UNIT 6 SOME INSTRUCTIONAL STRATEGIES FOR IMPROVED LEARNING FROM DISTANCE TEACHING MATERIALS*

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Editors' note: The first part of this article, the longest, looks at devices for orienting learners and suggests that writers should cultivate diversity in their use of such devices. The lengthy discussion of objectives touches on the relationship between the use of objectives and the actual learning that takes place.

The second section considers the use of questions inserted in the text and is more in the form of a useful discussion than firm guidelines derived from research. The authors comment that most research about questions has been conducted in conditions very different from those in distance learning, and the results are not necessarily applicable. They express the need for 'a brand of consumer psychology' of distance learning, which will show how learners use materials.

The last section of the article is also concerned with the use learners make of texts and the implications for design. The section contains a number of practical suggestions drawn from research on typography.

The article as a whole provides a mine of information for course designers.

All teachers without exception have to grapple with several perennial issues including motivation of students, specification of goals, the provision of worthwhile learning activities, giving effective feedback, and inducing an appropriate disposition towards learning in students. In responding to these issues classroom teachers can call on an abundant literature which addresses the issues either separately or collectively within the framework of carefully articulated and reasonably comprehensive approaches to teaching. Classroom teachers can similarly select from a wide range of in-service programmes to enhance their existing skills develop new ones.

No such luxury awaits the distance teacher. Distance education has not captured the attention of those involved in educational research, and its literature has a short history and remains slight with little theoretical discussion and little documentation of instructional practices; in fact, it is only during the last decade that distance teaching has become the focus of much discourse at all.

An examination of the literature of distance education and of many samples of distance teaching materials currently being used will show a preference

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for one particular approach to teaching through text. This can be readily aligned with traditional approach to teaching in which, typically, specific goals are defined for students; content and resources are presented by the teacher; interactive processes and patterns are largely initiated, guided and controlled by the teacher; obligatory assessment activities are set by the teacher; and feedback is provided by the teacher. These devices are considered by Macdonald-Ross (1979) to be the 'cultural descendants' of tightly structured programmed learning materials. Clearly they signal an approach to distance teaching which is heavily teacher-directed and which casts the teacher in the roles of manipulator, controller and director. Such an approach posits a close analogy between teaching and manufacturing. Some have criticised it because of the value it places on efficiency, cost-effectiveness, product orientation, and marketability of the product at the expense of diversity, individuality, and humanistic approach. Surprisingly the pervasiveness of this approach in distance teaching has not provoked much comment to date but it does invite investigation since this one-model dominance conflicts with a generally accepted proposition at the classroom level that there is not just one 'right' way to teach.

The reasons for the dominance of this approach are probably varied and complex. It does *seem* to give the teacher more control of what the student does, how he learns, and in what order he does it. The sense of control over learning that it imparts might be a palliative for those distance teachers troubled by their physical remoteness from learners and their inability to influence learners directly. However, this sense of control may be misleading. The evidence on this issue, as we shall show in this article, is not yet all in and, even where there has been fair degree of research, conclusions can only be tentatively drawn. Certainly we would not want to suggest that it is the best approach to distance teaching. We would rather argue for more eclecticism and more experimentation than seems presently to exist amongst distance-teaching enterprises. Diversity in instructional approach is warranted in view of the clearly established need to vary instructional strategies to suit differences in instructional goals, the demands of specific knowledge domains, and the needs of learners such as those arising from differences in cognitive style and cultural backgrounds. In particular, we would advocate the extension of the developmental work begun by Baath (1979) in delineating different instructional approaches in the distance teaching field and which parallels the efforts of Joyce and Weil (1972, 1980) on teaching in conventional classrooms.

We also believe that there is need to structure materials in a way which will provide the student with greater access to the content. In discussing this concept we have drawn considerably on the work of Walter and Macdonald-Ross of the Open University (UK). 'Access structure' refers to the 'coordinated use of typographically signalled structural cues that help students to read texts using selective sampling strategies' (Walter, 1979: 175). These cues help the reader to find his way about in the text. We believe that for too long we have ignored the fact that students at a distance read instructional texts *selectively*.
Another theme which has informed our thinking is that the 'veto power' over learning which students at a distance can exercise. They are able to make decisions about how they will deal with an instructional package, instructional decisions which are usually denied the internal student. Good design of instructional texts will recognise this veto power.

The main task we have set ourselves in this chapter, however, is to examine a number of devices which have been used in instructional text for tertiary level distance learners. In particular we focus on the devices which orient the learner and introduce the textual material (advance organizers, overviews, pretests, and objectives), on the insertion of questions, and presentation techniques which have instructional consequences, including graphics and typographical cues. These seem to us a major areas of concern. Anyone designing instructional text will usually make decisions about how to introduce materials and orient learners, how to provide appropriate questions to assist learners, and how to present the text in such a way that it will facilitate learning. Where appropriate, we have drawn on research and research reviews. On other occasions we have resorted to intuition, our own experience, and everyday rationality. Where possible we have tried to derive guidelines for those involved in the day-to-day preparation of teaching materials. Two caveats are in order here. Firstly, the guidelines which we propose are in many respects general ones. Their application in specific contexts should be made only after consideration has been given to the goals achieved, features of the particular context (including the nature of the subject matter) in which they are to be used, and characteristics of learner groups. Secondly, these guidelines do not apply to the preparation of the subject matter discourse but to instructional devices which are embedded in the text and which are intended as aids to facilitate students' use of text.

1. Orienting the learner

The writer of distance teaching materials has available a range of devices for introducing students to learning tasks. These devices usually appear in the introductory sections of textual material and include easily distinguishable forms such as advance organizers, overviews, pretests and objectives. Writers generally tend not to put all their eggs in one basket but rather use a combination of these devices. In our view, there are good reasons for encouraging this practice. Our investigation of introductory material in some examples of distance teaching texts showed that it was even more multifaceted than we expected.

In addition to the four components listed above we found: statements containing rationale for the objectives; pictorial and graphic material attempting to present an overview of the contents of the text; brief biographies of writers; statements on the writers' value positions and biases; advice to students on how to process the text; exhortations about the importance of adopting a sceptical frame of mind when reading and studying; and even a motto which sounded a similar warning — caveat.
emptor: Let the buyer beware. We believe that each of these forms of introductory material has its own intrinsic merits from a pedagogical standpoint and, while we could not find one jot of research evidence in respect of any of them, in contrast to those listed in the previous paragraph, we consider that they would satisfy the discerning eye of the educational connoisseur.

The diversity within and across those samples reviewed is quite high and their richness and potential for assisting learners seem impressive to us. We see no reason for not using a range of orienting devices. At the same time, diversity for its own sake is purposeless, especially where one device simply duplicates the effects and functions of another.

