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This report describes the results of a project to conduct research on and to develop instructional materials for use in on-the-job training of professional and non-professional library personnel in scientific and technical libraries. The project began on June 28, 1967 and was completed on May 15, 1969. This report reviews previous research, design, and development activities but concentrates on the effort following October 31, 1968, which involved field testing the developed instruction, analyzing the test results, and making final modifications to the packages before turning them over to the U.S. Office of Education. Three instructional packages were developed. One, directed to professional librarians, provided an introduction to system analysis, with particular emphasis on its relevance to library operations. The other two instructional packages, designed for non-professional library personnel, consist of workshop materials on reference tools and services and Russian-to-English transliteration. Each of the three packages was tested in the field in libraries of different sizes and with junior-college students. It is concluded that the developed instruction meets its design objectives and provides effective means to enhancing skills in the three areas concerned. (Author/CC)

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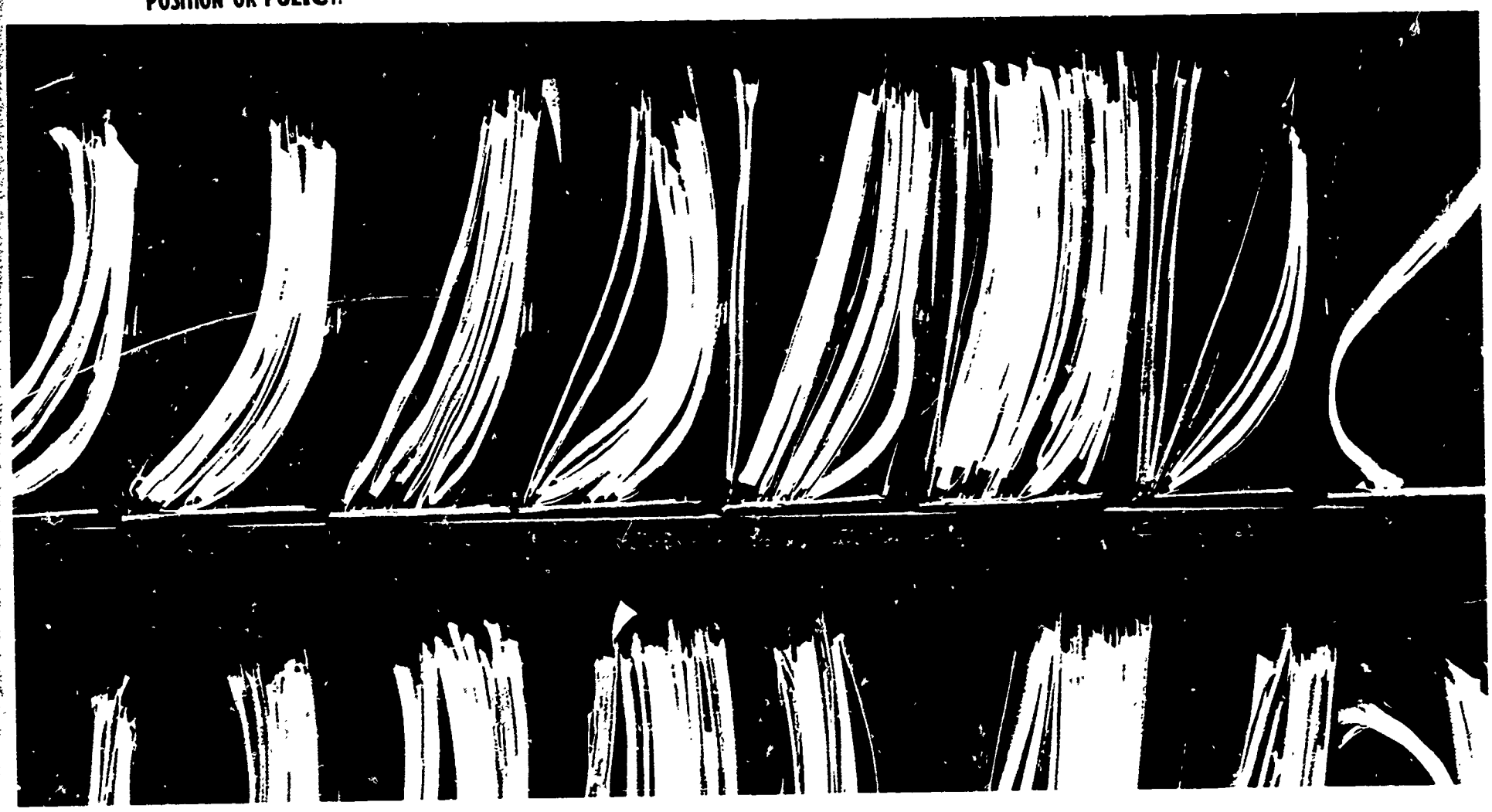

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RESEARCH AND DEVELOPMENT OF ON-THE-JOB TRAINING COURSES FOR LIBRARY PERSONNEL

Everett M. Wallace and Robert V. Katter

15 May 1969

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TECHNICAL MEMORANDUM

(TM Series)

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FINAL REPORT

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FINAL REPORT
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Research and Development of On-The-Job Training Courses for Library Personnel

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SUMMARY

This final report describes the results of a project to conduct research on, and to develop, instructional materials for use in on-the-job training of professional and non-professional library personnel in scientific and technical libraries. The work was conducted by System Development Corporation under contract with the U.S. Office of Education and with additional support by the U.S. Army ATLIS project. The project began on June 28, 1967, and was completed on May 15, 1969. This report reviews the research, design, and development activities completed in previous reporting periods, but concentrates on the effort following October 31, 1968, which involved field testing the developed instruction, analyzing the test results, and making final modifications to the instructional packages before turning them over to USOE.

Three instructional packages were developed. One, directed to professional librarians, provided an introduction to system analysis, with particular emphasis on its relevance to library operations. This package consists of nine units of instruction, of which five combine the media of slides, sound, and workbook exercising, and four are presented as workbook materials. The other two instructional packages, designed for non-professional library personnel, consist of workbook materials on reference tools and services and Russian-to-English transliteration. The Reference Tools and Services package contains 12 units of instruction. The Russian Transliteration package provides the equivalent of six such units, but is presented as a continuous sequence that requires a total of three to four hours of a trainee's time, divided at his discretion.

Each of the three instructional packages was tested in the field in libraries of different sizes and with junior-college students. The test design involved pre-testing to divide subjects into experimental and control groups and post-tests of the learning achieved by the two groups. In tests of the System Analysis and Reference Tools packages, the experimental groups were given the developed instruction, while the control groups were assigned to spend the same number of hours in self-directed study on the same subject matter. The Russian Transliteration differed in that two groups drilled on the same materials but one group's sequence was randomized. The test results indicate significant differences between experimental and control group learning for the System Analysis instruction and between the two treatment groups for the Russian-English Transliteration. There were smaller differences between the experimental and control groups for the Reference Tools and Services package instruction. We concluded from the results of the tests that the developed instruction meets its design objectives and provides effective means of enhancing skills in the three areas concerned.

1.0 INTRODUCTION

This project is directed toward improving the knowledge and skills of library personnel through research in and development of on-the-job training courses. This has involved inquiry into past and current projects concerned with in-service training, educational and training theory and technique, identification of skills needed for library work, and planning for a broad program of instructional development. This project is intended to illuminate the problems of building self-contained modular instructional packages designed to not require a personal instructor, and to explore the effectiveness of various media for imparting instruction to scientific and technical library personnel. An additional aim was that, while the initial course content would emphasize the special training needs of scientific and technical libraries, the design of the instruction would reflect the needs of other types of libraries so that the same instructional approaches, if successful, could be applied to their concerns.

After the initial research and planning effort, the work of the project involved designing, constructing, pilot-testing, modifying, and evaluating experimental instructional materials, together with final modification in the light of testing, and turnover of the finished packages to the Office of Education. Three instructional packages were constructed. The first addresses the area of technology in libraries and consists of 9 units of instruction in system analysis. Intended for professional library personnel, it emphasizes the perspectives and vocabulary of the system approach and seeks to facilitate communication between librarians and system personnel. The second package, consisting of 12 units of instruction in Reference Tools and Services, is intended for library assistants or technicians. This instruction emphasizes techniques of approaching unfamiliar reference works and attempts to impart, through precept and drill in specific works, a perspective and set of procedures applicable to reference work in general. The third instructional package concerns Russian-to-English transliteration. It presents the Russian alphabet, one letter at a time, with extensive drill on words containing only those letters that have already been presented--a simple version of programmed instruction.

This final report is the last of four project reports. The three that have preceded it include TM-3762/000/01, "Planning for On-the-Job Training of Library Personnel," which summarized the period July-December, 1967 and outlined the activities of the project, and two interim reports, TM-3962/000/00 and TM-3962/001/00, both titled "On-the-Job Training of Library Personnel." The two interim reports, covering the period January to October 31, 1968, describe the design, construction, pilot-testing, modification of the instruction, and the experimental design for field testing the developed instruction.

Section 2 of this report summarizes the methods used in the research and development efforts previously reported; discusses the field test design, the selection of a sample subject population, and the conduct of the field tests; and summarizes some of the reactions of that population to the instruction. Sections 3 and 4 present the findings and analysis of the test data, and the conclusions and recommendations. The pre-tests and post-tests given to the subject population are presented in the Appendix.

2.0 METHODS OF RESEARCH AND DEVELOPMENT

The general approach of this project has been to design instruction to assist in the mastery of skills, techniques, procedures, and other activities that are specific to a particular function or job in a scientific or technical library. We sought to ensure systematic coverage of materials and procedures, to test both alternative media and alternative techniques, and to test the efficacy of the finished instruction with a variety of persons. It was understood that to be effective, the means chosen for the instruction should be adaptable to individual differences in knowledge, learning capacity, and cognitive set, and should provide some sense of accomplishment and satisfaction in a reasonably short time. It was also understood that the field tests, because they were to be given immediately after the instruction was taken. could not test for the most important possible effects--those of long range improvement in skill, and the degree to which the immediate learning effects of the instruction are retained or attenuated over time.

One important task of the project was to determine the objectives, or goals, of on-the-job training and of the course as a whole. Objectives were formulated primarily on the basis of the testimony of librarians interviewed early in the project; they were also influenced by a review of the relevant literature. The three objectives that were formulated regard (1) the training's usefulness as a means of enhancing the skills and flexibility of library personnel, (2) its educational qualities, and (3) its cost, and were stated as follows:

> Personnel. The training should serve as a practical and effective means of introducing new information and techniques to library personnel regardless of their responsibility or professional skill level. It should also--by increasing the flexibility of personnel--alleviate the shortage of adequately trained personnel in the various library specialties and at various libraries.

Education. The training should encourage library personnel to view their jobs as--in part--learning experiences, and should establish the job setting as a learning environment. Further, it should create in those who undergo it a self-sufficiency with regard to how much they can (or should) learn, the approaches that aid their learning, and the degree to which they will seek out and participate in learning experiences; it should also stimulate in them a continuing desire to learn, and be useful to them in career planning, growth, and development.

Cost. The training should achieve its personnel and educational objectives without employing materials that are expensive to produce or that require expensive equipment, and without requiring that trainees spend unacceptable amounts of time away from their jobs.

To ensure that these objectives would be met most effectively, 10 specific design and production requirements were stated:

1. The format of all units in all packages should be consistent. This will help to ensure continuity in the manner and substance of the presentations; this continuity, in turn, will enable trainees to move easily and profitably from unit to unit and from package to package.

