

# Information mapping: a description, rationale and comparison with programmed instruction

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## Abstract

This article defines information mapping, illustrates it in practice, and presents the results from a study which compared a piece of instructional text set in map or programmed form. The results suggest that in this particular case, both forms of presentation taught equally effectively, but that it was significantly easier to retrieve information from the information map than it was from the programmed text.

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Editor's note: This paper is presented here in its original "map" form, but reduced photographically to fit the page size of *Visible Language*.

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INFORMATION MAPPING: A DESCRIPTION, RATIONALE AND COMPARISON WITH PROGRAMMED INSTRUCTION

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Introduction Information mapping<sup>\*</sup> is a method of structured writing developed just over a decade ago by Robert Horn (See Horn, 1976). It incorporates numerous techniques for explicitly structuring prose material to make it more comprehensible and easily rememberable. While its popularity as a written communication tool has grown, the mapping procedures remain largely unverified and devoid of an adequate theoretical base.

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Purpose The expressed purposes of this article are to:

- \* define information mapping
- \* illustrate its techniques (the article is mapped)
- \* suggest conceptual bases for these techniques
- \* compare its techniques with those employed in programmed instruction
- \* review a study comparing the two methods for structuring text
- \* suggest implications for information recall and retrieval

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Comment The popularity and potential of the information mapping method for structured writing is premised on a renaissance of print media in the educational communications and technology field. This trend is based largely on the contemporary emphasis on cost effectiveness as a selection criterion. Many consider expensive delivery systems such as film and videotape as the nostrum of a naive and wealthier period of emerging technologies. Print media have endured throughout. We now need to consider how to make them more effectual.

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\* Information mapping is a trademark of Information Resources Inc.

## INFORMATION MAPPING

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Introduction	The process of transfer, decoding, and recording into memory of information is enhanced by organizing the information or content being transmitted. Cognitive psychology has repeatedly documented the advantages of explicitly structuring information in ways that facilitate accomodation to learners' cognitive structures. Information mapping proposes techniques for graphically doing this.
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Definition: Basic Mapping Units	<p>Information mapping, to this end, employs these techniques:</p> <p><u>Information blocks</u> - a limited amount of information about a concise unit of content, with a label describing its type or function</p> <ul style="list-style-type: none"> <li>* introduction blocks</li> <li>* definition blocks</li> <li>* comment blocks</li> <li>* classification blocks</li> <li>* example blocks</li> <li>* procedure blocks</li> <li>* use blocks, etc.</li> </ul> <p><u>Information maps</u> - a collection of blocks related to a specific topic</p> <ul style="list-style-type: none"> <li>* fact maps - identifies units</li> <li>* procedure maps - describes sequence</li> <li>* process maps - explains sequence</li> <li>* concept maps - defines concept</li> <li>* classification maps - relates concepts</li> <li>* structure maps - describes objects</li> <li>* principle maps - applies principles</li> </ul> <p><u>Related pages</u> - internal indexing system (cross referencing)</p>
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Structural Methods	<p>The units used, to construct information maps are organized (structured) by ...</p> <ul style="list-style-type: none"> <li>* graphic presentation and isolation of information units</li> <li>* classification of content</li> <li>* prescribing empirically based thought units to relate specific types of content</li> <li>* rules and procedures for writing maps</li> <li>* formats for organizing and presenting blocks and maps</li> </ul>
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Uses Information mapping can be used to produce...

Book materials

- textbooks
- pamphlets
- workbooks

Primary instructional sequences, for teaching ...

- facts
- concepts
- procedures
- principles

Reference tools

- to aid instructor
  - to document information
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Non-examples Information mapping is not normally used to...

- organize speeches or presentations
  - teach psychomotor (physical) skills
  - document specific events
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Comment The information mapping method of analytical writing is grounded in information processing and cognitive theories, that is, an elaborate rationale can be proffered for its use.

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RATIONALE FOR INFORMATION MAPPING