1.1 Advance Organisers

Form and functions

It has been argued that, just as in the construction and fitting out of a new building the first stage involves the erection of a shell or framework based on a master plan, so, in assisting learners to acquire the content of disciplines, there is a need either to provide them with a framework of ideas (an ideational framework) or to make explicit an already existing framework to which new ideas in the material to be learned can be anchored. Such an approach is based on the premise that '....the most important factor influencing the meaningful learning of any new idea is the state of the individual's existing cognitive structure at the time of learning' (Ausubel and Robinson, 1969: 143). The notion of presenting the learners with an ideational structure prior to actual presentation of the material to be learnt was first developed by Ausubel in the context of his theory of meaningful verbal learning. Since then, many other writers have endorsed this proposition and it has also been the focus of considerable research. The term coined by Ausubel for this preparatory framework was 'advance organizer'.

The term advance organizer is used, then, to describe deliberately structured set of ideas presented to learners prior to the material to be learnt. The intention is to provide them with a conceptual framework for facilitating learning and retention of the new material by making available an organisation of old or familiar ideas to which the new ideas can be related and anchored. The framework provided by the advance organizer has therefore to encompass all the ideas in the new material (that is, the material to be presented subsequently), and so has to be more general and more abstract than the new material. In essence, then, advance organizers as distinct from summaries have to higher levels of generality, abstraction, and inclusiveness than the material to be presented subsequently to students for their learning. The basic proposition is that if an advance organizer contains ideas which are familiar to and understood by students, and which are relatable to the ideas in the material to be presented, then learning and retention of the new material will be enhanced. To be maximally effective,
advance organizers '...must be formulated in terms of language concepts already familiar, and use appropriate illustrations familiar and analogies if developmentally necessary' (Ausubel and Robinson, 1969: 316).

Two kinds of advance organizers have been proposed by Ausubel (Ausubel and Robinson, 1969):

- Expository organizers (for example, a definition of a concept or a generalization), which are recommended for use when the material to be presented to learners is completely unfamiliar to them. An expository advance organizer contains knowledge already established in learners' cognitive structures that is relatable to the new information they are to learn and that can make the new material more plausible and comprehensible.

- Comparative advance organizers (for example, an analogy), which are to be used when the new material is not completely novel as would occur, for example, when students, having previously examined one theory of learning, encounter another theory of learning. In this case a comparative advance organizer would make explicit similarities and differences between the two theories of learning.

**Research on advance organizers**

In addition to reports in the early sixties by Ausubel and his co-workers of their research into the facilitative effects of advance organizers, several major reviews of recent vintage have been undertaken. Of these, the most comprehensive review in terms of number studies was the meta-analysis by Luiten et al. (1980) of 135 advance organizer studies undertaken in the period 1960-79. The general conclusion reached in this meta-analysis was that, taking the research studies as a whole, '...advance organizers have a facilitative effect on learning and retention' (p.213). The majority of the reviewers cited above had earlier reached a similar conclusion though one or two (for example, West and Fensham, 1974) retained a healthy scepticism and wanted to reserve judgement until more research have been completed. Barnes and Clawson (1975) dissented from general opinion, asserting that, '...advance organizers, as presently constructed, generally do not facilitate learning' (p.651). However, serious flaws in their analysis have been exposed by Lawton and Wanska (1977). Though the general conclusion cited above is of significance *per se*, it also provides an important backdrop for what follows, because the issue that is of particular interest in this paper is reviewers' conclusions relating to the effects on tertiary-level students of advance organizers in textual materials. Some tentative conclusions have been ventured but their authors have been quick to point out the very limited empirical basis on which they have been grounded. Briefly the conclusions are:
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- University students comprise one section of a group of students that appear to derive more benefit from advance organizers than others (Hartley and Davies, 1976).

- Advance organizers appear to facilitate both learning at the higher cognitive levels and retention (Hartley and Davies, 1976; Hudgins, 1977; Luiten et al., 1980).

- Advance organizer formats other than continuous prose (for example, simulations, models, graphs, maps and networks) should be considered (Hartley and Davies, 1976).

- Advance organizer treatment groups derive a permanent rather than a short-term advantage in terms of retention of material (Luiten et al., 1980).

- Advance organizers have the strongest positive effect on transfer of knowledge rather than retention (Mayer, 1979).

- Subject areas in which advance organizers appear to be most facilitative are Mathematics and Science (Mayer, 1979).

Discussion

Our position is that these conclusions have relevance for writers of distance teaching materials in spite of the ecological differences between distance learning contexts and those in which most advance organizer studies have been done. In fact these studies involved neither distance teaching materials nor distance learners. So we are playing a hunch; but given the fact that many studies involved the students in just reading the advance organizer and then the text, we believe that the likelihood is slight that the facilitative effects of advance organizers would be noticeably or significantly depressed by features of distance learning contexts such as isolation, learner independence, and lack of immediate feedback. Apparently, however, the mode of presentation of the advance organizer does make a difference. Luiten et al. (1980) have claimed that studies in which the advance organizer has been presented orally '...show a much greater effect—size than studies using only written presentation mode for the advance organizer, especially at the college level' (p.27). Nevertheless we are still prepared to recommend use of advance organizers to writers of distance teaching materials.

In spite of the qualified support for the advance organizers, it appears that they have been used on only a very limited scale to date. Our examination of a small sample of readily available distance teaching materials from the UK and Australia provides partial confirmation of this. Joyce and Weil (1980) also reported finding only one curriculum project, the Anthropology Curriculum Project developed at the University of Georgia, in which design of learning materials had been based on an advanced organizer strategy.
Two reasons probably account for this low level of usage:

- Advance organizers have not been operationally defined. Hartley and Davies (1976) point out that there is no clear cut technology for the formulation of advance organizers as there is for behavioural objectives.
- Advance organizers are difficult to formulate.

Neither of these problems appears insoluble however, and, because of the degree of research vindication for advance organizers, serious efforts to alleviate these problems seem warranted. Such an effort is discussed later where guideline for writers of textual materials in distance education programmes have been proposed. Some, but not all of these guidelines, have an empirical basis, at least in part, but others are grounded in practical experience and considered opinion.

**Guidelines**

1. **When to use advance organizers**

   - We recommend that advance organizers be used when materials to be learned can be differentiated, step by step, into units and sub-units which become progressively specific, more concrete, and less inclusive; that is, when material to be learned can be organized hierarchically along three simultaneous dimensions: general to specific; abstract to concrete; more inclusive to less inclusive. For example, a study of different ways of teaching can begin with a definition of a model of teaching (advance organizer), an abstract, general and highly inclusive statement, and proceed through a consideration of different families of models and sub-families to a detailed study of specific examples of models of teaching, one at a time.

   A second example, in which the hierarchical structure of material to be taught is represented diagrammatically, appears below (Eggen et al., 1979:303). In this case, the advance organizer would be another definition, this time of the term 'minerals'.