2. The information that is to be mastered should be reinforced in as many ways and at as many points as is necessary.

3. The units within a package should be designed in the form of modules, so that a trainee can select the units he needs.

4. Wherever it is both feasible and not unduly expensive, information should be presented in more than one medium.

5. The training should require some active participation by the trainee.

6. The training should be designed in such a way that the time, personnel, and equipment it requires can be realistically allocated.

7. The course packages should be designed for use during normal working hours.

8. The use of the training packages should require a minimum of intervention by project staff members after they have installed them and briefed personnel on how to use them.

9. The use of the packages should not usually require the participation, during the training session, by anyone other than the trainee.

10. The packages should contain materials and references that will stimulate the trainee to augment his training from other sources after he has mastered the material in the course packages themselves.

2.1 REVIEW OF PREVIOUS REPORTING PERIODS

2.1.1 Planning for the Project

Between June and December, 1967, work on the project was devoted to reviewing educational and training literature, exploring in-service training needs in libraries of several kinds, and in writing a planning document for concurrence by the USOE and ATLIS project monitors. During this period it was agreed that the planning document should comprehend a broad range of future training activities, but that the work of the current project should be limited to three areas--reference work, language, and technology in libraries. The planning document was submitted for review and concurrence on December 15, 1967, and was then distributed through ATLIS to a broad range of U.S. Government installations for comment and criticism. The project staff also sought reactions from non-Government libraries. The comments were largely interested, constructive and useful to the project. Concurrence on the plan was reached on February 7, 1968.

2.1.2 Training Requirements and Design of Instruction

Between February and the end of May, 1968, job and task requirements analyses were conducted for the areas of reference work, foreign and technical terminology, and technology in libraries. As the design effort proceeded, it was decided that the technology in libraries package would consist of an introduction to system analysis, emphasizing library applications. It was also decided that the foreign and technical terminology instruction would consist of a package on Russian transliteration, and that the reference package would be devoted to reference tools and services. During this period, the project staff was materially aided by the advice and perspectives of the many librarians who were sought out for consultation on and reactions to these plans and designs.

The principal efforts during this period were devoted to developing formal statements of objectives for on-the-job training instruction and to detailing the design of instructional units within the three areas of concentration. Each unit was designed to be completed in 30-40 minutes by a typical trainee, with the expectation that some trainees would complete the units more quickly and others might take as long as 50 or 60 minutes. The work also included developing specific design and production requirements, including, in some detail, an outline of the content to be covered in each unit and the media to be used for presenting it.

2.1.3 Package Construction, Pilot Testing, and Field Test Design

From May 31 to October 31, 1968, the design and development of the three packages continued, and pilot tryouts--involving an iterative process of preliminary testing, subsequent modification, and retesting of instructional material--began. In addition, effort was devoted to completing an experimental design for field testing the completed instruction.

As work on the packaged proceeded, it became clear that the instruction could be improved if the original projection of the number and kinds of units to be constructed for the System Analysis and Reference packages were revised. It was originally thought, for example, that two multi-media units would be sufficient for the System Analysis package, with the addition of a sound and workbook unit on the problems of communication between librarians and systems personnel. In the end, nine units were constructed--five multi-media units consisting of slides, sound, and workbook exercises, and four workbook-only units. (Figure 1 lists the major topics covered in the nine units.) This, of course, increased the work involved considerably. A story line built about a realistic library situation had to be carefully scripted, many more photographs than had been originally planned had to be taken, and rehearsals were necessary for the speakers of the sound portion of the instruction. The number of units devoted to reference tools and services was also revised. In order to concentrate more effectively on that area we decided not to produce any units directed to interaction with users but confine the construction to reference books. The final list of units in the Reference Tools and Services package is shown in Figure 2.

The field test designs were described earlier, in detail, in TM-3962/001/00; they will be summarized here. Each package required a somewhat different test procedure. The System Analysis package, which was tested on experienced professional librarians who had no prior experience with system analysis, required an experimental and a control group. The

TECHNOLOGY IN LIBRARIES AN INTRODUCTION TO SYSTEM ANALYSIS
Unit 1: The System Approach and Basic Terminology
Unit 2: Communicating with Systems Personnel Objectives, Requirements and Constraints
Unit 3: Phase Analysis, Functional Analysis and Task Analysis
Unit 4: Allocation of Resources and Cost-Effectiveness
Unit 5: System Analysis and Decision Making
Unit 6: Applying the System Approach to Problems
Unit 7: Phase and Functional Analysis
Unit 8: Task Analysis
Unit 9: Utilizing Analysis Data

Figure 1. Major Topics in the System Analysis Instruction

REFERENCE TOOLS AND SERVICES
INTRODUCTION TO REFERENCE WORKS
BIBLIOGRAPHIC TOOLS - SERIALS
Ulrich's International Periodicals Directory
Union List of Serials in the United States and Canada
New Serial Titles
COMMERCIAL DIRECTORIES
Thomas Register of American Manufacturers
GENERAL TECHNICAL ENCYCLOPEDIAS
McGraw-Hill Encyclopedia of Science and Technology
ENGINEERING HANDBOOKS
Standard Handbook for Mechanical Engineers
Handbook of the Engineering Sciences
ORGANIZATION DIRECTORIES
Research Centers Directory
BIOGRAPHICAL DIRECTORIES
American Men of Science
SERIALS INDEXING AND ABSTRACTING SERVICES
Engineering Index
Physics Abstracts
REPORTS INDEXING AND ABSTRACTING SERVICES
U.S. Government Research and Development Reports

Figure 2. Reference Works Studied by Experimental and Control Groups

testing sequence for both groups consisted of a pre-test of their knowledge of system analysis, a training sequence, a post-test of their knowledge of system analysis, and a test of their ability to interpret the content of an article written from the system standpoint. The Reference Tools and Services test design included the administration of several kinds of tests, used to divide the control and experimental subject population into matched groups. It employed a content-knowledge pre-test, an instruction sequence, and a post-test. The testing of the Russian Transliteration package did not require a control group, as such; rather, it consisted of two groups of subjects matched by individual-difference pre-testing. The groups were given different kinds of instruction. One was given the programmed instruction; the other was given the same drill materials but in a randomized sequence, and a table designed to assist memorization. All tests for the transliteration subjects were timed. The primary statistical tools for analyzing the data for all three experiments were analyses of variance and covariance.

A final task during this period was to make arrangements for the field testing with cooperating libraries and students from Santa Monica City College. The libraries that participated in the field testing included the National Agricultural Library, the Los Angeles Public Library, Edgewood Arsenal Technical Library, Picatinny Arsenal Technical Information Branch, Bunker-Ramo Corporation Library, the University of California at San Diego's Engineering Library, the Marine Technical Information Center of the California Department of Fish and Game, and the Base Library of the Presidio of San Francisco.

2.2 COMPLETING THE PROJECT--NOVEMBER 1, 1968-MAY 15, 1969

2.2.1 Field Testing the Instruction

The first steps in preparing for the field tests were to determine the characteristics of the subject population and divide them into experimental and control groups, and to schedule the field tests in such a way that the timing of the pre-testing, instruction, and post-testing was similar for all subjects despite their widely scattered locations.

Subjects in the cooperating libraries were selected by the library staffs.

For the system analysis instruction, we asked the libraries to provide different kinds of professionals, as available, who had no experience with system analysis. We also asked that each subject have a professional degree in librarianship. We felt that intelligence and interest testing would be unnecessary for this population, since there would already have been systematic selection by education and job category,

but we did gather some biographical information from these subjects. The subjects for the experimental group were drawn from the National Agricultural Library and from the libraries at Edgewood Arsenal, Picatinny Arsenal, and the Presidio at San Francisco; all but the Presidio Base Library are technical libraries. The control group was drawn from the Los Angeles Public Library. The experimental group received the six-hour System Analysis package; the control group was directed to spend the same number of hours in self-directed study of system analysis and was supplied with a suggested list of books and serial titles for guidance. All of the experimental subjects were asked to comment on their personal reactions to the instruction before they were given the post-tests. This part of the experiment occupied the period January-March, 1969.

Subjects for testing the Reference Tools and Services and Transliteration packages consisted on non-professional library personnel and students. The control group included non-professionals from the National Agricultural Library. The experimental group included non-professionals from Edgewood Arsenal, Picatinny Arsenal, the National Agricultural Library, Bunker-Ramo Corporation Library, the Engineering Library of the University of California at Los Angeles, and the Marine Technical Information Center of the California Department of Fish and Game. Since the two packages were designed to train persons who had little or no formal library training, we felt that it was appropriate to use in both groups additional subjects who had a minimum of previous experience with the subject matter of the instruction. Therefore, 30 female Santa Monica City College students were used, since their preparation is comparable to that of new trainees employed in libraries at the library assistant or technician level; moreover, their behavior under the experimental conditions could be more readily controlled than that of the library personnel.

In addition to the pre-tests addressed to the content of the instruction, the subjects were given three tests to divide them into control and experimental groups. These were the Wonderlic Personnel Test Form I, the Strong Vocational Interest Blank for Women (Librarian Scale), and a truncated version of the Library Orientation Test for College Freshmen, published by Teacher's College Press. The Strong Vocational Interest Blank proved not to be useful for this purpose, and was not generally presented to the library personnel subjects. The tests were begun in January and completed in May, 1969. The control group was directed to spend nine hours--the same amount of time required for the instruction--in self-directed study of the same reference works. As with the System Analysis instruction, personal reactions were sought from the experimental group.

The Russian Transliteration field tests were begun with the students from Santa Monica City College in November, 1968, and finished with subjects provided by the National Agricultural Library. As has been indicated earlier, two matched groups were given different kinds of instruction. One was given the programmed sequence, in which one Russian letter is presented at a time with extensive drill materials confined to letters that have already been presented. The second group was given a table of the Russian-English equivalents designed to assist memorization, and a randomized sequence of the same drill materials given the first group. This latter situation was intended to simulate that of anyone's having to learn the Russian alphabet using a table of Russian-English equivalents and such practice materials as come to hand. Using the identical drill materials ensured a more severe test of the effectiveness of the programmed sequence than could be expected from using a completely self-directed control group.

Two kinds of difficulties were encountered in the field testing. The first was that there was some attrition in subjects that had begun to take the sequences of instruction. Certain of the subjects who had been assigned to groups on the basis of several kinds of pre-tests dropped away before finishing, and substitutes had to be sought and found to take their places where possible. We do not believe that the substitutions are likely to have had significant effects, however, because the numbers of substitutions involved was small (4). A more serious difficulty was encountered in retaining the integrity of the control groups. The control groups were much smaller than the experimental groups for the reference tools and system analysis instruction experiment. We had hoped to have a minimum of 15 in each control group. Unfortunately, we were left with only 12 in the control group for the reference tools instruction, and 11 for the system analysis instruction.

Another difficulty, which does not relate directly to the experiment but which may have considerable implications for the feasibility of on-the-job training of the kind that this project has built, was that most of the libraries participating in the experiment had some difficulty in providing the time required for their personnel to take the instruction. In several cases, the time devoted to the instruction was spread over many more weeks than was typical of the general experimental population. These problems reflect the pressure of work and the short staffing in those several libraries. This is in no sense a criticism of the libraries participating in this experiment. Rather, it is a confirmation of the shortage of library personnel and the prevalence of understaffing. It is probable that most libraries do not have sufficient manpower to allow adequate on-the-job training for systematic career development. It is clear, however, that if appropriate training is to be afforded in libraries and their staffs brought to higher levels of skill, training time must be budgeted for and allocated as a part of normal operations.

