DOCUMENT RESUME

ED 117 363   CE 005 986

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TITLE   Arriving at Individualization and Personalization: A
                    Set of Elements.
PUB DATE   Nov 75
NOTE   27p.; For related bibliography, see CE 005 987

EDRS PRICE   MF-$0.83 HC-$2.06 Plus Postage
DESCRIPTORS   Educational Counseling; Educational Facilities;
                    Educational Philosophy; Educational Planning;
                    *Educational Programs; *Individualized Instruction;
                    *Individualized Programs; *Program Content; Program
                    Design; Program Development; Students; Teacher Role;
                    Teachers; *Teaching Methods

ABSTRACT
            Individualized and personalized (I and P) programs
place learners at the center of all the activity. The eight main
elements of such programs are: philosophical and taxonomic
considerations; instructors as resource persons and learning
managers; peer tutoring, personal and academic counseling, and
cognitive style maps of students; instruction employing such
techniques as pre- and posttesting, computerized data banking,
individual diagnosis, and designed instructional mediation; financial
prioritization; inservice training for administrators and educators,
and individualized student orientation; open architecture of physical
facilities; computerized management information and evaluation
systems; and accountability and planning models. The development of
the elements of the I and P program is a dynamic process. Since the
computer, a full range of mediation, and paraprofessionals can
adequately dispense information, instructors are able to become
designers and managers of learning, prescribers of instructional
material, and interpreters of evaluation data. Instructors are able
to select a proper mix of a large variety of elements and tools for
each individual student. Educational technology thus does not replace
instructors; it merely frees them to humanize the educational
process. (Half the document consists of explanatory notes of
terminology used in the text.) (JR)

ARRIVING AT INDIVIDUALIZATION & PERSONALIZATION:

A SET OF ELEMENTS

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November 1975

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The author describes a set of elements that he considers essential for any program claiming to be individualized and personalized. These elements are based on his experiences in the implementation and management of innovative individualized and personalized education programs in the Continuing Education Division, Canadore College, North Bay.

Introduction to the Process of Individualization and Personalization

A variety of rapid changes has recently taken place in education. Many of these changes focus on the way we meet the needs of each student and respond to individual differences, or what is commonly labelled "individualization and personalization," (also referred to as I and P).

Most educators do not find such changes unpalatable, but developing procedures, techniques, and policies to make these changes is a much more demanding task than most envisage.

What is "individualization and personalization" and how does it differ from the traditional approach to education and specifically instruction? An individualized and personalized program is one that places the learner at the centre of all the activity. Lister Sinclair, said:

> "A tide of youth is rising, a generation, waiting, counting on us. They arrived at a decisive moment in human history. They must learn more, learn better and learn faster than ever before. They are faced with a sea of information that modern life

demands. They must master it or drown.
Much of what they are now being taught
is obsolete and much of what they will
need to know has not yet been discovered.
They must continue to learn until the
end of their days.

In a scientific and technological age,
education is the key to strength. A
nation which does not value trained
intelligence is doomed. The 'beep beep'
of a Russian satellite in 1957 sounded
the alarm challenging American self-
assurance, questioning the teaching of
science and techniques. Sputnik, that
ominous visual aid, appeared like a new
star in the sky of educational tradition.
The whole science of schooling was put in
doubt. What is teaching? What is learning?
Appeals were made to psychology, to
cybernetics, the great foundations poured
money into experiments which are still
being discussed. All the results are
not in, but the copernican revolution in
education begun in the 17th century is
underway to put the learner, rather than
the teacher at the centre of the educational
process."[1]

Today many colleges are attempting to place a new emphasis on

the learner by implementing an individualized and personalized

approach to instruction.

Individualization & Personalization as a Process Consisting of Many Elements

Is a program individualized and personalized if we

have large, open areas full of sophisticated hardware? or if

we declare it an "open program" with classrooms? Let me state

[1]By permission of Lister Sinclair, Vice Pres., Program Policy
and Development, Canadian Broadcasting Corporation, 1975.

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categorically that these programs are not based simply upon
open rooms and the sophistication and quantity of the hard-
ware. These are but two elements in the individualized and
personalized process of education programs. Too many
educational administrators today have an architectural
concept of I & P which often results either in the failure
of or dissatisfaction with the rest of the process. Successful
I & P education programs are based on the eclectic selection
and integrated implementation of a great many elements in the
I & P process. If an element is missing, problems will be
encountered and we will be tempted to "throw the baby out with
the bathwater."