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Minerals: A definition

- Fuels
  - Coal
  - Petroleum
- Metals
  - Iron
  - Lead
  - Copper
- Non-metallic
  - Building materials
  - Fertilizers
  - Chemicals
  - Sand
  - Clay
  - Sulphur
  - Salt

Fig. 6.1 The Hierarchical Structure of the Concept ‘Mineral’

- When it is important for students to have a conceptual framework for subsequent use in clarifying the task ahead, an advance organizer seems appropriate. For example, Ausubel and Robinson (1969), in preparing students familiar with the tenets of Christianity to study Buddhism, provided a comparative organizer setting out the similarities and differences between the two religions.

- When learning material possesses a structure which can readily be integrated with students' existing knowledge, an advance organizer seems appropriate.

The use of an advance organizer also seems appropriate when learning material is entirely unfamiliar and students are either:

- without relevant past experiences and ideas for relating to and integrating with new material; or
- unaware they have specifically relevant ideas in cognitive structure.

2. How to use advance organizers

- Use visual aids (for example, concept maps, disarms, graphs) in conjunction with advance organizers in verbal form. See, for example, Figure 6.1. An advance organizer could also be presented orally using an audio-cassette or take the form of simulation, demonstration, film, or a chart.

- Precede the advance organizer with a statement of objectives for the unit, overview, etc.

- Following presentation of the advance organizer, define criteria attributes of concepts, illustrate with examples, point out similarities and differences, encourage students to link new material with their own experiences, and relate new information to the advance organizer.
3. How to formulate advance organizers

- Become familiar with the subject area.
- Conceptualize the subject area, topic, or a field of study as a series of hierarchically organized concepts or propositions. Represent this structure diagrammatically. See, for example, Figure 6.1
- Prepare the advance organizer which can take these forms:
  - definition of a concept (for example, 'landforms (concept) are land surfaces that have characteristic shapes and composition' [Eggen et al. 1979: 260]).
  - generalisation (for example, 'culture may be viewed as sets of solutions to problems. Different cultures solve problems in different ways. [Joyce and Weil, 1972: 174]).
  - analogy (for example, a prose passage explaining functions of a computer in terms of filing cabinets and sorting baskets together with a concrete model [Mayer, 1979]).

1.2 Overviews

Forms and functions

Overviews are highly condensed content outlines which emphasize salient points and may contain a glossary of key terms. They are different from advance organizers in that the substance of the overview is at the same level of abstraction, generality, and inclusiveness as the subsequent material. Overviews can also take various forms, for example, verbal, pictorial or graphic, though the same presumed effects of overviews might also be achieved by employing typographic devices such as a system of headings and subheadings to segment texts.

The principal purpose of an overview is to familiarize students with the scope and broad structural features of the material to be presented — its central themes, generalizations, divisions, and classificatory systems, for example. It achieves its purpose by rendering down the material to be presented into a simple, coarse-grained form — what might be called a content map in which are displayed only the most prominent features of the content.

It seems likely that this map of the content might be appreciated by readers because it would allow students access to topics relevant to their needs and interests. Overviews, then, may be valuable to students as a form of access structure (Macdonald-Ross, 1978), a device which is not so much for assisting comprehension as for assisting the reader to find his way about within the text. Overviews also probably provide ready-made organizing
centres for rehearsal and mental storage of the elaborated material in text, an so may assist recall and hence the higher cognitive functions for which information recall is prerequisite.

**Research**

Apparently, little formal enquiry into the general effects of overviews on learning from text has been undertaken. What research has been done on overviews has occurred mainly in relation to films and has produced the seemingly inevitable division of opinion as to their worthwhileness, though Hartley and Davies (1976) reported that positive effects of overviews were found in a majority of these studies. Very little research seems to have been done on the effects of overviews on distance learning.

**Guidelines**

Our advice on use of overviews in instructional text will probably conform with common practice but will make explicit some of the principles tacitly followed in the preparation of overviews. We suggest the following:

- Overviews should be used where material to be learnt can be segmented or organized into units that help define the nature of the material. (When material can be structured hierarchically, an advance organizer could be more appropriate.

- The structure made explicit in the overview should be used in the presentation of subsequent material.

- Overviews should be brief, highly condensed outlines of teaching subject matter, and contain explanations of key terms.

- Pictorial and graphic devices that can illustrate overview content, or represent it more economically, should accompany or supplement verbal overviews.

- Stage-by-stage overviews should be used in preference to, or in addition to, mass overviews.

**1.3 Pretests**

**Functions**

Pre-testing, that is, administering a pre-instructional test to learners, is an instructional technique which has support in educational discourse if not in practice. Advocates of pretests claim that they can be used to determine what students, at the start of instruction, already know about material to be taught or whether or not students have the pre-requisite knowledge and skills for acquiring what is to be taught. Pre-testing, therefore, would allow
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for a more economical use of teaching effort. It seems, too, that pre-testing may have additional dividends such as orienting learners to the content to be presented and alerting them to performance standards expected of students, gap in their knowledge, and essential learning tasks. This last mentioned function is very likely an important one for distance learners who might have to be selective in their reading and study of instructional text because of limited time.

But all these benefits are alleged ones. Hartley and Davies (1976) cited only six investigations into the effects of pretesting on post-instructional performance. In the majority of these studies, effects were not discernible, prompting the suggestion that, like all overviews, the real value of pretests resides not in their capacity to facilitate actual comprehension of learning materials, but in their potential to function as access devices.

**Guidelines**

If pretests are to be used by text writers (and we see no reason why they should not), it would be advisable for writers to keep clearly in mind the probable range of functions served by pretests and to use them principally as devices for providing students with access to the text, and as cues about performance standards and salient material. Intending users of pretests can take heart from the fact that, in the context of educational measurement, the state of the art is relatively advanced. A technology for test development exists and is well respected, and the problems and pitfalls of administration and evaluation are well known.

As with so many other guidelines appearing in this paper, the ones we offer below on pretests should be viewed more as hypotheses to be tested rather than hard and fast rules.

- In the first place, we suggest using pretests in conjunction with other instructional devices such as objectives and overviews, always being clear about the content and processes which you wish to test.

- It seems appropriate to view pretests as one of a variety of devices for providing access to instructional material, and to use each where the appropriate situation presents itself.

- Situations which are most amenable to the use of pretests in distance teaching are those where prerequisite knowledge or skills or material to be taught can be tested by means of objective test items (multiple-choice, true-false, and short-answer questions), and performance can then be readily assessed by students from marking keys; for example, mathematical skill prerequisites for a course in research statistics.

- Use several shorter pretests, locating them before the relevant text units rather than one large pretest.
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- Students should be made aware of how to use pretests to assist their learning.