2.2.2 Final Modification and Packaging of the Instruction

Several changes were made in all three instructional packages as a result of the field testing, comments from those who took the instruction, and our own error-detection procedures. The Russian Transliteration package had been divided into appropriate units so that each would occupy a subject for 30 to 40 minutes. As revised, the package now forms one sequence of simple programmed instruction, and leaves it to the trainee to decide how much time to spend and how much to attempt in any one study session. Also, several improvements were made in the instruction and some of the exercise materials were revised and augmented.

Revision to the Reference Tools and Services package were confined primarily to rectifying typographical errors and mistaken page references in two of the units. There were comments to the effect that more instruction in the area of reports literature would be very valuable. There was some indication on the part of a minority of library subjects that there were more exercises in one or two of the units than was needed for mastery of the material. We felt, however, that trainees in the field would not be required to go further in exercising on practice material than they thought necessary.

Several modifications were necessary to the system analysis instruction, particularly in the workbook materials, where some of the definitions and explanations were not completely clear. It was necessary, also, to reshoot many of the slides because of inadequate quality of reproduction in processing.

In addition, the multi-media packages for the system analysis instruction had required the use of a stereo tape recorder and a Carousel 800 slide projector, together with an adapter for transmitting signals from the tape to the projector. This was an easily procured, flexible arrangement suitable for experimental purposes, providing projection on a wall or screen for numbers of persons at once, or, with the use of the Sawyer-Mirascreen, for one or two people at a time at a desk. Also, there were provisions for using either loudspeakers or earphones. This arrangement, however, is not optimum for unaided field use. Therefore we sought to find a simpler method of presenting material through filmstrip.

After surveying equipment currently on the market, we decided to make two filmstrips as a part of the five units of instruction to be turned over to USOE, that would be designed to be used with the DuKane Cassette A-V-Matic sound filmstrip projector. This equipment appears to be most satisfactory for individual use in that it is simple to use mechanically and provides a desk-mounted mechanism with a 9 x 7" projector screen built-in. The filmstrip could, of course, be displayed on other

projector equipment. Filmstrips offer many advantages over slides in that they cannot be put out of sequence and are available for projection on a variety of machines. The Cassette, as a carrier of magnetically recorded sound, has become an industry standard and should also be widely adaptable to different makes of projection equipment. Finally, if large numbers of copies of the instruction are desired, the filmstrip offers many economies over slides for volume production.

3.0 FINDINGS AND ANALYSIS

The results of the training experiments on the three instructional packages will be analyzed and discussed separately. We will first treat the system analysis training experiment, second the reference tool training experiment, and finally the transliteration training experiment. Selection of subjects for the experiments has been discussed earlier in Section 2.2.1.

3.1 SYSTEM ANALYSIS TRAINING STUDY

The system analysis training experiment was performed with an experimental group of 22 subjects and a control group of 11 subjects. The test procedures were as follows:

1. Both groups received an identical pre-test of content knowledge in the area of system analysis. This pre-test contained 43 multiple-choice items.

2. The experimental group received the nine system analysis training units (six hours of instruction).

3. The control group spent six hours in self-directed study of supplied reference materials.

4. After the training period, both groups were given a post-test of their knowledge of system analysis. This test contained 72 items, of which 43 were identical with the 43-item pre-test.

5. Both groups were asked to read a short article drawn from the system analysis literature and to take a 25-item test of their comprehension of the article's content. This test was intended to measure the extent to which the subjects' reading of the article was facilitated by the instruction and the self-study.

The summary statistical data for the experimental and control groups on the pre-test and on the 43 repeated items of the post-test are presented in Table 1.

Table 1. System Analysis Pre-Test and Post-Test Scores

		Experimental N = 22	Control N = 11
Pre-test			
	M	20.3	19.5
	s	4.2	3.3
Post-test (Repeat Items)			
	M	26.2	21.0
	s	4.9	3.9
Difference, Correlated Means ($\overline{D}$)			
	$\overline{D}$	5.9	1.5
	est $\hat{\sigma}_{\overline{D}}$	.95	.83

The information in the table includes the mean and standard deviation of the distribution of scores for each group for each test, the mean difference scores between pre-tests and post-tests, and the standard errors of the mean differences. The first statistical test made was between the pre-test and repeated-items scores of both groups. The standard error of a correlated difference between means was computed directly from difference scores. For the experimental group, the one-tailed t-test of the hypothesis that learning occurred yielded a t-value of 6.24 ($p \ll .0005$). For 21 degrees of freedom, this value of t is well beyond accepted "extremely high" significance levels. The estimate of the percentage of the variance attributable to training was 47.5% for the experimental group. The identical comparison for the control group yielded a t-value of 1.85, with 10 degrees of freedom, which is below conventional significance levels. Thus, while learning probably occurred in both groups, it was not statistically significant in the control group, but highly significant in the experimental group.

To confirm these results, a test of the "difference between the differences" was performed. A linear combination of the difference scores was formed to reflect the differences in learning between the two groups, and the standard error of the linear combination was computed. (This linear combination is analogous to the interaction term in analysis of variance.) The value of the linear combination was 4.05 with a standard deviation

of 1.26, yielding a t-value of 3.21 for the test of the hypothesis of the linear combination equaling 0 (a hypothesis equivalent to the "No interaction" hypothesis in analysis of variance). The hypothesis was rejected with a high degree of confidence: ($p < .005$). The interpretation of these three results is that:

(a) The experimental group exhibited a high degree of learning.

(b) The control group exhibited a low degree of learning.

(c) The difference in results between the two groups was very significant.

A further comparison, summarized in Table 2, was made to confirm these results using the total post-test scores. (This comparison is not entirely independent of the preceding comparisons because of the items in common.) The obtained value of t for a one-tailed test of the hypothesis of superiority of the experimental group yielded a t-value of 4.03 ($p < .005$), which supports the thesis that the experimental group performed considerably better on this test than did the control group. The estimate of the percentage of variance attributable to training was 32%, which is somewhat lower than the estimate made from the difference scores. (However, while the difference scores were effectively corrected for individual differences on the pre-test, these differences could not be corrected in the analysis of the total post-test scores, and therefore contributed to the error variance of the latter test.)

Table 2. System Analysis Total Post-Test Scores

	Experimental	Control
M	48.1	39.2
s	6.7	5.5
est $\hat{\sigma}_{M-M}$	2.21	

The statistical results of the reading-facilitation test, summarized in Table 3, were inconclusive. The control group had a slightly higher score, but the difference between groups yielded a t-value of 1.48, which is below conventional levels of significance. That is, while the earlier content test showed the expected learning differences, the reading-facilitation test did not. One explanation of these results is that the major effect of an introductory training sequence such as the System Analysis package is to increase one's knowledge of the vocabulary of the content area.

Table 3. Systems Analysis Reading Test Scores

	Experimental	Control
M	15.6	17.1
s	3.9	1.9
est $\hat{\sigma}_{M-M}$	1.038	

In conclusion, results of the System Analysis training experiment are positive. For both the test-retest and the post-test comparisons of the slides, sound, and workbook experimental package and the self-directed-reading control treatment, the findings were highly favorable to the slide-sound-and-paper package. However, the results from the reading-facilitation test probably constitute a factual reminder of the limits of what can reasonably be expected to be accomplished by a short course of study in an abstract, unfamiliar, wide-ranging subject matter; the six hours of slide, sound, and workbook instruction, while superior to self-directed reading, did not produce deep understanding of system analysis. Comments and testimony gathered from the subjects, however, suggested that the training package had succeeded in transforming system analysis into a topic perceived as approachable, manageable, and of new interest to the subjects.

3.2 REFERENCE TOOLS TRAINING STUDY

The reference tools experiment was performed with an experimental group of 28 and a control group of 12 subjects. The procedure was similar to that used for the system analysis training experiments, in that both groups were first given identical pre-tests, and, after their treatment, identical post-tests that repeated all the items on the pre-tests plus additional items. However, there was no reading-facilitation test for this experiment. The pre-test contained 38 multiple choice items. The post-test contained 60 items that included three fill-in questions.

Table 4 summarizes the scores for both groups on the pre-test, for both groups on those items on the post-test that were repeated pre-test items, and the difference scores. Standard deviations are given for the scores, and the standard error of the mean difference is given with the difference scores.

Table 4. Reference Tools Pre-Test and Post-Test Scores

		Experimental N = 28	Control N = 12
Pre-test	M	18.7	17.9
	s	5.3	5.4
Post-test (Repeat Items)	M	23.0	21.5
	s	5.5	1.2
Difference, Correlated Means ($\bar{D}$)	$\bar{D}$	4.25	3.58
	est $\hat{\sigma}_{\bar{D}}$	.81	1.25

The first comparison was for difference between pre-test scores and repeated-items scores. The experimental group yielded a t-value of 5.25 ($p \ll .0005$), which is beyond the "extremely significant" level. The estimate of the amount of variance attributable to training was 32%. A similar test for the difference between correlated means for the control group yielded a t-value of 2.88 ($p < .01$), a "very significant" difference. The estimate of the percentage of variance attributable to training was 24%. Finally, a test of the "difference between differences" was performed, using the same linear combination scheme that was used for the system analysis. Since the hypothesis that the linear combination equaled zero yielded a t-value less than one, it was not rejected.

These results show that considerable learning occurred. The experimental group's superiority over the control group is not resoundingly clear, but it is evident from the data that both groups did learn a considerable amount, as indicated by the percentages of the variance attributable to training. A final test of the differences between groups, summarized in Table 5, was performed using the total post-test scores. In this case, a test of the difference between non-correlated means yielded a t-value of 1.45 ($.10 < p < .05$), which indicates a slight superiority for the experimental group.

Table 5. Reference Tools Total Post-Test Scores

	Experimental		Control
M	31.5		27.8
s	8.5		5.9
est $\hat{\sigma}_{M-M}$		2.42	

Concluding, the most significant finding of the reference tools training experiment relates to the test-retest results. The experimental group's performance was at least marginally better than the control group, even with the limited sample sizes that we were able to employ in this experiment. Since the same source materials and equal study times were available to both experimental and control groups, it is reasonable to conclude that the added directions and exercises of the experimental treatment did contribute something to the learning.

3.3 TRANSLITERATION TRAINING STUDY

The Transliteration Package experiment was performed on two groups. The first group, which received sequenced training material, numbered 15. The second group, which received the same training material but without the sequencing, numbered 14. These groups were equated on a 4-minute pre-test of transliteration ability and several other tests that are referred to in Section 2.2.1. A post-test was given to both groups. The test was a 15-minute timed test containing 184 Russian words. Two scores were recorded--the total number of attempted items and an error score. These scores are summarized in Tables 6 and 7, respectively.

Table 6. Transliteration Items Attempted

	Sequenced Group N = 15		Non-Sequenced Group N = 14
M	144.9		153.3
s	32.9		32.9
est $\hat{\sigma}_{M-M}$		12.7	

Considering the total number of items attempted in Table 6, there is no appreciable difference in either the mean scores or the standard deviations. The t-value for the difference between means was less than 1. Thus, in number of items attempted there was virtually no difference between the two training methods.