Main Elements of the Individualization and Personalization Process

Most fully individualized and personalized
education programs contain a large proportion
of the following elements which comprise an
instructional systems technology.[1]

A. PHILOSOPHICAL & TAXONOMIC CONSIDERATIONS

(a) An orientation to I & P that blends educational
technology and educational humanism.

(b) A confluent (behavioristic/humanistic) orientation
to the cognitive and affective domains.

(c) Objectives that adhere to a confluent learning
approach; i.e., the affective or emotional should
not be ignored at the expense of the cognitive or
content objectives.

(d) Objectives to be written with attention to the
various taxonomies and taxonomic levels.

B. INSTRUCTORS

(a) Instructors in I & P programs are used as resource persons and learning managers. They organize the elements (of the set) to help the student achieve the agreed upon objectives of his or her educational program. Presenting information is no longer a major function of instructors.

(b) Instructors in individualized and personalized programs have more time to spend with each student, and are able to work with more students than is the case in traditional programs.

(c) Individualization and personalization includes a large number of elements and tools. An effective instructor creates an individualized process that is intellectually honest by selecting the proper mix for each individual student.

(d) Paraprofessionals are used in individualized and personalized programs to assist the instructors and students. They can perform a variety of tasks that can be specified and arranged in a hierarchy demonstrating different performance levels.

C. STUDENTS

 (a) I & P programs allow for student inputs in design and evaluation.

 (b) Peer tutoring is a program element; peer tutors should be paid for their service.

 (c) Personal and academic counselling is available to all students with regard to their individual needs. Counsellors must have faculty involvement with regard to learning problems. Faculty and counsellors utilize cognitive style mapping as one tool in the learning process.

A cognitive style map is a picture of the way a student derives meaning from his environment and personal experience. It identifies the modes (e.g., listening and reading) in which a student can master an educational task most readily, thereby contributing to efficient management of instructional resources. Further information is available on cognitive style mapping under "note 6".

D. INSTRUCTION

 (a) Individual diagnosis of learning problems.

 (b) Pre-tests and post-tests.

 (c) Prescriptions for each student after pre-testing and diagnosis of need.

 (d) Criterion-referenced measurement system.[2]

 (e) Content sequenced from the lowest to highest across levels.

 (f) Social and material reinforcement for learning.

 (g) Behavioral objectives.

 (h) The use of the generic objective:[3] This is a content free, standardized form of a behavioral objective.

 (i) Computerized data banking of objectives, test items and resources. Data banking necessitates a content classification system.

 (j) Mediate[4] instruction by design rather than by chance. This is achieved through the educational sciences and specifically cognitive style mapping.[5+6]

E. FINANCIAL

 (a) Financial priorities are determined to achieve the innovative educational objectives of the school.

F. COUNSELLING, TRAINING & ORIENTATION

(a) Behavior therapy (test desensitization, etc.)

(b) Counsellors in a partnership with students, faculty, paraprofessionals and administrators. The goal is learning and the solution of learning problems.

(c) In-service training for administrators, counsellors, faculty, and paraprofessionals.

(d) Individualized student orientation to the new methods and processes.

(e) An extensive individualized professional development program, supervised by an educational development officer, available to all campus personnel.

G. PHYSICAL FACILITIES

(a) An open architecture or the innovative use of traditional space.

(b) Priorities established to acquire the necessary hardware or equipment usually required in individualized and personalized programs. This hardware must be available in sufficient quantities for the new methodologies.

(c) An extensive variety of software either purchased, developed, or adapted to meet the instructional objectives.

H. MANAGEMENT INFORMATION, EVALUATION SYSTEMS, ACCOUNTABILITY AND PLANNING

(a) A computer-managed information system to be established to complete as much routine work as possible. Computer managed instruction (CMI) implies a sophisticated, flexible system. This can be distinguished from computer assisted instruction (CAI) which is one instructional delivery mode. The objective of CMI is to have a total management information system delivering accurate information at the appropriate time to the educational users who must make critical decisions, ie., administrators, faculty, paraprofessionals, counsellors and students.