1.4 Objectives

To those familiar with instructional planning and teacher education the next two statements will come as no surprise.

- The empirical and prescriptive literature on instructional planning is replete with advice and research reports about objectives but, in comparison, other facets of planning are poorly served.

- Prospective teachers are generally required to spend numerous hours in pre-service courses learning about the virtues of objectives and how to formulate them.

Both these conditions are symptomatic of a general obsession in educational planning with objectives. It emanates from a strong commitment to a model of planning which stresses the importance of rationality and ends-means logic, and which asserts the primacy of objectives in planning for effective teaching and learning. Proponents of this model argue for a high level of precision in formulating objectives, with some advocating the use of behavioural objectives which represent the ultimate in precision.

Their conviction about the need for clear, unambiguous objectives stems from two beliefs. The first is that precise objectives provide teachers with clear guidelines for selecting instructional means and evaluative criteria; the second is that providing students with these objectives will increase their motivation and learning.

The second proposition has been debated vigorously and has been tested in experimental research, but the issue has not been satisfactorily resolved. Instead, the research has revealed the complexity of relationships between use of objectives and learning and has raised many other issues requiring resolution. According to Macdonald-Ross (1979), this whole area is in a state of confusion which no simple summary can sort out. While such a warning cannot be overlooked, the practice of writing objectives into instructional text continues, so text writers will continue to look for answers to perennial dilemmas relating to level of specificity, location in text, number and distribution throughout the text, when to use them and, even, whether to use them at all. There is a need, therefore, to review evidence and opinion about the effects, functions and value to students of objectives, and then to generate some guidelines on their use.
Research

Research and theories about instructional objectives from within two different research traditions will be reviewed. The two traditions are:

- an experimental research tradition, owing much to behavioural psychology. Studies conducted within this tradition, of which there are many, have been undertaken in contrived learning-from-text situations, involving mainly tertiary and upper secondary students.

- a descriptive research tradition with allegiances to ethano-methodology and a cognitive view of learning.

Very little research relating to this second tradition has been reported, but its goals are to assess student responses to objectives in natural study settings and to trace the actual processes engaged in by students when using objectives. As might be expected, these reviews lead to two sets of conclusions which are not easily reconciled.

It was stated earlier that experimental research into the facilitative effects of objectives on overall learning (that is, intentional and incidental learning) is equivocal. This is the general opinion of most reviews (see, for example, Faw and Waller, 1976; Hartley and Davies, 1976; Macdonald-Ross, 1979). If a simple vote-counting procedure were used, there probably would be less a slight advantage for research showing positive effects from objectives (see, for example, Melton, 1978), but the result is certainly not clear-cut. If effects of objectives of intentional learning only were considered, the weight of evidence in favour of objectives increases, but it is still not convincing.

This failure of research to provide clear confirmation of a popularly held belief about the value of objectives has prompted attempts to pinpoint reasons for the unexpected result. Some blame has been attributed to flaws in research designs and statistical techniques, but many other plausible reasons have been advanced to account for the ambivalence in research results. Inferences about conditions when objectives could be effective aids to learning have also been generated. These conjectural statements have been summarised in Table 5.1 and may assist readers of the article to make decisions in respect of their own use of objectives.

From Table 6.1 it is clear that a variety of complex conditions govern whether or not objectives enhance relevant and incidental learning. So far, few insights have been obtained into the precise combinations of conditions that must prevail for desirable effects to occur. One inference about a main effect which is set down with less hesitation and trepidation than are most in this area of educational research is that specific objectives enhance relevant learning but decrease incidental learning (Duchastel, 1979; Faw and Waller, 1976). On this 'finding' has been built a selective attention hypothesis which proposes that objectives direct attention to objective-relevant material and
away from material which is not related to objectives. It is also frequently claimed that objectives, assuming students accept them as helpful and know how to use them, provide students with clear goals which assist them to organize more efficiently their learning activities and reduce time spent on misdirected effort.

It is also claimed that they offer a basis for student self-evaluation in the course. These attributions have not been confirmed by self-report data or other means, but enjoy a measure of credibility at the moment due to circumstantial evidence from research studies and the intellectual appeal of the logic underpinning them.

When we turn to descriptive research and the inferences generated from it, we see objectives from quite a different perspective. Though there is very little research to report, what there is indicates that, as with inserted questions, students do not use objectives as intended by those who have written them. The evidence from survey studies conducted at the Open University (UK) (Macdonald-Ross, 1979), suggests that student do not use objectives as attention-directors or as goal statements for problem solving, but as a means for assisting them to find their way about in the instructional text. This, and a view of the student as an active and selective reader, has led to a radically different conception of in-text instructional devices. Objectives, like inserted questions and overviews, are seen as 'access devices', providing students with a different points of entry to the instructional material and allowing them to chart their own ways through it. seen in this light, objectives would no longer serve as direct aids to learning and would not be fulfilling the role ascribed to them in the rational, ends-means model of planning.

It might be thought, then, that they need not be placed early in the text. However, if they are to serve effectively as part of the access structure they would still need to be in a prominent place and students would have to alerted to their presence. Macdonald-Ross (1979) and, before him, Kaplan and Simmons (1974) proposed that ‘objectives) be placed at the end of the teaching material as a check list... with page numbers for back reference' (Macdonald-Ross, 1979: 251). In that case they would appear to be duplicating a function of inserted questions or self-assessment checks. It then raises the question of whether they should be placed in place of, or in addition to, either of the other two devices.

Guidelines

The foregoing analysis makes it abundantly clear that generating guidelines on the use of objectives for writers of instructional text has many problems and pitfalls. There are no definitive answers from research, just a few clues or straws to clutch at, but even these lose much of their significance because of the disparities between research and study sittings. The guidelines supplied here are therefore rules of thumb to be used cautiously.
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- It would appear that objectives probably do serve some useful functions for students provided they are clear and precise and so are worth considering as an instructional aid in distance teaching text. This should not be taken to mean that they can or should be used all the time. Their use in conjunction with other instructional devices still must be justified in the light of specific conditions and requirements applying in each case.

- It appears also that their use is more warranted when learning tasks are complex and difficult (that is, require high level cognitive skills) and/or when important learning tasks are not clearly distinguishable. At the same time, there is no evidence that there are specific groups of learners for which, or specific subjects in which, objectives work best.

Actual use of objectives by students is also likely to be, in some respects, different from and more diverse than intended use. It is important for writers to recognize that such diversity of usage exists. One consequence of this diversity is that location of objectives in text, in terms of a simple choice between start of teaching materials and end of teaching materials, becomes a non-issue because location in text does not determine whether or how students use objectives. Students will use objectives to suit their own purposes irrespective of their location. There is, however, another aspect of in-text location of objectives, arising from consideration about frequency of insertion or density of objectives. Dispersing objectives throughout text in small sets in company with the relevant material seems to be a sensible practice to follow. Placing a large number may cause students to feel overwhelmed and frustrated and discourage them from using objectives.