Table 7. Transliteration Error Scores

	Sequenced Group	Non-Sequenced Group
M	15.13	31.85
s	9.5	32.8
est $\hat{\sigma}_{M-M}$	9.45	

The error score in Table 7, however, indicates a marked difference between the two groups. A test of difference between mean error scores yielded a t-value of 1.77 ($p < .05$) for a one-tailed test of the hypothesis that the sequenced training material was superior to the random material. In addition, it can be noted that the group using the random material were extremely variable in their error scores, with a standard deviation of 32.8 as compared to a standard deviation of 9.5 for the sequenced-instruction group. This increased variability inflated the standard error of difference between the means; therefore, the t-value is somewhat smaller than might be expected if the groups were homogeneous with respect to their variability. This difference in variability between the two groups is, however, further evidence of the superiority of the sequenced training; different individuals in the group that studied the randomly sequenced material apparently had very different learning effects, a few subjects learning the material fairly well, but others apparently learning little. In sum, the error rate for the random-material group was twice that of the sequenced-material group, and this was partly because more subjects in the first group did very poorly.

The conclusions for the Transliteration Package training experiment are positive. Both experimental treatments undoubtedly represent considerably more effective training regimes than the sporadic experiences with isolated bits and pieces of transliteration that are typical of informal transliteration training in most library environments. The more structured of the two training treatments, in which careful consideration was given to the sequence of instruction, resulted in appreciably lower error rates in the test performances. This finding should be viewed in the light of

the typically limited training time available for producing transliteration skills, the sporadic nature of the typical demand for transliteration; and the importance of accuracy in transliteration. Given these considerations, the carefully sequenced package of instruction is a valuable resource.

3.4 SUBJECTS' PERSONAL REACTIONS TO THE INSTRUCTION

Immediately before we gave the post-tests on the three packages of instruction, we sought personal reactions to the instruction from those who had completed it. We were interested in eliciting indications of interest or disinterest in the material and media as presented, as well as identifying the instruction's strengths and weaknesses as seen by the trainees. We wanted both to relate the subjects' impressions to the test results and to use these impressions to improve the instruction, where appropriate.

In inviting subjective impressions and reactions, as well as criticism, we obtained a broad range of responses, as might be expected; these responses did not, in fact, correlate well with the test results. For example, the reactions of professional librarians who took the system analysis instruction ranged from enthusiasm to distaste, with the preponderance of comment being critical both in general and in detail. Many of the "destructive" comments were just and accurate. Still, the tests of content mastery indicate that significant learning was achieved. In contrast, comments on the reference tools instruction was largely complimentary, approving, and constructive; the test results, however, show a less appreciable gap between significant learning in the experimental and control groups. The two groups exposed to different treatments in the Russian transliteration experiment expressed interest in the tasks to which they were put and testified almost unanimously that they found the instruction interesting. Here, again, there was a significant difference in the learning performance tested between the two groups, though both groups learned to transliterate well.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The major objective of this project has been to design, construct, and test modular packages of instruction that would improve the skills of library personnel without requiring a personal instructor. This objective has been met. This is not to say that the finished instruction is perfect, that the presence of a personal instructor would not be helpful, nor that the instruction is effective for all personnel. The work of the project has demonstrated the feasibility of building self-contained packages that do improve skills in a practical and useful manner.

A secondary objective of the project was to explore different media and techniques for presenting instruction. The System Analysis package exploited the media of slides, sound, and workbook exercising to present abstract ideas in several ways, and used self-testing under time constraints as an instructional tool. This permitted the presentation of many complex concepts and perspectives in a rather short sequence of instructions that would exploit several sense modalities to sustain interest in the trainees and be responsive to the differential ability of individuals to learn from different media. As has been noted, the subjective reactions of the experimental subjects to the instruction in the field tests varied from enthusiasm to distaste, while the test results show quite significant learning for most of the subjects. We conclude that the multimedia approach to teaching system analysis is effective and could, with the experience gained here, be usefully extended to a more advanced treatment of the subject matter.

The instruction directed to reference tools experimented with several approaches to presenting doctrine, procedure, and drill, and, like the system analysis instruction, used diagnostic self-testing to alert the trainee to what he was expected to learn. The test results show significant learning in both the experimental and control groups with not very significant differences between the two groups.

The testimony given by the experimental subjects indicated a much more preponderant interest in the subject content and liking for the instruction, than was characteristic of the system analysis sequence. We conclude that the use of several approaches and techniques does enhance interest and would be appropriate for any extension of instructional development in this area.

The Russian Transliteration package explored a simple programmed learning approach as compared with a simulated situation of self-directed study. The results show that the experimental subjects learned effectively and that they found the instruction interesting. We conclude that a programmed approach is an effective and efficient manner of teaching English transliteration of strange alphabets.

In sum, we find that the work of this project has pursued a viable line of inquiry and development that should be extended to additional areas of need for on-the-job training of library personnel. A logical extension of the work begun by the project would include:

1. Extension of the system analysis instruction at a more advanced level that would focus on functional and task analyses and their relationships to design decisions and managerial decisions, with emphasis on the quantitative aspects of data analysis, budgeting, and costing;

2. Development of a sequence on reference tools and services, intended for library-assistant or technician-grade personnel in non-technical libraries, that would emphasize materials held in small public libraries and the services such libraries perform;

3. Development of a sequence on microforms and reprography that would instruct library personnel how to use the materials, processes, and equipment in this area, and how to choose among them for particular applications; and

4. A study of the longer-range impact of instruction than was possible under the current project to provide means of assessing the effects--both motivational and informational--of packaged instruction, and the degree to which further learning and skill is developed by such training.

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APPENDIX

The following pages contain the pre- and post-tests for the three instructional packages. These include the pre-test and two post-tests for the System Analysis instruction, the Reference Tools and Services' pre-test and post-test, and the comparable tests for the Russian-English Transliteration instruction.

PRE-TEST

for

SYSTEM ANALYSIS

January 1969

All but one of the questions on the following pages are multiple choice. For each question circle the letter in front of the word or phrase providing the "best" answer.

1. In system analysis the main emphasis is:

    a. mathematical in orientation
    b. concerned with digital computers
    c. methodical application of common sense
    d. all the above
    e. none of the above

2. The statement "To provide high quality reference service to community X" is an example of a system:

    a. objective
    b. limit
    c. constraint
    d. resource
    e. all the above

3. The statement "The yearly book budget will not exceed $21,000" is an example of a system:

    a. objective
    b. limit
    c. constraint
    d. resource
    e. all the above

4. The process of "iteration" in system analysis refers to:

    a. a mathematical solution to a problem
    b. a declarative statement made at a given point in analysis
    c. repeated cycling of analysis at greater level of detail
    d. all the above
    e. none of the above

5. In the system development sequence:

    a. system analysis follows design, with a sharp separation
    b. design follows system analysis, with a sharp separation
    c. system analysis tends to follow design, with considerable overlap
    d. design tends to follow system analysis, with considerable overlap

ERIC

6. In the overall field of system analysis:

   a. there is standardized terminology, which is important
   b. there is NO completely general standardized terminology for the whole field
   c. standardized terminology is essential within any one project
   d. both b and c are true

7. The techniques of system analysis:

   a. are applicable mainly to modern automated systems
   b. are in fact restricted to computer-based systems
   c. are equally applicable to non-automated manual systems
   d. almost always involve the use of linear programming

8. The organization of system components and functions into an operating whole is based on:

   a. regular interaction between various parts and various functions
   b. overlapping of objectives for various parts and functions
   c. sharing of resources by various parts and functions
   d. all of the above

9. Parts of systems that perform major functions are called:

   a. subsystems
   b. components
   c. interfaces
   d. none of the above

10. In system analysis parlance, descriptions of lines of authority, physical facilities, and locations are:

   a. functional descriptions
   b. structural descriptions
   c. relational descriptions
   d. none of the above

11. The most direct connection in the system description is between objectives and:

   a. functions
   b. phases
   c. tasks
   d. interfaces

12. Each item listed below is either a system objective (O), system requirement (R), system limit (L), or system constraint (C). Put the correct letter designation in each of the blanks.

____ "Personnel manning cannot exceed 11 persons."
____ "Yearly budget cannot exceed $87,000.00."
____ "Budgeting cycle starts in July."
____ "High grade information service will be supplied to the research divisions."
____ "Complete administrative information will be generated for the library managers."
____ "Complete records will be kept for all items flowing through the system."
____ "The system must be capable of processing 20,000 acquisitions per year."
____ "$16,000.00 per year will be needed for purchase of hardcovers."
____ "Reference service for 1300 persons in the engineering division must be supplied."
"Selective alerting function must be available for 60
____ top managers."
____ "80 hours of IBM 360/67 time are needed per year."
____ "Average delay for copies of journal articles delivered to office should not exceed one working day."
____ "System must be capable of processing a minimum of 30 typical user requests per day."

13. Functional analysis asks the question:

a. How?
b. To what end?
c. When?
d. all the above
e. none of the above

14. A <u>detailed</u> study of the <u>activities</u> supporting a system function is called:

a. a functional analysis
b. a task analysis
c. a phase analysis
d. a trade-off analysis
e. none of the above

15. Managing a system and managing change and development of the system:

    a. should be one and the same thing
    b. should be done by the same person
    c. are distinct tasks that should be kept separate
    d. both a and b are correct
    e. none of the above are true

16. A system requirement may be defined as:

    a. a generalized statement of system purpose
    b. an authorized and specifically described need
    c. a necessary mechanical relation between system parts
    d. none of the above

17. In system development, the most common sequence of events would be:

    a. analysis, design, test, evaluate
    b. design, analysis, text, evaluate
    c. test, analysis, evaluate, design
    d. evaluate, design, test, analysis

18. As compared to system objectives, system requirements are:

    a. more specifically stated
    b. less specifically stated
    c. formally authorized
    d. both a and c are true
    e. none of the above are true

19. System criteria are:

    a. directly relevant to system objectives
    b. expressed in quantitative terms
    c. expressed in observable terms
    d. all of the above are true
    e. none of the above are true

20. In system analysis, system documentation is concerned with:

    a. citing supporting literature for decisions
    b. detailed descriptions of system objective and constraints
    c. detailed descriptions of system limits, functions, phases tasks
    d. recording the inquiries, reasoning, and findings of the analysis
    e. all the above

21. The flow of information across an interface goes:

    a. from input to input
    b. from output to input
    c. from input to output
    d. none of the above

22. In system analysis, the level of detail of description tends to be:

    a. greater for functions than for objectives
    b. greater for objectives than for functions
    c. greater for tasks than for objectives
    d. both a and c are true

23. A system analysis often shows that:

    a. one function serves several objectives
    b. one objective is served by several functions
    c. there is only one function for each objective
    d. both a and b are true
    e. none of the above are true

24. System requirements are:

    a. another name for system limits
    b. another name for system constraints
    c. another name for system objectives
    d. all the above are true
    e. none of the above are true

25. Some of the benefits of "mass production" can often be achieved by:

    a. function consolidation
    b. operational definitions of tasks
    c. system decentralization
    d. installing computers

26. It would be most accurate to say that:

    a. System effectiveness must be spelled out before system benefits can be detailed.
    b. System benefits must be spelled out before system effectiveness can be measured.
    c. System costs must be known before system benefits can be assessed.
    d. Value trade-off functions must be known before system benefits can be identified.

