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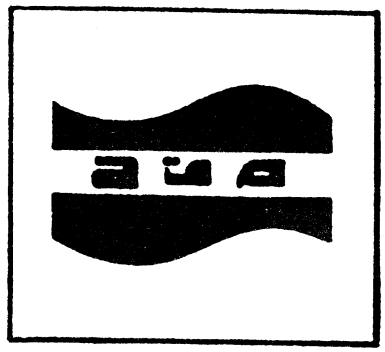





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# COURSEWARE DEVELOPMENT AND PRODUCTION

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87-1257

School Assistance Act has a specific title within it for the production of educational television programming to assist the large urban school systems in dealing with the problems of inner city learners. The Department of Education has provided most of the funding for the Children's Television Workshop to develop the well-known Sesame Street and Electric Company sequences. The National Institute of Education has funded the operation of the University of Mid-America in order to insure that the consortium could demonstrate its ability to service the needs of continuing education in the Midwest.

A second source of funds to meet the underwriting costs of courseware has traditionally been foundations of various kinds. The Ford Foundation has provided funds along with other agencies in several instances to develop the necessary capital. I'm sure many of you are familiar with some of the activities of the Markel Foundation and others in this area.

As I mentioned above, however, the most interesting and resourceful accumulation of films recently has been the development of various consortia for co-production. The Agency for Instructional Television has a successful enterprise here, as does The University Consortium which has produced *Man A Course of Study* and *The Ascent of Man* and many other instructional courses. I have not yet seen any consortia developed which has been able to capitalize on the development of courseware for microcomputers across the board.

At the moment, we are largely dependent on the hardware industry in the microcomputing world to provide courseware for us. However, that is changing and there are several publications which could be perused for an update on what is available from the private sector in the way of courseware for microcomputers. *Creative Computing, Personal Computing* and *Microcomputing* magazines all review commercial programs as they are introduced. Most of those sources are listed in AECT's publication, *Guide to Microcomputers*, by Franz Frederick.

## CONCLUSION

So, how can we *best* produce courseware for the video and microcomputing evolution? I suspect that my answer has to be that the *consortium route* is probably best for video-oriented materials in the form of coursewre and that for the moment we will probably have to depend on the *hardware industry* in microcomputing to assist us until we can get a courseware creation cadre built of such a size that the needs of edcuation can be served independently.

(2)

الدكتور

محمد رجب الجابري

# How Can We Best Produce Courseware? (The Process of Courseware Development)

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## INTRODUCTION

The process of curriculum development has had a history of slow evolution. Originally information was transmitted from highly-educated instructors to their students via lectures and handwritten notes. This type of education was centered around the instructor and the success of the learning process depended entirely upon the talents of the instructor or the initiative of the learner. With the invention of the printing press many of the lecture notes were transformed into support materials for students. This allowed for wider-spread distribution of ideas and for more continuous learning. This type of learning was centered upon the instructor and the textbook as the main sources of information and it was the student's responsibility to acquire the information by attending lectures and reading the text. More recently with the introduction of multimedia materials as support to the learning process, the student has been allowed to experience a wider range of stimulus. Many educationally-meaningful experiences were filmed, photographed, or diagrammed and used by the instructor during the lecture as support materials. Sometimes the multimedia materials were presented to the student in an individualized mode as the actual learning activity. This was the first step toward making the learning experience less teacher dependent and more student centered. Now, with the introduction of computers into education, the concept of a student-centered learning environment has become a reality. The computers can deliver instruction to the students independently of the instructor and the student can progress at his or her own pace commensurate with their abilities. This type of education constitutes a drastic shift away from the passive

instructor-centered transmission of the information to the more active process of the student interaction with a dynamic learning experience controlled by a computer.

Accompanying the evolution of education from a singular-source, lecture-centered environment to a multimedia, interactive, computer-based environment has been the tremendous increase in the need to have quality courseware materials available. To produce a set of lecture notes was a relatively-simple task for a well-educated professor, particularly in his field of expertise. To develop a textbook was far more extensive an effort, because many different instructors with various learning strategies would be expected to use the same textbook to teach in different locations. Therefore, the textbook had to be comprehensive, informative, accurate, and above all accepted by the teaching profession. To develop multimedia materials involving slides, audiotapes, videotapes, filmstrips, graphs, charts and a multitude of other embodiments, required a significantly-higher level of effort in the initial development stage than did the textbook. Multimedia development requires that many simulations be structured for photographing, professional actors be contracted for audiotape recording, and photographers be employed. To develop a computer-based education curriculum is possibly the most comprehensive and sophisticated activity that curriculum developers have faced. This usually involves large scale activity in the form of comprehensive curriculum definition, computer programs at different levels for a variety of users, and sophisticated testing and routing routines to afford flexibility and individualization of instruction. As an example of the amount of effort it takes to develop computer-based education materials, one only has to look at the small number of curriculum packages which are currently available using computer support following massive financial investments on the part of the government, the computer and publishing vendors, and the educational users. To develop a quality computer-based education environment you need to have well coordinated, comprehensive and systematic curriculum offerings. To assume that a teacher can develop a high quality computer-based education offering in his or her spare time is equivalent to asking teachers to write their own textbooks, script and record their own multimedia materials, stage and deliver their own television shows, and develop and analyze their own standardized tests. Perhaps with the introduction of the micro-computer into the classroom as a stand-alone delivery system, one might be fooled into thinking that with a little bit of effort you could write your own courseware for delivery on that system. However, this is analogous to giving a teacher a blank book and a typewriter and expecting him to write his own text.

In order to understand the complexities of courseware development for computer-based education delivery, it might help to examine the similarities and the differences between the traditional teacher/textbook



orientation to instruction and the computer-based education delivery. In terms of content coverage of a course, both the teacher/text and CBE approaches must present the materials completely and comprehensively. Objectives and goals must be stated and detailed background information must be developed. However, the CBE approach requires additional effort in the number of test items developed, the extensiveness of case studies delivered, the variety of alternative approaches presented and subsequent content expansion, and the amount of analysis given to the student upon demand. Specifically, the amount of pre-determined feedback is a major requirement. The instructional approach used in delivering education with teacher/text as well as CBE approaches can be discovery, exposition, inquiry, etc. The major difference between the two delivery systems is the amount of interaction required in the CBE This necessitates a flexible curriculum and increases the variety of responses in the material. The complexity of the development process increases as the interactive nature of the components increases. Both teacher/text and CBE approaches require valid test items to be developed for examining achievement and attitudinal changes. The difference is in the number of test items which must be generated for CBE delivery and the complex testing strategies which are available under computer control (i.e., tailor testing, mastery testing, variable criteria testing). Finally, with respect to the pace and flow of the curriculum offering, the major difference between the two approaches is that CBE instruction is generally self-paced. This requires that extensive branching schemas be well thought out in advance and that repetition and review for remedial education be allowed.

The difference between the teacher/text and the CBE delivery require more comprehensive and extensive development efforts to be undertaken for quality CBE courseware. There seems to be a need, then, for a systematic approach for courseware development because of the number of factors.[42] Most of these factors directly influence the cost of development and subsequent cost of delivery. Because CBE courseware development is quite time consuming, involves the use of and, therefore, the cost of terminals and computer technology, and requires a wider variety of people with different skills to be coordinated in a team in order to develop a comprehensive program, the cost of development is very high. Even though the computer terminal offers the capability of quick and instantaneous revision, the actual cost for making revisions is quite high. Most of these costs are a result of the amount of time it takes to gather accurate and appropriate data as to the type, scope and depth of the revisions necessary and the amount of time and effort required by development people to make the revisions which are recommended. Certainly specific criteria must be established early on to identify the type of changes which will be tolerated and the type of performance which will be achieved. The cost of implementing a computer-based education

curriculum involves the cost of support people and the cost of the computer terminals and technology itself. While these costs continue to come down on a year-by-year basis, certainly they are substantial enough to require that the products be of quality nature and reliable stature. Finally, the cost of failure of a CBE courseware offering is rather large. It may involve the changing from one entire CBE system to another system which is a large financial decision. In some cases there may be no alternative program to rely upon, in which case failure of the courseware to deliver the recommended achievement level means failure of education. It may mean wasted development and revision dollars as well as a tremendous waste in implementation costs to deliver a program which is ineffective. In many communities, businesses, and other educational institutions, computer-based education has only one chance to make a first and last impression and failure of the system to perform can mean failure of the community to avail itself of the new technology.

In order to guarantee the favorable use of computer-based education technology in the learning process it is imperative that high-quality, comprehensive curriculum materials be developed. These materials can only be developed through a systematic approach to courseware development similar to the one that follows in the next section.

## SYSTEMS APPROACH TO COURSEWARE DEVELOPMENT

The development of courseware materials is a complicated activity. The need for a systematic approach to the development of courseware material was presented in the first section of this paper. The systems approach model which follows in this section is one which separates out the six major phases of courseware development into specific well-related steps and identifies sequences of activities designed to solve educational problems and achieve instructional goals. This system may be employed by an individual, a small team, or a large courseware development group. Regardless of the specific team structure for the courseware development effort, each step of this systematic model should be followed to increase the likelihood of a quality product. The systems approach for developing instructional materials consists of six phases: analysis, design, development, formative evaluation, implementation, and summative evaluation. (See Figure 1.) These six phases are designed to build upon one another to generate instructional material which is integrated, efficient, and above all effective. In order to more fully illustrate this process, each of the phases will be expanded and illustrated by examples from the Basic Skills Learning System, a CBE curriculum designed to teach functional literacy.

### Phase I: Analysis

The first step in any courseware development process must be to determine the scope and the nature of the instructional materials required to satisfy the given set of educational needs. The analysis phase consists of four tasks. The first task is to define the learning requirements; the second is to define the instructional program; the third is to survey existing courses; and the fourth is to plan the design and development effort.



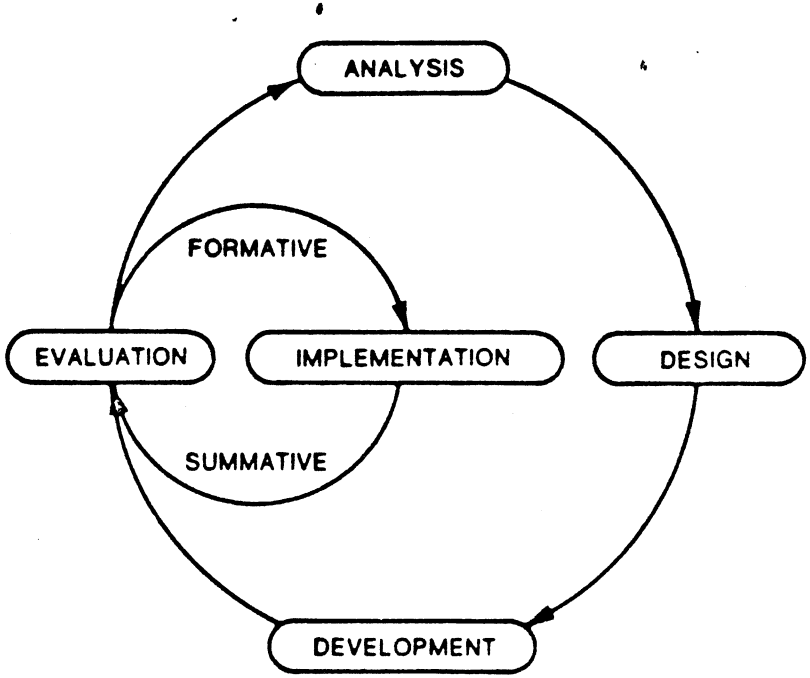


Figure 1: The development process

*Defining Learning Requirements*

Learning requirements are identified by: 1) analyzing learning needs; 2) defining needs and constraints; and 3) analyzing the target population. For example, consider the fact that 25 million Americans are designated as functionally illiterate. The impact of having this large a section of our population remain functionally illiterate is economically staggering. Most of these individuals do not participate in the production or the servicing of goods and are very often a drain upon, rather than a contributor to, the national wealth. To date many curriculum efforts have been made to train and retrain these individuals into productive members of the society. Most of these efforts have failed due to the dependency on quality instructors which are not readily available, the inconsistency of materials which vary drastically depending on location and instructor, and the ability to motivate the target population to participate in and

more importantly, remain in the training program being offered. How can computer-based education be employed to address functional literacy at the national level?

