

教育部高等教育司推荐
国外优秀信息科学与技术系列教学用书

教学系统化设计

(第五版 影印版)

THE SYSTEMATIC DESIGN OF INSTRUCTION

(Fifth Edition)

■ Walter Dick
Lou Carey
James O. Carey



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前 言

20 世纪末, 以计算机和通信技术为代表的信息科学和技术对世界经济、科技、军事、教育和文化等产生了深刻影响。信息科学技术的迅速普及和应用, 带动了世界范围信息产业的蓬勃发展, 为许多国家带来了丰厚的回报。

进入 21 世纪, 尤其随着我国加入 WTO, 信息产业的国际竞争将更加激烈。我国信息产业虽然在 20 世纪末取得了迅猛发展, 但与发达国家相比, 甚至与印度、爱尔兰等国家相比, 还有很大差距。国家信息化的发展速度和信息产业的国际竞争能力, 最终都将取决于信息科学技术人才的质量和数量。引进国外信息科学和技术优秀教材, 在有条件的学校推动开展英语授课或双语教学, 是教育部为加快培养大批高质量的信息技术人才采取的一项重要举措。

为此, 教育部要求由高等教育出版社首先开展信息科学和技术教材的引进试点工作。同时提出了两点要求, 一是要高水平, 二是要低价格。在高等教育出版社和信息科学技术引进教材专家组的努力下, 经过比较短的时间, 第一批引进的 20 多种教材已经陆续出版。这套教材出版后受到了广泛的好评, 其中有不少是世界信息科学技术领域著名专家、教授的经典之作和反映信息科学技术最新进展的优秀作品, 代表了目前世界信息科学技术教育的一流水平, 而且价格也是最优惠的, 与国内同类自编教材相当。

这项教材引进工作是在教育部高等教育司和高教社的共同组织下, 由国内信息科学技术领域的专家、教授广泛参与, 在对大量国外教材进行多次遴选的基础上, 参考了国内和国外著名大学相关专业的课程设置进行系统引进的。其中, John Wiley 公司出版的贝尔实验室信息科学研究中心副总裁 Silberschatz 教授的经典著作《操作系统概念》, 是我们经过反复谈判, 做了很多努力才得以引进的。William Stallings 先生曾编写了在美国深受欢迎的信息科学技术系列教材, 其中有多种教材获得过美国教材和学术著作者协会颁发的计算机科学与工程教材奖, 这批引进教材中就有他的两本著作。留美中国学者 Jiawei Han 先生的《数据挖掘》是该领域中具有里程碑意义的著作。由达特茅斯学院 Thomas Cormen 和麻省理工学院、哥伦比亚大学的几

位学者共同编著的经典著作《算法导论》，在经历了 11 年的锤炼之后于 2001 年出版了第二版。目前任教于美国 Massachusetts 大学的 James Kurose 教授，曾在美国三所高校先后 10 次获得杰出教师或杰出教学奖，由他主编的《计算机网络》出版后，以其体系新颖、内容先进而倍受欢迎。在努力降低引进教材售价方面，高等教育出版社做了大量和细致的工作。这套引进的教材体现了权威性、系统性、先进性和经济性等特点。

教育部也希望国内和国外的出版商积极参与此项工作，共同促进中国信息技术教育和信息产业的发展。我们在与外商的谈判工作中，不仅要坚定不移地引进国外最优秀的教材，而且还要千方百计地将版权转让费降下来，要让引进教材的价格与国内自编教材相当，让广大教师和学生负担得起。中国的教育市场巨大，外国出版公司和国内出版社要通过扩大发行数量取得效益。

在引进教材的同时，我们还应做好消化吸收，注意学习国外先进的教学思想和教学方法，提高自编教材的水平，使我们的教学和教材在内容体系上，在理论与实践的结合上，在培养学生的动手能力上能有较大的突破和创新。

目前，教育部正在全国 35 所高校推动示范性软件学院的建设和实施，这也是加快培养信息科学技术人才的重要举措之一。示范性软件学院要立足于培养具有国际竞争力的实用性软件人才，与国外知名高校或著名企业合作办学，以国内外著名 IT 企业为实践教学基地，聘请国内外知名教授和软件专家授课，还要率先使用引进教材开展教学。

我们希望通过这些举措，能在较短的时间，为我国培养一大批高质量的信息技术人才，提高我国软件人才的国际竞争力，促进我国信息产业的快速发展，加快推动国家信息化进程，进而带动整个国民经济的跨越式发展。

教育部高等教育司

二〇〇二年三月

PREFACE

During the many years since the original publication of *The Systematic Design of Instruction*, the field of instructional design has continued to grow, both as an area of study and as a profession. Increasing numbers of colleges and universities are offering courses in instructional design, and more companies are adding instructional designers to their staffs.