(b) A computerized sophisticated evaluation system to be adopted or developed. The system should have the following major capabilities:

i economize testing through the use of sampling techniques;

ii provide pre-test and post-test data;

iii provide information on student achievement by objectives, student achievement by manager, total group achievement, achievement by time and content area;

iv provide curriculum analysis and validation assisted by the computer;

v measure retention over time;

vi use curriculum embedded tests to monitor achievement;

vii allow for greater student management of learning;

viii furnish formative as well as summative evaluation
data for curriculum revision;

ix be computer managed for maximum efficiency in
evaluating large numbers of students.[7]

(c) Accountability models should be used and all members of
the educational organization should be held accountable
for student learning outcomes. Administrators should not
hold persons responsible for outcomes over which they
have no control. The use of accountability models assumes
that all the elements of individualization and personalization
necessary to achievement have been provided.

(d) A planning method must be used to solve complex problems
resulting from the interrelationship of individualization
and personalization elements. Anasynthesis, the process of
analysis, synthesis, modeling and simulation, is a form
of systems analysis and an excellent method for educators.[8]

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DISCUSSION

<u>Elements - Use, Misuse & Results</u>: I have listed the main elements to demonstrate that a fully individualized and personalized education program is not just an open classroom or a sheet of rote-memory-level behavioral objectives. Most of the criticism I hear about the systems approach to instruction or I & P programs is levelled at the misuse of that system. Before we can criticize the worth of an I & P program we must be sure that we are criticizing a process that includes most if not all, the elements necessary to its success in a given learning environment. In short, we must be sure we are criticizing a process that has <u>enough elements</u> to be termed individualized and personalized. An education program cannot be fully individualized and personalized in a week or two by a "declaration of individualization."

Instructional systems technology is a new field and innovations are being made constantly. The development of the set of elements listed in this paper is a dynamic rather than a static process. Using these elements, instructors and students achieve substantially better results and now have the means to measure much of what actually takes place. Before programs are individualized and personalized through the use of an instructional systems approach, results usually can't be measured.

Instructors in an I & P program have more time with each student, and in most cases are able to work with many more students than in traditional programs.

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Humanizing or Dehumanizing:

Despite some criticism, I & P programs are <u>not dehumanizing</u>.

However, if there is a pretence of individualization and

personalization, if only a few elements are used, learning can

be dehumanized. After the students, instructors are the most

important aspect in an I & P program. In such programs they

are released from many of the "non-human" tasks and can better

use their professional judgment in their new role as <u>managers</u>

<u>of learning</u>, and concentrate on the humanizing aspects of

education.

The Instructor as Manager of Instruction

The instructor is a manager who arranges the elements of the set

in an organized manner to help the student achieve the agreed

upon objectives of the student's education program. Success means

that there is a match between the objectives of the student's

program and the student's learning outcomes.

The elements of I & P place the instructor in the role of

designer and manager of learning rather than as the provider and

dispenser of information. Much of this last function is fulfilled

by the computer, a full range of mediation, and paraprofessionals.

The instructor is the professional resource person, the diagnostician,

the prescriber of instructional material, the interpreter of

evaluation data; in short, the humanizer of the educational process.

When many persons first individualize and personalize, they spend

more time diagnosing and testing than actually helping students learn.

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Sampling technique should be used to reduce testing in I & P programs. Sometimes educators are tempted to interfere too much in the learning process when interference is not necessary. There is often a reluctance to permit students to manage even a portion of their own learning. Curriculum-embedded tests are viewed with suspicion because their role is not understood. Sampling techniques are neglected in education -- those very techniques business schools promote so that industry does not place the product's cost beyond the consumer's reach.

It is my opinion that we have a tendency to produce reams of mediation without considering that we often mediate by chance. Granted, behavioral objective and criterion-referenced measurement can help students to learn by design rather than by chance, but we forget that we are mediating by chance.

A common misconception of I & P states that educational technology in such programs replaces the instructor. This is definitely not the case. Instructors may find themselves in a new role as managers of learning rather than as presenters of information. The educational sciences emphasize that some students learn best by lectures, consequently lectures and competent lecturers are an important component in an I & P learning program.

Selecting the Proper Mix of Elements for each Student

I & P is composed of a large number of elements and tools. The effective instructor is a manager who can select the proper mix for each individual student. An individualized process that is intellectually honest is simply one in which the managers use all of the available tools and select the proper mix for each student.