The first step is to analyze the educational needs. In this step, discrepancies between the desired performance and the actual capabilities are identified. For example, suppose the desired performance for these adults is to read and compute at an eighth grade level so they can enter into vocational training programs which will allow them to enter the work force. However, most of these individuals do not possess these skills. An analysis of the requirements of the vocational programs and the population capabilities will identify the discrepancies. Another important result of analysis of the educational needs is the analysis of the consequences of the performance discrepancy. In other words, what will happen to the people in this population and the country in general if the problem is allowed to continue?

The second step is to define needs and constraints. The needs analysis indicates which specific task must be learned in order to reach the desired performance. These tasks form the basis for instruction. The definition of constraints indicates the restrictions that affect the delivery of the instruction. The availability of funds, time, qualified staff, and the delivery environments are some of the constraints.

The third step in defining the educational requirements is to analyze the target population, the students for whom the instruction will be prepared. Student characteristics such as geographic location, age, ability, need for motivation, present skill level, and the number of students are important considerations in the preparation of instructional materials.

Defining the educational requirements means determining a discrepancy between actual and desired performance, identifying the skills or information needed to resolve the discrepancy problem, and determining factors such as constraints or student characteristics that will affect the solution of the performance problem. In the case of the functional illiteracy problem, it was determined through the defining of educational requirements that the majority of the population had literacy and computational skills well below the level needed to enter vocational training programs, that the skills of reading and computation were essential to their success in vocational training, that many opportunities would be available for vocational training if these students could function at an eighth grade level in both reading and mathematics skills, and that this population consisted of a low-motivated group which had experienced many failures through the traditional method of education. It was also identified that many of the individuals in the target population possessed some, but not all, of the necessary skills and that a program which was able to place individuals into the proper learning sequence and give students credit for already-acquired skills would be most efficient and most acceptable to this population.



### *Defining the Instructional Program*

In this step, curriculum and course goals that define the scope and the purpose of the instruction are documented. The major tasks and topics to be included in the instructional program are defined with specific requirements concerning media and expected performance levels. The overall curriculum structure and the inter-relationships of the course and sub-course components are specified. Furthermore, the specific routing requirements and constraints are documented and the type of placement and assessment strategy is determined in general terms for the overall curriculum.

The documentation of this step results in a general course specification document which is intended to solve the instructional problem within the identified constraints. This document should include: overall course length, structure, and proportions presented by the allowable media; a description of the target population and its present level of performance; definition of the constraints placed on the instructional delivery system; and the goals and topics to be covered. This document forms the preliminary basis from which the design phase proceeds.

In the case of the functional illiteracy problem, a document was generated which identified the need for a three-part curriculum called the Basic Skills Learning System. The first course is the Basic Skills reading course which addresses the main topics of vocabulary development, literal, interpreted and evaluated comprehension. The basic language skills curriculum addresses the topics of grammar, writing mechanics, and syntax topics. The basic math skills curriculum covers the topics of whole number operations, basic number ideas, fractions and decimals, geometry and measurement, and ratio and proportion. The target population was described as being between the third grade and the seventh grade levels as measured by the Adult Basic Learning Exam (ABLE). The purpose of the curriculum was identified as a CBE offering designed to enable functionally-illiterate adults, representing a wide range of abilities, goals and problems, to achieve an eighth grade equivalency education in the reading, language and mathematics skills.

### *Survey Existing Courses*

Identifying existing courses and comparing them with needs are the wo steps in the survey of courses. Before time and money are expended to develop a new course, existing courses are identified and analyzed for applicability to the training need. If an existing course appears to meet the needs and fulfills required quality standards, it is considered for use in either its present or a modified form.

In the case of Basic Skills Learning System, after an extensive survey of courseware materials used in basic education programs, two curriculum efforts were identified as having specific appropriateness. The first was

the Individual Learning for Adults (ILA) reading curriculum which was offered by Research for Better Schools in Philadelphia. This curriculum was in a paper-and-pencil, individualized, performance-based format and was being delivered with realtive success to the target population. The second curriculum identified was the Middle School Mathematics Learning System (MSMLS) under development by Dr. Ralph T. Heimer at the Pennsylvania State University. This was a computer-based basic mathematics skills curriculum which was being developed for children. These two curriculum efforts served as the fundamental cornerstones to the specification of the design for the Basic Skills Learning System. Indeed, entire sections of each of the curricula were adopted, modified and implemented in the Basic Skills Learning System.

### *Plan Design and Development Effort*

At this point there are three alternatives. The first is to proceed directly to the design of the instructional program. The second, given the availability of existing courses, is to go directly to the evaluation of those courses. Third, it may be desirable to discontinue the courseware development effort if costs and other associated parameters become prohibitive.

In the case of Basic Skills, a decision was made to acquire the rights to the two stated curricula and proceed in a total redesign and redevelopment of a new computer-based education product based on the fundamental structure and design of these two curricula.

## Phase II: Design

The purpose of the design phase is to prepare a detailed plan for the course. The information gathered in the analysis phase forms the basis for the designed plan. The basic tasks performed during this phase are: 1) perform instructional task analysis; 2) specify instructional objectives; 3) define entry behaviors; 4) group and sequence objectives; 5) specify learning activities; 6) specify assessment system; and 7) specify evaluation system.

### *Perform Instructional Task Analysis*

In this step, the course goals are analyzed to determine the skills and knowledge that are necessary for the performance of the tasks within each goal. Each individual task is then analysed to determine sub-tasks and how they fit together into the task. The result of this step is a hierarchically-arranged learning map, a visual representation of how the tasks and sub-tasks relate to each other within the overall goals.

In the case of the Basic Skills Learning System, specific objectives were identified. These objectives were grouped together in clusters for which specific learning activities were developed; these clusters were



grouped into bundles where retention testing and review was provided; and these bundles were grouped into strands which represented threads of common content.

### *Specify Instructional Objectives*

The task and sub-tasks on a learning map form the basis from which instructional objectives are written. Each objective describes a desired performance or behavior, the conditions under which the performance or behavior will be observed, and the criteria for acceptable performance.

An example of such an objective from the Basic Skills Math curriculum is: "Given a three-digit number and a two-digit number where regrouping only from tens to hundreds is necessary to find the difference, the learner will be able to find the difference. The criteria for mastery will be four out of five." An example from the Baskc Skills Reading curriculum is: "Given a selection and its main idea, the learner will be able to identify specific details in the selection and support of the main idea. Mastery criteria is three out of four." An objective from the Basic Skills Language curriculum is: "Given a series of adjectives, each in the positive degree of comparison, the learner will be able to select the correct word used to form the comparative and superlative degrees. Mastery criteria is three out of four."

### *Define Entry Behaviors*

After the instructional objectives have been completed, entry behaviors must be defined. In this step, entry behaviors are defined and thoroughly analyzed. In the development of courseware the specified entry behavior marks the minimal level of competence required for a student to enter the curriculum. These minimum entry behaviors must be examined and if students do not possess the minimum behaviors, they should not be allowed to enter the program without acquiring these skills. It is essential that the curriculum succeed or fail on its own merits rather than failing because the students entering the program were beneath the minimal level of competence for the curriculum.

In the case of Basic Skills, if students tested lower than the third grade reading level on the ABLE test, they were referred to a low-level remedial program delivered by an instructor to raise their skills to a minimum level. Due to the very nature of the curriculum being delivered on a computer terminal, the students had to be able to read at a third grade level in order to follow the directions and participate in the program.

### *Group and Sequence Objectives*

In this step, objectives are arranged in groups that are logically related in terms of instructional purposes. The objectives are then sequenced so that the ordered relationships indicated in the learning map are

preserved. This step assures that learning will progress logically and efficiently throughout the hierarchy of the content domain.

In the case of Basic Skills, the mastery learning model was employed and specific pre-requisite objectives were identified for every higher level objective and students were not allowed to proceed to the higher level skill until mastery was demonstrated on lower level pre-requisite skills. Retention was checked at periodic intervals to assure that lower level skills were, indeed, learned and retained.

*Specify Learning Activities*

When each group of objectives has been identified, learning activities can be determined. Learning activities are small segments of instructional materials that correspond to one or more objectives in a particular group. In the specification of learning activities, three tasks must be performed: 1) select media; 2) select instructional strategy; and 3) identify content. Media (text, audiotapes, videotapes, computer-based instruction, and so forth) are selected for each learning activity on the basis of appropriateness and instructional strategy. Instructional strategy determines the teaching approach for presenting concepts, soliciting interaction, providing feedback, and so on. The content specific to each learning activity is also identified.

The Basic Skills program effectively addresses the problem of a diverse and discouraged student population through well-defined curriculum which is: individualized, diagnostic and prescriptive, objective-based, based on mastery learning models, modular in structure, and multisensory in format. Specific media was determined for different components of the curriculum. A series of motivational audiovisual products presents an overview of the curriculum and describes the instructional activities in the curriculum. The purpose of the audiovisual activities is to act as an advanced organizer and motivator for the student. Each new skill is presented in the form of a tutorial lesson on the PLATO terminal, followed by a drill and practice activity on the PLATO terminal, accompanied by an "off-line" exercise application in a workbook and a mastery test delivered on the PLATO terminal.

*Specify Assessment System*

The means by which learning performance is measured and reported is specified in this step. The use of pre-test, progress checks, and post-test is defined. A plan may be presented for administering, scoring, and using test results.

In the case of Basic Skills, and effort was made to allow the student freedom within a structured curriculum. Two kinds of controls were established. 1) Router Control: The system's router makes available to the student the most appropriate cluster within a given strand. After mastery of this cluster has been demonstrated, the next cluster in the strand is made available to the student. Only one cluster per strand is available at one time; the student must demonstrate mastery of this cluster before continuing to the next. 2) Student Control: Within reason, the student is allowed to determine which strand to work on, and within the prescribed cluster for the strand, which type of instructional activity to work on. For example, a student may choose to work on the multiplication strand of the math curriculum. The router makes available to the student the most appropriate cluster within the multiplication strand. The student may then choose to work on the tutorial, the drill and practice, the off-line workbook, or any other instructional activity within the prescribed cluster. The students are also allowed to access their individual profile which allows them to see their progress graphically in each of the three curriculum areas.



*Specify Evaluation System*

In this step, a plan is prepared to outline the strategy for validating the instructional materials in the evaluation phase. The plan details the arrangements that pertain to student groups, sample sizes of groups, and data analysis requirements. The nature of the evaluation will determine the time required to complete the course, the attitudes expressed by the students, and the student performance. This is an absolutely critical stage. In order for any CBE curriculum to be accepted on a large scale, a thorough evaluation of that curriculum must be performed. Specific criteria for success must be outlined and the development team must know what criteria will be used to evaluate their work.