Another guideline, which we believe has some merit concerns advising students on the purposes for which objectives have been inserted in text and how they might be used by students. It is assumed that writers who use objectives in text do so with some clear preconceptions about how those objectives should be used. There are also good grounds for stating that students use them in those and other ways. Our position is that making explicit the intended and likely functions served by objectives could help students improve their study skills, thereby enabling them to derive greater benefit from objectives and the instructional material. Remaining silent about such functions would not achieve anything but it may account in part for lack of use by students of objectives and may impede refinements that could be made to objectives and the instructional device.
Finally, a comment about objectives and incidental learning. Writers, if they plan to use objectives, would be well advised to consider the implications of the selective attention hypothesis mentioned earlier, which proposes that objectives cause students to be selective in their text processing and focus only objective-relevant material. Writers could take two basic positions:

- adopt the view that pre-specified objectives represent a common core of student learning which is to be extended where possible.

Adoption of second position would require the use of instructional strategies to promote consciously extension of learning horizons beyond those represented by the pre-specified objectives.

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<tr>
<th>Independent variable</th>
<th>Effect on learning</th>
<th>Comment</th>
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<tbody>
<tr>
<td>Characteristics of objectives</td>
<td>+</td>
<td>Enhances intentional learning but effect is not clear cut; enhances learning of material not considered important by learner</td>
</tr>
<tr>
<td>Specific objectives</td>
<td>+</td>
<td>Decreases incidental learning (varying the topic or subject matter will not change the nature of the effect)</td>
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<tr>
<td>General Objectives</td>
<td>+</td>
<td></td>
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<tr>
<td>Large number of specific objectives distributed with each section of text</td>
<td>+</td>
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<td>Specific objectives located at one point</td>
<td>+</td>
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<td>Specific objectives requiring high level of cognition (that is, difficult objectives)</td>
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<td>Specific objectives requiring low level of cognition (that is, easy objectives)</td>
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Some Instructional Strategies for Improved Learning from Distance Teaching Materials

<table>
<thead>
<tr>
<th>Specific objectives and text</th>
<th>Specific objectives and student characteristics</th>
<th>Where text is highly structured specific objectives have no additive effect</th>
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<tbody>
<tr>
<td>Specific objectives in text with low degree structure</td>
<td>Specific objectives with students whose past experiences with objectives have been:</td>
<td>- rewarding</td>
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<td></td>
<td></td>
<td>- unrewarding</td>
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<td></td>
<td>Specific objectives with students trained in the use of objectives versus those not so trained</td>
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<td></td>
<td>Specific objectives with students who use objectives to search text for relevant material versus those not using objectives</td>
<td></td>
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<tr>
<td>Results favour students interested in objectives</td>
<td>Results favour students using objectives to search text for relevant material</td>
<td></td>
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Sources: Duchastel, P (1979); Duchastel, P and Merril, P (1973); Faw, H and Waller, T (1976); Gage, N and Berliner, D (1975); Hartley, J and Davies, I (1976); Kaplan, R (1976); Macdonald-Ross, M (1979); and Melton, T (1978).

Our position is that a policy of ignoring, discouraging or discrediting incidental learning is indefensible. Learning experiences will inevitably lead to unanticipated outcomes — sound or unsound, relevant or irrelevant, acceptable or unacceptable. Instructional science has not reached the point (perhaps it should not strive for it either) where it can control learning so that only targeted objectives are attained and unanticipated outcomes suppressed, even the unwelcome ones. Writers of distance teaching materials should acknowledge this and contemplate how they might monitor incidental learning, negate or counteract undesirable incidental outcomes and help students derive benefit from the positive incidental outcomes. Conventional strategies could be used such as specially designated self-assessment items which test extended or allied objectives, that is, learning beyond the range of prescribed objectives. Writers might also encourage incidental learning by giving greater emphasis to expressive objectives, that is, unanticipated learnings which are 'expressed' from the educational...
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encounters with the instructional materials. For example, writers could indicate areas in which expressive objectives could be attained, seek evidence of learning attainment through self-reports or contractual assignments, and provide feedback.

2. Inserting questions

The practice of inserting questions in instructional text is a long-standing one; it has also been the focus of considerable research effort over the past fifteen years or so as evidenced in several reviews (for example, Anderson and Biddle, 1975; Faw and Waller, 1976; Rickards and Denner, 1978). Most of this research has been conducted within Rothkopf's (1965, 1970) experimental paradigm which posits that questions inserted in text trigger mathemagenic behaviours, literally, mental activities that give birth to learning. Research undertaken within this framework has imposed rather unnatural reading or study conditions on research subjects. For example, subjects are often prevented from referring to text once inserted questions have been encountered. These constraints have prompted warnings from reviewers (Macdonald-Ross, 1979; Rickards and Denner, 1978) about the limited generalisability of findings from this research.

At this present time, one must be wary of making generalizations from studies employing the adjunct question paradigm to question answering in general. One must limit the extrapolation...to settings that match the paradigmatic setting. (Rickards and Denner, 1978: 342)

It would be rash to assume, therefore, that generalisations about the facilitative effects of adjunct questions appearing in the reviews cited above would apply to the real-life study contexts of distance learners.

Unfortunately, as Duchastel and Whitehead (1980) noted, little research on how distance learners use and benefit from inserted questions has been done. They asserted, however, that research undertaken at the UK Open University.

...confirms the belief that a greater number of students attach some importance to in-text questions even though they might at times criticise severely those questions they felt were not helpful or not relevant. (Duchastel and Whitehead, 1980: 41)

Their own research, involving a survey of a small number of students, confirmed a common anticipation that distance students would probably not use inserted questions in the way that was intended. It showed that referral by students during study time to the inserted questions ranged from never, or hardly ever, to always; it also revealed that some students used the inserted questions towards the end of the course as a framework for revision.
Those findings reinforce the caution about generalising across settings, but this important inference can be drawn from their report: that to make informed decisions about design of distance teaching materials, writers need access to a brand of consumer psychology — a psychology of distance learning dealing, *inter alia*, with how distance learner use, process and react to instructional materials. Though the database for such a psychology is very skimpy, some recently completed small-scale projects and action research are providing insights which can be seen as the primitive elements of an embryonic conceptualization of distance learning. It is interesting, but perhaps not surprising, to note that there are disparities between some of these insights and assumptions underlying experimental research on learning from text.

