Instructional Development Models: Analysis at the Task and Subtask Levels

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Abstract. A simple yet detailed process for analyzing and comparing instructional development models at the task and subtask levels is described, justified, and illustrated. The analysis process ensures that all major instructional development tasks and their subtasks are identified, assigns weights to the subtasks, and facilitates the comparison of different prescriptive models task by task, according to both comprehensiveness and operational level.

In a review of instructional development models, Gustafson (1981) noted that models can "serve a variety of purposes, including theory building and testing, description, prediction, and explanation" (p. 4). He also considered three principal uses of models by instructional developers: as communication devices, planning guides, and prescriptive algorithms. In this article, the usefulness of instructional development models as planning guides or management tools is considered. Viewed from this perspective, according to Gustafson, models "should account for *all* of the major tasks to be performed" (p. 4).

In this article, a new process for analyzing instructional development models is explained and then illustrated for five selected models.

Instructional Development Defined

Before examining how models for the development of instruction can be analyzed, compared, and contrasted, it may be useful to outline the fundamental activities involved in instructional development. The complex set of processes known as *instructional development* or instructional systems development is illustrated by Carey and Briggs' (1977) simplified "design" model, shown in Figure 1.

As used in this article, instructional development is defined according to Silber (1977):

> . . . a systematic approach to the design, production, evaluation, and utilization of complete systems of instruction, including all appropriate components and a management pattern for using them.

Instructional development is larger than instructional product development, which

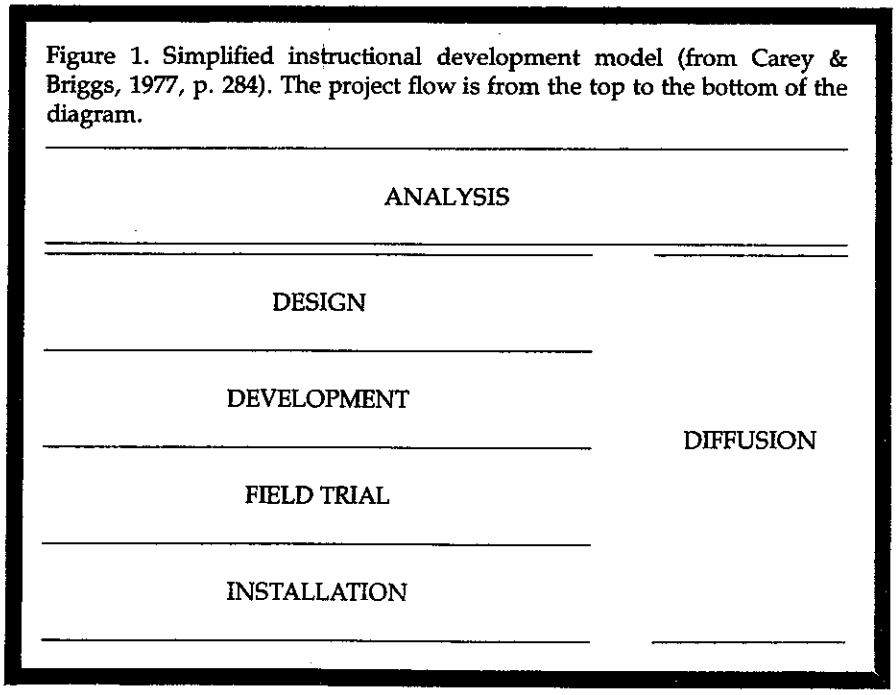

Figure 1. Simplified instructional development model (from Carey & Briggs, 1977, p. 284). The project flow is from the top to the bottom of the diagram.

Instructional development encompasses all of the activities that move a project from its conception to the implementation of an appropriate instructional system in a desired context.

is concerned with only isolated products, and is larger than instructional design, which is only one phase of instructional development. (p. 172)

Instructional development encompasses all of the activities that move a project from its conception to the implementation of an appropriate instructional system in a desired context.