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Introduction	<p>Since little analysis of mapping variables has been done, predictions about the effects of its internal characteristics must derive from other literatures, particularly prose comprehension.</p>
Internal Structure	<p>Prose passages normally contain an implicit organizational structure of content.</p> <p><u>Recall of material may be a function of...</u></p> <ul style="list-style-type: none"> <li>* height in content structure of idea - ideas high in structure better recalled (Meyer &amp; McConkie, 1973)</li> <li>* staging - the dimension of prose structure that determines the prominence of ideas within prose (Grimes, 1972)</li> <li>* staging - prose at higher staging levels better recalled (Clements, 1976)</li> <li>* signalling - non-content areas indicating level of content in structure - recall improved (Meyer, 1975)</li> </ul>
Comment	<p>The type of research cited above provides a rationale for the extrinsic reporting of prose structure, as occurs in information mapping (blocking and labelling).</p>
Blocking	<p><u>These effects partially result from blocking prose...</u></p> <ul style="list-style-type: none"> <li>* linguistic elements associated in holistic fashion</li> <li>* information in blocks become unitized, facilitating semantic comparison with other units (Gropper, 1970)</li> <li>* facilitates encoding of spatial attributes of information in memory (Christie &amp; Just, 1976)</li> </ul>
Labelling	<p><u>Labelling of blocks probably functions as...</u></p> <ul style="list-style-type: none"> <li>* advance organizers, providing conceptual cues about ensuing information (Wright, 1977)</li> <li>* subsumers, which facilitate recall (Dahl, 1973)</li> </ul>
Retrieval	<p>Retrieval of information from prose passages has not been researched to any degree.</p> <p><u>Information mapping should facilitate retrieval by providing...</u></p> <ul style="list-style-type: none"> <li>* table of contents</li> <li>* predictable textual format</li> <li>* consistent typography</li> <li>* marginal labels</li> <li>* local indexing</li> <li>* blocks</li> </ul>
Comment	<p>Retrieval involves textual searching, a process of associating spatial cues stored in memory with their referents as they appear on the page. The same structural characteristics that facilitate recall would also serve to aid the search process, probably by allowing parallel or subject-oriented search strategies as opposed to linear searches involved in normal non-distinguished (non-labelled) text. Scanning textual passages is facilitated by these locative cues provided by labels.</p>

## COMPARING INFORMATION MAPPING AND PROGRAMMED INSTRUCTION

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Introduction      The attributes and advantages of programmed instruction are well documented. Since the study described in the next four maps compares the facilitative effects of its characteristics with those of information mapping, these differences ought to be outlined.

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Classification    Information mapping can be distinguished from programmed instruction by making the following contrasts.

Characteristic	Information Mapping	Programmed Instruction
Basic Information Units	blocks, with marginal labels	frame
Sequencing	functional (information units labelled)	serial (rigid sequence)
Structure	superordinate general (maps) to specific (blocks)	inductive (specific to general)
Practice	occasional exercise blocks	consistent, continuous
Feedback	slightly delayed (in another map or page)	immediate (contiguous or sequential - beginning of next frame)

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Comment            The primary distinction between programming and mapping can be described in terms of the psychological rationale for each. Programming suggests that repetitious, overt practice and reinforcement will consistently produce learning (behaviorism). Mapping implies that explicating content structure will facilitate accomodation into one's cognitive structure (cognitive psychology).

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## REPORT OF RESEARCH PROJECT: STUDY PLAN

Introduction An experimental research project was conducted at the University of North Carolina at Greensboro that compared (conceptually and empirically) aspects of information mapping and programmed instruction (Jonassen & Falk, 1980)

Basic The study was designed to...

- \* assess the ability of information mapping to facilitate recall
- \* compare its instructional effectiveness with programmed instruction
- \* compare the usefulness of information mapping as a retrieval tool to programmed instruction

Classification and Design of Materials Information mapped and a programmed versions of a 2000 word prose passage, "Communication and the Teaching Process", were written. A comparison of the two versions, reflecting the technology of each includes...

Variable	Information Mapping Version	Programmed Instruction Version
Number of units	55 blocks, 18 maps	40 frames
Practice	none	multiple choice questions at end of each frame
Feedback	none	presented immediately below frames
Illustrations	two, embedded in text	two, located at end of program
Length	19 pages	20 pages
Critical Technique	content structuring and labelling	overt responding
Labelling	maps top-headed, blocks side-labelled	two units top-headed

Comment The study described in this and the next three maps was a seminal investigation, designed to document main effects and suggest theoretical bases for comparing these instructional methods. As such, it should raise more questions than it answered.

Related Maps Method, p. 7

## RESEARCH METHODOLOGY

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Subjects            The participants in the study included:

- 41 graduate and undergraduate students
- enrolled in an introductory media course
- attrition level of only two

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Instrumentation    Criterion examination, administered before and after treatment:

- consisted of 41 four option multiple choice questions
- tested recall of content
- stem and correct answer quoted from text
- validity established by panel of experts
- reliability established by Spearman-Brown split-half technique ( $r = .83$ )

Retrieval examination, administered two weeks after treatment:

- consisted of 45 fill-in-the blank question
- derived from recall items with key phrases deleted
- subjects required to write in missing information and page number on which it was located
- open-book test measured retrieval ability

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Comment            It was assumed that the effects of recall from the immediate post test on the retrieval test were diminished by the two week delay between administrations.