2.1 Descriptive and everyday rationality

The Duchastel and Whitehead study (1980) showed that some students objected to insertion of questions throughout the text on the grounds that such questions disrupted their study habits or routines and lines of thought while others reported feeling antipathetic and disinterested when they encountered too many in-text questions. Lockwood (1978) claims that leaving a space after inserted questions encourages students to respond; Reigeluth et al. (1978) cast serious doubts on writers' expectations that readers of written-instructions will start at the beginning and work through them systematically. It appears, too, that locating model answers to inserted questions at the end of the text does not necessarily persuade readers to prepare their own answers first and compare them with model answers later. Rather, it may engender, as a result of tedious page turning, feelings which work against induction of a desirable learning set in the reader (Henry, 1981).

2.2 Experimental research

With the caveats described early in this section in mind, consider now what the experimental research on learning from text shows. In the first place, Rickards and Denner (1978) reported that answering post-questions (questions inserted after the material to which they refer) is associated with at least four processes which do not necessarily occur concurrently:

- a specific review process, involving mental review of the material directly questioned
- a general review process, involving mental review of non-questioned material adjacent to or thematically related to the questioned material
- a learning set process which focuses attention on the particular kind of information usually sought in in-text questions and which is applied to material following the questions
- a general stimulatory process, resulting in heightened attention to post-question text.
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Clearly these processes could account for the facilitative effects of inserted questions on learning from text so frequently reported in research. The reasonableness of these interpolations and the evidence in favour of inserted questions are compelling reasons, we feel, for advising writers of distance teaching materials at the tertiary level to use inserted questions as an instructional strategy especially since 'nearly all the published studies on inserted questions have used high school or college students as subjects' (Faw and Waller, 1976: 701). This is the opinion of most research analysts. Anderson and Biddle concluded thus:

Neither the total length of the text, the topic, the age of the subject, nor the medium of presentation (text, taped lecture, film) seem to matter much. At least, positive results from adjunct questions have been obtained over a range of these factors. (1975: 103)

But providing formulae for in-text insertion of questions to maximise the facilitative effects of questions is fraught with difficulty. Formulae that could prove helpful to text writers we believe would encompass issues which have been the foci of much research already — type of question, position, timing or frequency, response mode, and provision of model answers.

2.3 Discussion

Type of question

Early research on this particular issue focused mainly on comparisons between effects of short-answer versus multiple-choice questions or effects of verbatim questions (that is, questions in the criterion test with identical wording to those appearing in text) versus non-verbatim questions. Generally these questions were low-level ones involving mainly recall. With the advent of cognitive movement in instruction, research interest shifted to levels of processing and differential effects of questions at high and low levels of cognitive demand. The position adopted by cognitive theorists was that processing of in-text information can occur at different levels and that questions requiring comprehension of the text would promote deeper processing and would result in better recall and learning than questions requiring processing of surface features of the text. The review of this research by Faw and Waller confirms this hypothesis. They concluded that 'for either factual or more meaningful material, higher-order inserted questions are of most benefit for total learning (that is, at all levels of the Bloom taxonomy)' (1976: 702). Rickards and Denner (1978) concur with this interpretation. Consequently it would appear quite justifiable to recommend to writers to insertion in text of high-level questions (for example, those requiring analysis of text, application of ideas, comparing and contrasting, exemplifying, generalising, inferring and generally going beyond the information). It would also appear desirable for such questions to be clearly related to course objectives.
One other type of question warrants a mention. According to Rickards and Denner (1978), questions generated by students enhance test performance. The implication is clear — writers should explicitly encourage students to frame their own questions about text and formulate answers to them.

**Position of inserted questions**

If low-level questions have been recommended for text insertion, it would have been simple matter to advise on the position of inserted questions. Post-questions (those placed after the material referred to in the questions) are every bit as facilitative of intentional learning as pre-questions and also result in more incidental learning. In other words, post-questions arouse the specific review process as effectively as pre-questions and are more effective in arousing the general review process which aids incidental learning.

With high-level questions the picture is not so clear. No consistent position effect has been demonstrated according to Rickards and Denner (1978), who speculated that some high-level question types would probably function best as pre-questions and other types as post-questions, but admitted that they were unable to predict which. So it seems that a recommendation on where to position high-level questions cannot be formulated. Anyway, decisions about the position of high-level inserted questions may not be critical if students disregard the study sequences implicit in the structure of the text.

**Timing or frequency**

The basic issue here is whether inserted questions should be batched in one place or appear throughout the text. The view of a practising instructional designer at the Open University (UK) is that there is no law for deciding frequency; some materials call for a student response every few minutes, others every few hours (Lockwood, 1978). Anderson and Biddle (1975) considered that the effects of adjunct questions on learning are pronounced, even when the questions are at the end of lengthy passages, but that the best effects were obtained when the questions were inserted immediately after the text they referred to, with Rickards and Denner (1978) claiming that proximity of questions to associated text is more critical for high-level questions than low-level verbatim questions. Again, it needs to be kept in mind these finding apply to contrived research situations which do not parallel real-life study contexts.

All things considered, it would appear that a useful rule of thumb for writers would be to insert a high-level question or two after each section of text material dealing with an important theme, topic, issue, theory, or similar substantive unit.
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Response mode

In only one review was there any reference to the nature of the response that students should be expected to make to inserted questions:

If in one category are placed all of the experiments in which subjects were requested to make an explicit, written response to adjunct questions, and in another category those studies in which either covert, mental answers were permitted or the description of the procedure was ambiguous, it is apparent that both the direct (intentional) and indirect (incidental) effects of adjunct questions are more consistent when the subject must make an overt response. (Anderson and Biddle, 1975: 99).

Subsequent comments by the authors make it clear that the quotation was intended to indicate that facilitative effects were consistently higher where subjects were required to make an overt response than where they could rehearse their answers mentally. As had already been noted, mainly low-level questions were used in the studies reviewed by Anderson and Biddle. It could seem that for high-level questions, it would be even more important for students to prepare a written response, because many questions of this type would require longer, structured answers in which sequence and logical development of a point of view are likely to be necessary characteristics of an answer.

Our recommendation, then, would be for writers to encourage students to provide written answers. This might be achieved in part by providing space for students to record their answers. Furthermore, retention of written answers by students could assist in periodic revisions.

Provision of model answers

Providing model answers in text to inserted questions is one feedback mechanism, albeit an indirect one. Research reviews tend to ignore this specific feedback issue but Anderson and Biddle (1975:99) claim that displaying the correct answer after the subject has had an opportunity to respond markedly enhances intentional learning. This generalisation is based on only handful of studies, and again they were conducted in controlled settings. Certainly the practice of providing model answers makes good pedagogical sense and we would recommend it. Their usefulness to students will increase if the purposes of the model answers are explained to them and if they are told how to use them. There also appears to be some in substantial evidence favouring the placement of model answers immediately after the questions or perhaps over page. As we said earlier, hiding the answers will not necessarily persuade students to formulate their answers before checking their adequacy against the models provided. In addition, Lockwood (1978) makes the point that locating answers after the questions allows the writer to integrate them into the flow of the text.
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**Guidelines**

- Use high-level questions (analysis of text, application of ideas, comparing and contrasting, etc.) and relate them clearly to course objectives.
- Encourage students to frame their own questions about the text.
- Encourage students to provide written answers to questions through the provision of space in the text.
- Provide model answers to questions preferably immediately after the questions.