In the case of the Basic Skills Learning System, the evaluation criteria was specified as achievement on a standardized exam such as the ABLE test, length of time in the training program as measured by student contact time and length of time in the class, student attitude, and attrition rate of the students within the program. In most cases, the Basic Skills Learning System has demonstrated a remarkable achievement rate in a very short period of time, and has been able to retain the students in the program with a high level of motivation.

## Phase III: Development

During the development phase, all initial drafts of instructional materials and tests specified by analysis and design phases are prepared. Test items, text materials, computer-based learning activities, and audiovisual scripts are developed in this phase. The documents prepared and the design specified how to: 1) prepare individual lesson designs; 2) construct test items and tests; 3) develop individual lessons; and 4) review and edit after this process is complete.

*Prepare Individual Lesson Designs*

Lesson designs are prepared for each learning activity. A lesson design

included identification of the activity and the objectives to which it corresponds; the general media strategy for that activity; a detailed statement of the content and instructional approach; and flow charts of the lesson structure, as appropriate. The approval of the designer and subject matter expert is required before each lesson design is finalized.

### *Construct Test Items and Tests*

Test item construction is based on the outcome of the assessment system and its specifications. After the individual items have been prepared and reviewed, they are assembled and entered into the testing-management system.

### *Development of Individual Lessons*

Individual lessons are text, audiovisual, or compter-assisted learning activities. Individual lesson designs are used to draft texts; to design, develop and program computer-based learning activities; and to draft audiovisual scripts.

### *Reviews*

At this point the development process of all the materials are in the form of drafts. All draft materials are reviewed by the subject matter expert for content integrity and the designer for instructional adequacy. After the materials have been approved by both the subject matter expert and the designer, the editor assigned to the team reviews the materials for final draft. Documentation products of the development phase are the CBE learning lesson designs and the draft of materials for the entire course.

In the case of the Basic Skills Learning System, the development phase produced over 1,000 lessons in the form of tutorials, drill and practice activities, mastery tests, and off-line exercises and applications. In addition, there were 14 videotapes and 12 student booklets containing over 293 sets of exercises. The development phase also produced a sophisticated student routing system which allows for pre-test, post-test and retention testing, generates a student profile, and allows for placement of the student within the curriculum.

## Phase IV: Formative Evaluation

The purpose of the formative evaluation phase is to try out and revise the course materials based upon actual student use data. During this phase the following tasks are performed: 1) conduct one-on-one tryout of draft materials and revise materials; 2) conduct small group pilot tests and revise materials; and 3) edit and produce the course.

### *Conduct One-on-One*

The one-on-one tryout of the draft of each learning activity is conducted by the team with at least one student who represents the target population. While this may appear to be a small sample size, at least 50 percent of all errors are identified at this time through this very simple process. After the one-on-one tryout, the designer, developer, and editors make the necessary revisions and assemble the materials for the pilot class.



### *Conduct Small Group Pilot*

During this step, a small group that represents the target population tries the course. In this pilot test, of course, the conditions of the environment in which the course will actually be used are simulated. Various evaluation instruments are used to gather data and the course is evaluated in terms of effectiveness based on the sepcific criteria identified in the design document. Problems identified in the small group pilot tests are analyzed and appropriate corrections or modifications are made.

### *Edit and Produce*

A technical and mechanical review is performed on all computer-based learning activities and final editing is performed on all text and audiovisual materials. The final edit ensures completeness and appropriateness of all materials and the course is ready for reproduction and distribution.

The Basic Skills Learning System went though an extensive formative evaluation phase. The curriculum was delivered at an adult learning center in a major urban area. Substantial data was collected at this site and analysis of that data was used to improve the curriculum materials and the curriculum structure.

## Phase V: Implementation

During the implementation phase, all instructional materials are reproduced and distributed to a select number of sites. The course is actually used with the target population in the intended environment. While the course is being used with the intended population, data is collected on student performance and attitude. Information is also recorded about the students' performance after they complete the course.

The Basic Skills Learning System was implemented in several sites representing a cross-section of the target population. The curriculum was delivered at an adult learning center in a major urban area, at a correctional facility, at a military base, and at an urban city high school. As a result of the analysis of the data collected, several instructional materials were revised, some new materials were added, some were deleted, more instructor/teacher options were incorporated into the routing system, and more flexibility was built into the entire system to allow for teacher involvement.

### Phase VI: Summative Evaluation

Evaluation in this phase is of the summative nature. It is intended to measure the effectiveness of the course involving the educational problem identified in the analysis phase. In this phase, data gathered during field use of the course is analyzed and summarized. This data is the basis for a report containing recommendations for course and delivery system modifications. Finally, a decision based on these recommendations is made. If minor modifications are to be made, corrections follow the course maintenance procedure. Usually these corrections do not interrupt the operation of the course. However, if major problems are identified it may be necessary to go back to the analysis phase to identify the source of the problem and take corrective action.

Summative evaluation was conducted on the Basic Skills curriculum across a number of different sites. The results indicated that the Basic Skills Learning System achieved its objective of teaching functionally-illiterate adults to read and compute at the equivalency of an eighth grade level. In addition, a large number of the participants in these programs have successfully entered vocational training programs. Furthermore, the attrition rate for the Basic Skills offerings has been significantly lower than traditional methods, which indicates that the materials are meaningful and motivational to the participants.

## CONCLUSION

It has been demonstrated in this paper that curriculum development is evolving dramatically in complexity, particularly with the influx of the computer into the educational process. As Heimer and Rizza noted (2), "The construction of substantive, high-quality, computer-delivered courseware is a complicated and many-faceted task that can be done successfully only by employing sophisticated *systems* approaches." A particular system approach for courseware development has been represented in this paper and examples of each of the phases have been specified. The dilemma for the 1980's is how to support the necessary courseware development activities to produce high-quality, cost-effective curriculum offerings. The cost of courseware development is substantial; the number of resources both human and technological are many; the time required for the development process is long; and the process which must be followed to produce a quality product is extremely complex and sophisticated. We know how curriculum development should be done; but we haven't figured out how to fund it and staff for it. If the school systems and universities, the federal government, and private industry do not take an aggressive and cooperative stance on curriculum development, the country will be plagued by individuals writing bits and pieces of courseware which in most cases will not be quality and will not be used. The question of how to develop courseware can be answered. The question of who should do the developing and how it should be funded remains to be answered.



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and announced the availability of various courseware items using conventional paper-based catalogues (Entwistle, 1975; CALCHEM, 1980; Pritchard, 1981). Unfortunately, the problem with this type of catalogue is that they become out of date so quickly and are also very difficult to update. Nowadays, there is increasing interest in the use of electronic cataloguing techniques based upon the use of information systems such as PRESTEL (Brown, 1980). Methods of this type are to be preferred since (1) they can be made more widely available than printed catalogues, and, (2) they are extremely easy to update.

Because of the many problems associated with cataloguing and indexing courseware (and computer software resources in general) a project to study possible solutions has recently been initiated (Templeton, 1983). The project is called SoCCS (Study of Cataloguing Computer Software). It is hoped that the results of the investigation will provide recommendations on cataloguing standards and a brief manual of practice. The importance of projects of this type cannot be over-emphasised since without effective cataloguing projects a significant amount of human development effort can be needlessly wasted.

## 2.7 EVALUATING COURSEWARE MATERIAL

One of the basic requirements of any evaluative study of courseware is obviously to assess its usefulness and quality. An item of courseware is useful if it performs a function which, for one reason or another, the teacher/instructor is unable to perform. Courseware quality is a more difficult thing to define and is something which is quite often just subjectively assessed, usually on a three point scale: good, average and bad. Obviously, such an evaluative classification is not very meaningful.

The basic function of courseware material is to teach, train or instruct those who use it. In view of this, it would seem that the evaluation of this type of teaching resource would be an easy matter. Unfortunately, this is not the case since many factors are likely to contribute to a good CAL package. Any objective evaluation of courseware thus involves an analysis of many different aspects. Some of these are outlined below.

### 2.7.1 The Problems of Assessment

One of the major problems often encountered during courseware evaluation is the subjective way in which many teachers/instructors approach the task. This situation is probably forced upon them because of the absence of any formal method of assessing the value of courseware units. Obviously, what is needed in order to overcome this difficulty is some form of objective evaluation metric that can be applied in a standard way to each of the courseware items to be evaluated. When designing such a metric a number of important contributing factors will need to be taken into account. Most of these are embodied in the list of questions enumerated below:



(1) **Is the courseware easy to use?**
(2) **Does it teach?**
(3) **Does it cater for individualised instruction?**
(4) **Does it utilise ancillary media?**
(5) **Does it use these to optimum effect?**
(6) **Is there good technical support?**
(7) **Is it easy to modify - if the need arises?**
(8) **Is it free from technical/procedural errors?**
(9) **Does it motivate the student?**
(10) **For what it does, is it cost effective?**

When attempting to answer these questions it is important to bear in mind two important points. Firstly, the answers to many of the questions will not be simply 'yes' or 'no'; hence, a scale of values will need to be introduced. Secondly, each of the factors that contribute to the assessment metric will probably be allocated different degrees of importance. Once these issues have been sorted out, a simple method of compounding the factors is next needed. One possibility is through the summation formula:

$$V = \text{SUM}[R(i).W(i)] \quad \text{for } i = 1 \text{ TO } N$$

where R(i) is the rating of the courseware unit with respect to dimension i (see the list of questions above) and W(i) is the corresponding weighting (or importance) associated with that attribute. Because the rating scales may not all be the same they may need to be normalised through the use of multiplicative normalisation factors.

Support for the idea of an evaluation metric, similar to that outlined above, has been provided by several other people. For example, one researcher has recently presented a list of guidelines that relate to software evaluation for microcomputer programs for teaching in schools (Harris, 1983). It is suggested that the following factors should be considered:

(1) **User Friendliness**
(2) **Style of Presentation**
(3) **Cost Considerations**
(4) **Technical Considerations**
(5) **Teacher's Reaction**
(6) **Student's Reaction**
(7) **Management Requirements**

A detailed discussion of each of these is presented in the original report, so nothing further will be said about them here. However, it is important to conclude that this list does support our initial premise that courseware evaluation is a multi-faceted task that requires considerable thought and planning. This is particularly the case in complex multimedia instructional systems (McIntosh, 1974; Hill

et al., 1977) in which a very large number of variables may be involved. When dealing with courseware for this type of system it is imperative that the person responsible for the design of the evaluation metric consults some of the standard textbooks devoted to the topic of curriculum material evaluation (Eraut, 1972).

There are two other important problems which have to be faced when attempting to perform courseware evaluation. Firstly, it is important to decide upon the methods to be used in order to acquire the information needed for the assessment metric. Secondly, some consideration must be given to the mechanisms by which these methods should be administered. These factors are discussed in more detail below.

### 2.7.2 The Use of Questionnaires

Undoubtedly, the most popular technique for acquiring evaluative information is via the use of some form of questionnaire. These are important because they enable people's reactions to an item of courseware to be documented for subsequent analysis – if need be, using statistical processing software such as SPSS (Nie et al., 1970) [1]. Successful design of a questionnaire is imperative if it is to solicit the required information from its respondent. Whenever it is feasible, the services of a professional survey researcher should be sought in order to discuss the best approach to adopt. If this is not possible then the standard textbooks on questionnaire design will need to be consulted (Moser, 1968; Oppenheim, 1973).

Naturally, the questionnaire should seek to solicit information relating to all aspects of the courseware, provided this does not make it unduly long. Copies of the questionnaire can then be distributed along with the courseware, either to all users or just to a preselected sample. It is not the purpose of this section to discuss the design details underlying the use of this type of evaluation tool. Rather, it is our intent only to mention how it is used and to point out a few of the problems involved. More detailed discussions of the use of this approach are given elsewhere (Yeates, 1981; Barker and Singh, 1983).