The natural tendency when preparing a new edition is to include the new trends and emerging ideas in the field. We have been confronted with a number of significant developments in the field of instructional design. For example, the term *performance technology* is now used as a superordinate concept that includes instructional design as a subset. We were faced with the decision to expand our coverage in this book to include all of performance technology. Similarly, a significant growth in the use of computers to deliver instruction has occurred during the last decade—quite a contrast to the almost obsolete mainframe-driven, computer-assisted instruction that represented the future when we published our first edition in 1978. Should we now orient the chapters on instructional strategies and developing instruction to computer-based multimedia instruction? In the area of theory, a challenge has been put forth by researchers who have adopted the constructivist view of learning. They have offered a variety of proposals about how learning occurs and have provided an array of interesting examples of instruction developed from the constructivist perspective. Should we attempt, in this edition, to present constructivist views and discuss how they reinforce or diverge from our own?

Issues related to performance technology, computers, and constructivism are important because they are influencing the field of instructional design. We have attempted to be responsive to these and other developments by relating them to the major components of the instructional design process. At the same time, we have chosen to stay, as nearly as possible, with the fundamental design process presented in the earlier editions of the book. We still think that this process works best as a starting point for learning instructional design. Furthermore, from our many years of teaching from this book, we have found that its current size and format are ideal for our students.

The changes we have made in recent editions of the text include a greater emphasis on these aspects:

- Analysis of the learner
- Analysis of the context in which skills will be learned
- Analysis of the context in which skills will be used
- Earlier and more frequent use of formative evaluation
- Concern for the transfer of learning to the ultimate site of performance
- Expanding formative evaluation to include assessment of newly learned skills and the impact of their use

We believe that these changes and additions will strengthen the fundamental process of instructional design without unduly complicating or confounding it for the novice.

The systems approach model used in this book was first taught in a course at Florida State University in 1968. Since that time, thousands of students have taken the course and have developed instructional materials that have had demonstrated effectiveness with learners. The model has been most heavily influenced by the work of Robert Gagné, Leslie Briggs, Robert Mager, Robert Glaser, and Lee Cronbach. It is a performance-oriented model stressing the identification of skills that students need to learn and the collection of data from students to revise instruction.

During the more than twenty years we have taught the instructional design course, we have had the valuable opportunity to observe our students' work and thus to refine our presentation of the concepts and procedures associated with each step in the model. This book is the culmination of a carefully conceived instructional strategy and of the many years of practical experience in implementing it. Since the publication of the first edition in 1978, we have obtained valuable feedback from instructors and students who have used the book, and we are most grateful for their helpful comments.

In the current edition we have retained the features that seem most important to readers of the previous editions. For example, theoretical descriptions of concepts are supplemented with numerous illustrations of their application. The examples have been carefully selected to represent a wide range of important skills. The examples and practice exercises have been designed to lead readers from an initial understanding of concepts to practical application, resulting eventually in their own instructional design project.

The reader will find that each of the chapters (after the first, which is an introduction to the overall instructional design model), is structured in a similar manner. We hope this structure will facilitate learning the concepts and procedures associated with the instructional design process. The description of the model's components in each of the chapters includes the following sections:

Objectives: The major objectives are listed for each chapter. They describe what the reader should be able to recall and apply after completing the chapter. They are stated in relatively general terms.

Background: This portion of each chapter provides the reader with a brief statement of the background, research and development, and/or problems that led to the development of the procedures associated with each particular component of the model.

Concepts: This section includes both definitions of critical concepts associated with the components as well as a description of "how to do it." It indicates how to carry out the procedures associated with each particular

component. In some chapters, the concepts and procedures are covered in several sections rather than in one main Concepts section. This allows for a more thorough examination of detailed procedures.

Examples: In each chapter we provide examples of ways the processes described for each component can be applied. We use a variety of examples in the hope that readers will be able to apply each procedure to the content area in which they are interested.

Summary: This section is specifically provided for those readers who will be developing instructional materials as they study these chapters. It summarizes the concepts and procedures discussed in each chapter. By presenting the material in this manner, we hope to illustrate the interrelatedness of the various components of the model.