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When I taught International Marketing at university, I was
very involved with a concept called "The Marketing Mix." This
concept required the student to consider all the elements of
marketing and select the proper mix of elements to solve a
specific marketing problem. I submit that there is a set of
elements in I & P and it is from that set that we must select
the proper mix for each student.

Having outlined the problems of creating a fully individualized
and personalized process, I don't want to discourage you. You
can begin . . . gradually! I may mention that no one has the
"perfect" package. Most attempts at I & P are eclectic and
involve simply plain hard work. First, you can begin by writing
objectives and progress to higher and higher levels of sophistication
(don't forget that today a great deal of material can be obtained
commercially). This should save you a great deal of time and
money in the long run.

CONCLUSION

In closing, it is my sincere hope, that my experiences will stimulate
you to implement an I & P educational program. I hope you will
participate actively in attempting to solve the many problems
that still exist in the implementation and management of I & P
programs.

NOTES

1   INSTRUCTIONAL SYSTEMS TECHNOLOGY

This is a systematic way of designing, carrying out, and
evaluating the total process of learning and teaching in
terms of specific objectives, based on research in human
learning and communication, employing a combination of
human and non-human resources to bring about more effective
instruction.[1]

[1] "Six Characteristics in Search of a Profession, An
Intellectual Technique" Howard B. Hitchens Jr.
Audiovisual Instruction November 1971, pp. 101-102

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2. MEASUREMENT

There are two approaches to measurement in education programs:

- Norm-referenced measurement is used to identify an
individual's performance in relation to the performance
of others on the same measure.

- Norm-referenced measures are devised to facilitate
comparisons among individuals.

- Criterion-referenced measurement is used to identify
an individual's status with respect to an established
standard of performance. The individual is compared
with some established criterion rather than other
individuals[1]

Criterion-Referenced Reliability: For norm-referenced measures
the classical concepts of reliability apply, but for criterion-
referenced measures they are inappropriate. If, after instruction,
everyone scores perfectly on a test that reflects accurately the
instructional objectives, the test need not be faulted if it
produced no variability, hence a zero reliability co-efficient.[2]

Content Validity: Criterion-referenced measures are validated
primarily in terms of the adequacy with which they represent
the criterion. A carefully made judgment, based on the test's

[1]"Criterion-Referenced Measurement," W. James Popham, Editor,
Educational Technology Publication, (1971)

[2]Modern Measurement Methods from the Prentice-Hall Teacher
Competency Development System by W. James Popham & Eva L.
Baker, Copyright 1973. By permission of Prentice-Hall, Inc.,
Englewood Cliffs, New Jersey.

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apparent relevance to the behaviors delimited by the criterion is the best procedure for validating criterion-referenced measures. This judgment-based operation is referred to as content validity. The more precisely instructional objectives can be explicated, the more accurately judgments can be reached regarding a test's content validity.[3]

<u>Domain Referenced Achievement Testing</u>: Measurement specialists such as Wells Hively have devised techniques to increase the precision with which content validity can be determined.

For each measurably scaled instructional objective an "item form" is written delimiting the form of the test items which may legitimately be used to assess whether the objective has been achieved. In this sense, the domain of eligible test items has been defined and therefore this approach is called "Domain Referenced Achievement Testing."[4]

<u>Item Sampling</u>: Both norm-referenced and criterion-referenced measures that are used to make decisions regarding individuals require the same test, or an equivalent form, be used with each individual. However, criterion-referenced tests used for evaluating instructional programs need not be the same for everyone. The concept of item sampling (sometimes referred to

[3]Ibid., p. 13

[4]Modern Measurement Methods from the Prentice-Hall Teacher Competency Development System by W. James Popham & Eva L. Baker, Copyright 1973. By permission of Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

as matrix sampling) in which different people complete
different items, thereby permitting the sampling of more
behavior with shorter tests, is highly appropriate for
evaluating instructional sequences.[5]

Formative Evaluation: is an instructional sequence evaluated
to improve the sequence itself.

Summative Evaluation: is the worth of a completed instructional
sequence appraised (in comparison with competing sequences).[6]

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[5]Ibid., p. 16.

[6]Current Conceptions of Educational Evaluation from the
Prentice-Hall Teacher Competency Development System by
W. James Popham & Eva L. Baker, Copyright 1973. By
permission of Prentice-Hall, Inc., Englewood Cliffs,
New Jersey.