Procedure  
Followed

Step	Procedure
1	Pretesting during class
2	Random assignment to treatment
3	One week later, self-study materials distributed and completed at individual pace
4	Immediate posttesting with recall test
5	Two weeks later, retrieval test administered

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## RESULTS

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## Variables

Two dependent variables were measured by this study:

Recall = the differences between pretest and posttest scores on the criterion exam

Retrieval = the number of blanks and page numbers filled in on the retrieval test.

One independent variable was assessed: treatment method

## Test Scores

Test		Map Group	Programmed Instruction Group
Pretest (Recall)	$\bar{X}$	28.28	27.84
	SD	3.51	5.37
Posttest (Recall)	$\bar{X}$	38.86	37.53
	SD	2.87	3.37
Retrieval Test	$\bar{X}$	33.90	22.94
	SD	8.16	7.76
	N	22	19

## Data Analysis

- \* 2 x 2 (test by method) analysis of variance
- \* F test for homogeneity variance in retrieval scores
- \* t test for independent means on retrieval scores

## Results

- \* F (1,39) = 340.92,  $p < .001$ , main effect for treatment
- \* no significant interaction (group x test)

## Retrieval scores:

- \* F (21,18) = 1.11,  $p < .05$  indicated homogeneous variables
- \* t (21,18) = 4.14,  $p < .001$  comparing retrieval scores

## Interpretations

Both mapping and programmed instruction produced significant amounts of learning (recall). No differences in effectiveness were found. A very significant difference between treatments in favor of mapping occurred on the retrieval task.

## Comment

The retrieval task was independent from (not cued by) the recall task. Correlation between posttest scores and retrieval scores was low ( $r = .15$ ) and variances were greatly different. Analysis of covariance confirmed no effect of prior learning on retrieval.

## CONCLUSIONS REGARDING RECALL

Introduction Both programmed instruction and information mapping produced significant amounts of learning. Both are equivalently effective presentational devices.

Comment Without a control group (narrative prose), it is difficult to assess the benefits resulting from the structural characteristics of both techniques.

Rationale Both information mapping and programmed instruction are methods of structured writing. The rationale for programming is firmly established. The conceptual bases for the success of mapping are suggested below:

Structural Characteristic or Mapping	Research Conclusions as Conceptual Base
Breaking down information into chunks and explicitly structuring the content	Recall enhanced by informing reader of passage structure prior to reading (Fraser, 1969)
Defining function of chunks and their relationship to other chunks yields explicit organizers as conceptual tags	advanced organizers provide explicit "ideational scaffolding" for accomodating information (Ausubel, 1968)
Structuring of content in textual passages	Structural linguistic literature (Grimes, 1972; Meyer, 1975)
Explicit content structuring	Class III mathemagenic activities (those affecting visual scanning, translation, internal cognitive processing) (Rothkopf, 1970)
Structuring supplants mathemagenic activities	Supplantation hypothesis (Ausburn & Ausburn, 1977)

Comment Additional research, considering the level and type of learning as it interacts with the characteristics employed in mapping is badly needed. Numerous studies are also possible on ways of optimizing learning by manipulating presentation strategies. If mapping is to assume the stature of a method such as programmed instruction, a great deal of verification and experimentation will be necessary.

Related Maps Results, p. 8

## CONCLUSIONS REGARDING RETRIEVAL

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Introduction	It is obvious from the results that information mapping provides clear advantages for retrieving information from textual materials.
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Important Techniques for Retrieval	The techniques involved in mapping that probably contribute to this advantage include: <ul style="list-style-type: none"><li>* marginal labels</li><li>* consistent format</li><li>* information blocking</li></ul>
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Comment	The previous discussion regarding recall facilitation by mathemagenics and other methods have no implications as a conceptual basis for retrieval, since learning is not the issue of concern. Retrieval requires a different set of mental skills.
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Definition Retrieval	Information retrieval, according to information scientists, is <ul style="list-style-type: none"><li>* the searching of a collection of documents to identify those which deal with a particular subject</li></ul> Computer specialists would define retrieval as <ul style="list-style-type: none"><li>* the recovery of information from a collection of documentation or other graphic records</li></ul>
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Comment	These approaches, and the characteristic techniques they employ, suggest possible conceptual bases for analyzing the retrieval benefits of information mapping.
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Related maps	Results, p.8
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## Note

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