3. Presenting the text

3.1 Typographical considerations

Much of our discussion in this paper has so far focused on aspects of text presentation which have been investigated, for the most part, by psychologists. Many educators have put most of their energies into preparing and using these devices to assist learners, but have ignored the typographical presentation—the arranging of the printed material on the page. Indeed, until relatively recently in distance education, we paid scant attention either to the instructional devices or typography; content was our primary consideration. Most materials, furthermore, were prepared on standard typewriters. The 'golfball' typewriter did provide new options and the advanced technology of word processors and photo-typesetting has placed before us a range of typographical choices which hitherto were unavailable.

The establishment of large and significant distance teaching organisations such as Open University (UK) also generated a new set of standards, new benchmarks, for distance educators. These sophisticated, typeset publications used a range of graphical and cueing devices, were printed using different colours, were attractively laid out, and presented in attractive covers. They not only set new standards but made distance educators begin to ask questions about the way they presented their materials.

Many associate typography with aesthetic considerations; what type face looks good and what the final printed page looks like. These are legitimate concerns. By presenting the materials attractively the distance educator hopes he will motivate students more effectively. But he ought also to ask: 'What are the likely educational consequences of the decisions I make concerning the layout, the choice of type face, the typographical cueing devices I use, and the numbering system I employed?' Good decisions will be made if they are informed by research evidence and some sound theoretical perspectives.
The research background

Hartley and Burnhill (1977b:223) comment that 'until recently, it would seem, typographical research has not had a great deal of relevance to authors and designers, to printers and to publishers'. They suggest following reasons:

- A concern with molecular rather than molar issues. This concern is reflected in research on legibility of typefaces rather than 'higher-level organisational problems' of textual material.
- The research has not been related to the choices which actually have to be made by practitioners.
- The research has uncritically accepted the conventional practices used in typography.
- The research has often been experimental, using materials divorced from their real-life context.
- Typographical research has generally had no theoretical base. (Hartley and Burnhill, 1977b:223-24)

Macdonald-Ross and Walter (1975a) have argued that research should be of immediate relevance in practical decision-making and that it should recognise the intuitive insights of practising typographers. From these assumptions they suggest that research should criticise existing solutions and produce alternatives which can be tested in a real-life situation. They conveniently show how the first two stages can be accomplished in their most useful paper 'Open University texts: criticism and alternatives' (Macdonald Ross and Waller, 1975a).

One of the most attractive, compelling, and helpful ways of thinking about the arrangement and organisation of textual materials is that advanced by Waller (1979). He argues that the only reading behaviour which authors of conventional textbooks can confidently predict is that 'their readers must read selectively' (Waller, 1979:181). Such a view assumes that readers are active participants, seeking and finding information rather than passively processing information. It assumes further that, as active participants, students should be able to assess and sample the material through skimming, careful reading, and browsing, all of which may be achieved in anything but linear, sequential progression.

Waller (1981) has suggested that the three functions of text preparation are transactional, stylistic, and structural. The transactional function adds nothing to the shared linguistic base of speech and writing, but is a channel of communication. The stylistic function includes features of text often described as 'cosmetic'. The structural function includes the graphic argument, global and local access. Examples of these functions are indicated below (Figure 6.2).
Within this scheme, there are devices which help the student plan his reading/learning strategy, and there are other devices which enable him to execute that strategy. Macdonald-Ross (1979) has suggested that this scheme is a kind of macrotypography, interested in the text as a whole, in contrast to the more traditional microtypography, which concentrates on the details of prose setting.

**Guidelines**

Although the research evidence is not very helpful, it is possible to call upon useful advice from such writers as Hartley and Burnhill (1977a, 1977b). They have conveniently set down a range of helpful ideas based in party on research, common sense, and practice. Some of the most important considerations which they discuss are included below.

- **Page size.** The choice of page size is clearly important as it will determine the decisions which must be made concerning the general layout, type size, and positioning of illustrations, to name but a few. It is clearly important to work within standard sizes. Practical considerations such as ‘will the package easily fit into most letter boxes?’ should not be passed over lightly.

- **Preplanning.** A frame of reference, a reference grid for setting the print on the page, should be adopted ‘which the learner can move to and from without confusion’ (Hartley and Burnhill, 1977b:227). Hartley and Burnhill discuss this at length and provide helpful examples showing that word length and line spacing should be consistent throughout.
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- **Line justification.** There seems little evidence to suggest that 'justified' text increases legibility. Justified text is text where spacing between words is varied to form lines of equal length. A particular problem is that it can cause unnatural word spacing within lines. Many would defend its use for aesthetic reasons but the disadvantages of unnatural word spacing, in practice, make it a less attractive option for most organisations.

- **Type size.** Hartley and Burnhill (1977b) recommend a ten point type on a twelve point line-to-line feed. They suggest eight point on ten point is as low as one would want to go in the design of instructional text.

- **Column structure.** A single-column structure is probably preferable for an A4 size page, especially where the text is frequently broken by tables, graphs, etc. Burnhill (1976) argues that argues for paragraphs separated by line spacing rather than indentation at the beginning of the paragraph.

- **Emphasis.** Emphasis using bold lower case is preferable to using capitals. Emphasis using underlining is probably effective.

- **Colour.** It is probably best to use colour sparingly as cueing device. There seems little to recommend it. Wright (1977) refers to the work of Haber and Fried (1975) who suggest that the use of colour is appropriate to indicate material which may be skipped or which requires attending to in a rather different way from the majority of the text.

All of these typographical devices can be used 'not so much to delineate a single route through the course material but to provide an access structure that displays the content, context, status and argument of the text' (Waller, 1977b:8).

The use of alternative typefaces, spacing, colour, borders, or marginal printer's devices all signal the status of and draw attention to various components of text. A useful and practical summary of the use of these devices by Waller is contained in Rowntree and Connors (1979, Chapter 7). Waller has also discussed elsewhere the need to pay particular attention to other access devices such as contents lists, number schemes, headings, and so on.

On number systems, Waller (1977a:9) offers the following advice:

- Use numbers mainly for reference and sparingly for structuring the arguments. Chapter, page, and figure numbers are almost always perfectly adequate for continuous prose texts.
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- Consider incorporating figure numbers, exercise numbers and so on in the chapter numbering system; particularly when there are too few figures for easy location or when too many different systems would cause confusion.

- Use Arabic numerals rather than roman numerals.