Instructional development models presented in the literature have a variety of origins and purposes. For this article, only the development of elementary- and secondary-school instructional materials is considered. Therefore, only tasks specifically directed toward creating instruction for those contexts have been examined. The phases of Analysis, Design, Development, and Field Trial in the Carey and Briggs (1977) model are relevant to this article. Responsibility for the Diffusion and Installation phases usually falls to school systems or to sales and marketing groups.

Previous Analysis Methods: Model and Task Levels

Two well-known reviews of instructional development models (Andrews & Goodson, 1980; Stamas, 1973) present "macro-analysis" comparisons. In both reviews, instructional development tasks are described in very broad terms, and each model is analyzed with respect to *all* tasks. In neither review is the amount of explanatory detail that each model includes for particular tasks examined.

Andrews and Goodson selected fourteen instructional development tasks with very broad descriptions. For example, "Task 11: Need" includes the following subtasks: "Assessment of need, problem identification, occupational analysis, competence, or training requirements" (p. 5). There is no indication in their review as to which of the several itemized subtasks are the one(s) actually included in a particular model. Stamas identified sixteen tasks common to at least three of the models he reviewed, defining these tasks somewhat more narrowly.

Andrews and Goodson evaluated *all* of the 40 models they reviewed across *all* fourteen tasks. After describing 23 models individually, Stamas reported a similar, though more specific, across-models analysis. Both reviews employed a models-by-tasks matrix to report the major tasks included in each of the models reviewed: the scope of these analyses is at the *task level.* No information is provided about how many subtasks are included in each task included in a model, nor about *how thoroughly* the task is explained in a model.

New Analysis Process: Task and Subtask Levels

A process has been devised which, when conducted by an experienced instructional developer, yields a more precise comparative analysis of models at the *subtask level.* The steps of this "micro-analysis" are presented in this article. Several terms are introduced in order to describe the analysis process and its results; each is defined when first used. Although the terms may at first appear to be somewhat lengthy and cumbersome, they are both functional and descriptive.

Subtask and Task Identification

The first part of the new analysis process involves creating a list of major tasks, with the specific activities contributing to each major task identified as subtasks of that task. This is done in three steps:

1. Determine an extensive list of models applicable to the creation of elementary and secondary instructional materials (or the context of choice).
2. Use these models to generate an exhaustive list of specific instructional development activities.
3. Group related activities into major *tasks,* with the constituent activities designated as *subtasks* of the major tasks.

In order to determine what development tasks are recommended by model builders, an extensive literature review was conducted. As a beginning, those models already reviewed by Andrews and Goodson (1980), Diamond (1985), Gentry (1984), Gustafson (1981), Reigeluth (1983), Stamas (1973), and Twelker, Urbach, and Buck (1972) were considered. Additional potential models were identified through a computer search of the ERIC and *Psychological Abstracts* data bases.

Examination of 30 models selected as relevant to the development of school materials resulted in the identification of 67 basic instructional development subtasks (see Appendix I). These subtasks have been grouped into sets of related activities to form twelve major tasks:

Task 1: Needs assessment
Task 2: Goals and objectives specification
Task 3: Resource and constraint analysis
Task 4: Target population description
Task 5: Task analysis

Task 6: Test construction
Task 7: Instructional sequencing
Task 8: Instructional planning
Task 9: Media selection
Task 10: Instructional materials specification
Task 11: Materials production
Task 12: Formative evaluation

In carrying out this process, the major tasks and subtasks of a comprehensive development model (Briggs, 1977) were used initially, then additional models were reviewed. If new subtasks were identified, the subtask lists were extended; if necessary, the major tasks were also redefined. A flow chart of this iterative tabulation and grouping procedure is included as Figure 2.

Clearly, the model selection process will influence which subtasks are identified for each major task. However, in this case, the grouping of subtasks into major tasks stabilized quite early in the analysis process, so it is unlikely that the list of major tasks has been affected by the selection process.

The twelve major tasks are at about the same level of generality as those identified by Andrews and Goodson (1980) and by Stamas (1973). At the overall task level, there is considerable similarity between the major tasks defined here and those identified in the other reviews. The instructional development tasks of this analysis and those enumerated by Andrews and Goodson and by Stamas are compared in Table 1. These comparisons are only general, because the *subtasks* included in the major tasks of the earlier analyses do not correspond closely with each other or with those determined here.