Undoubtedly, two of the most difficult problems to overcome when using a questionnaire are: (1) failure of the respondent to understand some of the questions – thereby resulting in incorrect feedback, and (2) ensuring that they are completed and indeed returned for analysis. The first of these problems can be overcome by preparing a guidebook or a

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[1] SPSS is an acronym for Statistical Package for Social Scientists. This is a collection of computer programs which may be used to perform a variety of different standard statistical tests and processing tasks. The programs are well documented and are used in many scientific research applications.



series of explanatory notes that the respondent can refer to if any doubt arises with respect to particular questions. Alternatively, a telephone number might be included on the form so that respondents can contact the evaluator directly. Unfortunately, it is much more difficult to provide any guarantee that completed questionnaires will be returned. One incentive, perhaps, is to offer free versions of software updates to those who co-operate in the courseware evaluation exercise.

### 2.7.3 Pre-testing and Post-testing

In order to evaluate certain aspects of courseware utility, such as items (2) and (6) in the lists presented in section 2.7.1 – it will be important to let students interact with it. This interaction must take place in such a way that the effect of the courseware on the student can be assessed. One of the most frequently used methods of performing this type of assessment is through the use of pre-testing and post-testing. These techniques are quite well documented in the literature and so we present only an overview of the steps involved. The basic strategy that is normally employed is as follows:

(1) select a test group of students having a known ability range,
(2) subject the test group to a pre-test in order to ascertain their knowledge/skill levels with respect to the courseware that is to be evaluated,
(3) let the test group interact with the courseware,
(4) perform a post-test on the student group, and
(5) determine if there is any significant enhancement in the knowledge/skill levels of the test group.

Both the pre-testing (step 2) and the post-testing (step 4) can, of course, be conducted by the computer, as can the application of the statistical tests that need to be performed on the raw results obtained. However, there is no reason why each of these steps could not be performed using conventional manual techniques based on quizzes or other forms of specially compiled test material.

This approach to courseware evaluation can provide useful feedback for the CAL author who can then modify the material in order to accommodate any changes deemed to be necessary.

## 2.8 CONCLUSION

In this chapter the importance of courseware has been emphasised. We have examined its history, current status and likely future directions of development. In its simplest form, courseware is a special type of software resource. Techniques for its generation are therefore similar to those used for preparing conventional computer programs. Two broad approaches are used for the preparation of CAL packages: programming languages and author languages. Examples of each of these have been

presented. Special attention will be given to author languages in the subsequent chapters of this book; we will be particularly interested in those systems that facilitate the development of courseware for use in multimedia instructional systems. When considering the use of CAL courseware packages several important factors need to be considered. Perhaps the most important of these are (1) its distribution, and (2) its evaluation. Each of these topics has been discussed in this chapter.

In the following chapter we turn our attention to the use of author languages as a means of developing courseware. The motivation for this stems from the fact that courseware authoring systems do provide a facile method for the preparation of CAL material.

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of the tracks of the tape; the graphical information (as computer programs) is then added to the other track. The sound information is synchronised with the visual information so that a fully coordinated presentation is obtained. When complete, the tape is sent to the student who inserts it into the CYCLOPS unit attached to his/her TV set. Instruction can then commence. This technique obviously offers one solution to the problem of disseminating courseware material (see section 2.6).

## 3.5 AUTHOR LANGUAGE EVALUATION

As has happened in the past, the future development of CAI courseware is likely to continue in two distinct directions. Conventional programming languages (PASCAL, BASIC, APL and others) will continue to be used. There is also likely to be renewed interest in the use of author languages, particularly for use with microcomputer systems. Indeed, several new languages of this type have recently been reported in the literature. If the popularity of this approach increases, a number of problems may need to be addressed. One of the most important of these will be that of author language evaluation.

Unfortunately, there is not an extensive amount of published material available (either guidelines or results) on the objective evaluation of author languages for CAI. This state of affairs probably exists because of the complex nature of the tasks involved and the number of facets that need to be considered. There are at least ten major factors that should figure prominently in any evaluative study. These are summarised below:

(1) THE AUTHOR'S VIEW
Is it easy to use?

Does it provide the facilities that are required without the need for undue effort on the part of the author?

Does it provide adequate monitoring facilities?

Is it possible to modify/update materials easily in the light of experience with them?

(2) THE STUDENT'S VIEW
Does it permit the generation of highly individualised instructional schemes tailored to the particular needs of each student?

Do these stimulate interest, improve understanding and allow active participation in the learning process?



(3) EFFECTIVENESS
Does the author language permit improved author productivity and enhanced student learning?

(4) COST FACTORS
For the job that it does, how expensive is it to (a) produce the tools for instruction (the supporting media) and (b) develop the courseware?

(5) AVAILABILITY
How accessible is the language (and the system in which it is likely to be embedded) to those who wish to use it?

(6) PORTABILITY
Can the language easily be made available on other machines? That is, can it be moved from one computer to another without difficulty?

(7) EXTENSIBILITY
How easily can the language be extended to accommodate new features and new facilities?

(8) TECHNICAL FEATURES
What instructional modes are permitted?

What types of communication media are supported?

(9) DOCUMENTATION AND TECHNICAL SUPPORT
Is the author language adequately documented, that is, does a language reference manual exist?

Does the language supplier provide adequate technical support in the event of software errors arising?

(10) COURSEWARE AVAILABILITY
Does the author language supplier also supply a range of off-the-shelf courseware units?

Is there a network of courseware exchange centres available to facilitate software exchange?

In an attempt to obtain an objective assessment of some of the previously listed author languages we have examined an extensive number of reports and research papers. The majority of these devote only minor attention to the problem of assessing authoring tools. Most of the evaluations only enabled us to arrive at qualitative views on whether such languages are useful or not. For example, with respect to TUTOR, Hody and Avner (1978) comment: 'As the PLATO community increased in size, commands and new features were added to TUTOR in

response both to user requests and to data from student and author interactions. The resulting language is now rather complex and difficult to master completely.' They then go on to cite the views of one of the many PLATO users: 'To learn the first steps in TUTOR – how to set up drill and practice lessons for instance – is unusually easy. To do anything complex, however, requires you to learn the bulk of the TUTOR language.'

In a slightly contrasting way, Davies et al. (1977) have written: 'TUTOR is useful for a diversity of purposes. It is simple enough that it can be used by elementary school students and by inexperienced teachers, yet it provides enough power to allow sophisticated programming that takes advantage of the large CDC machine to which all terminals are linked.' Some evaluations of the PLATO system (Jenkins and Dankert, 1981) completely ignore this aspect of system evaluation.

Other author languages have been evaluated in an analogous fashion. Thus, some years ago, Lower and Arsenault (1972) performed a functional evaluation of COURSEWRITER III. Their results are cited in a later work when Lower (1977) writes: 'Because it has failed to evolve with the needs and practices of CAI, it is now regarded as somewhat obsolete and in my view is certainly not adequate for general purpose CAI.' This criticism of COURSEWRITER is also supported by the findings of Yobb (1977).

The lack of objective assessment of languages available on microcomputers is much more apparent, probably because they have only recently started to become widely available. At present, PILOT seems to be the one which is most commonly used. About this language Lower (1977) has written: 'Although PILOT will no doubt be popular among computer hobbyists, I do not regard the language as a good model for a future CAI authoring language. It seems likely that the rapid development of hardware technology will soon eliminate the need for such a limited language.'

An attempt to evaluate the merits of PILOT objectively as an author language has been made by Barker and Singh (1983). They conducted an experiment that was designed to expose a variety of potential users to the language; the views of the various user populations were then solicited by means of a questionnaire. Of the four test groups involved, only two reported that they found PILOT easy to use; both of these groups had had significant previous experience of computers.

From what has been said above, it is easy to see that the problem of evaluation is not insignificant. Furthermore, as systems become more complex (with respect to both the interactions and the roles they support), the problem is not likely to get easier. In the long term, popularity may prove to be the best evaluative measure, at least in the context of micro-systems.



## 3.6 CONCLUSION

In this chapter a number of author languages (running on small, medium and large computers) have been briefly described. We do not claim that the treatment we have presented is in any way comprehensive. Instead, our objective has been to give our readers an indication of some of the types of facility that are likely to be encountered when systems of this type are used. The problems of author language evaluation have also been briefly outlined. Unfortunately, this topic is so immense that only the surface has been scratched.

In this chapter we have suggested that author languages should include facilities for the provision of multimedia CAL. Because of its growing importance this is a topic to which we return in subsequent sections of this book.

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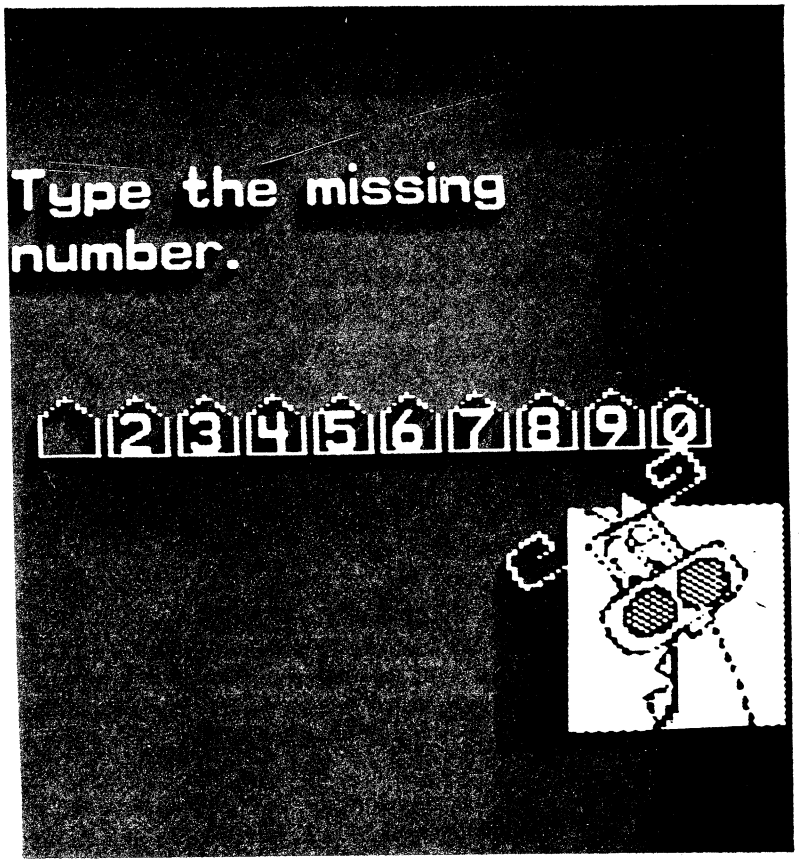


Figure 8.3. Screen from Lollipop Dragon (SVE), with row of number keys and dragon. Lollipop Dragon is a "computer literacy" program featuring interactive tutorials and games. In this scene from an exercise that teaches familiarity with the number keys on a computer keyboard, the Dragon is the friendly tutor. He asks the student to find and fill in the missing number on the keyboard, thereby reinforcing the keyboard lesson. Photo courtesy of the Society for Visual Education.

programs also offered users a sense of being very creative, whether in the creation of maps (as in Snooper Troops) or simple tunes or in the facilitation of creative decision making or puzzle solving.