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27. To estimate system effectiveness requires:

    a. data on system costs
    b. data on system benefits
    c. value trade-off functions for benefits
    d. both b and c are true
    e. all the above are true

28. A system benefit is quantified or measured by:

    a. its cost
    b. counting or rating of defining events
    c. the value trade-off function for the benefit
    d. none of the above

29. The most useful common denominator measure for system <u>costs</u> is probably:

    a. personnel time
    b. personnel effort
    c. personnel inconvenience
    d. money

30. The purpose of (decision tables) in system analysis is:

    a. to specify what decision is indicated by the data
    b. to focus the decision on effectiveness factors
    c. to focus the decision on cost factors
    d. to portray cost-effectiveness balances

31. In almost all system analyses:

    a. Most system costs can be added and subtracted directly.
    b. Amounts of various system benefits can be added and subtracted directly.
    c. Value trade-off functions for benefits need not even be considered.
    d. Cost-effectiveness analyses comprise the preliminary step.

POS

for

SYSTEM ANALYSIS

Part I

January 1969

All but one of the questions on the following pages are multiple choice. For each question circle the letter in front of the word or phrase providing the "best" answer.

1. In system analysis the main emphasis is:

    a. mathematical in orientation
    b. concerned with digital computers
    c. methodical application of common sense
    d. all the above
    e. none of the above

2. A system analysis of a library would be unlikely to use knowledge from the field of:

    a. decision theory
    b. time and motion studies
    c. attitude measurement
    d. statistical mechanics
    e. all the above

3. The statement "To provide high quality reference service to community X" is an example of a system:

    a. objective
    b. limit
    c. constraint
    d. resource
    e. all the above

4. The statement "The reference service must be able to handle a minimum of twenty requests per day" is an example of a system:

    a. objective
    b. limit
    c. constraint
    d. resource
    e. all the above

5. The statement "The yearly book budget will not exceed $21,000" is an example of a system:

    a. objective
    b. limit
    c. constraint
    d. resource
    e. all the above

6. The statement "Interlibrary loan arrangements are in effect with the main library at city Y" is an example of a system:

    a. objective
    b. limit
    c. constraint
    d. resource
    e. all the above

7. The process of "iteration" in system analysis refers to:

    a. a mathematical solution to a problem
    b. a declarative statement made at a given point in analysis
    c. repeated cycling of analysis at greater level of detail
    d. all of the above
    e. none of the above

8. One of the greatest strengths of system analysis as a technique for understanding a system is:

    a. its selection of only certain details for study
    b. its elimination of the need for great detail
    c. its relating of each detail to the overall picture of the system
    d. its practice of considering each detail in isolation from all others

9. In the system development sequence:

    a. system analysis follows design, with a sharp separation
    b. design follows system analysis, with a sharp separation
    c. system analysis tends to follow design, with considerable overlap.
    d. design tends to follow system analysis, with considerable overlap

10. The relationships between parts of a system are organized through consideration of:

    a. system objectives
    b. system limits
    c. system resources
    d. all the above

11. In the overall field of system analysis:

    a. there is standardized terminology, which is important
    b. there is no completely general standardized terminology, for the whole field
    c. standardized terminology is essential within any one project
    d. both b and c are true

12. In analyzing a system, the sequence of analysis tends to be:

    a. objectives, functions, structure
    b. structure, objectives, functions
    c. functions, objectives, structure
    d. structure, functions, objectives

13. The techniques of system analysis:

    a. are applicable mainly to modern automated systems
    b. are in fact restricted to computer-based systems
    c. are equally applicable to non-automated manual systems
    d. almost always involve the use of linear programming

14. The organization of system components and functions into an operating whole is based on:

    a. regular interaction between various parts and various functions
    b. overlapping of objectives for various parts and functions
    c. sharing of resources by various parts and functions
    d. all of the above

15. The terms "system", "subsystem", and "component" are:

    a. functional descriptions
    b. structural descriptions
    c. hierarchically related (some subsume others)
    d. both b and c are true

16. Parts of systems that perform <u>major functions</u> are called:

    a. subsystems
    b. components
    c. interfaces
    d. none of the above

17. A system component is:

    a. a task performed by one or more parts
    b. a function performed by one or more parts
    c. a structural part that performs one or more tasks
    d. a structural part that performs one or more functions

18. In system analysis parlance, descriptions of lines of authority, physical facilities, and locations are:

    a. functional descriptions
    b. structural descriptions
    c. relational descriptions
    d. none of the above

19. It would be most accurate to say that in doing system analysis:

    a. functions must be understood before structure can be perceived
    b. structure must be perceived before functions can be understood
    c. structural arrangements should depend on function requirements
    d. functional requirements should flow from structural arrangements

20. The most direct connection in the system description is between objectives and:

    a. functions
    b. phases
    c. tasks
    d. interfaces

21. It would be most accurate to say that in doing system analysis:

    a. system objectives are deduced from system structure
    b. system functions are deduced from system objectives
    c. system tasks follow directly from system objectives
    d. system components are assigned directly to system objectives

22. Each item listed below is either a system objective, (O) system requirement, (R) system limit, (L) or system constraint (C). Put the correct letter designation in each of the blanks.

___"Personnel manning cannot exceed 11 persons."
___"Yearly budget cannot exceed $87,000.00."
___"Budgeting cycle starts in July."
___"High grade information service will be supplied to the research divisions."
___"Complete administrative information will be generated for the library managers."
___"Complete records will be kept for all items flowing through the system."
___"The system must be capable of processing 20,000 acquisitions per year."
___"$16,000.00 per year will be needed for purchase of hard-covers."
___"Reference service for 1,300 persons in the engineering division must be supplied."
___"Selective alerting function must be available for 60 top managers."
___"80 hours of IBM 360/67 time are needed per year."
___"Average delay for copies of journal articles delivered to office should not exceed one working day."
___"System must be capable of processing a minimum of 30 typical user requests per day."

23. In system terminology, a target date for a deliverable end item in design or development is called a:

a. due date
b. milestone
c. data item
d. none of these

24. Functional analysis asks the question:

a. How?
b. To what end?
c. When?
d. all the above
e. none of the above

25. Phase analysis concentrates on:

a. the purposes of system activity
b. sequence of information flow
c. activities supporting the information flow
d. stage of system development
e. none of the above

26. A detailed study of the activities supporting a system function is called:

    a. a functional analysis
    b. a task analysis
    c. a phase analysis
    d. a tradeoff analysis
    e. none of the above

27. A system analysis usually is concerned with:

    a. existent system conditions
    b. projected system conditions
    c. environmental trends
    d. all of the above
    e. none of the above

28. Managing a system and managing change and development of the system:

    a. should be one and the same thing
    b. should be done by the same person
    c. are distinct tasks that should be kept separate
    d. both a and b are correct
    e. none of the above are true

29. The system analysis technique:

    a. depends only on observations from the existing system
    b. employs extrapolation and simulation as tools
    c. uses information and specifications from the literature
    d. both b and c are correct
    e. none of the above are true

30. A system requirement may be defined as:

    a. a generalized statement of system purpose
    b. an authorized and specifically described need
    c. a necessary mechanical relation between system parts
    d. none of the above

31. In system development, the most common sequence of events would be:

    a. analysis, design, test, evaluate
    b. design, analysis, test, evaluate
    c. test, analysis, evaluate, design
    d. evaluate, design, test, analysis

32. In system analysis, documentation of the process and its product is considered:

    a. a desirable practice that must be considered in terms of funds available
    b. mainly
    c. a waste of time and funds
    d. absolutely essential for preserving the benefits of the analysis
    e. purely a matter of individual tastes
    f. not vital since what counts is the analyst's grasp of the system

33. As compared to system objectives, system requirements are:

    a. more specifically stated
    b. less specifically stated
    c. formally authorized
    d. both a and c are true
    e. none of the above are true

34. As compared to system objectives, system criteria are:

    a. expressed more in concrete terms
    b. expressed more in terms of observable events
    c. expressed more in terms of quantifiable observations
    d. all of the above are true
    e. none of the above are true

35. System criteria are:

    a. directly relevant to system objectives
    b. expressed in quantitative terms
    c. expressed in observable terms
    d. all the above are true
    e. none of the above are true

36. Operational definitions are:

    a. specific descriptions of actions required to observe or measure a defined event
    b. very important to system analysis
    c. highly abstract (in distinction to concrete) definitions
    d. both a and b are true

37. In system analysis, system documentation is concerned with:

    a. citing supporting literature for decisions
    b. detailed descriptions of system objectives and constraints
    c. detailed descriptions of system limits, functions, phases and tasks
    d. recording the inquiries, reasoning, and findings of the analysis
    e. all the above

38. The concept of inputs and outputs applies to:

    a. any system
    b. subsystems
    c. components
    d. all the above
    e. none of the above

39. The flow of information across an interface goes:

    a. from input to input
    b. from output to input
    c. from input to output
    d. none of the above

40. System boundaries are defined:

    a. only by inputs
    b. only by outputs
    c. by both inputs and outputs
    d. only by task analysis

41. Almost all system analyses consist partly of:

    a. functional analysis, and phase analysis
    b. task analysis and tradeoff analysis
    c. computer programming and statistical analysis
    d. both a and b are true

42. In system analysis, the level of detail of description tends to be:

    a. greater for functions than for objectives
    b. greater for objectives than for functions
    c. greater for tasks than for objectives
    d. both a and c are true

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43. A system analysis often shows that:

    a. one function serves several objectives
    b. one objective is served by several functions
    c. there is only one function for each objective
    d. both a and b are true
    e. none of the above are true

44. It would be most accurate to say that:

    a. functions rationalize (i.e., provide the basis for) objectives
    b. objectives rationalize functions
    c. tasks rationalize phases
    d. tasks rationalize functions

45. System requirements are:

    a. another name for system limits
    b. another name for system constraints
    c. another name for system objectives
    d. all the above are true
    e. none of the above are true

46. System analysis documentation would ordinarily not include descriptions of:

    a. system objectives and requirements
    b. acceptance testing results for the system
    c. system constraints and limits
    d. system phases, functions, and tasks

47. Some of the benefits of "mass production" can often be achieved by:

    a. function consolidation
    b. operational definitions of tasks
    c. system decentralization
    d. installing computers

48. Cost-effectiveness analysis can be helpful for:

    a. making resource-allocation decisions
    b. checking task analyses
    c. checking implementation of resource-allocation decisions
    d. both a and c are true

49. System analysts tend to view a good decision as one which:

    a. no one can argue about
    b. accurately anticipates the outcome of future events
    c. is the most popular with powerful decision makers
    d. requires the most sophisticated technical system design

50. It would be most accurate to say that:

    a. system effectiveness must be spelled out before system benefits can be detailed
    b. system benefits must be spelled out before system effectiveness can be measured
    c. system costs must be known before system benefits can be assessed
    d. value tradeoff functions must be known before system benefits can be identified

51. Information about system costs is obtained:

    a. from cost figures for the system
    b. from literature about similar systems
    c. by extrapolation and estimation procedures
    d. all the above are true
    e. none of the above are true

52. To estimate system effectiveness requires:

    a. data on system costs
    b. data on system benefits
    c. value tradeoff functions for benefits
    d. both b and c are true
    e. all the above are true

53. Proper resource allocation decisions are based on:

    a. system cost figures
    b. system benefits measurements
    c. value tradeoff functions for benefits
    d. both b and c are true
    e. all the above

54. A system benefit is quantified or measured by:

    a. its cost
    b. counting or rating of defining events
    c. the value tradeoff function for the benefit
    d. none of the above

55. Information about the comparative values of various system benefits can best be obtained:

    a. from system cost analyses
    b. from the general system's literature
    c. from system personnel and users
    d. from the system analyst

56. The most useful common denominator measure for system costs is probably:

    a. personnel time
    b. personnel effort
    c. personnel inconvenience
    d. money

57. It would be most accurate to say that:

    a. measuring system costs is always harder than measuring system benefits
    b. the amount and value of a benefit are essentially the same thing
    c. costs and benefits are sometimes two ways of looking at the same thing
    d. there is no way to measure the value of a benefit

58. The purpose of (decision tables) in system analysis is:

    a. to specify what decision is indicated by the data
    b. to focus the decision on effectiveness factors
    c. to focus the decision on cost factors
    d. to portray cost effectiveness balances

59. When various system alternatives are closely competitive:

    a. cost and effectiveness measures must be made more explicit
    b. value tradeoff functions must be more explicit
    c. more raw intuition is usually the most useful
    d. both a and b are true

60. In almost all system analyses:

    a. most system costs can be added and subtracted directly
    b. amounts of various system benefits can be added and subtracted directly
    c. value tradeoff functions for benefits need not even be considered
    d. cost-effectiveness analyses comprise the preliminary step

POST-TEST

for

SYSTEM ANALYSIS

Part 2

January 1969

Testing Instructions: Circle the single best answer for each of the 25 items. The questions should be answered from the point of view of the authors of the article. You will have 30 minutes to answer the 25 questions.