Task-Level Analysis of Models

The model builders' stated purposes determine the major tasks that are analyzed for each model. For example, if a model builder did not outline a procedure for a given major task, such as "Task 1: Needs Assessment," then the model is not analyzed for that task. Therefore, models are first analyzed to determine which major tasks they include.

Subtask-Level Analysis

The second level of analysis applied to the models determines which sub-

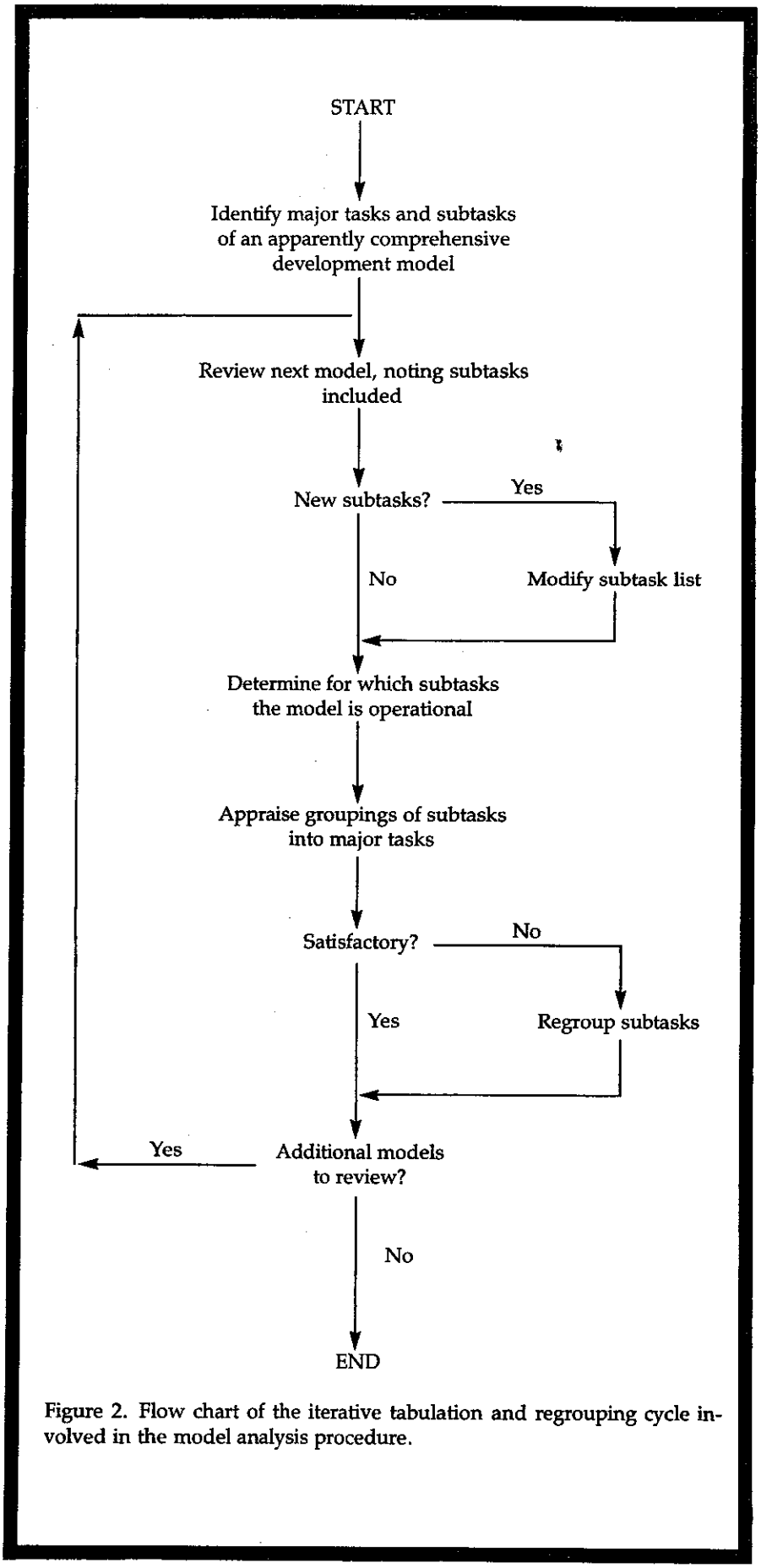

Figure 2. Flow chart of the iterative tabulation and regrouping cycle involved in the model analysis procedure.