## QUALITIES OF EFFECTIVE EDUCATIONAL SOFTWARE

### OPINIONS OF TEACHERS AND ADMINISTRATORS

As a part of the field observations in our research, we consistently asked teachers and administrators about their favorite software choices, then inquired as to the reasons for their attitudes. Although opinions differed on many characteristics—for example, the merit of "drill-and-fill" programs—there were twelve overall generalizations that we drew from these data. These are summarized in the form of questions educators need to ask when selecting software.

#### (1) Does the Program Have Clear Objectives?

If a student completes the program, is it clear what he or she has learned? Although we are not advocating a system of rigid programmed instruction, it is nevertheless good educational management to have specifically defined objectives for any instructional investment. Moreover, those objectives must be intelligible to the different people managing the instruction.

#### (2) Is There an Effective Instructional Design?

Professionally developed software, especially when designed for formal use in schools, should have a readily apparent instructional design. There are practical as well as theoretical questions about instructional strategies. Given the instructional objectives, what are the strategies for reaching them? Is the strategy one of drill-and-practice, simulation, gaming, or discovery? How will it fit with other classroom strategies?

#### (3) What Are the Reward or Reinforcement Strategies?

In instructional design, it is often said that the more an individual finds the content itself rewarding, the less demand there is for ancillary or contextual rewards in the materials. In many types of software, particularly for younger children, a critical quality of a program is the degree to which a child finds it rewarding or reinforcing while pursuing the experience. Moreover, the feeling should prevail even when the going gets difficult. Particularly for younger children, rewarding qualities are associated with sound, color, and graphics.

**(4) Is the Program Interactive?**

The minimal power of a computer is used if applied only for "drill-and-fill" exercises. Unless the computer's wide capabilities for interaction are being used, a student might as well be doing the drills in a workbook. Interaction, of course, is more than simply being able to answer questions back to the computer. In sophisticated programs it allows a student to go on to other parts of an exercise when he or she is ready. It may also afford a dialogue between computer and student, even for something as simple as asking students what they wish to do next. It is this capability that gives students the feeling that they, rather than the computer, are in charge of the ongoing experience. Interaction is a distinguishing quality of the educational use of computers.

**(5) Does the Program Take Full Advantage of the Computer's Capabilities?**

The more a program is generalized for adaptation to many different computers, the less it may take advantage of the specific capabilities of a given brand or model of machine. What capabilities are possibly missing? Chief among them are graphics, color, and sound capabilities, since computers frequently differ most in these routines. The extent to which a program utilizes a computer's memory capabilities also differs.

**(6) Is the Program "Fail-Safe"?**

Is the program likely to change erroneously or stop altogether if a wrong key is pressed? A well-developed program may require that two different keys be depressed to stop or change it.

**(7) Is There Minimum Keyboard Interference?**

Particularly for young children, the keyboard is a major barrier to computer usage. If a program is designed for youngsters, can it be operated with one key or the space bar, a joystick, paddles, or a "mouse"? If keyboard use is necessary, are the keys involved easily found?

**(8) Does It Meet Adequate Standards of Clarity and Accuracy?**

This may become less of a problem in our era of increasingly professionally developed programs. Within existing examples of software, it is not unusual to find, for example, a set of on-screen directions intended for an 8-year-old but using the vocabulary of an adult. We have seen frequent examples of misspelling (even in spelling programs!).



**(9) What Are the Program's Production Qualities?**

By "production qualities," we mean how does it look and sound, even feel? Are the graphics clearly related to the instructional goals as well as attractive to the eye? What have been the choices of harmonizing colors? (If sound is used, is it of sufficiently pleasant quality so as not to become objectionable over time? This, of course, can be a limitation of the machine in accommodating software.) Quality includes the design of how text is arranged on the screen. Are graphics, color, sound, and text all combined to enhance the instructional quality, value, and pleasantness of the program?

**(10) Is Program Documentation Adequate?**

Experience suggests two levels of concern in regard to the adequacy of documentation. First, as professional educators would expect, any serious program package should include a full set of instructions. A second practical level of documentation is the degree to which minimal instructions for operating the program are included within the program itself. As anybody who has used any type of instructional media, from filmstrips to computer programs, knows, eventually the printed instructions are likely to be misplaced.

**(11) Does the Program Offer Timely and Useful Feedback?**

Obviously a student's progress in instruction cannot be gauged without some type of feedback. In many cases, that feedback may be given directly to the student as a part of the interactive quality of the program. High-quality programs will typically give feedback at intervals that are timely and helpful for students. In more sophisticated programs, a cumulative record of performance is maintained so that at the end of a session, performance can be reviewed by the student or instructor.

**(12) Does the Manufacturer Invite Feedback or Offer Updates?**

The better programs are developed by manufacturers who wish to stay in close touch with their customers. Many modern textbooks or

instructional materials packages invite such user feedback. Moreover, manufacturers who want to nurture a long-term relationship with the market will not only use this feedback to improve the qualities of their programs, but may issue suggestions or updates regarding their use.

### ONE FINAL CAVEAT

Beyond the foregoing criteria, there was one caveat that emerged often in conversations with computer-using teachers. Essentially, it was this: "If a program works well in your classroom, use it!" In practical terms, one could consult endless lists of software criteria and overlook some unique set of qualities that underlie a specific successful implementation. As summed up by one administrator: "Let us not quarrel with success."

# *PART III*

# *Studies of Educational Effects*

## PART ONE / UNIT 6

John Robertson is a doctor who works in a hospital in one of the big industrial cities of the Midlands. He is married to a young woman called Mary who, when they first met, was working in the same hospital as a nurse. But that was seven years ago, and now she spends all her time looking after their house and their two children, Pamela, and Simon.

Dr. Robertson works very hard in the hospital, but on his free days he doesn't like to sit at home doing nothing. He is fond of fishing, especially as this takes him out into the country, away from the smoke, the fumes, and the dirt of the city. He is never happier than when he is driving with his family through the green countryside, leaving the houses, offices, and factories behind him.

One September week-end the Robertson family went to Scotland and stayed at a small village near a river. Dr. Robertson caught a fine salmon and several trout; while he was fishing, his wife and the children were picking blackberries. When it was time for them to return home, they had picked about five kilos of fruit.

They got into the car and started on their return journey at about three O'clock in the afternoon. They were all feeling tired but happy, were looking forward to eating the fish and the blackberries when they got home. Soon they were travelling down a beatiful motorway, the M6, in the north of England. While they were going along they were listening to a programme of pop music. The speed limit on the motorway was 70 miles an hour, but he noticed that a great many cars were exceeding this limit, and even some of the big lorries were travelling at about 75 miles an hour.

On the radio the music stopped and the announcer said, "Now here is a warning for traffic on the M6. Patches of thick fog are forming on stretches of this motorway between junctions 18 and 20. Motorists are advised to drive with great care. Even though there is bright sunshine over most of the road, they may suddenly find themselves in one of these patches of fog. Reduce your speed NOW if you are travelling between junctions 18 and 20 on the M6!"

# تطوير وانتاج البرمجيات التعليمية

# Courseware Development And Production

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عمـــان - الاردن ١٩٨٧

## ١. ماهية البرمجيات التعليمية :

لقد دخل الحاسوب ميدان الاستخدام منذ اواسط هذا القرن ، حيث اخذ يغزو مجالات الحياة المختلفة واحدة بعد الاخرى حتى دخل ميدان التربيةوالتعليم. ومجالات استخدامه في المؤسســـات التعليمية ، كثيرة جدا منها استخدامه كاداة تعليمية في غرفة الصف . وبالرغم من ان ادخـــال الحاسوب الى غرفة الصف كوسيلة تعليمية قد بدأ منذ اواسط الستينات الا ان ذلك الاستخدام كـــان محدودا ومقصورا على بعض المؤسسات في الولايات المتحدة.

لقد انتشر استخدام الحاسوب كادة تعليمية في اواخر عقد السبعينات بعد اختراع الحاسوبات المايكروية . ونتيجة لتدني اسعارها المتواصل اخذ يزداد الاقبال عليه لاكثر من هدف اهمهـــا استخدامه كوسيلة تعليمية بحيث يتم دراسة وتعلم مواضيع مختلفة من كافة المقررات الدراسيـــة . ان المواد التعليمية التي يتم اعدادها وبرمجتها بواسطة الحاسوب من اجل تعلمها تسمى برمجيات تعليمية :
(Instructional Software - Courseware) . ويطلق على عملية التعلـــم بواسطة الحاسوب عبارات مختلفة متقاربة في الكتب الغربية ذات العلاقة . ومن هذه العبارات :

- Computer Assisted Instruction ( CAI)
- Computed Aided Instruction ( CAI)
- Computer Aided Learning( CAL)
- Computer Based Learning (CBL)

- Computer Based Instruction ( CBI)

وسنستخدم العبارة الاخيرة ( CBI) في هذه الورقة وتعني:
التعليم القائم على الحاسوب.

ولكن السؤال الذى يتبادر الى الذهن : كيف يتم اعداد هذه البرمجيات ؟ وهل استخدام الحاسوب في تعلم مواد المقررات المختلفة له مبرراته؟

سنجيب اولا عن السؤال الثاني بايجاز ، اما الاجابة عن السؤال الاول فسيكون موضوع هذه الورقة.

نحن نعرف ان الخبرات والمعلومات كانت ولاتزال تنقل من المعلمين الى المتعلمين من خلال المحاضرات والالقاء والتلقين ، حيث يكون المعلم هو محور العملية التربوية ، ولايوجد دور حقيقي للطالب. وهذا الاسلوب في التعليم جعل طرق التدريس التقليدية تتصف باختفاء عنصر التفاعل الحقيقي بين المعلم والمتعلم الا ماندر وذلك لكثرة الطلاب المتعلمين في غرفة الصف الواحدة.

ان عملية ادخال الحاسوب الى غرفة الصف تجعل الطالب محور العملية التعليمية وليس المعلم . فالحاسوب يستطيع ان يقدم المعلومات والخبرات الى المتعلم بشكل مستقل عن تدخل المعلم، كما انه يؤمن التفاعل المتبادل بين الطالب والمادة التعليمية مع ما يرافق ذلك من توفير خاصية التقويم الذاتي والفورى، بالاضافة الى ازالة عنصر الخوف او الرهبة من جانب الطالب وتوفير الفرص الكافية للمتعلم ليتقدم في عملية التعلم حسب قدراته وامكاناته الفطرية.

ويتوفر في الحاسوب المستخدم للتعليم مرونة وفرصا تعليمية لم يقدر عليها حتى المعلم. ان مرونة مزج الصوت بالصورة اثناء عملية التعليم مع عرض الاشكال اللازمة لتعزيز المفهوم مع جعل البرنامج يتقدم خطوة خطوة حسب قدرة الطالب مع مافيه من تفاعل مشترك بين المعلم والمتعلم هو موقف تعليمي مشوق ومثير ومملوء بالرغبة والحماس ، وهما من اهم عناصر نجاح عملية التعلم والتعليم.

وتعتمد عملية اعداد البرمجيات التعليمية بواسطة الحاسوب على نظرية العالم التربوى الشهير سكينر ( Skinner ) المبنية على مبدأ الاستجابة والتعزيز ( Response and Reinforcement )، حيث تركز هذه النظرية على اهمية الاستجابة المستحبة من المتعلم بتعزيز ايجابي من قبل المعلم او الحاسوب.

وتختلف مصادر اعداد ونشر البرمجيات التعليمية واكثر هذه المصادر انتشارا المؤسسات المنتجة لاجهزة الحاسبات الالكترونية ، ودور النشر الخاصة ، وبيوت متخصصة في البرمجيات ( Software Houses ).