This test is based upon the article you have just been asked to review: Baker, Norman R. and Nance, Richard E., "The Use of Simulation in Studying Information Storage and Retrieval Systems." American Documentation, October 1968, pp. 363-370.

1. In the past, most simulation models for information storage and retrieval systems have been used to study:

    a. tangible characteristics of information retrieval and usage
    b. statistical measures of system output
    c. varieties of component relations in the system
    d. all the above are true

2. In the "reward-cost theory" modelling of systems:

    a. the interaction between system, user, and funder are ignored
    b. funding level is calculated from system design and predicted load
    c. the user is included in the analysis of the system
    d. none of the above is true

3. The utility of an ISRS (Information Storage and Retrieval System) is:

    a. computable from cost data
    b. constrained by funders and users
    c. a sum total of component outputs
    d. none of the above is true

4. Operational constraints, (as compared to resource constraints) tend to be:

    a. more direct
    b. less direct
    c. equally direct
    d. more costly

5. In the model of the ISRS/User/Funder complex:

    a. future allocations are not influenced by funder evaluation
    b. reward-cost theory is applied to prices of system components
    c. overall resource constraints are not considered pertinent
    d. none of the above is true

6. A system simulation model consisting of specifications for processing operations; component linkages; service unit availability, reliability, and schedule; and system load could best be called:

    a. an ISRS/User/Funder complex model
    b. a partial simulation model
    c. an exhaustive simulation model
    d. none of the above

7. The statement: "Provide a complete collection of documents relevant to thermo-physical properties" is an example of:

    a. specifying a system operating characteristic
    b. establishing an overall resource constraint
    c. establishing an activities-resource constraint
    d. none of the above is true

8. The statement: "Spend no more than X amount of resource Y in producing Z" is an example of:

    a. specifying a system operating characteristic
    b. establishing an overall resource constraint
    c. establishing an activities-resource constraint
    d. none of the above is true

9. The problem of representing several independently operating funders is best handled in modelling by:

    a. the ISRS/User/Funder complex model
    b. the linear programming model
    c. the retrieval precision model
    d. the simulated search model

10. The user's behavior in <u>identifying</u> sources of need satisfaction can be modelled by:

    a. linear programming models
    b. reward-cost theory models
    c. response-constraint models
    d. none of the above is true

11. The <u>utility</u> of an ISRS is affected by:

    a. resource constraints
    b. operational constraints
    c. system design
    d. all of the above

12. It is most accurate to say that:

    a. a library is an ISRS
    b. an ISRS is a library
    c. an ISRS is <u>not</u> a library
    d. both a and c are true

13. A model of a Library/User/Funder complex would be least likely to focus on:

    a. ordering of materials
    b. computer program language specifications
    c. book loan procedures
    d. floor space allocation

14. In models of ISRS/User/Funder complexes, policies controlling behavior are most often portrayed as:

    a. linear, i.e., continuous, functions
    b. discontinuous functions
    c. ill-structured functions
    d. both b and c are true

15. Simulation models of systems can be used to study:

    a. ability of the system to operate as intended in the design of its inputs and outputs
    b. interactions of the system with the users and funders in its environment
    c. actual costs of the system
    d. both a and c are true

16. In a study of X-ray crystallographers, Rubenstein found that users who made a priori estimates of the benefits of certain special information services were apt to:

    a. underestimate the user-costs associated with a service
    b. overestimate the user-costs associated with a service
    c. devalue the services
    d. both b and c are true

17. Resource and operational constraints are most likely to be imposed on the system by:

    a. users
    b. funders
    c. managers
    d. none of the above

18. When there are several funders operating relatively independently, funder control tends to be:

    a. minimized
    b. maximized
    c. slightly augmented
    d. not noticeably affected

19. In the "reward-cost theory of behavior" as applied to the ISRS/User Funder complex model in the article:

    a. the funder is confronted with information problems
    b. the user is faced with deciding his sources of need-satisfaction
    c. the manager is faced with technical design problems
    d. none of the above is true

20. In Simon's principle of satisficing, need-satisfying source expectations are:

    a. exhaustively scanned, evaluated and established
    b. established only until enough sources have been generated
    c. ranked accurately from greatest to least
    d. both a and c are true

21. In the ISRS/User/Funder model:

    a. feedback from users may be viewed as attempts at control
    b. feedback from funders may be viewed as opportunity to learn
    c. both a and b are true
    d. none of the above is true

22. In the ISRS/User/Funder model, funder-user interactions:

    a. are concerned with user needs and the systems ability to satisfy them
    b. are concerned with the funders' resources and plans
    c. are portrayed as always taking place only outside of the channels provided by the system
    d. both a and b are true

23. In the model of the Library/User/Funder complex, one relation that was omitted (because it did not appear as a factor in direct studies of the library) was:

    a. funder evaluations of the library
    b. user evaluations of the library
    c. funder-user interactions
    d. funder-library interactions

24. In the model of the Library/Funder/User complex, detailed modelling of sectors was not planned for:

    a. book loan and man hours of service
    b. space and funding
    c. computer support and bindery
    d. users' need and materials acquisition

25. As compared with sector models, the Library/User/Funder complex model is more complete with respect to:

    a. system overview
    b. data collection and analysis procedures
    c. sector interface details
    d. none of the above is true

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REFERENCE TOOLS AND SERVICES

Pre-test

January 1969

Circle the letter or letters preceding the correct answer or answers.

1. Your most important criterion in selecting a reference work is whether or not it includes the information you are seeking and in sufficient detail. Is it correct, then, to assume that with diligence and persistence you will be able to find the perfect reference work for your individual purposes?

    a. true
    b. false

2. Among books intended for reference purposes and nothing else--that is, books designed to be consulted rather than read through--are encyclopedias, dictionaries, directories, handbooks, etc. All sources of the same general type can be expected to contain approximately the same amount of information in both scope and detail.

    a. true
    b. false

3. In selecting a reference work, a formula that holds true in the majority of cases is that the more limited the overall scope of a reference work, the greater coverage it gives to the specific field or fields to which its coverage is limited.

    a. true
    b. false

4. In choosing your reference sources, you must first determine the level of the information you are seeking and then match this as closely as possible with the level of a particular reference work. For example, let us say your interest is in literature. If you are interested in the literature of all countries and only in the most general ways, what would be the most logical reference source?

    a. literary guide
    b. general encyclopedia
    c. gazeteer

5. If your interest is specialized, if you seek great detail on a specific aspect of a particular problem, what would be a good reference choice?

    a. specialized encyclopedia
    b. specialized directory
    c. specialized dictionary
    d. all

6. Since all reference works have been compiled from primary sources, you can be reasonably certain that the information they give is accurate.

    a. true
    b. false

7. In evaluating the authority of a reference work, sources that can be accepted as accurate on faith and trust alone include

    a. trade association data
    b. official U.S. statistics
    c. data from foreign publications
    d. all
    e. none

8. How may the authority of a reference work be evaluated?

    a. by looking up entries in subjects you feel you can judge as to their accuracy
    b. by matching specific entries in a fair sampling of different subjects against similar entries in other reference works
    c. by identifying the authors and assessing the authority of the work in terms of the authority of the work's creators
    d. all

9. In judging the "up-to-dateness" of any reference source that is newly published or that has not been revised, you can use the rule that its contents are

    a. ten years or more old
    b. at least two months old
    c. about a year older than the copyright date

10. Up-to-dateness is invariably an asset in a reference work

    a. true
    b. false

11. Reference books contain introductory material called "forematter." What kinds of information can be found here?

    a. clues to the book's peculiarities
    b. frequency with which revisions are made
    c. imprint date
    d. description of the scope and limitations of the work
    e. techniques used in making the book
    f. abbreviations used
    g. all

12. Any book which is not organized in an encyclopedia or dictionary-type format must have an index in order to be used successfully as a reference work. Which of these characteristics do all indexes have

    a. they are done while the main body of the work is being completed
    b. they limit a reference to one heading
    c. they refer a reader to a specific page
    d. they pinpoint specific information
    e. all
    f. none
    g. c and d
    h. b and c

13. The largest single group of reference material is periodical literature. Among the values peculiar to periodical sources are that

    a. much material appears in them that never finds its way into book form
    b. information is much more comprehensive than that in permanent book form
    c. material is often more accurate than similar data in book form
    d. b and c
    e. a and c
    f. all

14. There are two types of guides to periodical literature. One type guides you to individual periodicals. The second type consists of the various indexes to the contents of periodicals. Of the latter type, there are

    a. indexes that cover all periodicals in one index
    b. indexes that cover periodicals in a wide variety of subject fields
    c. specialized indexes
    d. all
    e. a and b
    f. b and c

15. Use of biographical sources presents several problems. Among them is (are)

    a. much biographical information has its basis largely in opinion
    b. the majority of available biographical data has not been unearthed, recorded, and confirmed in a scholarly fashion
    c. much of the material is derived from second-hand or third-hand sources
    d. all

16. Specialized biographical sources offer a number of advantages. Among them is(are)

    a. the specialized work indludes more persons in the specific field of minor note than you will find in more general sources
    b. each biography is more detailed than in works severely limited in space
    c. the care with which the specialized sources are prepared and the amount of checking done usually exceed that found in general sources
    d. the authors usually have access to primary sources
    e. all
    f. a and d

17. Most firms and persons advertise in the Yellow Pages because they want you to call them. For that reason, many listings there give detailed information. Reference sources in the library that will help locate suppliers of particular products or services include

    a. commercial directories
    b. specialized encyclopedias
    c. specialized dictionaries

18. The most common method of keeping a reference work up to date is through the issuance of periodic supplements. These appear

    a. quarterly
    b. annually
    c. at intervals determined by the publisher

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POST-TEST

for

SYSTEM ANALYSIS

Part 2

January 1969

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    d. users' need and materials acquisition

25. As compared with sector models, the Library/User/Funder complex model is more complete with respect to:

    a. system overview
    b. data collection and analysis procedures
    c. sector interface details
    d. none of the above is true

REFERENCE TOOLS AND SERVICES

Pre-test

January 1969

Circle the letter or letters preceding the correct answer or answers.