TABLE 1
Major Development Tasks Defined in This Analysis Compared with Tasks Identified in Previous Analyses

Major Tasks	Andrews & Goodson (1980)[1]	Stamas (1973)[2]
1 Needs Assessment	11 Need 12 Alternatives	4 Identify Problem
2 Goals & Objectives Specification	1 Outcomes	1 Broad Instructional Goals 6 Specification of Behavioral Objectives
3 Resource & Constraint Analysis	13 Constraints 14 Cost	—
4 Target Population Description	5 Learner Attributes	5 Pre-Assessment of Entry Skills
5 Task Analysis	3 Analysis	2 Collect Data 7 Enabling Objectives 8 Task Analysis
6 Test Construction	2 Tests	6 Specification of Performance Tests
7 Instructional Sequencing	4 Sequencing	10 Review/Revise Instructional Content
8 Instructional Planning	6 Strategy	9 Analyze Setting 14 Design Teaching/Learning Activities
9 Media Selection	7 Media	12 Select Design Format
10 Instructional Materials Specification	8 Development	14 Design Teaching/Learning Activities
11 Materials Production	8 Development	13 Construct Prototype 11 Technical & Communications Review
12 Formative Evaluation	9 Tryout/Revision	13 Test Prototype

[1]In addition, Andrews and Goodson identified Task 10, Install/Maintain.
[2]Stamas also identified Task 3, Organize Management; Task 15, Support Services; and Task 16, Implement/Evaluate/Revise/Recycle/Feedback Loop.

tasks of each relevant major task are included in the model (*comprehensiveness* for that task), and which subtasks are explained thoroughly (*operational level* for that task).

These analyses are sharpened by the use of a weighting factor for each subtask. A *subtask weight* within each major task is simply the number of relevant models that include the subtask. The assignment of weights is not done at the task level, because all of the major development tasks are essential, at least to some degree. At the subtask level, different but equally valid methods for carrying out a task are presented by different model builders. Subtask weights demonstrate the overall acceptance of each of these methods by instructional development theorists.

Comprehensiveness of Task Coverage

For each major task, a weighted *comprehensiveness rating* is then assigned to each relevant model, as follows:

$$\frac{\text{sum of weights of included subtasks}}{\text{sum of weights of all subtasks in that task}}$$

and expressed as a percent. (Alternatively, one could just count the subtasks and determine a simple proportion. However, that approach would give no indication of the relative acceptance, or "importance," of the subtasks included.)

Operational Level of Task Coverage

A model is considered to be "operational" with respect to a given subtask if it supplies enough detail to teach that subtask, or if a student (or a person with little knowledge about instructional development procedures) could carry out that task using *only* the information included in that model. Thus, a model in which the process for a given subtask is described very briefly, or in which only references to other sources are given, is not operational *for that subtask.*

In the models analysis process, for each subtask included in a model, an informed yes/no judgment is made by one or more experienced instructional developers as to whether the model is operational for that subtask. A weighted *operational level rating* (expressed as a percent) is then assigned to each relevant model in each major task, as follows:

$$\frac{\text{sum of weights of operational subtasks}}{\text{sum of weights of all subtasks in that task}}$$

Full-Model Analysis

Although the comprehensiveness and operational level ratings of a model *for each task* addressed are important data, questions remain about how comprehensive or operational that model is *for all of the tasks it addresses.* To answer these questions, it is necessary to display the individual ratings in larger matrices and derive some broader ratings from the subtask- and task-level analyses.