## ٢٠ انماط البرمجيات التعليمية:

لاشك ان الحاسوب يمكن استخدامه وسيلة تعليمية لحل كثير من المشكلات التربوية ذات الاثار والابعاد المتعددة . واذا ما احسن استخدام الحاسوب في العملية التربوية، فحينئذ يمكن اعتباره الوسيلة الثانية لتفريد التعليم.

وحتى يحقق الحاسوب الاهداف التربوية المرجوه منه، لابد من اعداد برمجيات تعليمية ذات سوية تربوية عالية. ويمكن انتاج البرمجيات التعليمية في عدد من الاشكال او الانماط منها :-

(١) التعليم الخاص - Tutorial

(٢) التدريب من اجل المهارة - Drill and Practice

(٣) المحاكاة - Simulation

(٤) حل المشكلة - Problem Solving

(٥) الحوار السقراطي - Dialogue

(٦) الاستقصاء - Inquiry or Retrieval

(٧) الالعاب التعليمية - Gaming

(٨) التأهيل للاختبارات العامة - Certification for Testing

وسيتم توضيح بعض هذه الانماط

## ١. التعليم الخاص المتفاعل:- ( Tutorial Interactive Learning )

ويقدم من خلال هذا النوع من التعليم المواد التعليمية بشكل فقرات او صفحات من على شاشة العرض تدعي (Frames) متبوعة او ممزوجة باسئلة وبتغذية راجعة وبتعزيز يعتمد على نوع الاستجابة وبتفريع اذا لزم الامر، ويتميز هذا النوع من البرامج بكثرة المادة المعروضة المكونة من مفاهيم وعلاقات بين المفاهيم ، وامثلة ، وامثلة مضادة ، وغيرها . ويعتبر التفاعل بين المتعلم والجهاز العمود الفقرى لهذا النوع من التعليم .

ومن فؤائد التعليم الشخصي المتفاعل مايلي:-

١. انه يحقق اهداف التعليم الانفرادى
( Individualized Instruction)

٢. انه يقدم المادة التعليمية في شكل خطوات منفصلة.

٣. يعطى الطالب الفرصة الكافية لتعلم اية فكرة والتمكن منها قبل الانتقال الى فكرة اخرى.

٤. يقوم الطالب بالتعلم بالسرعة التي تتناسب مع قدراته هو وبذلك يتنافس مع نفسه.

٥. تعرض المادة بشكل منظم ومقنن.

وهناك سيئة لا بد من التحذير منها وهي ان المادة المبرمجة بواسطة الكمبيوتر اذا لم يكن قد احسن اعدادها وفق معايير معينة فقد تنقلب الى مجرد عرض لصفحات مادة الكتاب على شاشة الكمبيوتر مع فقدان عنصر التفاعل.

## ٢. التدريب لاكتساب المهارة ( Drill And Practice )

يتضمن هذا النوع من البرامج التعليمية بواسطة الكمبيوتر نمطا مميزا من التفاعل بين الطالب والكمبيوتر بحيث يستجيب الطالب الى الكمبيوتر بشكل سريع ثم يعطي الكمبيوتر بشكل سريع ثم يعطي الكمبيوتر تعزيزا في شكل تأكيد لصحة اجابة الطالب كتغذية راجعة واذا ما اخطأ الطالب عند استجابته للكمبيوتر فعندئذ اما ان يعطى الطالب فرصة اخرى

او اكثر لتصحيح الاجابة او يحدث نوعا من التفريع من اجل مراجعة مادة ما للتمكن منها وفهمها قبل استمرار التدريب وذلك في ضوء نتيجة الطالب . ومن فوائد هذا النوع من المواد التعليمية المبرمجة بواسطة الكمبيوتر :-

(١) انه يثير الحماس والرغبة لدى الطالب.

(٢) يعطى الطالب الفرص الكافية للتدريب دون مراقبة احد.

(٣) يتكيف البرنامج في ضوء قدرة الطالب على التعلم بحيث يستمر في التدريب او يتفرع لمراجعة مادة ما حسب نتيجة استجابات الطالب.

(٤) يزود الطالب بنتيجة تحصيله اولاً باول.

## ٠٣ المحاكاة ( Simulation )

والمحاكاة في البرامج التعليمية بواسطة الكمبيوتر تمثل تكرارا لسلوك ظاهرة ما في الطبيعة بحيث يصعب او يستحيل تنفيذها في غرفة الصف او بشكل افرادى اما لخطورتها او استحالتها (كرسم مسار قنبلة تنطلق من مدفع بسرعة اولية معينة وتعمل زاوية ما مع الافق) او لارتفاع كلفة تنفيذها او لطول المدة اللازمة لمعرفة النتيجة.

ولهذا النوع من البرامج التعليمية فوائد كثيرة من حيث اثاره اهتمام الطلاب والوقوف على كثير من مشاكل الحياة الاجتماعية ، كما تشجع عنصر البحث وتمثيل الادوار لدى الطلاب.

## ٤. حل المشكلة ( Problem Solving ):-

" ان مهارات حل المشكلة يمكن تدريسها للطلاب كموضوع مستقل ( Hayes ١٩٨٧٦).

وفي تقييمه لواقع قضية حل المشكلة يستشهد ( Gagn'e، ١٩٨٠) باصوات قوية لبعض التربويين المشهورين بانه بغض النظر عن طبيعة منهاج المادة فان محور التربية المركزي هو تعليم الطلاب كيف يفكرون ، وكيف يستخدمون قواهم العقلية والمنطقية ليصبحوا افضل في حل المشكلة.

ويمكن استخدام الكمبيوتر في تنمية القدرات التالية التي تعتبر من اساسيات حل المشكلة :-

(١) المفاهيم والقوانين ( مهارات ذهنية) ،

(٢) وتنظيم المعارف اللغوية ،

(٣) وقوة الادراك والربط بين المتغيرات.

وهذه العناصر الثلاثة تساعد بالتأكيد على تهيئة الطلاب واعدادهم ليصبحوا مفكرين احسن، ومبدعين اكثر، وخلاقين افضل ومن ثم اكثر فاعلية في حل المشكلة.

٠٥ **الحوار** ( Dialogue Mode )

هناك برمجيات تعليمية تتسم بالمحاورة او الطريقة السقراطية حيث يعرض على الشاشة بعض الاسئلة التي تتطلب اجابات عليها من الطالب. فقد تقود الاجابات الى اسئلة اخرى مرتبطة بالاولى او تكون الاجابات في شكل اسئلة تتطلب اجابات متعددة من الحاسوب الذى بدوره يمكن ان يقود الطالب الى تغيير طريقته في الاستفسار او الحوار وهكذا.

٠٦ **الاستقصاء او استرجاج المعلومات** (Inquiry)

تؤمّن هذه البرمجيات للطالب معلومات قد يطلبها وتكون مخزنة في شكل قاعدة بيانات خاصة. فمثلا يمكن ان تكون البيانات عبارة عن قاموس يتكون من كلمات ومعانيها بحيث اذا ادخل الطالب الكلمة حصل على معناها اما في شكل تعريف لها او في شكل مرادف لها.

٠٧ **الالعاب التعليمية** ( Gaming)

هي نمط اخر تتصف بصفة الالعاب وتشتمل على منافسة بين لاعبين او اكثر يكون الحاسوب احدهما. وتعتمد برمجيات الالعاب على قوانين قابلة للتغيير خلال اللعبة وفي ضوء المعطيات والنتائج.

## ٠٣ استخدام البرمجيات التعليمية :

تبدأ عملية التعليم بالحاسوب بتحميل المادة التعليمية المبرمجة في ذاكرة الحاسوب والتي قد تكون مخزنة على اسطوانة ممغنطة مثلا ٠ ثم تبدأ عملية عرض تلك المادة على شاشة العرض للحاسوب في شكل صفحات او اطارات ( Frames ) ٠ وعادة لا ينتقل الطالب من اطار الى آخر حتى يحقق الهدف من تلك الصفحة او ذلك الاطار ٠

وعادة تبدأ العملية بعرض مقدمة للطالب قد تتضمن ترحيبا به وتطلب فيه ان يدخل اسمه مثلا ، كما تعرض امامه وصفا عاما لموضوع الدرس الذى سيتعلمه ٠ ثم يلي ذلك عرض لقائمة خيارات ( MENU ) بمحتويات تلك البرمجية التعليمية ليختار الطالب الدرس او الموضوع او الجزء الذى يريد ان يتعلمه ٠ فمثلا اذا كان المبحث الدراسي في التربية الاسلامية ، فقد تعرض على الشاشة الدروس التالية :-

(١) الصلاة (٢) الزكاة (٣) الحج

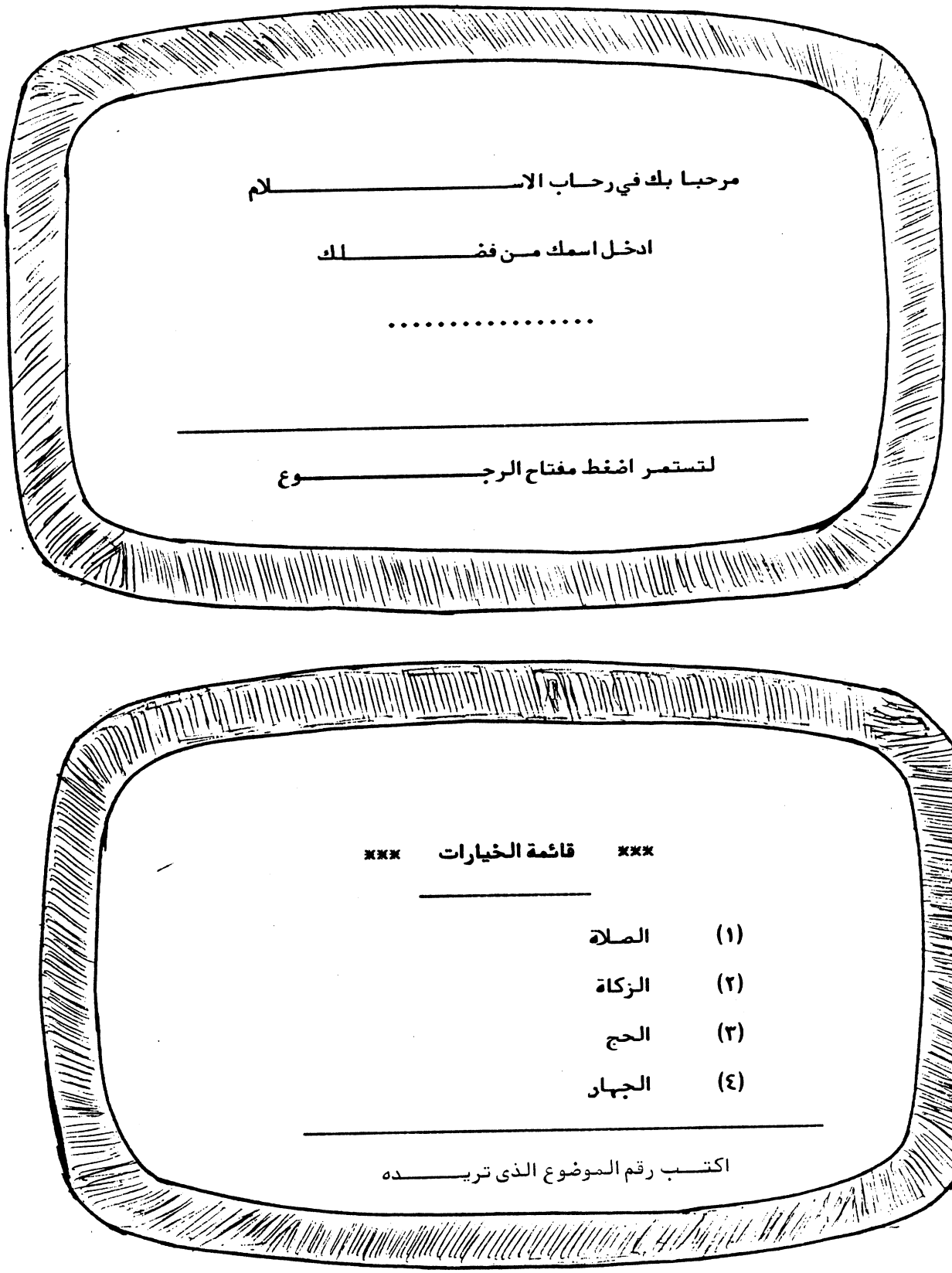
(٤) الجهاد

ويطلب من المتعلم ان يضغط على الرقم الواقع بجانب الموضوع المراد دراسته ٠

انظر شكل (٣ ـ ١ )