1. Your most important criterion in selecting a reference work is whether or not it includes the information you are seeking and in sufficient detail. Is it correct, then, to assume that with diligence and persistence you will be able to find the perfect reference work for your individual purposes?

    a. true
    b. false

2. Among books intended for reference purposes and nothing else--that is, books designed to be consulted rather than read through--are encyclopedias, dictionaries, directories, handbooks, etc. All sources of the same general type can be expected to contain approximately the same amount of information in both scope and detail.

    a. true
    b. false

3. In selecting a reference work, a formula that holds true in the majority of cases is that the more limited the overall scope of a reference work, the greater coverage it gives to the specific field or fields to which its coverage is limited.

    a. true
    b. false

4. In choosing your reference sources, you must first determine the level of the information you are seeking and then match this as closely as possible with the level of a particular reference work. For example, let us say your interest is in literature. If you are interested in the literature of all countries and only in the most general ways, what would be the most logical reference source?

    a. literary guide
    b. general encyclopedia
    c. gazeteer

5. If your interest is specialized, if you seek great detail on a specific aspect of a particular problem, what would be a good reference choice?

    a. specialized encyclopedia
    b. specialized directory
    c. specialized dictionary
    d. all

6. Since all reference works have been compiled from primary sources, you can be reasonably certain that the information they give is accurate.

    a. true
    b. false

7. In evaluating the authority of a reference work, sources that can be accepted as accurate on faith and trust alone include

    a. trade association data
    b. official U.S. statistics
    c. data from foreign publications
    d. all
    e. none

8. How may the authority of a reference work be evaluated?

    a. by looking up entries in subjects you feel you can judge as to their accuracy
    b. by matching specific entries in a fair sampling of different subjects against similar entries in other reference works
    c. by identifying the authors and assessing the authority of the work in terms of the authority of the work's creators
    d. all

9. In judging the "up-to-dateness" of any reference source that is newly published or that has not been revised, you can use the rule that its contents are

    a. ten years or more old
    b. at least two months old
    c. about a year older than the copyright date

10. Up-to-dateness is invariably an asset in a reference work

    a. true
    b. false

11. Reference books contain introductory material called "forematter." What kinds of information can be found here?

    a. clues to the book's peculiarities
    b. frequency with which revisions are made
    c. imprint date
    d. description of the scope and limitations of the work
    e. techniques used in making the book
    f. abbreviations used
    g. all

12. Any book which is not organized in an encyclopedia or dictionary-type format must have an index in order to be used successfully as a reference work. Which of these characteristics do all indexes have

    a. they are done while the main body of the work is being completed
    b. they limit a reference to one heading
    c. they refer a reader to a specific page
    d. they pinpoint specific information
    e. all
    f. none
    g. c and d
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    a. much material appears in them that never finds its way into book form
    b. information is much more comprehensive than that in permanent book form
    c. material is often more accurate than similar data in book form
    d. b and c
    e. a and c
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14. There are two types of guides to periodical literature. One type guides you to individual periodicals. The second type consists of the various indexes to the contents of periodicals. Of the latter type, there are

    a. indexes that cover all periodicals in one index
    b. indexes that cover periodicals in a wide variety of subject fields
    c. specialized indexes
    d. all
    e. a and b
    f. b and c

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    a. much biographical information has its basis largely in opinion
    b. the majority of available biographical data has not been unearthed, recorded, and confirmed in a scholarly fashion
    c. much of the material is derived from second-hand or third-hand sources
    d. all

16. Specialized biographical sources offer a number of advantages. Among them is(are)

    a. the specialized work indludes more persons in the specific field of minor note than you will find in more general sources
    b. each biography is more detailed than in works severely limited in space
    c. the care with which the specialized sources are prepared and the amount of checking done usually exceed that found in general sources
    d. the authors usually have access to primary sources
    e. all
    f. a and d

17. Most firms and persons advertise in the Yellow Pages because they want you to call them. For that reason, many listings there give detailed information. Reference sources in the library that will help locate suppliers of particular products or services include

    a. commercial directories
    b. specialized encyclopedias
    c. specialized dictionaries

18. The most common method of keeping a reference work up to date is through the issuance of periodic supplements. These appear

    a. quarterly
    b. annually
    c. at intervals determined by the publisher

19. The handbook, particularly the specialized handbook, is one of the most important types of reference works. Among the reasons for this is the fact that

    a. they contain more detail and concrete data
    b. they provide sources of often rare and hard-to-find items of information
    c. information in them often does not need updating
    d. a and b
    e. a and c
    f. all

20. Almanacs contain much statistical data and other minutely specific information reaching back over many years. They are well organized for reference purposes. To familiarize yourself with them most quickly so that you can find almost any item, you should

    a. consult the index
    b. study the table of contents
    c. leaf through the books
    d. all
    e. a and b

21. The most frequently used sources of general information about scientific and technical periodicals is

    a. Ulrich's International Periodicals Directory
    b. Ayers' Directory of Newspapers and Periodicals
    c. New York Times Index
    d. New Serial Titles

22. Handbooks contain tables of numerical data, graphs, and statistical information, but seldom contain substantial amounts of text and discussion.

    a. true
    b. false

23. A patron would like to obtain such data as addresses of main and branch offices of companies; credit ratings; and the kinds of products made. This information can most readily be found in

    a. specialized handbook
    b. commercial directory
    c. professional register

24. Basic information concerning nonprofit research centers is listed in Research Centers Directory. This information is usually of high quality because

    a. it is taken from newspaper sources
    b. it has been published in technical journals
    c. it was obtained directly from the head or a responsible official of the organization

25. The process of telling a user about a specialized library that he might wish to use is called

    a. interlibrary loan
    b. referral
    c. bibliography
    d. reprography

26. Ulrich's International Periodicals Directory lists only scientific and technical periodicals.

    a. true
    b. false

27. Bibliographies may be used

    a. as selection tools
    b. to find information about publishers and prices
    c. to verify titles
    d. all of the above

28. When examining a new reference book, the best place to look for information about scope, level and purpose is the

    a. index
    b. frontispiece
    c. inside back cover
    d. preface

29. All technical reports issued by the Atmoic Energy Commission are announced in Nuclear Science Abstracts and in

    a. U.S. Government Research and Development Reports
    b. Monthly Catalog of U.S. Government Publications
    c. Bibliography of Agriculture
    d. Science Information Notes

30. Someone requests all the 1946 issues of a particular journal that your library does not receive. To identify a library in the United States or Canada that might fill the request on interlibrary loan, you should consult

    a. Directory of Special Libraries and Information Sources
    b. Bowker Annual
    c. Ulrich's International Periodicals Directory
    d. Union list of Serials

31. Engineering Index is arranged by

    a. title
    b. author
    c. subject
    d. abstract

32. The best source of information about a scientific discovery that was announced eight months ago is a

    a. encyclopedia
    b. directory
    c. periodical index
    d. almanac

33. Most technical reports abstracting services provide a corporate author index. "Corporate author" indicates the originator of the report. It could be a

    a. Federal laboratory
    b. university
    c. foreign research organization
    d. U.S. corporation
    e. all of these

34. The publication which continues the Union List of Serials and lists serials that began publication after January 1950 is called

    _____

35. The main arrangement of Ulrich's International Periodicals Directory is by

    a. subject
    b. author
    c. title
    d. contract number

(page 64 blank)

36. In an index, a cross-reference

    a. is the same as an authority list
    b. helps to relate similar subjects
    c. is always shown by indentation
    d. explains the location of tables and charts

37. Abstracts of documents (technical reports, books, symposia, etc.)

    a. can be informative or descriptive
    b. always appear in print before the full documents are available
    c. are often used as selection aids
    d. none of these

38. Many handbooks in scientific and engineering fields consist mostly of short articles, tables and charts related to a broad range of specialized topics.

    a. true
    b. false

REFERENCE TOOLS POST-TEST

January 1969

On the following pages there are sixty questions relating to the material you have studied. You will have 45 minutes to complete the test. If you finish earlier, turn in your paper and leave quietly, so as not to disturb those not yet finished.

Circle the letter or letters preceding the correct answer or answers.

1. Your most important criterion in selecting a reference work is whether or not it includes the information you are seeking and in sufficient detail. Is it correct, then, to assume that with diligence and persistence you will be able to find the perfect reference work for your individual purposes?

   a. true
   b. false

2. Among books intended for reference purposes and nothing else--that is, books designed to be consulted rather than read through--are encyclopedias, dictionaries, directories, handbooks, etc. All sources of the same general type can be expected to contain approximately the same amount of information in both scope and detail.

   a. true
   b. false

3. In selecting a reference work, a formula that holds true in the majority of cases is that the more limited the over-all scope of a reference work, the greater coverage it gives to the specific field or fields to which its coverage is limited.

   a. true
   b. false

4. In choosing your reference sources, you must first determine the level of the information you are seeking and then match this as closely as possible with the level of a particular reference work. For example, let us say your interest is in literature. If you are interested in the literature of all countries and only in the most general ways, what would be the most logical reference source?

   a. literary guide
   b. general encyclopedia
   c. gazeteer

5. If your interest is specialized, if you seek great detail on a specific aspect of a particular problem what would be a good reference choice?

   a. specialized encyclopedia
   b. specialized directory
   c. specialized dictionary
   d. all

6. Since all reference works have been compiled from primary sources, you can be reasonably certain that the information they give is accurate.

    a. true
    b. false

7. In evaluating the authority of a reference work, sources that can be accepted as accurate on faith and trust alone include

    a. trade association data
    b. official U.S. statistics
    c. data from foreign publications
    d. all
    e. none

8. How may the authority of a reference work be evaluated?

    a. by looking up entries in subjects you feel you can judge as to their accuracy
    b. by matching specific entries in a fair sampling of different subjects against similar entries in other reference works
    c. by identifying the authors and assessing the authority of the work in terms of the authority of the work's creators
    d. all

9. In judging the "up-to-dateness" of any reference source that is newly published or that has not been revised, you can use the rule that its contents are

    a. ten years or more old
    b. at least two months old
    c. about a year older than the copyright date

10. Up-to-dateness is invariably an asset in a reference work.

    a. true
    b. false

11. Reference books contain introductory material called "forematter." What kinds of information can be found here?

    a. clues to the book's peculiarities
    b. frequency with which revisions are made
    c. imprint date
    d. description of the scope and limitations of the work
    e. techniques used in making the book
    f. abbreviations used
    g. all

12. Any book which is not organized in an encyclopedia or dictionary-type format must have an index in order to be used successfully as a reference work. Which of these characteristics do all indexes have

    a. they are done while the main body of the work is being completed
    b. they limit a reference to one heading
    c. they refer a reader to a specific page
    d. they pinpoint specific information
    e. all
    f. none
    g. c and d
    h. b and c

13. The largest single group of reference material is periodical literature. Among the values peculiar to periodical sources are that

    a. much material appears in them that never finds its way into book form
    b. information is much more comprehensive than that in permanent book form
    c. material is often more accurate than similar data in book form
    d. b and c
    e. a and c
    f. all

14. There are two types of guides to periodical literature. One type guides you to individual periodicals. The second type consists of the various indexes to the contents of periodicals. Of the latter type, there are

    a. indexes that cover all periodicals in one index
    b. indexes that cover periodicals in a wide variety of subject fields
    c. specialized indexes
    d. all
    e. a and b
    f. b and c

15. Use of biographical sources presents several problems. Among them is(are)

    a. much biographical information has its basis largely in opinion
    b. the majority of available biographical data has not been unearthed, recorded, and confirmed in a scholarly fashion
    c. much of the material is derived from second-hand or third-hand sources
    d. all

16. Specialized biographical sources offer a number of advantages. Among them is(are)

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38. Many handbooks in scientific and engineering fields consist mostly of short articles, tables and charts related to a broad range of specialized topics.

    a. true
    b. false

39. A handbook may be described as a specialized encyclopedia contained in a single volume. Which of the following characteristics are typical of handbooks?

    a. They consist of articles on a limited range of specialized subjects.
    b. The articles survey the state of knowledge on a specific subject in a way that will be understood by specialists in the subject.
    c. The articles vary from one another in authority of coverage, factual detail, clarity of presentation, accuracy, and the degree to which the article is up-to-date in a special field.
    d. The articles contain a list of references to the literature of the subjects covered.
    e. Articles are signed by contributors.