3   GENERIC OBJECTIVE: The "generic objective" (GO) is a
standardized format for a behaviourally-oriented objective
that is both specific and general.   It is specific in that it
describes the type of stimulus to be given, states how the
stimulus will be presented and limits the student response
to a particular behaviour.   It is general in that it does not
cite the specific stimulus material or content to be used.
If the objective in any course (including skill) can be
expressed behaviourally, it can be formulated as a generic
objective.[1 & 2]

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[1] O'Reilly, Robert, Gorth, William & Pinsky, Paul. Comprehensive
Achievement Monitoring. Amherst, Massachusetts: University of
Massachusetts, School of Education.

[2] Further information on the application of Comprehensive
Achievement Monitoring at Canadore College Continuing
Education Division is available from Paul J. Dudgeon,
Dean, Continuing Education.

4   <u>MEDIATE</u>:   To mediate is to make available a variety of
instructional delivery modes or communication vehicles for
each instructional objective.   A fully mediated program
would be based upon:

> 1.   The use of hardware such as audio recorders
>   and playback units, computers, video-cassette
>   recording and playback units, overhead
>   transparency and filmstrip production
>   equipment.
>
> 2.   The use of print and non-print software such
>   as audio cassettes containing course material,
>   computer programs and CAI programs, video-
>   cassettes containing course material,
>   transparencies and filmstrips containing
>   course material and textbooks.
>
> 3.   The availability and use of a variety of
>   presentation formats for each objective such
>   as lecture, seminar, lecture-discussion,
>   independent study, tutorial and programmed
>   instruction.

<u>Mediation</u>:   Mediation is a complex subject and mediation of
instruction by design can be understood best by a study of
the Educational Sciences and Cognitive Style Mapping.
Mediation of instruction by design means choosing the optimum
mix of communication vehicles so each student receives
instruction according to their individual cognitive style.[1]

[1]Dudgeon, Paul J. Dean, Continuing Education Division, Canadore
College, North Bay, Ontario.

5. THE EDUCATIONAL SCIENCES

The seven educational sciences as defined by Dr. Joseph Hill are:

1. symbols and their meanings

2. cultural determinants of the meanings of symbols

3. modalities of inference

4. biochemical and electrophysiological aspects of memory

5. cognitive styles of individuals

6. teaching styles, administrative styles, and counselling styles

7. systemic analysis and decision making.[1]

In educational programs a knowledge of the educational sciences is essential if we wish to individualize and personalize. The educational sciences stress that a knowledge of administrator, faculty, counsellor and student styles ensures that mediation will occur by design. This approach enables educators to take a success-oriented approach to avoid failing students and wasting their time due to a lack of sophisticated style information that can be provided through an analysis of cognitive style. The vehicle for cognitive style analysis is a computer produced cognitive style map derived from test results.[2]

[1] The Educational Sciences, Dr. Joseph Hill, President, Oakland Community College, Bloomfield Hills, Michigan.

[2] Paul J. Dudgeon, Dean, Continuing Education Division, Canadore College, North Bay, Ontario.

6   <u>COGNITIVE STYLE MAPPING</u>: A cognitive style map is a
picture of the way a student derives meaning from his
environment and personal experience. · Each map, like each
student, is unique and different. A student's cognitive,
style is determined by the way he takes notice of his total
surroundings: how he seeks meaning, how he becomes informed.
Is he a listener or a reader? Is he concerned only with his
point of view or is he influenced in decision-making by his
family or group associates? Does he reason more like a.
mathematician or a social scientist?

A cognitive style map identifies the modes in which a student
can master an educational task most readily, thereby con-
tributing to the effective managment of instructional resources.
A cognitive style map provides the individual with the self-
knowledge essential to pursuing realistic career goals. Since
cognitive style is not immutable, it can be augmented. ·Missing
strengths required for a specific occupation can be built up
on a student's existing strengths. Using the individual's
cognitive style map and subjective information gathered in
private conversation, a team of instructors with the student
develop a personalized education program geared to the student's
strengths and weaknesses – a program that is a personal
educational prescription and will promote success. A computer
may be used to expedite the process.[1]

[1]Further information about the educational sciences and their
use in education can be obtained from:

    (a) Dr. Joseph Hill, President, Oakland Community College,
       Bloomfield Hills, Michigan,

    (b) Paul J. Dudgeon, Dean, Continuing Education, Canadore
       College, North Bay, Ontario.