- Place the numbers near the fore edge of the book so that it is easy to see them when flicking through.

- If in-text numbering has to be used, place the numbers in the margin rather than within the column.

On the use headings, Crooks, Rowntree and Waller (1979) offer the following advice:

- The main function of headings is an 'orienting' one.

- Try to use similar wording for headings as used in the contents list and objectives.

- Side-headings in the margin have the advantage of summarizing the argument for those who want to skim through quickly.

- Side-headings are easy to write and can be added afterwards.

3.2 Graphics

Crooks, Rowntree and Waller (1979) classify the purposes of illustrations under four headings. They assign illustrations the following functions: a descriptive function (showing what things look like); an analytic function (showing how things work — for example, a flow diagram or a cutaway drawing); an expressive function (making an impact hard to achieve in words — for example, a political cartoon); and a quantitative function (displaying quantitative data). Of course it is rare that any one illustration will have a single purpose. This discussion will not deal with the descriptive, analytic, or expressive functions but will focus on the quantitative function. Two types of graphic formats will be singled out for particular consideration; namely tables, and graphs and charts because, of all the formats used in instructional text, these are amongst the most common.

In 1977, three separate but important reviews on the presentation of graphics in text were published. Hartley and Burnhill's (1977a) and Macdonald-Ross' (1977) reviews focus especially on instructional text, while Wright's (1977) review focuses on the presentation of technical information. Each draws on the research literature, attempts a summary of the literature, and conclusions are provided based on the research findings. We can find little advance on
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the insights provided in the reviews by these three writers. What follows is a summary of some of their main findings.

*Graphs and charts*

- Bar graphs are generally superior to circle charts (Macdonald-Ross).
- Where the reader is to estimate percentages, bar charts are better than cross-sectional drawings of three-dimensional objects (Hartley and Burnhill).
- An advantage of bar charts is the ease with which they can be used to present many differently related variables (Wright).
- Where possible, labels should be placed directly on bars or lines (Macdonald-Ross; Wright).
- Repeating the X and Y axis at the top and right-hand sides of a graph will increase the ease with which extreme points on the graph can be read (Wright).
- If pie charts are used, avoid fine, angular discrimination as subtle differences are more difficult to detect on pie charts than on bar charts (Hartley and Burnhill; Macdonald-Ross).
- Text should be used to support charts and tables (Macdonald-Ross).
- Circles of differing sizes should be avoided. If used, they should be range-graded, and a key provided to show the number presented by each step (Macdonald-Ross).

*Tables*

- Left-ranging tables are easier, quicker, and cheaper to typeset and no less comprehensible than centre-style tables (Hartley and Burnhill; Macdonald-Ross).
- Tables should include a full and direct presentation of all the information a user will need (Hartley and Burnhill; Macdonald-Ross).
- If columns in a table are lengthy, use regular line spacing (say, every five lines) or typographical cueing to facilitate the reader's search task (Wright; Hartley and Burnhill).
- Readers take longer and are more error-prone with formats that require them to do anything but search for specific items (Wright).
- If the table is wide and contains many columns, place row headings to the left and to the right to help comprehension (Hartley and Burnhill).
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- If there are many rows and columns, number or letter headings (Hartley and Burnhill).

- Round numbers to two significant figures, thus facilitating mental arithmetic (Ehrenberg (1977) quoted in Macdonald-Ross).

- Provide row or columns averages as reference points (Ehrenberg (1977) quoted in Macdonald-Ross).

- As figures are easier to compare in columns, use columns for the most important comparisons (Ehrenberg (1977) quoted in Macdonald-Ross).

- Rows and columns should be ordered by number size and not, for example, by alphabetical order of the labels (Ehrenberg (1977) quoted in Macdonald-Ross).

Guidelines on when to use graphs, charts and tables

When faced with decisions about what graphic devices should be used, Macdonald-Ross (1977:401) has recommended that the following questions be asked:

- What kind of data is to be shown?
- What teaching point needs to be made?
- What will the learner do with the data?
- Can previous models be copied?
- Do we have the time and skills to execute the format?

Macdonald-Ross (1977:68-69) suggests that the best advice which can be offered at present is as follows:

- If we wish to show general relationships to the general public (or say, first-or second-year tertiary external students), use horizontal charts.
- If we wish to show general relationships to the professional (or say, advanced tertiary external students), use tables.
- If we wish to present exact data showing the results of experiments or investigations, use graphs or tables.
- If we wish to present data for operational purposes, use tables (ignore the two significant figures rule in this case).
4. Conclusion

In preparing this paper we have tried as far as possible to bring together the evidence of research and the wisdom of practice in developing useful guidelines for those involved in the difficult task of writing instructional text. Some readers may be offended by the advice which we proffer, and label it 'recipe approach'. We make no apology for our approach as it is the sort of advice which we wish had been conveniently summarised for use when we were neophytes in the preparation of external studies materials. Further, although research on the design of instructional text is still in its infancy and not always very helpful, we believe that there is a body of knowledge which can be distilled into a useful form.

We would not want to suggest, however, that these guidelines which we have presented should be assumed always to be applicable. Nothing can replace the construction-trial-rewrite-trial cycle. And we are pragmatists. We know that often constraints such as deadlines and costs will influence how a writer of instructional text will be able to use the various devices which we have described. We are also aware that there are many devices and unanswered questions which we have not been able to deal with in this paper.

We would also want to suggest that, as with any written communication, no matter what devices are used, it is possible to do it well or poorly. If we have suggested an embryonic technology, we also believe that there is still much art which should go into the design of the instructional text.
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Waller, R. (1977b) *Three functions of text presentation* (Notes on transforming, 2), Milton Keynes, Institute of Educational Technology, The Open University, mimeograph.


Notes
1 Printers use a point system to size letters, where 1 point = 0.351 mm. 10 point type is about the minimum size for comfortable reading; 8 point is very small and best used for footnotes, etc.
2. This page is A4 size.
Dear Student,

While studying the units of this block, you may have found certain portions of the text difficult to comprehend. We wish to know your difficulties and suggestions, in order to improve the course. Therefore, we request you to fill out and send us the following questionnaire, which pertains to this block. If you find the space provided insufficient, kindly use a separate sheet.

**Questionnaire**

**Enrolment No.**

1. How many hours did you need for studying the units?

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<th>6</th>
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2. Please give your reactions to the following items based on your reading of the block:

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<td>Presentation Quality</td>
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<td>Language and Style</td>
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<td>Illustrations Used (diagrams, tables, etc.)</td>
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<td>Check Your Progress Questions</td>
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<td>Feedback to CYP Questions</td>
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3. Any other comments:

Mail tc:
Course Coordinator (ES-312)
STRIDE, IGNOU, Maidaan Garhi
New Delhi – 110068, India.