Mean Relative Comprehensiveness. Simply counting the number of tasks addressed would give, for each model, a measure of how "broadly comprehensive" the model is; that is the approach taken by Andrews and Goodson (1980) and by Stamas (1973). However, task-by-task comprehensiveness ratings can be used to provide a finer measure for those tasks included in each model.

Taken together, the task-by-task comprehensiveness ratings show the overall comprehensiveness of each model *relative to the model-builder's intended purpose.* A *mean relative comprehensiveness rating* is derived as follows:

$$\frac{\text{sum of individual comprehensiveness ratings}}{\text{number of tasks included}}$$

Mean Relative Operational Level. The task-by-task operational level ratings show the overall operational level of each model *relative to the model-builder's intended purpose.* A *mean relative operational level rating* is derived as follows:

$$\frac{\text{sum of individual operational level ratings}}{\text{number of tasks included}}$$

Selecting Reference Models. Instructional developers can use the data provided by this analysis process to select one or more reference models suitable for their needs.

In order to identify an "optimal" instructional development model, the most comprehensive model(s) for each major task could be determined. The complete set of comprehensive models so identified could be considered to represent an overall, eclectic, comprehensive "model" for all major tasks. Alternatively, a single "broadly comprehensive" model could be chosen, based on both the number of tasks addressed and the relative mean comprehensiveness rating. For some tasks, any model would, in all likelihood, have to be supplemented by additional models.

Similarly, the most operational model(s) for each major task could be identified. The complete set of operational models so determined could represent an overall, eclectic, operational "model" for all major tasks. Selecting a "broadly operational" model would require consideration of both the number of tasks addressed and the relative mean operational level rating.

Instructional developers can use the data provided by this analysis process to select one or more reference models suitable for their needs.

An Illustration of the Analysis Process

Four instructional development models (Briggs, 1977; Control Data Corporation, 1979; Dick & Carey, 1978; Gagné & Briggs, 1979) and one instructional design model (Reigeluth & Stein, 1983) illustrate how the analysis process is used.

Task-Level Analysis of Models. The major tasks addressed by each of the five selected models are identified in Table 2. This simple matrix is very similar to those created by Andrews and Goodson (1980) and by Stamas (1973).

In this analysis process, each model is analyzed only for the tasks it addresses to some degree. In other words, not all models are considered for each task. Therefore, the number of models contributing to the data for each task varies. As shown in the far right column of Table 2, the number of models addressing a given task ranges from one (Task 11) to five (Tasks 5, 7, 8). Because it is a task that all five of these models include, "Task 7: Instructional Sequencing" will be used to illustrate the subtask-level portions of the analysis process.

Subtask Weights. For Task 7, those subtasks included by each of the five models are shown by open bullets in Table 3. Each of the five subtasks, 7.1 through 7.5, is included in at least one, and at most five, of the models. The number of models including each subtask gives the subtask weights shown in the far right column of Table 3.

Comprehensiveness. Summing the weights of included Subtasks 7.1 through 7.5 for each model, and dividing by the sum of the weights of *all* subtasks in Task 7 (14), gives the comprehensiveness ratings in the bottom row of Table 3. In this example, Dick and Carey (1978), at 93%, is the most comprehensive model for Task 7. A different model might be the most comprehensive for a different task.

TABLE 2
Major Tasks Addressed by Selected Models

TASKS	Briggs (1977)	Control Data Corp (1979)	Dick & Carey (1978)	Gagné & Briggs (1979)	Reigeluth & Stein (1983)	TOTALS
1. Needs assessment	X	X		X		3
2. Goals & objectives specification	X	X	X	X		4
3. Resource & constraint analysis	X	X		X		3
4. Target population description		X	X			2
5. Task analysis	X	X	X	X	X	5
6. Test construction	X	X	X	X		4
7. Instructional sequencing	X	X	X	X	X	5
8. Instructional planning	X	X	X	X	X	5
9. Media selection	X	X	X	X		4
10. Instructional materials specification	X	X	X	X		4
11. Materials production		X				1
12. Formative evaluation	X	X	X	X		4

TABLE 3
Comprehensiveness Ratings of Five Models for Task 7 Instructional Sequencing, Taking Subtask Weights into Account