40. The Standard Handbook for Mechanical Engineers is intended to supply both the practicing engineer and the student with a reference work that is useful in the rapidly changing scope and practice of mechanical engineering. Pick the way(s) in which this has been accomplished.

    a. by disregarding volume size in the interest of providing comprehensive information
    b. by enlisting the aid of a considerable number of specialists
    c. by incorporating the Engineering Index in the Appendix

41. It is stated in the preface to the seventh edition that the Standard Handbook for Mechanical Engineers

    a. has had to reconcile the need to offer the user as comprehensive information as possible with volume size
    b. is the work of more than one hundred contributors
    c. is revised annually
    d. enlists specialists to review contributions for criticism and suggestions

42. Specialists contributing to the Standard Handbook for Mechanical Engineers

    a. must be listed in American Men of Science
    b. write on various aspects of engineering practice
    c. are in an alphabetically arranged List of Contributors with the affiliation and the stated professional specialization given
    d. are listed, with their affiliations, in the Contents to the sections in which the articles appear

43. How can you obtain a listing of the aspects of a subject covered in the Standard Handbook for Mechanical Engineers?

    a. by consulting the Contents to the section
    b. by consulting the Index
    c. by consulting the Index to Major Topics
    d. by reading the Preface

44. If a patron would like to purchase a text that will provide a non-technical interdisciplinary approach to the engineering sciences and asks you if you think the Handbook of the Engineering Sciences would be a good choice, how should you respond?

    a. Volume I, The Basic Sciences, contains background material for the applied engineering sciences
    b. The Handbook of the Engineering Sciences uses an interdisciplinary approach that should suit his needs admirably
    c. The Handbook of the Engineering Sciences would be unsuitable for his needs

45. When attempting to obtain standards information from the Handbook of the Engineering Sciences, what is the best approach?

    a. Consult Volume 2, The Applied Sciences
    b. Consult Volume 1, The Basic Sciences
    c. Look in the indexes to both Volume 1 and Volume 2
    d. Save your energy; there is no standards information in the Handbook of the Engineering Sciences

46. How can bibliographical citations be found in the Handbook of the Engineering Sciences?

    a. by noting the specializations of the contributors to the Handbook of the Engineering Sciences
    b. by consulting the Contents
    c. by consulting the Index

47. If you need to obtain information that is probably contained in the Handbook of the Engineering Sciences but do not know which volume will contain it, what should you do?

    a. Consult the indexes in both volumes
    b. Suggest a different, more specialized handbook
    c. Consult the Contents to both volumes

48. Encyclopedias are one type of reference works and are intended to be consulted for specific information rather than read through. Which of the features listed below apply to a good encyclopedia?

    a. The articles give basic information about specific subjects
    b. The columes are arranged alphabetically or by broad categories
    c. There is an alphabetical subject index
    d. There are cross references to lead the user to related topics
    e. Illustrations, schematic drawings, photographs, tables, etc., accompany the text

49. The McGraw-Hill Encyclopedia of Science and Technology is a comprehensive multi-volume encyclopedia. Which of the following statements are applicable to it?

    a. It contains descriptive information useful to the layman or nonspecialist
    b. It records modern developments in basic areas of science, especially those stimulated by modern research and technological developments
    c. It keeps up with new developments through annual revision
    d. It contains several indexes with special information

50. In order to find information in the McGraw-Hill Encyclopedia of Science and Technology on any subject, what approach(es) can be used?

    a. The alphabetical placement by title of articles in the encyclopedia
    b. The comprehensive (analytical) index
    c. The topical index
    d. The cross references among articles
    e. The list of contributors in Volume 15 which shows the major articles written by each contributor

51. Titles in the McGraw-Hill Encyclopedia of Science and Technology are alphabetized by word and not by letter. Place the following list of words in the order in which they appear in the encyclopedia.

    Earthmover _____
    Earthquake _____
    Earth sciences _____
    Earth tides _____

52. A word used as a noun in the McGraw-Hill Encyclopedia of Science and Technology precedes the same word used as an adjective. Place the following list in the order in which it would appear in the encyclopedia:

    Aircraft _____
    Air cooling _____
    Air-cushion _____
    Airfoil _____

53. Hyphened terms in the McGraw-Hill Encyclopedia of Science and Technology are alphabetized as single words. Place the following list in the order in which it would appear in the encyclopedia:

Grassland _____

Grasserie _____

Grass-root beetle _____

Grass crops _____

54. The Thomas Register of American Manufacturers is claimed by its publisher to be the largest and most complete purchasing encyclopedia ever published anywhere. Which of the following statements are applicable to it?

a. It is issued annually
b. It comes in seven volumes and an index
c. It contains an alphabetical product finding guide and an index to advertisers
d. It contains an alphabetically arranged list of all important manufacturers, trademarks, boards of trade, and other commercial organizations

55. The American Trademark Index in Volume 7 of the Thomas Register of American Manufacturers is an alphabetically arranged list of names under which various products are stamped, labelled, and advertised. The Index

a. is limited to registered trademarks
b. includes trademarks that are not registered
c. is endorsed by the U.S. Patent Office

56. Names of manufacturers are listed in the Thomas Register

a. under multiple classifications
b. if the companies' assets are over $50,000
c. if they sell their products or services in the United States or Canada

57. The Research Centers Directory includes centers for fundamental and applied studies in the mathematical, physical, life, engineering, and social sciences as well as instructional programs that include laboratories and research activities. Which of the following statements also apply?

    a. Units listed are established on an interim basis to carry on research programs in all fields of endeavor
    b. Units listed are established on a permanent basis to carry on research programs in selected fields of endeavor
    c. Units listed include laboratories and facilities used primarily in instructional programs and internship activities, with research of incidental concern
    d. None of the above

58. New Research Centers is published in conjunction with the Research Centers Directory. Which of the following statements apply to it?

    a. It is published annually.
    b. It is published periodically.
    c. It contains information on newly-established non-profit research cneters not in Research Centers Directory.
    d. It supplants the Addendum formerly included in Research Centers Directory.

59. Biographies of scientists who are listed in American Men of Science are arranged alphabetically within sections and are

    a. approved by the National Academy of Sciences
    b. divided between the Physical and Biological Sciences and the Social and Behavioral Sciences
    c. updated on an annual basis

60. Which of the following are criteria for inclusion in American Men of Science?

    a. U.S. citizenship
    b. a doctoral degree
    c. international fame
    d. membership in scientific societies
    e. none of the above

ON-THE-JOB TRAINING FIELD TEST

RUSSIAN-ENGLISH TRANSLITERATION

PRE-TEST

November 1968

You are about to be taught how to transliterate Russian into the Roman alphabet, used in writing English. Russian is written in the Cyrillic alphabet, similar in many ways to the Greek alphabet and in fewer ways to the Roman. Transliteration merely involves converting letters from one type of alphabet to the corresponding letters of some other alphabet, and to transliterate effectively, you do not have to know anything about the language you are transliterating from.

To start, memorize the following:

RUSSIAN		ROMAN
Aa	=	Aa
Ee	=	Ee
Oo	=	Oo
Кк	=	Kk
Мм	=	Mm
Тт	=	Tt
Гг	=	Gg
Йй	=	Ii
Ии	=	Ii
Нн	=	Nn
Рр	=	Rr
Пп	=	Pp
Лл	=	Ll
Вв	=	Vv

(page 82 blank)

Now transliterate the following words:

1	Кето	1	_____	9	Мотека	9	_____
2	Нагий	2	_____	10	Гинай	10	_____
3	Гитай	3	_____	11	Гигий	11	_____
4	Гата	4	_____	12	Кегото	12	_____
5	Текамо	5	_____	13	Кемато	13	_____
6	Нигий	6	_____	14	Монай	14	_____
7	Гигай	7	_____	15	Гитагий	15	_____
8	Гатего	8	_____	16	Мегога	16	_____
17	Крепой	17	_____	25	Каврай	25	_____
18	Погой	18	_____	26	Кловрий	26	_____
19	Гопрой	19	_____	27	Гавлой	27	_____
20	Припай	20	_____	28	Тегвай	28	_____
21	Ранагрой	21	_____	29	Полгий	29	_____
22	Критрий	22	_____	30	Локрой	30	_____
23	Арегра	23	_____	31	Крелпо	31	_____
24	Макрай	24	_____	32	Каплай	32	_____

ON-THE-JOB TRAINING FIELD TEST

RUSSIAN-ENGLISH TRANSLITERATION

POST INSTRUCTION QUIZ

November 1968

On the following pages you will be asked to transliterate Russian to English in the same way you have been doing exercises given to you as instruction. You will be given a limited amount of time to complete this quiz so work as quickly and as accurately as you can.

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO BEGIN.

Please write the English equivalents to the right of each Russian word.

RUSSIAN	ENGLISH
Племя	
Прямо	
Рояль	
Молодой	
Народ	
Обед	
Кловрий	
Гавлой	
Тегвай	
Погой	
Гопрой	
Припай	
Нагий	
Нигий	
Гинай	
Подъесть	
Съеживать	
Разъярить	
Походить	
Похудевший	
Походка	
Закончить	
Дурачок	
Ерофеич	

Please write the English equivalents to the right of each Russian word.

RUSSIAN	ENGLISH
экзекутор	
элемент	
эпилог	
Площадь	
Посещать	
Прощать	
Лишать	
Лишний	
Пешком	
Прежний	
Свежий	
Нож	
Болетво	
Балвебий	
Галеблой	
Германский	
Встороне	
Блеск	
Изобретение	
Кавказ	
Мороз	

Please write the English equivalents to the right of each Russian word.

RUSSIAN	ENGLISH
Трогать	
Смерть	
Родость	
Узнавать	
Украдкой	
Украсть	
Гемисфера	
Памфлет	
Префект	
Воплю	
Жую	
Каюта	
Оказанный	
Окружённый	
Отказывать	
Кузница	
Птица	
Принц	
Кето	
Текамо	
Мотека	

Please write the English equivalents to the right of each Russian word.

RUSSIAN	ENGLISH
Гата	
Гатего	
Кегото	
Гитай	
Гигай	
Гигий	
Праглай	
Преглий	
Тралпай	
Нограй	
Ранагрой	
Критрий	
Арегра	

Write the English transliteration opposite each line of Russian words.

Какая сегодня прекрасная погода.
Приятно ходить пешком, когда
светит солнце. Я живу недалеко
от школы и часто хожу пешком; но
когда идёт дождь, я езжу на
трамвае. В такую прекрасную
погоду как сегодня хорошо гулять
или играть в теннис, но я должен
сидеть в школе.

Я теперь изучаю русский язык.
На сегодня у нас очень лёгкий урок,
но упражнение довольно трудное. Я
много работаю, потому что хочу
свободно говорить по-русски.
Учительница говорит, что у меня
хорошее произношение и что я уже
довольно хорошо пишу по-русски.

Завтра мы не идём в школу, и у
меня также нет урока музыки. Завтра
праздник, и мы едем в деревню к
дяде и тёте.