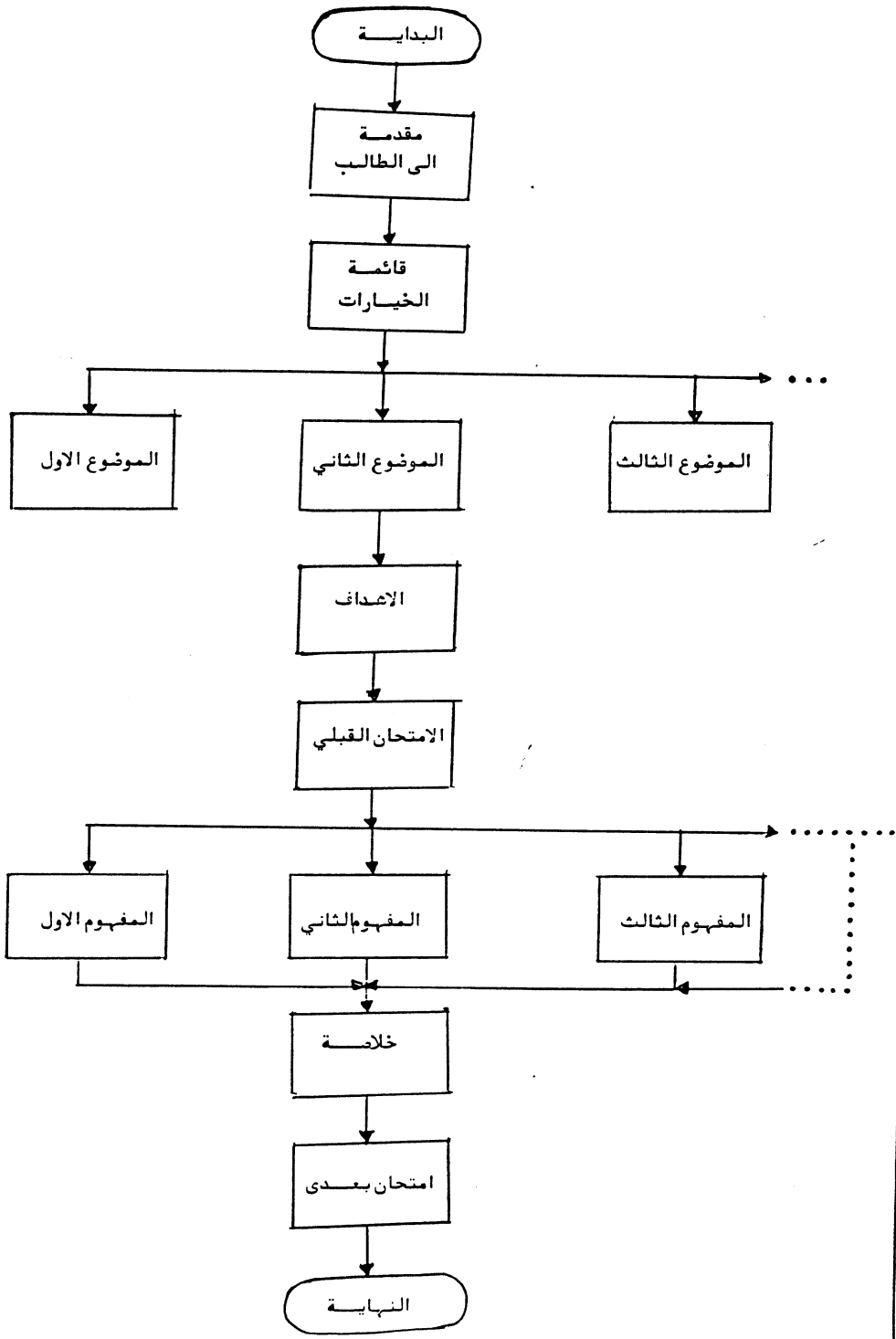
بعد ذلك يعرض امام الطالب قائمة بأهداف ذلك الدرس ، واذا تطلب الموقف التعليمي اجراء امتحان قبلي ( Pretest ) فسيقوم به الطالب وذلك للتأكد من ان لديه القدرة على تعلم ذلك الدرس الجديد ٠ واذا لم يحقق الطالب مستوى مقبولا في الامتحان القبلي فقد يطلب منه مراجعة متطلب ما لذلك الدرس ٠

ثم يستمر الطالب في استعراض المفاهيم والانشطة التي يتخللها التفاعل المتبادل القائم على الاستجابة والتعزيز حتى ينتهي من تلك الوحدة ، والتي قد تتبع بخلاصة لاهم ما ورد فيها من مفاهيم وكذلك قد تتبع باختبار بعدى ( Posttest ) ٠ انظر الشكل ( ٣ ـ ٢ ) ٠


مرحبا بك في رحاب الاسلام
ادخل اسمك من فضلك
.....
لتستمر اضغط مفتاح الرجوع
*** قائمة الخيارات ***
(١) الصلاة
(٢) الزكاة
(٣) الحج
(٤) الجهاد
اكتب رقم الموضوع الذى تريده

شكل ( ٣ ـ ١ )

مخطط لسير تنفيذ برنامج تعليمي بواسطة الحاسوب




الشكل ( ٣ ـ ٢ )

## (٣ - ٥) مراحل اعداد البرمجيات التعليمية

تمر عملية اعداد وتطوير البرمجيات التعليمية في عدد من المراحل هي :-

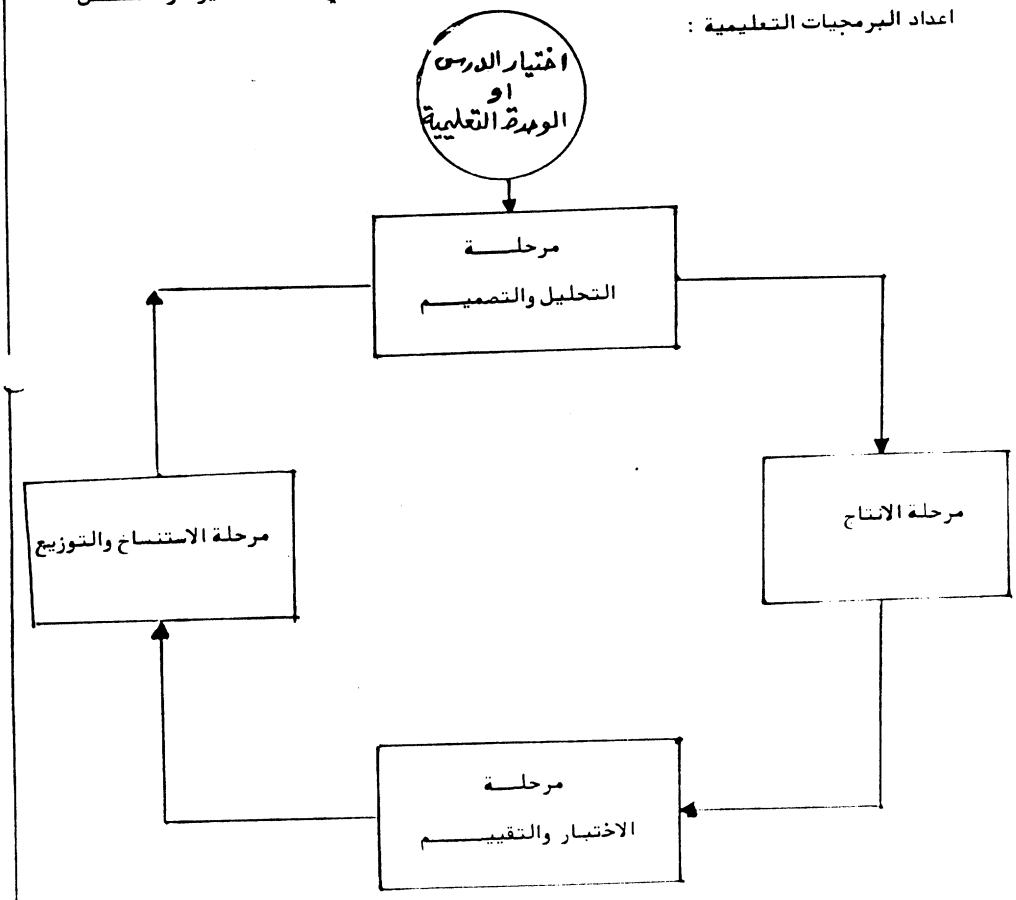
(١) مرحلة التحليل والتصميم

(٢) مرحلة الانتاج

(٣) مرحلة الاختبار والتقييم

(٤) مرحلة الاستنساخ والتوزيع والتنفيذ

وتتكون كل مرحلة من هذه المراحل من عدد من المراحل الجزئية ، كما ان كل مرحلة جزئية تتكون من عدد من الانشطة بحيث ان تكامل جميع هذه الانشطة يؤدى الى تكامل بناء البرمجية التعليمية . ويجب ان تخضع كل مرحلة اثناء عملية الاعداد الى معايير خاصة سيتم ذكرها في البند القادم المخصص لهذه الغاية . ويبين الشكل ( ٣ - ٣ ) التالي مخططا لسير مراحل اعداد البرمجيات التعليمية :




الشكل ( ٣-٣ )

## ٥. معايير انتاج البرمجيات التعليمية :

من السلبيات وجوانب الضعف التي توصف بها معظم البرمجيات التعليمية المتواجدة حاليا في الاسواق انها لم تخضع لمعايير مقبولة لانتاج مثل هذه البرمجيات ٠

وفيما يلي بعض المعايير الرئيسية التي يجب مراعاتها عند اعداد او برمجة المواد التعليمية بواسطة الحاسوب ٠

أ معايير تتعلق بالجوانب العامة التي يجب ان تشتمل عليها البرامج التعليمية بواسطة الحاسبوب ٠

ب معايير تتعلق بما يجب مراعاته في المحتوى عند اعداد البرمجيات التعليمية بواسطة الحاسوب ٠

### (٥ ـ ١) المعايير التي تتعلق بالخصائص العامة التي يجب ان يشتمل عليها البرنامج وكيفية عرضها :ـ

(١) وجود عنوان يتصدر البرنامج ٠

(٢) ملخص لما سيتعلمه الطالب في ذلك البرنامج ٠

(٣) قائمة بالاهداف السلوكية لذلك الدرس او تلك الوحدة ٠

(٤) القدرات والمتطلبات اللازم معرفتها مسبقا لتعلم ذلك الدرس ٠

(٥) استعراض التعليمات العامة التي سينفذها الطالب بوضوح ٠

(٦) وجود قائمة خيارات ( MENU ) ٠

(٧) اختبار قبلي ( Pretest ) اذا لزم الامر لاتخاذ قرار ما ٠

(٨) ان يتقبل البرنامج الاسم الشخصي للطالب لتكون المخاطبة فيما بعد شخصية ٠

(٩) خلاصات ومراجعات ورؤوس اقلام لتساعد الطالب على تنظيم الافكار الرئيسية للوحدة ٠

(١٠) اجراء اختبار بعدى ( Posttest ) لمعرفة مدى تحقيق الاهداف بحيث يعطي النسبة المئوية لتحصيل الطالب ٠

## (٥ - ٢) المعايير التي تتعلق بمحتوى المادة عند اعداد البرمجيات التعليمية

(١) مراعاة الخبرات السابقة لفئات الطلاب المستهدفة ( Target Population ) التي تلزم لبناء الدرس الجديد عليها .