SUBTASKS	Briggs (1977)	Control Data Corp (1979)	Dick & Carey (1978)	Gagné & Briggs (1979)	Reigeluth & Stein (1983)	SUBTASK WEIGHTS
7.1 Verify enabling objectives	○	○	○			3
7.2 Select organizing content					○	1
7.3 Determine overall teaching order	○	○	○	○	○	5
7.4 Determine "size" of lessons			○	○	○	3
7.5 Validate instructional sequence	○		○			2
COMPREHENSIVENESS RATING (%)	(10/14) 71	(8/14) 57	(13/14) 93	(8/14) 57	(9/14) 64	(14/14) 100

TABLE 4
Operational Levels of Models for Task 7 Instructional Sequencing, Taking Subtask Weights into Account

SUBTASKS	Briggs (1977)	Control Data Corp (1979)	Dick & Carey (1978)	Gagné & Briggs (1979)	Reigeluth & Stein (1983)	SUBTASK WEIGHTS
7.1 Verify enabling objectives	●	○	●			3
7.2 Select organizing content					○	1
7.3 Determine overall teaching order	●	○	○	●	●	5
7.4 Determine "size" of lessons			○	○	●	3
7.5 Validate instructional sequence	○		○			2
OPERATIONAL LEVEL RATING (%)	(8/14) 57	(0/14) 0	(3/14) 21	(5/14) 36	(8/14) 57	(14/14) 100

Operational Level. In Table 4, the subtasks of Task 7 for which descriptions in the models are operational are indicated by solid bullets; subtasks for which the descriptions are *not* operational are indicated by open bullets.

When the weights of *operational* subtasks are summed for each model and compared to the sum of the weights of all subtasks in Task 7, the operational level ratings in the bottom row of Table 4 result. In this example, Briggs (1977) and Reigeluth and Stein (1983) are the most operational models for Task 7, both at 57%. A different model might be the most operational for a different task.

Full-Model Analysis. For simplicity, the preceding illustrations have focused on the analysis of five models for a single task. However, because very few of the five selected models include certain tasks (refer to Table 2, Tasks 1, 3, 4, and 11), it is necessary to consider a greater number of models in order to illustrate meaningful across-tasks data. Therefore, the data for *twenty* instructional development models (see Appendix II) have been used to compute the mean relative comprehensiveness and operational level ratings.

Using a greater number of models increases both individual subtask weights and the sum of subtask weights for a task. However, the resulting task-by-task ratings for a given model differ very little. In Tables 5 and 6, the ratings for the individual models for Task 7 differ only slightly from those in the preceding illustrations (compare with Tables 3 and 4). (The total number of models contributing to the ratings for each task is displayed in the far right columns of Tables 5 and 6.)

In Table 5 are displayed the comprehensiveness ratings for each task addressed by the five selected models. The ratings were determined using all relevant data for twenty instructional development models, not just the five selected for reporting here. The last two rows of Table 5 show the number of tasks included in each model and the mean relative comprehensiveness rating for each model. Of these five models, the model with the highest mean relative comprehensiveness rating is Dick and Carey (1978), with a rating of 89%. Note that, although the Dick and Carey model includes just nine of the twelve tasks, it is highly comprehensive (rating $\geq$ 80%) for seven tasks and the most comprehensive of these five models for five tasks. Together, the Gagné and Briggs (1979) and Control Data Corporation (1979) models provide highly comprehensive coverage of the three tasks missing from Dick and Carey (Tasks 1, 3, 11) and could also be used to amplify the treatment of Tasks 2, 9, 10, and 12).

In Table 6 are displayed the operational level ratings for each task addressed by the five selected models. These ratings were determined using all relevant data for twenty instructional development models. The last two rows of Table 6 show the number of tasks addressed by each model and the mean relative operational level rating for each model. Of these five models, the model with the highest mean relative operational level rating is Briggs (1977), with a rating of 50%. Note that, although Briggs includes just ten of the twelve tasks, it is fairly operational (rating $\geq$ 50%) for seven tasks and the most operational of the five models for five tasks.

