.g., these four “power personalities” which affect their efforts in managing ID encounters: the gate (information) keeper, the decision-maker, the opinion leader, and the change agent. Role negotiation between the consultant and client best achieves an equal power relationship. Promotion, or publicity, entails providing information on the organization’s I.D. style and services, as well as on consultative style and orientation. Since organizational placement of the consultant influences trust and openness, the consultant should report to the chief academic officer to maximize his stability and legitimacy. At Iowa’s Kirkwood Community College, diverse instructional development activities were merged into an ID center in the fall of 1977, which brought all resources and activities under one coordinating function. This center stresses a supportive, service-oriented philosophy, as well as a collaborative internal atmosphere. Promotion of services has been both formal (external, highly publicized) and informal (low-key, internal). A list of 11 references is attached.—Microfiche 83¢

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“The Program Analysis Phase of Instructional Systems Design: Details of Phase II,” by E. Curtis, is the first of five symposium papers included in this collection. This paper describes the program analysis subsystem within the context of a systematic approach to instructional design and reviews the process of carrying out such an analysis. “The Course Analysis Phase of Instructional Systems Design at Athabasca University: Details of Phase II,” by C. Shobe and Dan Coldeway, describes the steps which occur in the course analysis phase, identifies the personnel responsible for carrying out the steps, and discusses the expected end products and decisions which should follow the analysis. A model which is currently being implemented and evaluated for determining the degree of instructional design involvement with faculty members is summarized in a paper by Dan Coldeway. In “An Evaluation of the Effect of Instructional Systems,” Dan Coldeway considers the effects of the application of instructional systems design at Athabasca University. The final paper, “A Complex Instructional Systems Design Model for Post-Secondary Education,” by Douglass Shale and Dan Coldeway, focuses on Athabasca University as the model and examines problems within that model.—Microfiche 83¢ plus 48¢ postage, as document ED 178 043.

Aptitude, Learner Control, and Adaptive Instruction. Richard E. Snow
Paper presented at the annual meeting of the American Educational Research

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JOURNAL OF INSTRUCTIONAL DEVELOPMENT
In addressing the question of whether learner control of instruction can accommodate individual differences, this paper discusses some characteristics of learner control, including those conditions of learning which the student can control and those imposed by society and its institutions which are not under individual control. Studies of attempts to accommodate individual differences by various methodologies are reviewed, and a more detailed description is provided of a study of BIP, an interactive computer course on computer programming offered at Stanford University. This course, which involved university undergraduates who spent 15 hours learning the BASIC computer language, is cited as an advanced example of learner controlled instruction. The BIP program is designed to keep detailed protocols of each student's learning activities, thus providing intermediate measures to describe individual differences in learning activities that may contribute to success or failure in the course. Findings of the study indicate that individual differences in learning increased over the duration of the course, that a multi-dimensional scaling of the correlations among learning activity variables showed a clear circumplex structure, and that measures of learning activities, rate, and outcomes were strongly predicted from initial aptitude differences. Summary conclusions suggest that learner control does not accommodate individual differences. —Microfiche 834, paper copy $3.32 plus 48¢ postage, as document ED 178 577.


An analysis of the historical roots of educational technology is followed by discussions of concerns in instructional design and media selection, systematic approaches to instruction, and the future uses of technology for the delivery of instruction and information. The development and growth of the field are explored, future applications of advanced technologies are proposed, and the need for more refined theories of information processing for describing how people learn is pointed out. This paper includes definitions of educational technology, as well as discussions of the use of media in delivering instruction, various ways of using computers in education, and the development of new products that will impact the field. Problems facing educational technologists are reviewed, and additional research to identify characteristics that influence learning is recommended. —Order from Syracuse University Printing Services, 125 College Place, Syracuse, NY 13210 (TR-38; $3.00); or EDRS: microfiche 834, paper copy $3.32 plus 48¢ postage, as document ED 179 230.

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