(٢) مراجعة المفاهيم والافكار والقواعد والعلاقات التي تعتبر كمتطلب للدرس الجديد .

(٣) ان يسبق كل بند او جزء او وحدة صغيرة متكاملة من المادة عنوان جزئي ( Subtitle ) لتعريفها .

(٤) ان تكون المادة والمعلومات دقيقة وصحيحة وخالية من الاخطاء .

(٥) ان يكون مستوى الكلمات والتعابير وتركيب الجمل والامثلة والمضادة ضمن مستوى الفئات المستهدفة للطلاب .

(٦) ان يشتمل البرنامج على مستويات مختلفة من المادة لتراعي الفروق الفردية للطلاب المستهدفين حتى يتمكن الاذكياء منهم من التفرع الى المستوى الاصعب لارضاء رغباتهم .

(٧) ان يحتوى البرنامج على تقييم ذاتي لكل تقدم يقوم به الطالب .

(٨) ان تعرض المادة في " لهجة " صداقة وليونة وحنان .

(٩) الاكثار من فرص التدريب والتفاعل حيثما امكن .

(١٠) جعل التلميذ في حالة استنفار مستمر للنشاط .

(١١) ان يكون المدى المتوقع لاجابات الطلاب واسعا .

(١٢) ان يكون هناك تعزيز مناسب لجميع اجابات الطالب .

(١٣) ان يعطى التعزيز للطالب حالما انتهى من الاجابة .

(١٤) اذا اخطأ الطالب في الاجابة فيفضل اعطاؤه اشارة او تلميحا نحو الاجابة الصحيحة .

(١٥) اذا اخطأ الطالب في آخر محاولة اعطيت له فيجب اعطاؤه الاجابة الصحيحة .

(١٦) يجب ان يتحكم الطالب في سرعة العرض وان يتعلم حسب قدراته .

(١٧) يجب ان يكون الطالب متحكما في البرنامج وليس البرنامج متحكما في الطالب .

(١٨) يجب ان يعالج الامتحان البعدى ( Posttest ) المفاهيم الاساسية ، والمهارات ، ومجموعة المعارف المشمولة في الاهداف ٠

(١٩) ان يكون الطالب قادرا على تصحيح الاخطاء عند كتابة الاجابات قبل ضغط مفتاح الرجوع ٠

(٢٠) يجب ان لا يسبب ضغط مفتاح بشكل عشوائي توقف البرنامج ٠

(٢١) ان تمر المادة في مراحل متعاقبة من الاختبار والتقييم حتى تصبح مقننة قبل توزيعها على المدارس ٠

UNIT TITLE:_____

SCRN. No.( 1 )

اطار رقم ( ١ )

YOU ARE WELCOME TO AN ENGLISH LESSON

THIS LESSON IS ABOUT UNIT 6, TAKEN FROM YOUR

OXFORD SECONDARY ENGLISH COURSE, JORDAN

BOOK ONE

TYPE YOUR PERSONAL NAME, PLEASE:

TO CONTINUE PRESS 'RETURN'. TO QUIT PRESS'ESCAPE'

SCRN. No. ( 2 )

اطار رقم ( ٢ )

OBJECTIVES

1. To improve students' English language by practicing new different structures.
2. To enrich their stock of vocabulary by knowing and using new words.
3. To create positive attitudes among students such as helping injured people.

TO CONTINUE PRESS 'RETURN'. TO QUIT PRESS 'ESCAPE'

UNIT TITLE: _____

SCRN. No. ( 3 )

اطار رقم ( ٣ )

## MENU

1. FRAME-1
2. FRAME-2
3. FRAME-3
4. FRAME-4
5. FRAME-5

6. MEANING OF WORDS
7. SENTENCE COMPLETION BY SUITABLE WORDS
8. SENTENCE COMPLETION BY SUITABLE SENTENCES OR PHRASES
9. GRAMMAR

Ø. ESCAPE

TYPE THE NUMBER YOU WANT; THAT IS:
1, 2, 3, 4, 5, 6, 7, 8, 9, Ø

SCRN. No. ( 4 )

اطار رقم ( ٤ )

PART ONE

FRAME 1

John Robertson is a doctor who works in a hospital in one of the big industrial cities of the Midlands. He is married to a young woman called Mary, who when they first met, was working in the same hospital as a nurse. But that was seven years ago, and now she spends all her time looking after their house and their two children: Palma & Simon.

TO CONTINUE PRESS 'RETURN'. TO QUIT PRESS 'ESCAPE'

UNIT TITLE: _____

SCRN. No. ( 5 ) اطار رقم ( ٥ )

FRAME 2

Dr. Robertson works very hard in the hospital, but on his free days he does not like to sit at home doing nothing. He is fond of fishing, especially as this takes him out into the country, away from the fumes, and the dirt of the city. He is never happier than when he is driving with his family through the green countryside, leaving houses, offices, and factories behind him.

TO CONTINUE PRESS 'RETURN'. TO QUIT PRESS 'ESCAPE'

SCRN. No. ( 6 ) اطار رقم ( ٦ )

FRAME 3

One September week-end the Robertson family went to Scotland and stayed at a small village near a river. Dr. Robertson caught a fine salmon and several trout; while he was fishing, his wife and the children were picking black-berries. When it was time for them to return home, they had picked about five kilos of fruit.

TO CONTINUE PRESS 'RETURN'. TO QUIT PRESS 'ESCAPE'

UNIT TITLE: _____

SCRN. No. ( 7 ) اطار رقم ( ٧ )

FRAME 4

They got into the car and started on their return journey at about 3 O'clock in the afternoon. They were all feeling tired but happy, and they were looking forward to eating the fish and the blackberries when they got home. Soon they were travelling down a beautiful motorway the M6 in the north of England. While they were going along ~~they were listening to a programme of pop music.~~ The speed limit on the motorway was 70 miles an hour, but ~~he noticed that a great many cars were exceeding this limit, and even some of the big lorries were travelling at about 70~~ miles an hour.

TO CONTINUE PRESS 'RETURN'. TO QUIT PRESS 'ESCAPE'

SCRN. No. ( 8 ) اطار رقم ( ٨ )

FRAME 5

On the radio the music stopped and the announcer said, 'Now here is a warning for traffic on the M6. Patches of thick fog are forming on stretches of this motorway between junctions 18 and 20, motorists are advised to drive with great care. Even though there is bright sunshine over most of the road, they may suddenly find themselves in one of these patches of fog. Reduce your speed Now if you are travelling between junctions 18 and 20 on the M6!'

TO CONTINUE PRESS 'RETURN'. TO QUIT PRESS 'ESCAPE'

الإطار

UNIT TITLE: _____

SCRN. No. ( 9 ) اطار رقم ( ٩ )

INSTRUCTIONS FOR QUESTIONS 1 TO 4

In each of the following questions, a sentence will be given. You will be asked about the meaning of a word in that sentence. Four answers will be listed where there is one correct answer only. Type the number of the correct answer.

TO CONTINUE PRESS 'RETURN'. TO QUIT PRESS 'ESCAPE'

SCRN. No. ( 10 ) اطار رقم ( ١٠ )

QUESTION 1:

... They were all feeling tired but happy, and they were Looking forward to eating the fish and the black-berries when they got home.

to Look forward to means:

1. 1. To Look through a window
2. To take care of
3. To expect Something nice to happen
4. To Look after Somebody.

TO CONTINUE PRESS 'RETURN'. TO QUIT PRESS 'ESCAPE'

الاول

UNIT TITLE: _____

SCRN. No. ( 11 )

اطار رقم ( ١١ )

QUESTION 2

... The speed limit on the motorway was 70 miles an hour, but he noticed that a great many cars were exceeding this limit.

To exceed means:

1. To go slower than
2. ~~To go faster than~~
3. To go back
4. To decrease

TO CONTINUE PRESS 'RETURN'. TO QUIT PRESS 'ESCAPE'

SCRN. No. ( 12 )

اطار رقم ( ١٢ )

QUESTION 3

... On the radio the music stopped and the announcer said, 'Now here is a warning for traffic on the M6 road. ...

An announcer means:

1. A person who drives a lorry.
2. A person who sells gasoline.
3. A person who takes care of roads.
4. A person who introduces programmes and reads news on the radio.

TO CONTINUE PRESS 'RETURN'. TO QUIT PRESS 'ESCAPE'

UNIT TITLE: _____

SCRN. No. ( 13 ) اطار رقم ( ١٣ )

QUESTION 4

... Patches of thick fog are forming on stretches of this motorway between junctions 18 and 20.

A junction means:

1. A place where two roads (or railways) join.
2. A hole in the ground.
3. An area of fog.
4. A piece of metal.

TO CONTINUE PRESS 'RETURN'. TO QUIT PRESS 'ESCAPE'

SCRN. No. ( 14 ) اطار رقم ( ١٤ )

INSTRUCTIONS FOR QUESTIONS 5 TO 9

Use the following words to complete the sentences in questions 5 to 9 by typing the number of the most suitable word:

1. forward 2. hard 3. after 4. stop 5. pop
6. terrible 7. bright 8. patches 9. limit

QUESTION 5

Who looks ... your children when you goto work?

الأصل

UNIT TITLE: _____

SCRN. No. ( 15 )

اطار رقم ( ١٥ )

(نفس التعليمات في اطار ١٤)

QUESTION 6 :

You are driving too fast; you shouldn't exceed the speed ... .

SCRN. No. ( 16 )

اطار رقم ( ١٦ )

(نفس التعليمات في اطار ١٤)

QUESTION 7

I Look ... to visiting London next month.

UNIT TITLE: _____

SCRN. No. ( 17 )

اطار رقم ( ١٧ )

( نفس التعليمات في اطار ١٤ )

In order to pass the examination you must work ... .

SCRN. No. ( 18 )

اطار رقم ( ١٨ )

( نفس التعليمات في اطار ١٤ )

Fog ... are likely to form during the evening.

UNIT TITLE: _____

SCRN. No. (19)

اطار رقم (19)

INSTRUCTIONS FOR QUESTIONS 10-13:

Type the number of the correct answer which completes the sentence in the following question:

QUESTION 10

On his free days Dr. Robertson

1. Likes to sit at home doing nothing.
2. Works very hard at the hospital.
3. likes driving into the country and going fishing

SCRN. No. (20)

اطار رقم (20)

INSTRUCTIONS FOR QUESTIONS 10-13

Type the number of the correct answer which completes the sentence in the following question:

QUESTION 11:

The speed limit on the M6 was 70 miles an hour, but:

1. many cars were exceeding this limit.
2. only big lorries were exceeding this limit.
3. Dr. Robertson was exceeding this limit.

UNIT TITLE: _____

SCRN. No. (  )  اطار رقم (  )

SCRN. No. (  )  اطار رقم (  )

UNIT TITLE: _____

SCRN. No. (  )  اطار رقم (  )

SCRN. No. (  )  اطار رقم (  )