7   CANADORE COMPREHENSIVE ACHIEVEMENT MONITORING (CAM)

> The Canadore Continuing Education Division Comprehensive
> Achievement Monitoring (CAM) mathematics system fulfills
> all of the above requirements for both CMI and a
> computerized evaluation system. (Several papers on the
> Canadore CAM are available from Dean Paul Dudgeon at
> Canadore College.)

CAM provides an innovative, effective means of evaluating student

performances for a particular course of study, whether it is

conventional or experimental in nature.

The Canadore Math CAM provides:

1. a complete achievement profile for each student on a
   continuous basis.

2. information on any student's performance by objectives,
   by manager, and many concomitant variables, as well as
   total group achievement by time and content area.

3. the detection of learning, non-learning, forgetting
   and retention.

4. diminished testing jitters. Students find the CAM
   approach to evaluation refreshing - boredom and
   apathy are effectively countered.

5. a course structure which is not fixed or rigid.   The
   structure is open to manager preference.

6. continuous intake and exit. It is now possible to have
   any student start and stop at any point in the curriculum.

7. continuous feedback to administrators, managers and
   students.

8. formative and summative evaluation in a systematic fashion.

9. cost reduction. Costs associated with the retrieval of
   evaluation data have been reduced stubstantially
   through CAM's sampling technique.

10. an important tool for instructional decision-making.
    Decisions relating to re-teaching, omitting, condensing,
    adding to, digressing from, altering and re-forming
    instructional groups tasks and sequences can now be
    made on a sound basis.

11. computer-assisted curriculum analysis and validation.[1]

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[1]Dudgeon, Paul J. Learner at the Centre. A Project in the
Management of Instruction. Canadore College, Continuing
Education Division, North Bay, Ontario.

8. ANASYTHESIS

A system is defined as the structure or organization of an
orderly whole, clearly showing interrelations of the parts
to each other and to the whole itself.

The process of analysis, synthesis, modeling and simulation
is called anasynthesis.

- Analysis is performed on existing information to
  identify the problem, existing elements (e), and
  their interrelationships (i).

- Synthesis is performed to combine unrelated elements
  into a new whole.

- Models that can predict effectiveness before actual
  implementation of the system are constructed.

- Simulation is performed using these models to produce
  alternative solutions.

- A model is a conceptualization in the form of a
  mathematical (or other) equation, a physical device,
  a narrative consisting of words and/or symbols,
  or a graphic analog such as a flowchart.

- Models are constructed to represent real-life
  situations. The faithfulness of this representation
  is known as fidelity.

- The modeling to which anasynthesis refers is customarily
  flow-chart and mathematical models.

- Whenever possible, mathematical models are preferred.

Anasynthesis has discrete steps and is a definitive process. It
can be applied to all aspects of education and is not necessarily
limited to analyzing, synthesizing, modeling and simulating in
the curriculum development domain. In this sense, it is
characteristic of general systems theory which deals with a
set of rules common to all systems.

Anasynthesis is utilized to obtain solutions in complex systems.
When is a system complex? Complexity is simply a function of
the number of elements (e) and the number of interrelationships (i):

$$C = f(e, i)$$

In a flowchart model consisting of rectangles containing
descriptors and signal paths or arrows containing information,
as in figure 1, the rectangles are elements (e), and the
signal paths represent interrelationships (i). Thus, a
large system with many e and i will be more complex than a
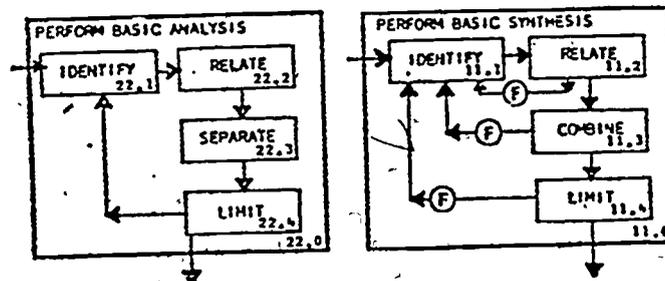small system having only a few e and i.[1,2]

Figure 1   Flowchart Model

[1]Silvern, Leonard C. Education and Training Consultants,
California

[2]For a detailed overview of Canadore's use of anasynthesis
see "An Instructional Systems Technology Model for Institutional
Change." ERIC ED 099 095.