In selecting a single reference model from among the five illustrated here, an experienced instructional developer might choose the Control Data model (1979) because it addresses all twelve tasks and is fairly comprehensive (mean relative comprehensiveness rating 77%). Such a practitioner's experience could be sufficient to "fill the gaps" suggested by the model's operational level ratings. However, that model's low mean relative operational

TABLE 5
Comprehensiveness Ratings for All Tasks Addressed and Mean Relative Comprehensiveness Ratings

TASKS	Briggs (1977)	Control Data Corp (1979)	Dick & Carey (1978)	Gagné & Briggs (1979)	Reigeluth & Stein (1983)	NO. OF MODELS (out of 20)
1. Needs assessment	60	57		77		8
2. Goals and objectives specification	94	88	66	94		13
3. Resource and constraint analysis	88	88		63		5
4. Target population description		75	100			7
5. Task analysis	100	79	100	83	83	14
6. Test construction	89	75	100	75		11
7. Instructional sequencing	81	67	95	62	67	11
8. Instructional planning	63	51	77	75	35	13
9. Media selection	75	75	91	100		14
10. Instructional materials specification	68	96	84	68		11
11. Materials production		100				5
12. Formative evaluation	68	68	90	100		9
NO. OF TASKS	10	12	9	10	3	
MEAN RELATIVE COMPREHENSIVENESS (%)	79	77	89	80	62	

TABLE 6
Operational Level Ratings for All Tasks Addressed and Mean Relative Operational Level Ratings

TASKS	Briggs (1977)	Control Data Corp (1979)	Dick & Carey (1978)	Gagné & Briggs (1979)	Reigeluth & Stein (1983)	NO. OF MODELS (out of 20)
1. Needs assessment	60	27		0		8
2. Goals and objectives specification	59	0	41	53		13
3. Resource and constraint analysis	63	31		0		5
4. Target population description		0	0			7
5. Task analysis	83	0	69	83	42	14
6. Test construction	43	0	46	0		11
7. Instructional sequencing	67	0	19	48	62	11
8. Instructional planning	63	11	67	75	14	13
9. Media selection	0	0	16	64		14
10. Instructional materials specification	0	28	68	0		11
11. Materials production		0				5
12. Formative evaluation	58	0	77	32		9
NO. OF TASKS	10	12	9	10	3	
MEAN RELATIVE COMPREHENSIVENESS (%)	50	8	45	36	39	

level rating (8%) limits its usefulness to students and other inexperienced instructional developers. For such novices, either the Briggs model, with mean relative ratings of 79% and 50% across ten tasks, or the Dick and Carey model, with ratings of 89% and 45% across nine tasks, would appear to be more helpful.

Concluding Remarks

In this article a process for analyzing prescriptive models for the development of instructional materials has been described. The process has four steps:

1. Group related subtasks into major tasks.
2. Analyze each selected model relative only to the major tasks the model actually includes.
3. Within each major task, determine weights for the subtasks, as a measure of the "importance" assigned to each subtask by the field.
4. For each major task, analyze relevant models for comprehensiveness and operational level, using the sum of the subtask weights as the base.

This model-analysis process is iterative and cybernetic. As they are published, new models can be analyzed and the resulting data integrated with previous results. At the same time, the parameters dependent on subtask weights can be refined by input from those new models.

The process for analyzing models developed in this article can be applied to the analysis of instructional development models intended for other contexts, such as military training. The process may also prove to be of value in analyzing and comparing models that are intended for quite different purposes, such as courseware evaluation.

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APPENDIX I. The Tasks and Subtasks of Instructional Development (in brief)

Task 1: Needs Assessment. The task of needs assessment involves determining goals, identifying discrepancies between goals and the status quo, and establishing priorities for action.

1.1 Identify and rank a range of possible goals.
1.2 Identify discrepancies between expected and actual performance.
1.3 Analyze consequences of discrepancies.
1.4 Determine possible solution areas.
1.5 Set priorities for action.
1.6 Select intervention.

Task 2: Goals and Objectives Specification. The task of determining instructional goals and objectives involves generating increasingly specific objectives from more general objectives.