Practice and Feedback: We also provide a series of practice activities in which the reader is asked to apply a component of the instructional design process to a variety of examples. Readers will receive feedback to their responses to determine whether they understand the principles described in the chapter and to correct any misunderstandings they may be having. The examples used to illustrate procedures in the book have been purposefully kept simple. The reader should not have to learn the content related to an example to understand the procedure, which is the main focus.

References: A brief listing of the most relevant references appears at the end of each chapter. These are annotated to direct the reader to those resources that may help to amplify points made in the chapter.

The authors wish to extend their appreciation to Dennis C. Myers (deceased) of the University of Toledo for his assistance with various aspects of this book, and to James Russell, Donald Stepich, and their students at Purdue University for developing the first draft of the glossary. Bob Reiser, a Florida State colleague, has used the text in recent years to teach instructional design and has made many helpful suggestions for both teaching and revising the text.

In the spirit of constructive feedback, always an important component of the systematic design process, the authors welcome reactions from readers about ways in which the text may be strengthened to better meet their needs. Please send comments to the authors at the following e-mail addresses.

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TO THE INSTRUCTOR

We would like to share some of our experiences in teaching with this text. The fundamental decision that must be made by the instructor is to identify the instructional goal for the course. As in any instructional design effort, the nature of the goal will drive the instructional strategy and the evaluation.

The instructional goal can be expressed either as verbal information (i.e., list, describe, or recall various aspects of the instructional design process), or as an intellectual skill (i.e., apply the instructional design process in the creation of instruction). We refer to the first approach as the *knowledge approach* and the latter as the *product approach*.

When knowledge is the course goal, the text serves as a source of information. The role of the instructor is to amplify the principles presented in the materials, to provide examples, and to evaluate students' acquisition of the knowledge. *The Systematic Design of Instruction* is well suited to this type of instruction. It provides students with an instructional design model they can use to understand the major concepts in the field of education. Such ideas as "performance objectives" and "formative evaluation" can be presented and understood in terms of the overall design, delivery, and evaluation of instruction.

The product approach to teaching instructional design requires that students not only know about designing instruction but also develop instructional materials. It is this approach that we personally have found to be most successful in teaching instructional design. From our experience, students learn more through actually developing instruction. Concepts that appear to be academic in the text become very real to students as they grapple with such decisions as how many test items they need or what kind of practice exercises to use. The personal motivation and involvement of students also tend to increase with each succeeding assignment as they begin to produce instruction in their own content area. When students reach the one-to-one formative evaluation stage, they often become quite enthusiastic about observing learners as they interact with, and learn from, the materials the students

have created. We believe that the product approach to teaching instructional design provides the greatest long-term return to students.

Instructional Strategy

The second major decision you, the instructor, must make in teaching instructional design is the instructional strategy you will use. First is the issue of the sequence of topics. The text presents the model components in the sequence typically followed when designing instruction. If the knowledge approach to the course is used, then it is likely that the components in the model will be presented as they appear in the text. If the product approach is used, then the component sequence and resulting instructional strategy may be different.

The first sequence we used was to have students learn about a component in the model and then complete the developmental assignment related to that component. For example, after students read the chapter on instructional goals, they develop a goal for the instruction they plan to write. Then, after reading about instructional analysis procedures, they would do an instructional analysis for their selected goal. This read-develop, read-develop process continued until they completed the model. Even though this approach seems quite rational, students often comment that they would have done things very differently in the beginning of the development of their instructional materials if they had been knowledgeable about the components at the end of the model. Many students also indicated that they needed more knowledge about the design process before making a significant commitment to developing instruction for a particular topic.

An alternative strategy, and one that we now use in our product approach to teaching the class, is best described as a *cluster approach*. In a semester course the students read several chapters in sequence each week. After several weeks, they identify their instructional goal and complete the first stage of analysis, the goal analysis. This demonstrates that they understand what they are going to teach, and the instructor can quickly remediate any who are having trouble.

The first report submitted by the students includes their goal statement, goal analysis, subordinate skills analysis, and learner and context analysis. (Our evaluation sheets are shown in Table 1.) While the reports are being graded, students continue with their study of objectives, assessments, and instructional strategies. These then become the major contents of the second report. The students in our courses typically create printed modules as the delivery mechanism for their instruction. They learn about this format and begin to write their instruction according to their instructional strategy. We have also taught instructional design in conjunction with a second course in computer-based instruction. The students who take both courses convert and present their instruction via computer.

While the students are writing their instruction, class time is spent learning about formative evaluation, and they begin, as soon as possible, to conduct their one-to-one evaluations. We require students to do three one-to-ones and a small group with at least eight learners. We do not require them to conduct the field-trial phase—there just is not enough time in the semester. (See Table 2 for our semester schedule for the course.) We are insistent that students complete the first two phases of the formative evaluation process. Their third and final report consists of their instruction and their formative evaluation.