2.1 Define overall instructional goals.
2.2 Specify end-of-course objectives.
2.3 Specify unit objectives.
2.4 Write terminal behavioral (performance) objectives.
2.5 Draw instructional map.
2.6 Determine objectives' "fit" within curriculum.

Task 3: Resource and Constraint Analysis. This task involves determining whether a cost-effective development effort can be undertaken.

3.1 Assess resources available.
3.2 Analyze existing constraints.
3.3 Plan constraint removal.
3.4 Make go/no-go decision.
3.5 Plan resource use.

Task 4: Target Population Description. This task involves determining the characteristics of the target population, or students, so that instructional materials can be prepared to suit the learners' needs.

4.1 Determine general characteristics.
4.2 Determine aptitude, ability, and skill levels.
4.3 Determine attitude and motivational characteristics.

Task 5: Task Analysis. Task analysis provides a conceptualization for the instructional design and useful guidance for the writing of assessment devices.

5.1 Identify and classify tasks/content to be learned.
5.2 Conduct information-processing/content analysis.
5.3 Conduct learning task analysis.
5.4 Draw learning map.
5.5 Define entry behaviors.
5.6 Validate objectives.

Task 6: Test Construction. The student's performance level on each prerequisite or terminal objective is determined in order to monitor each learner's progress and thus prevent failures and minimize remedial instruction.

6.1 Specify administrative details/assessment system.
6.2 Specify appropriate test characteristics for each prerequisite or terminal objective.
6.3 Construct and review test items.
6.4 Determine test validity and reliability.
6.5 Try out the test and revise it.

Task 7: Instructional Sequencing. The general sequencing of instruction among *terminal* objectives is the aim of Task 2. Task 7 involves the sequencing of instruction among *enabling* objectives.

7.1 Verify enabling objectives for each terminal objective.
7.2 Select the organizing content.
7.3 Determine overall teaching order of enabling objectives/content.
7.4 Determine "size" of lessons.
7.5 Validate instructional sequence.

Task 8: Instructional Planning. Instructional planning includes specifying instructional events, or teaching steps, for each enabling objective. Not all teaching steps must be built into the instructional materials. Some may be provided by the teacher, others by the student.

8.1 Identify content.
8.2 Plan pacing and grouping of instruction.
8.3 Identify options for instructional methods.
8.4 Select instructional methods.
8.5 Plan pre-instructional activities.
8.6 Plan presentation of new content.
8.7 Plan practice with feedback.
8.8 Plan performance assessment.
8.9 Plan for retention and transfer.
8.10 Specify conditions of learning.

Task 9: Media Selection. This task involves selecting appropriate media by considering task variables, learner variables, the assumed learning environment,

Continued

APPENDIX I. (Continued)

the assumed product development environment, the economy and culture, and practical factors.

9.1 Determine fundamental delivery methods.
9.2 Specify stimulus characteristics.
9.3 Specify response characteristics.
9.4 Identify potential media.
9.5 Make final media selection.

Task 10: Instructional Materials Specification. This task involves preparing manuscripts, scripts, sketches, and storyboards for the instructional materials.

10.1 Prepare instructional standards.
10.2 Review existing materials.
10.3 Write prescriptions.
10.4 Review and revise prescriptions.

Task 11: Materials Production. This task involves producing first the prototype, then the final text, audio, and visual materials that will make up the instructional package.

11.1 Draft and review the learning activities.
11.2 Edit and revise draft materials.
11.3 Produce audio-visual materials.
11.4 Assemble course materials.
11.5 Revise on basis of field trial results.
11.6 Produce text materials.

Task 12: Formative Evaluation. This task involves three phases of product validation, after each of which the instructional materials are revised.

12.1 Plan materials evaluation system.
12.2 Describe learning environment.
12.3 Conduct one-to-one evaluation.
12.4 Conduct small-group evaluation.
12.5 Train field trial teachers.
12.6 Conduct field trial evaluation.

APPENDIX II. Models Used in Computing Mean Relative Comprehensiveness and Operational Level Ratings.

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