Classroom Activities

The selection of the knowledge or product approach to instruction has significant implications for course management strategies and, particularly, for the use of class time. If the knowledge approach is chosen, then the course will focus primarily on the knowledge objectives that are stated at the beginning of each chapter in the text. The pace of classroom activities can be slow enough to allow for discussion time and the opportunity to talk about various examples and practice and feedback exercises. Students may learn the concepts best when they are required to provide their own examples.

If the product approach is used, the instructor must carefully monitor the weekly progress of the course to ensure that students have sufficient time to conduct the formative evaluation. In our experience talking with students who have used the text at other institutions, their greatest problem is moving through the course at a pace that allows time for the formative evaluation.

In our product approach to instruction, we provide some lectures to highlight important ideas, but we also use numerous class participation activities. Several sessions during the semester are considered workshops—students work in teams of three or four to review and critique the work of the other students in their group. This is excellent preparation for the group contexts in which most designers will work after graduation.

Evaluation of Student Products

We require students to prepare several reports that document their use of the systematic design process. We base our evaluation of students on these reports and on the instruction that the students create. Table 1 outlines the major components of these reports and shows the points allotted to each component. (The assignment of points is arbitrary; however, the points for the third report are approximately equivalent to those for the first two.) This distribution is proportional to the amount of work represented by the reports, and it keeps students motivated throughout the course (i.e., they can make up for early poor performance, or possibly detract from good performance, based on their performance on the final report).

For the instructor, the Report Checklists provide a convenient outline of the content that should be included in the documentation reports and the relative weighting of sections of the reports for evaluation purposes. If a component of a student's report fully meets a stated criterion, then the total points for the component should be assigned to the student. If some of the criteria are not met, then points should be deducted from the component accordingly. If the component is not included in the student's report, then no points should be given for it.

TABLE 7

Report Checklists

Report 1		
	Points	Score
1. Goal statement	5	_____
2. Goal analysis	10	_____
3. Subskills analysis	10	_____
4. Identification of entry behaviors	3	_____
5. Description of learner interview	3	_____
6. General description of learners	2	_____
7. Description of performance context, implications for instruction	3	_____
Total	34	_____
Report 2		
	Points	Score
1. Comments on revisions made since Report 1	0	_____
2. Attach copy of revised instructional analysis and goal statement	0	_____
3. Performance objectives	10	_____
4. Sample assessments for each objective	8	_____
5. Describe instructional sequence	2	_____
6. Describe pre-instructional activities	2	_____
7. Information/example for each objective	10	_____
8. Practice/feedback for each objective	10	_____
9. Describe strategy for teaching terminal objective	2	_____
10. Describe student groupings and media selections	2	_____
11. Attach copies of pre- and posttests that will be used with the instruction.	4	_____
Total	50	_____
Report 3		
	Points	Score
1. Comments on revisions made since Report 2	0	_____
2. Attach copy of instructional analysis and Report 2	0	_____
3. Describe learners, materials, and procedures used in one-to-ones	5	_____
4. Describe results of one-to-ones, revisions	10	_____
5. Enclose copy of instructional materials and assessments used in small-group evaluation	20	_____
6. Describe characteristics of small-group learners	3	_____
7. Describe all the materials and instruments used in the small-group evaluation	3	_____
8. Describe the procedures in small-group evaluation	5	_____
9. Present the data from small-group evaluation	12	_____
10. Discuss the small-group data	10	_____
11. Describe revisions to instruction and assessment	12	_____
Total	80	_____

TABLE 2

Sample Semester Schedule

Week	Class Topic	Assignment Next Class
1	Course introduction	Chs. 1-3
2	Needs assessment and goal analysis	Ch. 4
3	Identify subskills, entry knowledge, and skills	Ch. 5
4	Learner and context analysis Report 1 due	Chs. 6 and 7
5	Objectives and assessments	Ch. 8
6	Developing an instructional strategy	Ch. 9
7	Developing instructional materials Report 2 due	Ch. 10
8	Formative evaluation procedures	Write instruction
9	Consulting session	Finish writing instruction Ch. 11
10	Formative evaluation: analyzing and reporting data	One-to-one evaluations
11	Discussion of projects	Small-group formative evaluation
12	Consulting session	Write report 3
13	Summative evaluation, course summary Report 3 due	Ch. 12
14	Report 3 returned	

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